



Evaluation of multi-annual and seasonal cash transfers to prevent acute malnutrition: the MAM'Out project

Audrey Tonguet-Papucci

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École doctorale n° 581
Agriculture, alimentation, biologie, environnement et santé (ABIES)

par

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**Evaluation of multi-annual and seasonal cash transfers to prevent
acute malnutrition: the MAM'Out project**

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ABBREVIATIONS

ABC	Activity Based Costing
ACF	Action Contre la Faim – Action Against Hunger
AIDS	Acquired Immune Deficiency Syndrome
BCC	Behavior Change Component
CI	Confidence Interval
CIOMS	Council for International Organizations of Medical Sciences
CMAM	Community Management of Acute Malnutrition
COREQ	Consolidated Criteria for Reporting Qualitative research
CT-OVC	Cash Transfer to Orphans and Vulnerable Children
DFID	Department for International Development
ECHO	European Commission
EER	Estimated Energy Requirements
FAO	Food and Agriculture Organization
FCFA	XOF - Francs Communauté Financière Africaine
FGD	Focus Group Discussion
GAM	Global Acute Malnutrition
GHI	Global Hunger Index
H/A	Height/length-for-Age
HEA	Household Economy Analysis
HIV/STD	Human Immunodeficiency Virus / Sexually Transmitted Disease
IFPRI	International Food Policy Research Institute
II	Individual Interview
LEWIE	Local Economy-Wide Impact Evaluation
MAM	Moderate Acute Malnutrition
MAM'Out	Moderate Acute Malnutrition Out
MCT	Multiannual and seasonal Cash Transfers
MSM	Multi-Source Method
MUAC	Mid-Upper Arm Circumference
NEEP	Nutrition Embedding Evaluation Program
NCA	Nutritional Causal Analysis
OR	Odd ratio
PATH	Name of an international health organization
PCA	Principal Component Analysis
RUSF	Ready-to-Use Supplementary Food

RUTF	Ready-to-Use Therapeutic Foods
SAM	Severe Acute Malnutrition
SCTS	Social Cash Transfer Scheme
SD	Standard Deviation
SES	Socio-Economic Status
SIM	Subscriber Identity Module
SMART	Standardized Monitoring and Assessment of Relief and Transitions
UCT	Unconditional Cash Transfer
UIN	Unique Identification Number
UNICEF	United Nations Children’s Fund
UNU	United Nations University
W/A	Weight-for-Age
W/H	Weight-for-Height/length
WHO	World Health Organization

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« Regarde chaque jour le monde comme si c'était la première fois. »

Eric Emmanuel Schmidt – *Oscar et la dame rose*

1.

CHAPTER 1: GENERAL INTRODUCTION

1. OUTLINE OF THE PHD THESIS

This PhD dissertation presents an evaluation of a cash transfer program designed to prevent childhood undernutrition, and more precisely acute malnutrition. In this purpose, this thesis is divided into 5 parts, as illustrated in Figure 1. **Chapter 1** introduces the context and background of the research, highlights the problem of childhood acute malnutrition and presents some of the available strategies to fight against this burden. **Chapter 2** is a critical literature review of unconditional cash transfers for the prevention of acute malnutrition. **Chapter 3** describes the aims of the research, the study area and details the MAM'Out study, a cluster randomized controlled trial to assess multiannual and seasonal cash transfers for the prevention of childhood wasting. **Chapter 4** displays some of the qualitative results of the research and focuses on beneficiaries' perception and use of the cash received in the framework of the project. The fourth part, consisting of **chapter 5** and **chapter 6**, contains some of the quantitative findings of the research. Chapter 5 looks at the effects of the cash transfer program on young children's diet and presents the results of 24h-recalls carried out within the MAM'Out study. Chapter 6 contains the main results of the research, namely the effects of multiannual seasonal cash transfers on children's morbidity and nutritional status. Finally, **chapter 7** is a general discussion of the findings presented in this PhD thesis. It highlights some of the public health implications of this study and formulates recommendations for future research.

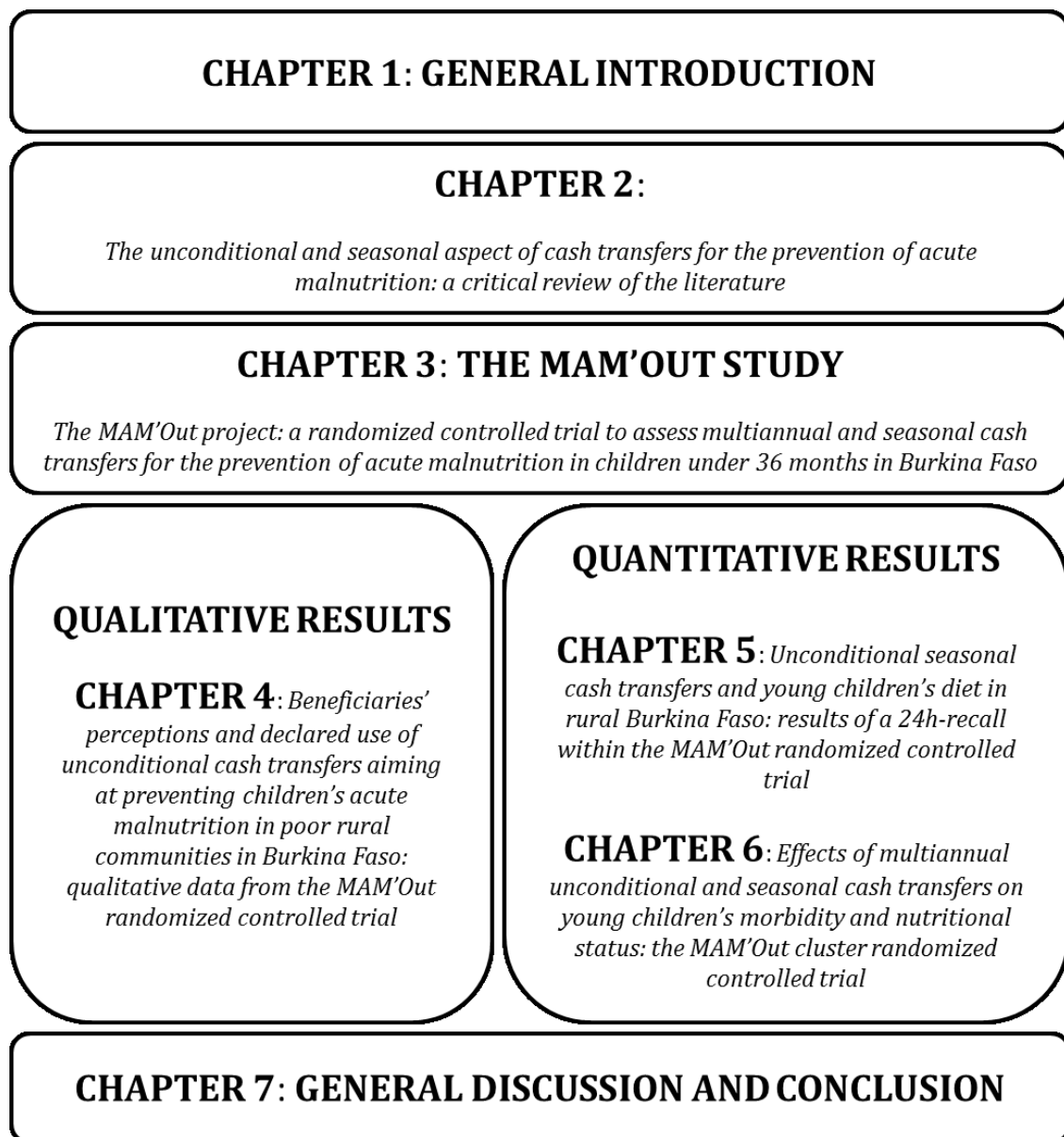


FIGURE 1: OUTLINE OF THE PHD THESIS

2. THE PROBLEM OF ACUTE MALNUTRITION

2.1. INTRODUCTION

In 2000, leaders of 189 countries gathered together and adopted the United Nations Millennium Declaration, presenting eight millennium development goals to achieve within 15 years. “Eradicate extreme poverty and hunger” and “reduce child mortality” were two of these targets (United Nations General Assembly, 2000). In 2015, the efforts done worldwide were assessed. Between 1990 and 2015, the number of people living in extreme poverty and the number of undernourished people decreased by half. The same trend was observed for under-5 mortality (United Nations, 2015). Although progresses have been impressive, millions of people still live

below the poverty line and suffer from food insecurity and hunger. In September 2015, another meeting with leaders from all around the world took place and resulted in seventeen sustainable development goals (United Nations Development Program, 2015b). Among them, “zero hunger” aims at fostering decrease in hunger and malnutrition rates particularly in children.

2.2. DEFINITIONS AND INDICATORS

One way of defining hunger is as an uncomfortable or painful feeling one's have when he wants food. Another dimension of hunger is considered when talking about world hunger. In that case, hunger relates to the fact of not having enough to eat in order to cover the body energetic requirements (United Nations World Food Program, 2016), estimated for each age group and sex in a joint report of the Food and Agriculture Organization (FAO), World Health Organization (WHO) and United Nations University (UNU) (Food and Agriculture Organization, World Health Organization, & United Nations University, 2001).

Malnutrition is usually used to describe an imbalanced nutrition. It is categorized into overnutrition and undernutrition. Overnutrition won't be developed here as it is of lesser interest for the present subject. Undernutrition is one consequence of hunger, that is to say of insufficient food intake, or results of an inadequate use by the human body of the eaten food due to illnesses (Action Contre la Faim, 2012). In this thesis, we are focusing on children's undernutrition, and more precisely on children under 5 years old.

Undernutrition is usually measured by weight-for-age (W/A), height/length-for-age (H/A) and weight-for-height/length (W/H) ratios, respectively corresponding to underweight, chronic malnutrition and acute malnutrition. Z-scores are used to classify the severity of the three above mentioned dimensions of undernutrition (World Health Organization, 2006):

- A ratio superior or equal to -2 standard deviation (SD) of the WHO Child Growth Standard Median represents a normal anthropometry;
- A ratio comprised between -2 and -3 SD of the WHO Child Growth Standard Median corresponds to a moderate type of undernutrition;
- A ratio strictly inferior to -3 SD of the WHO Child Growth Standard Median stands for a severe type of undernutrition.

Chronic malnutrition, also called stunting, results of a slow process over time and is characterized by growth retardation. Stunted children are generally shorter than they should be. Among acute malnutrition, three clinical forms are distinguished (IASC Global Nutrition Cluster, 2011a):

- Marasmus, or wasting, is characterized by a recent and severe weight loss corresponding to fat and muscles reduction. Children suffering from marasmus are emaciated (IASC Global Nutrition Cluster, 2011a). Wasting is the most common form of acute malnutrition. In addition to Z-scores, the mid-upper arm circumference (MUAC) is used to classify wasting in three categories: absence of wasting, moderate acute malnutrition (MAM) and severe acute malnutrition (SAM). A child is considered as suffering from MAM if his/her MUAC is comprised between 115 and 125 mm (Annan, Webb, & Brown, 2014). A MUAC inferior to 115 mm refers to SAM (World Health Organization & United Nations Children Funds, 2009).
- Kwashiorkor is defined by an important loss of muscle mass and the presence of bi-lateral edemas due to water retention. A child suffering from kwashiorkor has a swelled

body and may also have skin lesions. The presence of edema is a criteria to categorize kwashiorkor as SAM (IASC Global Nutrition Cluster, 2011a).

- Marasmic kwashiorkor corresponds to wasting with additional edemas. It is also a form of SAM (IASC Global Nutrition Cluster, 2011a).

Stunting and wasting have different prevalence according to the age in children under five years old. Generally, the prevalence of low weight-for-height shows a peak in the second year of life (World Health Organization, 2017), mostly around 12-15 months of age (Victora, de Onis, Hallal, Blossner, & Shrimpton, 2010). In parallel, the prevalence of low height-for-age starts to rise at about three months of age and slows down at around two to three years of age (Victora et al., 2010; World Health Organization, 2017).

Global acute malnutrition (GAM) rate is one possible measure of the nutritional status of a population. It is the sum of MAM and SAM rates (Center of research of Epidemiology of Disasters, 2016). In this thesis, a particular emphasis is put on acute malnutrition, and especially on wasting.

2.3. CAUSES OF UNDERNUTRITION

The causes of acute malnutrition, and more globally of undernutrition, are multiple. In 1990, UNICEF developed a conceptual framework and categorized these causes into three levels: basic, underlying and immediate causes (UNICEF, 1990). Ever since, this framework has been used worldwide and endorsed by the humanitarian community. Figure 2 is an adaptation of this framework in the 2008 Lancet Series on Maternal and Child Nutrition (Black, Allen, Bhutta, Caulfield, de Onis, Ezzati, Mathers, & Rivera, 2008).

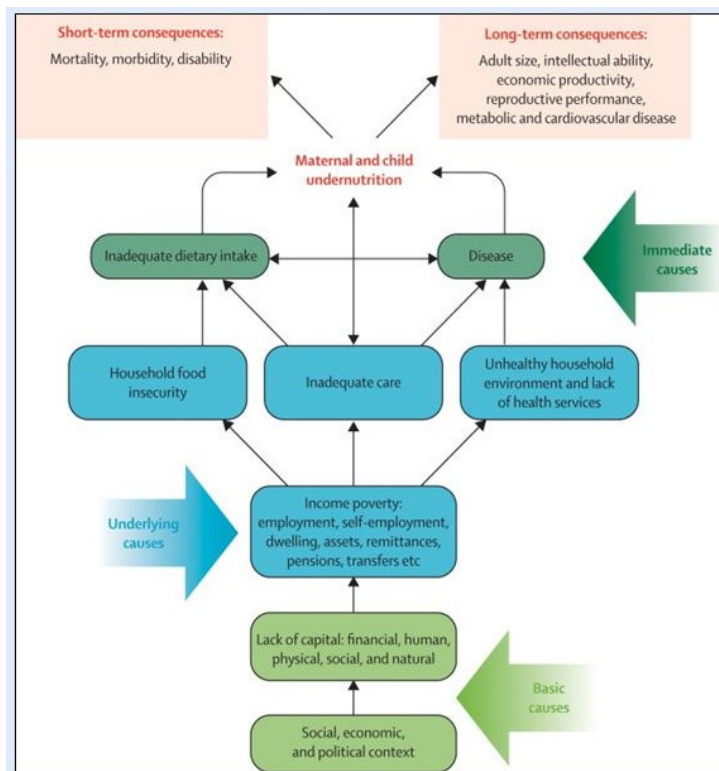


FIGURE 2: CONCEPTUAL FRAMEWORK OF THE CAUSES OF UNDERNUTRITION AND ITS CONSEQUENCES (FROM BLACK AND AL. 2008)

Two factors are considered as immediate causes of undernutrition: inadequate dietary intake and disease. A child has an inadequate dietary intake when the quantity and/or the quality of food he/she eats don't correspond to the needs. In terms of quantity, a child may eat less than required for his/her optimal development. The composition of breastmilk and the adequacy of food given to the child with regards to his/her age, especially at food diversification time, are crucial for an adequate food quality. A child may become undernourished if the diet is not balanced or food insufficient. Disease is the second direct cause of undernutrition and forms with this latter a vicious circle (IASC Global Nutrition Cluster, 2011b; Katona & Katona-Apte, 2008; Tomkins & Watson, 1989). Indeed, a child facing illness needs more energy and selected macronutrients and micronutrients to fight infections. As such an adequate energetic intake is required. As far as macronutrients are concerned, protein intake plays a central role to answer an increased need in some particular amino acids (Biolo, Antonione, & De Cicco, 2007; Wijnands, Castermans, Hommen, Meesters, & Poeze, 2015). However, disease usually reduces appetite or sometimes even the ability to eat, leading to inadequate food intake and undernutrition. As a result, muscles and organs don't receive the necessary energy or molecules for their satisfactory growth and functioning. In parallel, malabsorption of essentials micronutrients may occur especially when intestinal infections appear. Successive intestinal infections in young children lead to chronic intestinal dysfunction, ultimately leading to undernutrition (Guerrant, Oria, Moore, Oria, & Lima, 2008; Prentice et al., 2008). The whole situation results in increased vulnerability to infections and new episodes of disease. The vicious circle begins again. The most frequent illnesses associated with undernutrition are diarrhea, measles, malaria, acute respiratory infections, intestinal parasites and acquired immune deficiency syndrome (AIDS) (IASC Global Nutrition Cluster, 2011b; Tomkins & Watson, 1989).

Among the underlying causes of undernutrition, poverty has a central role (Black, Allen, Bhutta, Caulfield, de Onis, Ezzati, Mathers, & Rivera, 2008). Poverty is not only a lack of revenue, but also takes into account the available assets and land of the households. Poverty often results in household food insecurity, inadequate care and unhealthy environment, the three key underlying causes of undernutrition.

Food security exists "when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life." (Food and Agriculture Organization, 1996) It embraces four dimensions: food availability, access, utilization and stability (J. L. Leroy, Ruel, Frongillo, Harris, & Ballard, 2015). Food availability refers to the presence of food in markets or in household's stock, from the family's own production. In this regard, agricultural and livestock farming practices have a major role in the quantity and quality of available food within the household. Food access is conditioned upon having enough resources (generally cash) to get appropriate foods for a nutritious diet (Food and Agriculture Organization, 2006). Food use is the adequate utilization of food based on knowledge of nutrition, care, water and sanitation. How the meal is prepared and cooked is particularly important for the quality of micronutrients in the food. Food stability refers to the stability of the three above mentioned dimensions over time. Household food insecurity is due to the absence of one or several of these dimensions and is responsible for an inadequate dietary intake. Positive associations were shown between food security and children's anthropometry (Abdurahman, Mirzaei, Dorosty, Rahimiforoushani, & Kedir, 2016; Saha et al., 2009).

The second major underlying cause of undernutrition is inadequate care. "Care is the provision [...] of time, attention, and support to meet the physical, mental, and social needs of the growing child and other household members." (Patrice L. Engle, Menon, & Haddad, 1997) Proper

caregiving practices include exclusive breastfeeding during the first six months of life of the baby, a step-by-step food diversification and the child stimulation, all playing a major role in the child's nutritional status (Bentley, Wasser, & Creed-Kanashiro, 2011; Lamichhane et al., 2016; Scherbaum & Srour, 2016). Adequate care requires that the caregiver has sufficient time to dedicate to her/his child, but also that she/he has the possibility to take decision regarding child's care. The concept of care also refers to mother and child's mental health and psychosocial well-being, two important determinants of their nutritional status (Hadley, Tessema, & Muluneh, 2012; Surkan, Kennedy, Hurley, & Black, 2011).

The last underlying cause of undernutrition is unhealthy household environment and lack of health services. An healthy environment can be defined as an environment "with clean air, clean water, safe food, and minimal exposure to harmful chemicals" (World Health Organization & United Nations Environment Programme, 2010) This notion encompasses all actions allowing for the reduction of environmental contaminants for the families, such as adequate hygiene, proper sanitation and water related equipment, bed nets, etc. Having a healthy environment for the whole family is one key factor helping to prevent the spread of illnesses, particularly diarrhea, while access to water of good quality is essential to prevent child's undernutrition (Checkley et al., 2004; Esrey, 1996; Sharghi, Kamran, & Faridan, 2011). The presence of functional and quality health services is a prerequisite to treat and cure illnesses, including acute malnutrition. Access and utilization of health centers have to be feasible for both preventive and curative care.

The basic causes of undernutrition take roots at the country level. The state's social, political, ideological and economic contexts play a critical role on the type of resources available (IASC Global Nutrition Cluster, 2011b). The available natural resources and their monitoring at the global level are key determinants of the country's wealth. The way the state handles revenues, taxes assets, food and merchandises and the country's level of corruption also has a direct impact on the country's economy and the redistribution of resources to the population. For example, social protection policy directly depends on the available state's budget, on the will of leaders to implement such policies and the country's capacity to handle them. Developing and maintaining decent national infrastructures such as public schools, roads and health centers are prerequisites to low rates of undernutrition. Indeed, roads of good quality allow for markets supply and efficient redistribution of food within the country; school permits caregiver's education; and functional health centers are essential to provide adequate care to patients. Besides, politics implemented at country level determine the extent of people's liberties and the rights of the most vulnerable. In this respect, women's rights and freedom can directly be linked to maternal and child health, as well as religious and racial discrimination. Instable political contexts, civil violence or internal displacement of population can also be cited as basic causes of undernutrition. From a social point of view, population customs and habits in terms of feeding and care practices play a major role on child nutrition.

Next to the causes described in Figure 2, three transversal aspects can be cited as modulators. First, individual factors, such as genetic predispositions, may modulate the resistance a child has to undernutrition (Ahmed, Haque, Shamsir Ahmed, Petri, & Cravioto, 2009). Secondly, seasonality may differently affects the above mentioned causes, exacerbating vulnerabilities during some key periods of the year and leading to peaks of undernutrition, and more particularly acute malnutrition (Hillbruner & Egan, 2008; Kinyoki et al., 2016). Children's morbidities are largely impacted by seasonal variations in temperature and rainfalls. During the rainy season, access to good quality water is reduced and the number of water-related diseases increases. In the meantime, some localities are cut from the rest of the countries because of floods, closing the access to health centers or markets. As far as food security is concerned, availability of food is lessened before the harvest period. Time dedicated to care practices also

varies with the caregiver's workload, often depending on the agricultural work (Morwenna Sullivan, 2013). Finally, climate change is also known to intensify hunger and undernutrition, particularly through food insecurity (Food and Agriculture Organization, 2016; Phalkey, Aranda-Jan, Marx, Hofle, & Sauerborn, 2015; World Food Program & Met Office, 2012). Indeed, climate is known to have a crucial importance in food crop productivity. Recurrent floods or droughts negatively affect the soil quality and its hydrological balance, leading to reduced agricultural productivity.

2.4. IMPORTANCE OF THE PHENOMENON AT THE INTERNATIONAL LEVEL

Although important progresses have been made since two decades in reducing the burden of childhood undernutrition (Black, Victora, Walker, Bhutta, Christian, de Onis, Ezzati, Grantham-McGregor, Katz, Martorell, Uauy, Bhutta, et al., 2013; Food and Agriculture Organization, International Fund for Agricultural development, & World Food Program, 2015), it remains a public health issue at the international level. Ten years ago, the International Food Policy Research Institute (IFPRI) created the global hunger index (GHI) as a broad measure of hunger in the world and by regions. This index combines four indicators, three focusing on children under 5 years old and one reporting on the global population: undernourishment (or insufficient caloric intake) of the population, child stunting, child wasting and child mortality. The 2015 GHI founds 52 countries with serious or alarming states of hunger. Among them, sub-Saharan countries and South Asian states were the worst in terms of hunger (International Food Policy Research Institute, Concern Worldwide, & Welthungerhilfe, 2015). In absolute numbers, 795 million people were reported as undernourished in 2014-2016 by FAO (Food and Agriculture Organization et al., 2015). This represents one person out of nine in the world. This proportion gets worse in Sub-Saharan Africa, where almost one out of four people was undernourished in 2014-16 (Food and Agriculture Organization et al., 2015).

95 million of under 5 years-old children living in developing countries were categorized as underweight in 2014. This corresponds to one child out of seven living in less developed regions or 16% (World Health Organization, 2016a). The highest prevalence of child underweight were found in Southern Asia (28%) and Western Africa (21%) (Food and Agriculture Organization et al., 2015; World Health Organization, 2016a). Data from 2011 published in the 2013 Lancet Series on Maternal and Child Nutrition estimated that 165 million children aged under 5 years old were stunted, most of them also living in South Asia and Sub-Saharan Africa (Black, Victora, Walker, Bhutta, Christian, de Onis, Ezzati, Grantham-McGregor, Katz, Martorell, Uauy, Bhutta, et al., 2013). In 2015, this number slightly decreased to reach 156 million: nearly one child out of four was stunted (World Health Organization, 2016b).

In 2011, 52 million of under 5 years-old children were suffering from wasting according to the above mentioned Lancet Series (Black, Victora, Walker, Bhutta, Christian, de Onis, Ezzati, Grantham-McGregor, Katz, Martorell, Uauy, Bhutta, et al., 2013). In 2015, this number was reduced to 50 million, representing 7% of all children of this age group worldwide (World Health Organization, 2016b). Figure 3 presents the prevalence of wasting for children aged less than 5 years old, according to the latest available data. Countries of South-Eastern Asia, Sub-Saharan Africa and East Africa are the more affected by under 5 child wasting.

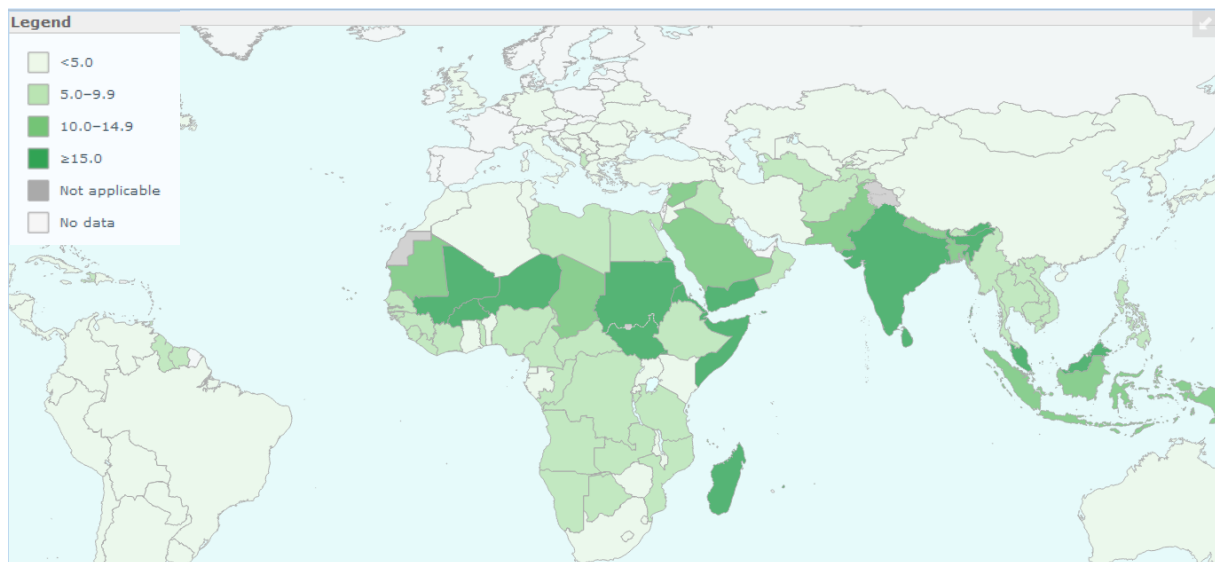


FIGURE 3: PREVALENCE OF WASTING IN UNDER 5 YEARS-OLD CHILDREN (DATA FROM LATEST AVAILABLE YEAR). MAP FROM THE WHO GLOBAL HEALTH OBSERVATORY; DATA ACCESSED ON JUNE 14TH, 2016

2.5. CONSEQUENCES OF UNDERNUTRITION

As shown in Figure 2, two types of consequences of suboptimal energetic or nutrient intake can be distinguished: the short-term complications and the long-term ones, corresponding roughly to diseases and developmental delays.

The short-term consequences of acute malnutrition, and more globally of undernutrition, are morbidity, disability and mortality (Black, Allen, Bhutta, Caulfield, de Onis, Ezzati, Mathers, & Rivera, 2008). Indeed, a child suffering from acute malnutrition, or undernutrition, has a weaker immune system compared to his/her well-nourished peer. This low immunity makes him/her more sensitive to infections, such as diarrhea, measles, malaria and tuberculosis (Katona & Katona-Apte, 2008; U. E. Schaible & S. H. Kaufmann, 2007). Ultimately, this may lead to mortality. A study from 1994 evaluated the risk of dying according to the severity of undernutrition: a severely malnourished child was 8 times more likely to die compared to a non-malnourished child (Pelletier, Frongillo, Schroeder, & Habicht, 1994). At the beginning of the year 2000, Caulfield assessed the risk of dying from a low weight-for-age by cause of death in ten cohort studies. More than 50% of all child deaths were due to low underweight. If a child died because of diarrhea, this percentage increased to nearly 61% (Caulfield, de Onis, Blossner, & Black, 2004). In 2006, the World Bank estimated that undernutrition is associated with almost 60% of all child mortality. Mildly underweight children also faced twice the risk of dying compared to children with adequate nutritional status (The World Bank, 2006). Nowadays, 45% of all deaths among under 5-years old children, or 3.1 million deaths annually, are attributable or caused by nutritional disorders, namely wasting, stunting, vitamin A and zinc deficiencies, fetal growth restriction and inadequate breastfeeding (Black, Victora, Walker, Bhutta, Christian, de Onis, Ezzati, Grantham-McGregor, Katz, Martorell, Uauy, Bhutta, et al., 2013; World Health Organization, 2016a).

The long-term consequences of undernutrition are numerous, from metabolic and cardiovascular diseases to reduced adult size, intellectual ability, reproductive performance and economic productivity (Black, Allen, Bhutta, Caulfield, de Onis, Ezzati, Mathers, & Rivera, 2008;

Victora et al., 2008). Among physiological consequences, childhood undernutrition was shown to increase the risk of visceral fat accumulation, insulin resistance, hypertension and diabetes in adulthood (Vinicius J. B. Martins et al., 2011).

Undernutrition, and especially stunting, negatively affects physical, motor and cognitive development. Positive associations were demonstrated between preschool nutritional status and adolescent's/adult's height (Alderman, Hoddinott, & Kinsey, 2003; Victora et al., 2008). At the cognitive level, children suffering from undernutrition show less attention in schools, may have memory deficiencies, delayed language development and reduced learning capacities. A child has less capacity to focus when he/she is hungry. Various studies have shown that undernourished children while young had worst results on tests of cognitive function or intellectual quotient (The World Bank, 2006). Better height-for-age Z-score during early childhood was also linked with more grades attained at school (Alderman et al., 2003). Reduced learning capacities at school and cognitive performances have undoubtedly negative effects on work and earnings once adult (The World Bank, 2006; Vinicius J. B. Martins et al., 2011). In Zimbabwe, having 0.7 less grade of schooling were associated with a 12% reduction in lifetime earnings (Alderman et al., 2003). The economic cost of undernutrition are huge, not only in terms of individual earnings, but also at the national level: undernutrition is responsible for a 2 to 3% lost in a country gross domestic product (The World Bank, 2006).

Most importantly, undernutrition is an intergenerational problem. Indeed, when looking at chronic malnutrition, stunting in young girls results in stunted adolescent girls, with all the above mentioned consequences, and favors complications during pregnancy, often resulting in low birth weight babies. These babies, once submitted to inadequate care, household environment and food intake, become undernourished children, adolescents and adults, and the vicious circle begins once again (Benson T & M., 2006).

2.6. TREATMENT VERSUS PREVENTION OF ACUTE MALNUTRITION

Child undernutrition is a public health issue and has important consequences in terms of morbidity, mortality and physical and cognitive development. Actions are thus needed to reduce the burden of childhood undernutrition. To date, two complementary solutions exist: treatment and prevention of undernutrition. Although chronic and acute malnutrition often coexist in the same areas, there are notable divergences in programs addressing these two types of undernutrition (Bergeron & Castleman, 2012). This paragraph will only focus on acute malnutrition.

In 2012, the WHO issued technical guidelines for the management of MAM via supplementary foods (World Health Organization, 2012). At that time, supplementary feeding was considered for the treatment of MAM, but key guidance was missing regarding the duration of the intervention, the quantity of complementary food to be given, etc. In 2014, the Global Nutrition Cluster MAM Task Force produced a decision tool for the prevention and treatment of MAM in emergencies and clarified some aspects (Global Nutrition Cluster MAM Task Force, 2014). Targeted supplementary feeding programs should be implemented for the management of MAM while blanket supplementary programs are intended to prevent MAM. Various types of products can be considered when implementing supplementary feeding programs: ready-to-use supplementary food (RUSF) or fortified blended food for the treatment of MAM in children 6-59 months old and lipid based nutrient supplements (LNS) or fortified blended food (but in different quantities) for the prevention of MAM.

Very clear guidance exists for the management of SAM. Children suffering from SAM are intended to benefit from therapeutic care delivered via the community management of acute malnutrition (CMAM). In this approach, community health workers play an essential role in the detection and referral of SAM children and allow reaching more patients. Uncomplicated SAM are treated in outpatient care, while inpatient care is provided for children with complications or children below 6 months of age. Ready-to-use therapeutic foods (RUTF) are given as treatment for children with appetite (Bhutta et al., 2013; World Health Organization, 2013b).

Although treatments of acute malnutrition have proven their efficacy (Bhutta et al., 2013), one must keep in mind that the treatment impact is reduced if underlying causes of acute malnutrition are not addressed. Moreover, even if the CMAM approach helped reducing the cost compared to in-patient care for all children (Puett et al., 2013), acute malnutrition treatment remain expensive and the provision of therapeutic products mainly relies on external funding (Greiner, 2014; ICF International, 2014; Webb et al., 2011). Shortage of RUTF is common in developing countries, leading to non-treatment of acutely malnourished children. Moreover, there is evidence that preventive strategies can be more efficient than curative ones in the reduction of child wasting (Ruel et al., 2008). In this regard, prevention strategies should be considered when implementing programs aiming at reducing the burden of child acute malnutrition.

3. EXISTING INTERVENTIONS TO PREVENT ACUTE MALNUTRITION

Actions aiming at preventing child undernutrition are the most efficient if implemented during a specific timeframe, beginning during pregnancy and ending at the child's two years of age. This period is called the "window of opportunity" or "1000 days" (Black, Victora, Walker, Bhutta, Christian, de Onis, Ezzati, Grantham-McGregor, Katz, Martorell, Uauy, Bhutta, et al., 2013; Bryce, Coitinho, Darnton-Hill, Pelletier, & Pinstrup-Andersen, 2008). Strategies intending to prevent children acute malnutrition have to tackle its causes. In this respect, a distinction was made in the 2013 Lancet Series on maternal and child nutrition between two types of preventive approaches: the nutrition specific actions, focusing on the immediate causes of undernutrition in order to have a direct impact on children's nutritional status (Bhutta et al., 2013), and the nutrition sensitive actions addressing the underlying causes of undernutrition (Ruel & Alderman, 2013).

Nutrition specific interventions are mainly designed to tackle one of the two direct causes of acute malnutrition: inadequate dietary intake. When aiming at preventing children's undernutrition, young children and pregnant women are the two main targets of this kind of approaches. Bhutta and al. listed and reviewed major promising nutrition specific actions (Bhutta et al., 2013). Their impact on the prevention of children acute malnutrition varies according to the type of intervention implemented. Interventions targeting pregnant women's nutritional status, such as iron or folic acid supplementation and multiple micronutrient supplementations, have high potential to prevent low-birth weight babies (Bhutta et al., 2013), but their impact on acute malnutrition is unclear. Promotion of exclusive breastfeeding during the first six months of life and continuous breastfeeding until two years of age is a prerequisite in developing countries to ensure adequate nutritional intake in infants. However, its long-term effect on children's nutritional status is imprecise (Bhutta et al., 2013). Simple and multiple micronutrient supplementations via micronutrient powder, fortified food or special food such as ready-to-use supplementary food (RUSF) are part of the food based strategies. Globally, information regarding the impact of vitamin A, iron or zinc supplementation on wasting is missing, and multiple micronutrient supplementations didn't have an effect on wasting (Bhutta

et al., 2013). Complementary feeding promotion (process introducing food in the child's diet when breastmilk is no longer sufficient to cover the nutritional needs of infants (Pan American Health Organization & World Health Organization, 2004)) was often shown to have positive effect on weight, height, weight-for-age Z-score and height-for-age Z-score in food insecure populations (Bhutta et al., 2013; Guldán et al., 2000; Penny et al., 2005; Zaman, Ashraf, & Martines, 2008), but data on wasting is still missing. Mixed findings were also found regarding the impact of supplementary feeding on children's nutritional status, including community-based supplementary feeding (Sguassero, de Onis, Bonotti, & Carroli, 2012), ready-to-use food to prevent child wasting (Defourny et al., 2009; Grellety et al., 2012; Huybregts et al., 2012) and lipid-base nutrient supplement (Lanou et al., 2014; Leisel Talley et al., 2012). Nutrition specific actions have thus proven to have high potential to prevent childhood chronic undernutrition (Bhutta et al., 2013), but when specifically looking at wasting, results are inconsistent.

Nutrition sensitive actions are designed to address the underlying causes of undernutrition, among which poverty, food insecurity, inadequate care practices, lack of access to health care and unhealthy environment. Four main preventive approaches were assessed in the last Lancet Series on Maternal and Child Nutrition: schooling, early child development, agriculture and social safety nets (Ruel & Alderman, 2013). While parental schooling was shown to be positively linked to child nutrition outcomes, the effects of early child development associated with nutrition specific interventions on child nutritional status are promising but less clear (Ruel & Alderman, 2013). As the impact of both approaches on child wasting seems small, they won't be detailed further there.

Among nutrition sensitive agricultural programs, home gardening, biofortification, livestock and cash cropping can be cited. Except for vitamin A biofortified sweet potatoes, their effects on children's nutritional status still need to be proven via rigorous evaluations (Ruel & Alderman, 2013). Indeed, one literature review and one systematic review found little evidence of the impact of agricultural actions on the prevalence of stunting, wasting and underweight in children less than 5 years old (Berti, Krasevec, & FitzGerald, 2004; Masset, Haddad, Cornelius, & Isaza-Castro, 2012). However, the available trends are encouraging. Homestead food production is usually associated with an increase in food diversity in poor populations as well as an augmentation of the consumption of protein rich food (A.Talukder et al., 2010; Masset et al., 2012).

Last but not least, social safety nets, understood as programs providing income or in-kind transfers to vulnerable people, are nowadays more and more used by humanitarian and development agencies and reach a billion poor people or victims of shocks. Their design can vary greatly from one food aid policy to another, ranging from direct food distribution to cash transfers (Banerjee, 2016). They were identified as having an important potential to prevent child undernutrition through their impact on food security, adequate dietary behaviour and women's empowerment (Ruel & Alderman, 2013). Among social safety nets, cash based interventions are the most commonly used and can remove financial barriers of access to health care and nutritious food (Bhutta et al., 2013).

4. CASH TRANSFERS TO PREVENT ACUTE MALNUTRITION

4.1. DEFINITIONS

Cash based interventions, or cash transfer programs, can be defined as the provision of cash to individuals or households in needs. This cash can take various forms: money or vouchers (The Cash Learning Partnership, 2016), as presented in Figure 4. Vouchers are tickets that can be exchanged for a fixed amount of money and/or predefined commodities or services. In this thesis, we will only focus on cash transfers programs where money is distributed.

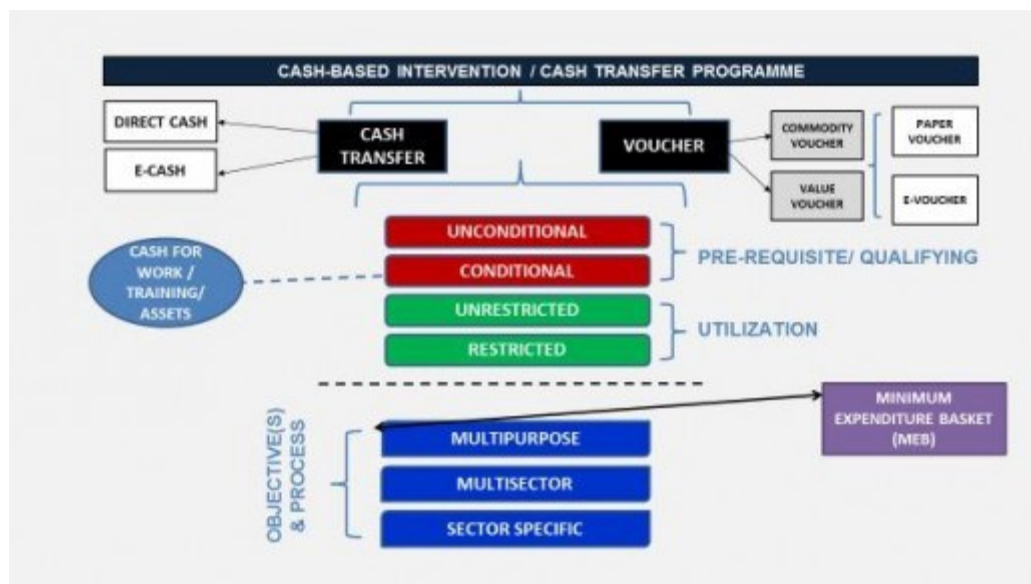


FIGURE 4: THE VARIOUS FORMS OF CASH-BASED INTERVENTIONS (FROM THE CASH LEARNING PARTNERSHIP, 2016)

Different modalities can be associated with the subvention. The subvention can be restricted or unrestricted. In the first case, beneficiaries must use the received cash to access specific predetermined goods or services. In case of unrestricted subvention, beneficiaries are free to use the money received as they wish. Transfers can also be conditional or unconditional. In the first option, beneficiaries must comply with a prerequisite action or activity before receiving the transfer. This can for example be attending educational sessions or preventive health care visits. Cash for work activities, where people work on a specific duty, are also conditional cash transfers. People benefiting from unconditional cash transfers don't have to fulfill a specific condition before receiving cash.

4.2. CASH TRANSFER AND UNDERNUTRITION

Cash transfer programs can be a powerful tool to influence several underlying causes of child acute malnutrition, and more globally childhood undernutrition. By improving the economic status of households, they can result in more empowerment and increased access to basic services and goods. Such changes can in turn lead to an improvement in health, care practices, food intake, and ultimately on the prevention of child undernutrition, given sufficient and adequate knowledge and attitudes are present. Changes in children's nutritional status were particularly reported following the implementation of conditional cash transfer programs in Latin America. They had positive effects on linear growth in Mexico, Nicaragua and Colombia (O. Attanasio, Gómez, Heredia, & Vera-Hernández, 2005; Jef L. Leroy, Ruel, Verhofstadt, & Olney, 2008) and on under-5 mortality resulting from malnutrition in Brazil (Rasella, Aquino, Santos, Paes-Sousa, & Barreto, 2013). More globally, foreseeable cash transfers can participate to prevent seasonal peaks of acute malnutrition (Sarah Bailey & Kerren Hedlund, 2012).

One of the first effects of conditional and unconditional cash transfer programs is the increase in family income and hence of its purchasing power. This generally results in an increase in total household expenditure, allowing purchase of consumption goods such as hygiene products (Sarah Bailey & Kerren Hedlund, 2012). This could favor improvement in care and hygiene practices via for example the purchase of soap. Of specific interest is the effect of cash transfers on food expenditure, increasing the quantity and/or quality of consumed food (Alderman, 2013) thereby improving household dietary diversity (Sarah Bailey & Kerren Hedlund, 2012). The effect of cash transfers on total household expenditures and food expenditures is potentially important in relation to child undernutrition as studies on conditional cash transfers demonstrated that the improvement of child nutritional status was mediated by the child's dietary intake (Jef L. Leroy, Marie Ruel, & Ellen Verhofstadt, 2009). Conditional cash transfers in Mexico, Nicaragua and Brazil showed a positive effect on household food expenditure and on the consumption of fruits and vegetables (Jef L. Leroy et al., 2008), and in Colombia children's consumption of vegetables, pork, chicken, beef, cheese and milk increased significantly (O. Attanasio et al., 2005).

When receiving additional income, households can also choose to invest in productive assets and livelihoods, improving their economic well-being (Vincent & Cull, 2009b). Increased income can also lead to a rise in health expenditure, as observed in Vincent's review of 20 cash transfer programs (Vincent & Cull, 2009b), allowing access to preventive and curative care. Cash transfer conditioned to keep up-to-date with preventive health care increased antenatal care visits and well-baby clinic visits in Honduras (Morris, Flores, Olinto, & Medina, 2004) and the use of antenatal services in Mexico (Sosa-Rubi, Walker, Servan, & Bautista-Arredondo, 2011). However, improved access to health care does not systematically translate into improved health or nutrition status.

Another possible effect of cash transfer programs is on the family's psychosocial well-being. In Mexico, conditional cash transfer was linked to a 10% reduction of aggressiveness and oppositional problems in children (Ozer, Fernald, Manley, & Gertler, 2009). This could be explained by the fact that parents are more available to provide adequate care to their children. It was also reported in Mexico that for young children, benefiting from these conditional social transfers for an additional 18 months resulted in a reduction of the amount of socio-emotional problems reported by mothers for 8 to 10 year-old children (L. C. Fernald, Gertler, & Neufeld, 2009).

Cash transfers targeted at women also increased women's control and decision power over income (Ruel & Alderman, 2013), a strong hypothesized pathway towards the prevention of child undernutrition (Bold, Quisumbing, & Gillespie, 2013). Indeed, in most developing countries, mothers are the primary responsible for a child's health and nutrition: they are the one taking care of the children, managing food and the kitchen, bringing children to health center and knowing the households' needs. In urban areas of Brazil for example, conditional cash transfers were associated with increased decision of women on children's school attendance and health expenses (Bold et al., 2013).

Cash distributed can be used for a multitude of purposes and is likely to influence several underlying causes of child undernutrition. However, most of the evidence presented here comes from conditional cash transfers implemented in Latin America. One might thus wonder whether unconditional cash transfers program have similar effects on the prevention of child undernutrition.

2.

CHAPTER 2: THE UNCONDITIONAL AND SEASONAL ASPECT OF CASH TRANSFERS FOR THE PREVENTION OF ACUTE MALNUTRITION: A CRITICAL REVIEW OF THE LITERATURE

1. ABSTRACT

The positive effects of cash transfer programs on poverty, food security, maternal and child health, and nutrition have been reviewed previously. However, these evaluations mostly focused on transfers with specific conditions, set at specific behaviors impacting directly these outcomes. The objective of this article is to review the available evidence on the effect of seasonal and unconditional cash transfers (UCTs) on acute malnutrition and its underlying causes: food, care and health (the three pillars of the UNICEF/Lancet framework of the immediate causes of undernutrition). Thirteen papers reporting the evaluations of UCTs based on randomized controlled trials were considered. Consistent evidence of positive effects of UCTs was found regarding food availability and food access. UCTs are associated with increases in livestock, agricultural production and variety. This leads to higher food expenditure in the households. However, we need more evidence to be able to assess the effects on the quality of children's diet. The evidence on health care showed inconsistent results. Even if UCTs seem to increase health expenditures, the results showed conflicting aspects of their effects on health care utilization and children's health status. Inconsistent evidence was also reported concerning the mental health and psychosocial well-being of adults benefiting from UCTs. There is poor quality data concerning the link between UCTs and care availability, as well as on women's empowerment. No rigorous study was found regarding the link between seasonal UCTs and the prevention of acute malnutrition. No study assessed the effect and cost-effectiveness of season specific cash transfers on nutrition outcomes. Besides using more rigorous evaluation designs, cash transfer studies should also look beyond the direct outcomes like expenditure patterns and include nutrition and health outcomes. Moreover, pathways to change in nutritional status should be carefully assessed based on a theory of change adapted to the local context.

2. INTRODUCTION

Undernutrition remains a crucial public health issue in low and middle income countries: an estimated 159 million children are stunted, and 50 million suffer from wasting (UNICEF, WHO, & WorldBankGroup, 2015). The underlying determinants are numerous and relate, among others, to food insecurity, inadequate health and care practices, and poor hygiene and sanitation (UNICEF, 1990). While the 2008 Lancet nutrition series focused on "what works" to reduce maternal and child undernutrition (Bhutta et al., 2008), the 2013 new series presented a new framework of interventions to reach optimum child nutrition. Nutrition-specific programs tackling the direct causes of undernutrition were distinguished from nutrition-sensitive programs addressing the underlying causes (Black, Victora, Walker, Bhutta, Christian, de Onis, Ezzati, Grantham-McGregor, Katz, Martorell, Uauy, Bhutta, et al., 2013). Among the latter, social safety nets were identified as having an important potential to prevent child undernutrition through their impact on food security, adequate dietary behaviour and women's empowerment (Ruel & Alderman, 2013). Social safety nets were defined as initiatives providing income or consumption transfers to vulnerable people in order to protect their livelihoods. The most

common type of social safety nets is cash transfers and provides money to individuals or households.

The positive effect of cash transfer programs on poverty, schooling, food security (Fiszbein, Schady, Ferreira, et al., 2009), maternal and child nutrition (Adato & Bassett, 2009; Sarah Bailey & Kerren Hedlund, 2012; Jef L. Leroy et al., 2009), diet quality (Wall, Mhurchu, Blakely, Rodgers, & Wilton, 2006), child development (Engle et al., 2011) and child health (Adato & Bassett, 2009; Lagarde, Haines, & Palmer, 2009) has been reviewed previously. These reviews mostly focussed on conditional transfer programs in which the cash transfer included compliance with certain conditions such as sending children to school and participating in preventive health and nutrition activities.

Nowadays, *unconditional* cash transfers are increasingly used for humanitarian and development aspects. This interesting strategy may counteract the seasonal fluctuations in food security and disease load, and thus help maintaining the children's nutritional status. In some Sub-Sahara African countries, seasonality is known to be an important factor for food insecurity and acute malnutrition (de Pee et al., 2015a; Hillbruner & Egan, 2008; Vaitla, Devereux, & Swan, 2009b). Furthermore, the rainy season is generally associated with peaks of malaria and infectious diseases (Vaitla et al., 2009b). In resource-limited environments with poor service capacity for health and education, and given the seasonal character of the additional burden of malnutrition and disease, the necessity to impose strict conditions on cash transfers can be questioned. Seasonal unconditional transfers, i.e. cash grants without conditions, are intended to help households to bridge the lean season and thus alleviate its negative effects. Seasonal cash transfers could potentially be very cost-effective if they target the months of the year where the households' budget is the most under pressure. Primarily this would prevent households to seek refuge in negative coping strategies. There is a lack of good quality evidence to support this hypothesis. Handing out money during the post-harvest season can also have a positive effect. The question is whether it actually affects children's health and nutrition which remain the aim of this review. The hypothesis should thus be reformulated and directly address the child's situation. Is an UCT during lean season more cost-effective on child undernutrition compared to UCTs during post-harvest season? Or in other words: are children more likely to benefit from household expenses during lean season compared to post-harvest season? The evidence on the effectiveness of seasonal unconditional transfers on nutrition outcomes or their immediate determinants has not been thoroughly reviewed.

The objective of this article is to review available data on the effect of unconditional cash transfers on acute malnutrition. Our review was guided by a program theory framework to help understand how cash transfers reduce undernutrition (Jef L. Leroy et al., 2009). The data was organized based on the three pillars of the UNICEF/Lancet framework of the immediate causes of undernutrition: food security, health and care (Black, Allen, Bhutta, Caulfield, de Onis, Ezzati, Mathers, & Rivera, 2008). Special attention was given to the pattern on seasonal aspects of these transfers as the lean season was expected to put additional stress on households' expenditure. A key contribution to our review was to identify research gaps on the relation between seasonal and unconditional cash transfers and acute malnutrition.

3. MATERIAL AND METHODS

Search strategy

A literature search was conducted for available data on the effect of seasonal and/or unconditional cash transfer programs on child undernutrition, health and development. We first searched Pubmed using the following search terms: “cash transfer”, “monetary transfer”, “social transfer”, “cash distribution” and “financial incentive”, combined with one or several of the following terms : “nutrition”, “undernutrition”, “acute malnutrition”, “anthropometry”, “food security”, “food consumption”, “health”, “development”. A restriction was not put on the publication date, but only articles in English or French of studies conducted in developing countries were taken into consideration. We also searched websites of several non-governmental and international organizations and institutions such as Action Contre la Faim, Save the Children, the International Food Policy Research Institute, the Overseas Development Institute, the Cash Learning Partnership or the World Bank, for technical and evaluation reports of implemented cash transfer projects documenting at least one outcome of interest. Finally, we included articles suggested by colleagues and used a snowball search strategy to find supplementary references.

Articles and reports were first screened by title and then by abstract. Only studies reporting randomized controlled evaluations of unconditional cash transfer programs were included in this review. We first gathered and organized evidence regarding the effects of unconditional cash transfers on children’s nutritional status. We then organized the results according to the three main pathways of the UNICEF/Lancet framework of undernutrition: food security, health and care. Only quantitative comparisons that were statistically significant ($P < 0.05$) are presented in the results section, unless specifically stated otherwise in the text.

Children’s nutritional status

Anthropometric indicators were used to assess children’s nutritional status. Acute malnutrition, or wasting, is defined by having a weight-for-height Z-score inferior to minus two standard deviations of the WHO Child Growth Standards median. In the same way, child stunting and underweight are respectively defined via height-for-age Z-score and weight-for-age Z-score. Children’s nutritional status was also evaluated using hemoglobin levels, a bio-marker for anemia.

Program theory

Household food security pathway

Food security exists “when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.” (Food and Agriculture Organization, 1996) Cash transfers can improve food availability, access, utilization and stability (the four dimensions of food security (J. L. Leroy et al., 2015)) in different ways. Food availability is understood as the availability of an appropriate quantity of food of adequate quality. Food access is defined by having enough resources to get appropriate foods for a nutritious diet. Food utilization is the adequate use of food based on knowledge of nutrition, care, water and sanitation (Food and Agriculture Organization, 2006). Finally, food stability refers to the stability of the three above mentioned dimensions over time.

The additional resources generated by cash transfers might be used to purchase more food of higher quality for immediate consumption. Households may use the cash to invest in agricultural assets or inputs that increase production yield. Food crops can be consumed or sold on the market to increase a household’s purchasing power. Both purchased and home-produced crops may be stored for later consumption and thus may serve as a buffer against future seasonal shocks. A cash transfer program can also help a family to be more selective as to when the harvest should be sold to maximize profit.

Health pathway

According to the World Health Organization's constitution, health is defined as a "state of complete physical, mental and social well-being". A three level subdivision can be made regarding the link between health and cash transfers: access to health care, utilization of health services and health status (Lagarde et al., 2009). Cash transfers can facilitate access to and the use of health facilities for both preventive and curative care. Transfers may also help households create a healthier environment through improved access to clean water, adequate hygiene and sanitation practices, the use of bed nets, etc. Finally, a higher use of health facilities translates into better health.

Caregiving practices pathway (care providing practices)

"Care is the provision [...] of time, attention, and support to meet the physical, mental, and social needs of the growing child and other household members." Proper feeding and care providing practices require adequate "caregiving resources", including adequate care providers' health and nutrition, mental health and psychosocial wellbeing, autonomy, and sufficient time (Patrice L. Engle et al., 1997). Cash transfers can positively affect all these resources. For instance, increasing a household's income may reduce the stress families face to meet their daily needs, and participate to the improvement of their mental health, creating a more stable environment for the child. Cash transfers may also reduce workload and thus increase the time care providers can spend on their child's wellbeing. Furthermore, women targeted to receive cash transfers can increase their empowerment, particularly the control and decision power about the income (Ruel & Alderman, 2013), which in turn can improve children's nutritional status (Bold et al., 2013). Finally, increasing women's control over money can lead to increases in food and/or health expenses (Glassman, Duran, & Koblinsky, 2013).

4. RESULTS

Thirteen studies (see Table 1) met our inclusion criteria. They corresponded to eight different unconditional cash transfers (UCT) programs. One program was implemented in Latin America (Ecuador (L. C. Fernald & Hidrobo, 2011; Hidrobo & Fernald, 2013; Paxson & Schady, 2007)); all others were implemented in Africa: Burkina Faso (Richard Akresh, Walque, & Kazianga, 2012), Kenya (Johannes Haushofer, 2013; The Kenya CT-OVC Evaluation Team, 2012), Malawi (Baird, Hoop, & Özler, 2011; Boone, Covarrubias, Davis, & Winters, 2013; Covarrubias, Davis, & Winters, 2012; Luseno, Singh, Handa, & Suchindran, 2013; Miller, Tsoka, & Reichert, 2011), Zambia (David Seidenfeld et al., 2014) and Zimbabwe (Robertson et al., 2013). Among these programs, none were specifically implemented during a particular season of the year or presented CT effectiveness by season.

Countries	Project name	CT's aim	CT details	Inclusion criteria	Study design	Study's aim	Statistical model	Seasonality of transfer	Domain of concern	Study
Burkina Faso	Nahouri Cash Transfers Pilot Project (NCTPP)		1000 FCFA per quarter (\$9.64 per year) for each child under age six. 2000 FCFA per quarter for each child age 7 to 10. 4000 FCFA per quarter for each child age 11 to 15. Transfers for two years.	Poor households according to the national poverty line	Cluster randomized controlled trial with 5 arms. 15 villages / arm: CCT to fathers (540 households), CCT to mothers (540 households), UCT to fathers (540 households), UCT to mothers (540 households), control group (615 households)	To assess health utilization for children 0 to 59 months old, in particular their visits to health clinics for routine preventative care.	Baseline + 2 follow-up surveys. Endline comparison.	No	Pathway 2: visit to health centers	(Richard Akresh et al., 2012)
Ecuador	Bono de Desarrollo Humano (BDH)	To improve both child health and education	15 USD per month to mothers for approx 18 months (approximately 6-10% increase in household income)	Households in the bottom two poverty quintiles of the Selben index with mothers living with their husbands or partners at the baseline survey.	Cluster randomized controlled trial. 79 parishes for treatment group (1564 mothers) and 39 parishes in the control group (790 mothers)	To assess how an exogenous increase in a woman's income affects domestic violence	Baseline and follow-up survey. Intent-to-treat analysis with linear probability models.	No	Pathway 3: Education level and domestic violence	(Hidrobo & Fernald, 2013)
				Households in the bottom two poverty quintiles of the Selben index, with at least one preschool age child, have no children older than 6 years old, be eligible for the cash transfer program, and not have been recipients of a previous welfare program	Cluster randomized controlled trial. 79 parishes for treatment group (797 children aged 12-35 months) and 39 parishes in the control group (399 children)	To assess whether very young children (12-35 months old) benefit in terms of health outcomes or language development if their families receive a cash transfer	Baseline and follow-up survey. Intent-to-treat analysis with ordinary least squares regressions for the continuous outcome variables and probit regressions for the dichotomous outcome variables		Pathway 2 and 3: health care utilization, health outcomes, children behavioral problems, mother depression...	(L. C. Fernald & Hidrobo, 2011)

				Households in the bottom two poverty quintiles of the Selben index, with at least one preschool age child, without children older than 6 years old, eligible for the cash transfer program, who weren't recipients of the previous welfare program	Cluster randomized controlled trial. Sample of 1,479 children aged 3 to 7 at follow-up	To assess how cash transfers affect the health and development of young children (3-7 years old)	Baseline and follow-up survey. Intent-to-treat analysis			(Paxson & Schady, 2007)
Kenya	CT-OVC	To provide regular cash transfers to families living with orphans or vulnerable children (OVC) to encourage fostering and retention of children and to promote their human capital development	Monthly transfer of 21 USD for two years	Within districts chosen based on overall poverty levels and prevalence of HIV/AIDS: ultra-poor households with at least one OVC, defined as being between 0 and 17 years old with at least one deceased parent, or who is chronically ill, or whose main caregiver is chronically ill	Cluster randomized longitudinal design. 1862 households, of which approximately two-thirds were assigned to treatment and the remainder serving as controls.	To assess whether the CT-OVC has changed the preferences of households in terms of their consumption behavior	Baseline and follow-up survey. Difference-in-difference model.	No	Pathway 1 + 2: Expenditures on food and other domains	(The Kenya CT-OVC Evaluation Team, 2012)

Kenya	GiveDirectly UCT program		Several groups: * 183 male recipients + 208 female recipients + 110 single recipients; * 244 households benefiting from monthly transfers for 9 months + 256 from a lumpsum transfer; * 137 households benefiting from large transfer (95200 KES = 1085 USD) + 366 from small transfer (25200 KES = 287 USD).	Households living in a thatched-roof house in a specified poor region	Two-level cluster randomized controlled trial. 126 villages : 63 villages in treatment zone (471 households in the treatment group, 469 households in a control group for spillover effects) + 63 villages in a control zone (432 households in a pure control group)	To assess the relative welfare impacts of three design features of unconditional cash transfers: the gender of the transfer recipient; the temporal structure of the transfers (monthly vs. lump-sum transfers); and the magnitude of the transfer	Baseline and follow-up survey.	No	Pathway 1,2 and 3: food security, health, consumption, expenses, well-being...	(Johannes Haushofer, 2013)
Malawi	Malawi Social Cash Transfer Scheme (SCTS)	To reduce poverty, hunger and starvation, and improve school enrolment and attendance and the health and nutrition of children among the poorest 10 per cent of households	From 4 USD per month for a household with one eligible member to 14 USD per month for households with four or more eligible members + schooling attendance bonus ranging from 1.30 USD per month for primary school age children to 2.60 USD per month for secondary school age children. In September 2007, all	Ultra-poor households which are also labor constrained (having a dependency ratio undefined or higher than 3. Dependents include children under the age of 19, elderly over the age of 65, or adults aged 19–64 with a chronic illness or disability that renders them unable to work.)	Cluster randomized controlled trial. 4 control and 4 treatment village development groups. 365 treatment and 386 control households: 1090 children under 18 years old in treatment group and 786 in control group	To analyze the impact of the program on productive activities	Baseline + 2 follow-up surveys. Differences in differences (DD) with conditioning variables and DD combined with PSM	No	Pathway 1, 2: Ownership of agricultural assets and livestock. Household and farm work. Negative coping mechanisms.	(Covarrubias et al., 2012)
					Cluster randomized controlled trial. 4 control and 4 treatment village development groups. 696 children aged 6–17 in intervention	To assess whether Malawi Social Cash Transfer Pilot Scheme improved health outcomes for children aged 6–17.	Baseline + 2 follow-up surveys.. Multilevel logistic regression models		Pathway 2: Child illness, health services use	(Luseno et al., 2013)

			comparison households received a one-time-only food bucket valued at 8.80 USD containing oil, sugar, tea, salt, soap and beans.		group and 501 children in control group.					
					Cluster randomized controlled trial. 4 control and 4 treatment village development groups. 411 households in control group and 408 intervention households	To assess the impact of the Malawi Social Cash Transfer Pilot Scheme on food security	Baseline + 2 follow-up surveys. Difference-in-differences estimates using regression models		Pathway 1: food consumption, expenditures, dietary diversity.	(Miller et al., 2011)
					Cluster randomized controlled trial. 4 control and 4 treatment village development groups. 386 households in treatment group and 365 in control group	To assess the impact of the Malawi Social Cash Transfer Scheme on agricultural production.	Baseline + 2 follow-up surveys. Difference-in-difference estimator and matching approaches		Pathway 1, 2: agricultural assets, food diversity, coping mechanism	(Boone et al., 2013)
Malawi	Zomba cash transfer program		Transfer to the parents (4,6,8 or 10 USD/month) + a transfer directly to the girl (1, 2, 3, 4 or 5 USD /month) + payment of school fees for girls attending secondary school, for two years.	Never married females, aged 13-22 and living in a particular district	Cluster randomized controlled trial. 3796 females in 176 enumeration areas (EA). 88 treatment EAs: all baseline dropouts received CCT. 88 remaining EAs for baseline schoolgirls: in 46 EAs CCT, in 27 EAs UCT, in 15 EAs no transfer.	To assess the effect of positive income shocks on the mental health of adolescent girls	Baseline + 2 follow-up surveys. Intention to treat analysis using linear probability model	No	Pathway 3: mental health	(Baird et al., 2011)

Zambia	Zambia Child Grant Program	To reduce extreme poverty and the intergenerational transfer of poverty through five primary areas: income, education, health, food security and livelihoods.	60 ZMW / month (12 USD) for two years. 99% female recipients.	Any households with children under 5 years old living within the three districts with the highest rates of child mortality and poverty	Cluster randomized controlled trial. 45 Community Welfare Assistance Committees (CWAC) in intervention group and 45 CWAC in control group. 2514 households in total: 14 565 people whom 4793 children under 5 years old and 1427 under one year old.	To assess the effects of the program for nutrition outcomes after two years of program implementation	Baseline and follow-up survey. Difference-in-difference model.	No	Pathway 1 and 2: food consumption, diet diversity, food security, child anthropometry	(David Seidenfeld et al., 2014)
Zimbabwe	Manicaland HIV/STD Prevention Project		Household enrolled in the UCT program collected 18 USD + 4 USD per child in the household (up to a maximum of three children) every 2 months for one year. For all clusters: parenting skills classes + households received maize seed and fertiliser twice	Households in selected high HIV-prevalence sites, with children younger than 18 years and at least one other criteria at baseline: the head of the household was younger than 18 years; the household cared for at least one orphan (a child younger than 18 years with one or more deceased parents), disabled person, or an individual who was chronically ill; or the household was in the poorest wealth quintile	Matched, cluster-randomized controlled trial. 12 sites. 1118 households in the control group, 1452 in the UCT group, 1248 in the CCT group // 369 children aged 0-4 in the control group, 530 in the UCT group and 419 in the CCT group	To assess the effects of unconditional cash transfers (UCTs) and conditional cash transfers (CCTs) on birth registration, vaccination uptake, and school attendance in children	Baseline and follow-up survey. Intention to treat analysis with linear regressions.	No	Pathway 2: vaccination records	(Roberts et al., 2013)

TABLE 1: SYNTHESIS OF THE REVIEWED UCT PROGRAMS

Impact on child nutritional status

Among the thirteen studies included in this review, only one directly addressed the impact of UCTs on acute malnutrition. UCTs made in the framework of the Zambia Child Grant Program had no effect on wasting among children under 5 years of age and mean weight-for-height z-score (David Seidenfeld et al., 2014). More generally, four studies assessed child nutrition factors and none found positive effects of UCTs on children's anthropometry. The Give Directly program was unable to demonstrate a statistically significant effect on child's nutritional status compared to the control group (Johannes Haushofer, 2013). In Zambia, the Child Grant program also had no impact on the anthropometry of children under 5 (David Seidenfeld et al., 2014). In Ecuador, the children group 3 to 7 years of age within the poorest benefiting households had a significantly higher hemoglobin concentration (+39%) compared to control peers. (Paxson & Schady, 2007). Younger children (aged 12 - 35 months) showed no significant differences in hemoglobin level and height-for-age z-score (L. C. Fernald & Hidrobo, 2011).

Household food security pathway

Food availability

Four out of thirteen studies (three of which were on the Malawi Social Cash Transfer Scheme - SCTS) reported on food availability factors such as agricultural production, livestock holdings and crop variety. The SCTS had a statistically significant positive impact on the ownership of agricultural assets (increase of 16% for hoes, 32% for axes and 30% for sickles) and livestock (increase of 52% for goat, 59% for chicken and 1.5% for cattle) (Covarrubias et al., 2012) and led to a rise in agricultural production. The latter allowed beneficiaries to consume more cowpeas, beans, potatoes and sweet corn from their own lands. Compared to peers belonging to the control group, cash beneficiaries invested more in livestock, particularly poultry which was associated with a higher consumption of eggs (27% vs 2%) and poultry (17% vs 1%). Global food stores were also bigger in cash households compared to non-cash households ($p < 0.0001$) (Boone et al., 2013; Miller et al., 2011). In Kenya, the Give Directly program was associated with an increase in livestock holdings representing an added value of US\$85 per household, or 51% more than the control group. The number of cows, small livestock and poultry was significantly higher in the cash receiving group. And again beneficiaries receiving larger sums of cash were reported to have larger livestock units. Looking at the agricultural production: aided households consumed the equivalent of US\$2.5 more in food from their own production. Furthermore, households benefiting from monthly transfers consumed significantly more home produced food compared to recipients of a single lump sum (Johannes Haushofer, 2013).

The SCTS had a significant positive effect on food stores: 59% of intervention and 23% of control households had stores that would last more than 1 month after the main harvest period. At the end of the hunger gap (just before harvest), 28% of intervention and 10% of control households had stores that would last for 1 month or more (Miller et al., 2011).

In Kenya, 43% of the beneficiaries of the Give Directly program reported having sufficient food available for the day after data collection compared to only 36% in the control group (Johannes Haushofer, 2013).

Food access

Four evaluations assessed the effect of UCTs on food expenditure and all found significant statistical improvements. Results from the Zambia Child Grant program showed that the very poor with children under 5 (living under the national extreme poverty threshold) benefiting from UCTs significantly increased their total spending by 31.2% per capita per month compared

to the control group, and their food expenses rose by 32.4% at the trial endpoint. The households in the intervention group spent more on cereals (+45.6%), pulses (+158.4%), meat (+30.8%), dairy (+158.3%), sugar (+130.6%) and fats/oil (+91.2%) after 24 months on the program compared to their control peers (David Seidenfeld et al., 2014). In Kenya, households benefiting from the CT-OVC transfers reported significantly higher than predicted food expenses (+8.1%) at end point, with significant statistical predicted increase for cereals (+6.6%), meat and fish (+14.6%) and dairy products (+15.2%) and a significant expected decrease for tubers (-39.1%) (The Kenya CT-OVC Evaluation Team, 2012). The evaluation of the Malawi SCTS revealed that total food expense increased by 86% during one year of the program compared to only 8% in the control group (Miller et al., 2011). The Give Directly program in Kenya was similarly associated with a 19% higher food expense compared to the control group ($P < 0.01$). Food groups that were purchased more frequently as a consequence of the UCT were cereals (+10%), fruits and vegetables (+15%), dairy (+24%), meat and fish (+39%), fat (+12%) and sugar (+9%) (Johannes Haushofer, 2013).

Two evaluations reported on the number of meals taken per day. The Zambia Child Grant program led to a small, but significant (8%) increase in the number of beneficiary households having more than one meal per day after two years on the program (David Seidenfeld et al., 2014). Households benefiting from regular cash transfers in the Give Directly Program in Kenya were also less likely to go to bed hungry (reduction of 30%, $p < 0.01$). They also skipped less meals in the month before data collection (reduction of 22% for adults (< 0.01) and 29% for children ($p < 0.05$)) compared to the control arm (Johannes Haushofer, 2013).

Only two papers directly described the effects of UCT on the quality of the family diet, although data on household food purchases presented above can also serve as a proxy for dietary quality. The Malawi SCTS reported positive effects of UCT on the quantity of food eaten as well as the quality of food consumed between baseline and midline in intervention households, with more meat and fish (61%), dairy (25%) and pulses (22%) in the households' diet ($p < 0.0001$). These differences persisted until study end point. Mean household's dietary diversity increased from 5 to 7 food groups in the intervention arm from baseline to end point ($p < 0.0001$), while it decreased from 5 to 4 in the control group (Miller et al., 2011). In Kenya, the Give Directly program was associated with a significantly higher proportion (+25%) of households and children eating protein-rich food at end point. At study end point, benefiting households also ate 0.5 time more meat or fish during the week before data collection ($P < 0.01$) (Johannes Haushofer, 2013).

Health pathway

Health care

Two studies reported an impact on household health expenses. In Kenya, the CT-OVC program reported a significant statistical increase in health expenses (including treatment, consultation, diagnostic and hospitalization fees, visits to traditional healers and hygiene expenses) after two years on the project. However, this impact was no longer significant when controlling the total expenses (The Kenya CT-OVC Evaluation Team, 2012). Beneficiaries from the Kenyan Give Directly reported 43% higher medical expenses. However, no significant impact was found on health expenses especially related to children, although expenses per episode of child illnesses was significantly higher by 35% in the intervention group ($p < 0.05$) (Johannes Haushofer, 2013). Unfortunately, the above study did not provide detailed information on morbidity, so it remains difficult to assess whether the increase in health care spending was a consequence of seeking health care for issues not treated in the past.

The six studies assessing healthcare reported mixed findings. In Malawi, children aged 6-17 years in households benefiting from the Social Cash Transfer Scheme were found to have a significantly higher use of health services for a serious illness in the previous year (OR=10.98, $p<0.01$) (Luseno et al., 2013). The number of children up to 4 years of age with full vaccination records in the Manicaland HIV/STD Prevention Project in Zimbabwe was slightly higher (3.1%) after benefiting from the transfers. However this effect did not show a statistical significance (Robertson et al., 2013). In the Give Directly Program in Kenya, the proportion of illnesses for which a doctor was consulted was 7% higher in the intervention group. The program did not show any effect on preventive visits to clinics for children under 14 or on newborns' vaccination coverage (Johannes Haushofer, 2013). The Nahouri Cash Transfers Pilot Project in Burkina Faso found no effect on reported preventive health care visits for children up to 59 months for households benefiting from UCTs, and the results were not different if either the mother or the father was the primary recipient of the cash. (Richard Akresh et al., 2012). In Ecuador, the Bono de Desarrollo Humano program did not show an overall increase on health center visits for preventive child growth monitoring, and neither did the vitamin supplements (L. C. Fernald & Hidrobo, 2011; Paxson & Schady, 2007). However, the probability of having received a vitamin supplement was significantly higher (+11%) for children 12 to 35 months of age living in rural areas in the treatment group compared to children in the control arms (L. C. Fernald & Hidrobo, 2011). Among the poorest families, children between 3 to 7 included in the treatment group were also 20% more likely to receive deworming treatments than their peers in control group (Paxson & Schady, 2007).

Healthy environment

No study reported data related to improved household hygiene or healthier environment in general.

Health

Except for the children's nutritional status, no study reported data on children's global health.

Caregiving practices pathway

Mental health and psycho-social well-being

Four out of thirteen evaluations reported on adults' psychosocial well-being and mental health. In Kenya, the Give Directly program was associated with a 0.20 SD increase ($p<0.01$) in a psychosocial well-being index in the group benefiting from UCTs. When detailing this index, results showed an increase in happiness (+0.18 SD; $p<0.01$) and life satisfaction (+0.15 SD; $p<0.01$) and a decrease in stress (-0.14 SD; $p<0.05$) for benefitting women compared to the control group. For a subgroup of households benefiting from larger transfer sums, the increase of the psychosocial well-being index reached 0.35 SD ($p<0.01$) compared to households benefiting from lower transfers. The program also measured the salivary cortisol level which is positively associated with stress levels. However, except for some subgroups, no mean difference in end point cortisol concentration was found between households benefiting from UCTs and the control group. When the mother was the recipient of the benefits, however, cortisol levels in both men and women were lower ($p<0.05$) and female self-esteem increased ($p<0.05$) compared to when men were the recipients of the transfer (Johannes Haushofer, 2013). In Ecuador, the Bono de Desarrollo Humano cash transfer had no overall effect on emotional and physical violence when comparing UCTs households to the control group, but significantly reduced the husband's controlling behaviors, mainly related to the husband restricting his

partner's freedom to visit friends or family. The program found significantly more emotional violence in UCT households where the woman's education was equal or superior to her partner's (Hidrobo & Fernald, 2013). Two other assessments of the same Ecuadorian program showed no meaningful effects on maternal depressive symptoms, parental harshness and perceived stress (L. C. Fernald & Hidrobo, 2011; Paxson & Schady, 2007).

Workload and time

The Bono de Desarrollo Humano program in Ecuador did not find an impact on the time mothers worked (Paxson & Schady, 2007). No other studies looked at workload and time.

Women empowerment

Only one study reported on the UCT effect on women's empowerment. In Kenya, the Give Directly program did not find a significant effect on women's empowerment index (a composite index of bargaining power and domestic violence) (Johannes Haushofer, 2013).

5. DISCUSSION

This review documents data on the impact of UCTs on children's acute malnutrition and its three main driving pathways: food security and more precisely dietary intake, child health and care. We didn't find studies demonstrating that UCTs impacted child nutrition status. It is noteworthy that none of the studies mentioned in this review included the evaluation of the effect of UCT on children's acute malnutrition, but addressed more indirect factors like household food security, health care participation and poverty reduction.

We found consistent evidence of positive UCT effects on food availability and household food access. However, the paucity of studies on children's health and care does not allow us to draw any conclusions.

UCTs are associated with a higher livestock and agricultural production and a larger crop variety. Considering the overall household expenses pattern, cash was both used to buy food for the whole family and invest into agricultural productivity assets. However, since no dietary intake data was reported that paralleled these additional food purchases and/or extra food production, it remains unclear whether UCTs can actually improve the children's diet quality. With health and health care, the evidence regarding positive effects from UCTs was much more inconsistent. Even if UCTs seem to increase household's health expenses, the results do not suggest strong effects on children's health care use and health status. This is consistent with the results of the Pega's Cochrane review (Pega, Liu, Walter, & Lhachimi, 2015a).

Actually, poor evidence was found on whether or not UCTs can improve care providers mental health, psychosocial well-being, care availability or women's empowerment. Only the Give Directly study was able to demonstrate some improvement in psychosocial wellbeing, whereas other studies only found associations in very specific sub-groups. Nevertheless, more studies should include care related outcomes in their design because there are clear hypothetic pathways through which cash can affect child nutrition via improved care. One report on the effects of an agricultural intervention on nutrition showed that mothers working in the fields provided less care to the child (Dury, Alpha, & Bichard, 2014), which has negative consequences on the child nutritional status. As agricultural labor is much more frequent during the rainy season in Sub-Saharan Africa, one can hypothesize that giving cash to mothers during this specific period may allow them to spend less time doing strenuous agricultural work and

therefore have more time for child care. Similarly, cash could help to reduce male migration, prevent the overload on the remaining household members and provide time for child care. However, none of the studies included in this review reported data on such factors.

Targeted UCTs can also have a positive spillover effects for non-beneficiary households on all three pathways. In most programs, cash transfers typically target the most vulnerable households in a community. Firstly, relating to the food-pathway: when receiving supplementary income, such households can opt to invest in productive assets and livelihoods bought locally. They can also contribute to a higher market demand for food from local markets. This demand can either lead to price inflation or a higher supply from local markets. Thome et al. suggested positive spillover effects of the CT-OVC UCT in Malawi on food production and income by non-beneficiary households using LEWIE simulations, however the authors could not exclude that the additional income would lead to price inflation (Thome, Filipski, Kagin, Taylor, & Davis, 2013). On the other hand, the few studies that assessed price inflation as a consequence of cash transfers did not show important price increases for food commodities (Angelucci & Giorgi, 2009; Blattman, Green, Annann, & Jamison, 2013; Haushofer & Shapiro, 2013a). Regarding spillover effect on health, a reduction of water-related disease in benefiting areas could be considered if cash is used to improve hygiene and sanitation. However, no study evaluated the impact on investing the cash to improve water, sanitation and hygiene practices such as buying soap, handwashing, water treatment (boiling, chlorination) etc.. Finally, spillover effects on the caregiving practices pathway was reported in Haushofer's study (Johannes Haushofer, 2013). Although no effect of the Give Directly program was found on women empowerment index, this mean index value was significantly higher for women belonging to intervention villages, but whose households were not receiving any cash, which suggests a spillover effect. For the authors of the study, this effect could be linked to a change in men's behavior in non-benefiting households, in the hope of receiving future transfers.

In addition to the documentation of the effects of UCTs on the three main pathways leading to child malnutrition, a second objective of this review was to explore the specificity of seasonal unconditional cash transfers on the pathways leading to the prevention of undernutrition. However, no randomized controlled trial evaluating seasonal UCTs was found. Two studies from Niger can be briefly mentioned: one pre-post evaluation of poor and very poor households benefitting from an UCT (Fenn, Noura, Sibson, Dolan, & Shoham, 2014) and one prospective study (Langendorf et al., 2014a). In the first study, seasonal UCTs implemented during the hunger gap were associated with statistically significant improvements of children's nutritional status and dietary diversity, but also declines in women's decision taking and mother's self-reported health (Fenn et al., 2014). However, without a control group, it is difficult to attribute the above mentioned changes to UCT. Langendorf's prospective study in Niger assessed the effectiveness of seasonal UCT versus food distribution alone or food and cash. Benefiting from cash and nutritious supplementary food distribution was shown to be twice as more effective in reducing the incidence of moderate child acute malnutrition and child mortality rates as compared to cash alone (Langendorf et al., 2014a).

This review was based on limited evidence from randomized controlled trials. The results of the mentioned studies are to be interpreted with caution but are nevertheless encouraging in designing more rigorous studies to assess the preventive effects of seasonal UCTs on child undernutrition, particularly in countries where seasonality has an important role in illnesses, food insecurity and undernutrition. The different strengths and limitations of such a study should be addressed so that the evaluation would lead better evidence on which conclusions could be drawn.

Our aim was to reduce publication bias that might favor the inclusion of studies with more important impacts, by inspecting grey literature and contacting agencies with a history in conducting or evaluating cash transfers. Studies included in this review often did not evaluate the data with the same set of measurements and outcomes which hampered a straightforward comparison. Finally, the review is based on an evidenced-based program theory framework in order to better investigate research gaps. A broad form of the model was kept to allow for a broader understanding of the theoretical action of unconditional cash transfers on the prevention of acute malnutrition.

Based on this review, we suggest a number of recommendations for future UCT studies. Cash transfer studies are more complex than a specific nutrition intervention as they can affect child nutrition outcomes by a myriad of pathways. Nevertheless, evaluations of cash transfer programs should invest in analyzing which pathways are primarily responsible for a change in child nutrition (Browne, 2013). The advantage of cash transfers is that they allow flexibility to cover the most pressing needs of a household, which might lead to better cost-efficient interventions. However, it is unlikely that the child will benefit from all the expenses compared to a child-centered nutrition intervention. Therefore, a cost-effectiveness analysis on cash transfers for child nutrition outcomes seems indispensable. The design of a program including a theory framework model for evaluation purposes should ideally be elaborated at the beginning of the program, and not at the time of the evaluation. Such frameworks should be further adapted to the local context and based on a thorough local nutritional causal analysis. This will allow understanding not only if the implemented program works, but also how it works to achieve its nutritional objectives. Finally, four main research gaps can be highlighted regarding the effects of (seasonal) UCTs on the prevention of children's undernutrition, and more precisely acute malnutrition:

- The pathways impact for better child nutrition and nutritional status should be identified;
- Barriers and facilitators of UCTs having an effect on improved child nutrition status should be identified in order to improve future programs. In other words, should other intervention components be added to UCTs to make them more effective?
- Cost-effectiveness of UCTs related to child undernutrition outcomes should be investigated as it could be a key feature in designing programs;
- Assessing which impact UCTs received during lean season can have on post-lean season with highlights on residual effects.

6. CONCLUSION

This review documents the available data on the effects of UCTs may have on child acute malnutrition and its three main pillars: food security, health and care. Good evidence was found that UCTs improve food availability and food access. Regarding the health pathway, the data showed conflicting results. Even if UCTs seem to increase health expenses, the few reported effects on health care use and children's health status were inconsistent, particularly on child nutritional status. The effects of UCTs on child care practices and their determinants are unclear and more data is needed on the link between UCTs and women's empowerment or availability of care for women. There were no studies that assessed the effect and cost-effectiveness of season specific cash transfers and nutrition outcomes. Besides using more rigorous evaluation designs, cash transfer studies should move beyond the evaluation of direct outcomes like expenditure patterns and include nutrition pattern and health outcomes. Furthermore, pathways to change

the nutritional status should be carefully assessed pursuing a program theory framework adapted to the local context.

3.

CHAPTER 3: THE MAM'OUT STUDY

1. OBJECTIVE AND HYPOTHESES OF THE RESEARCH

The MAM'Out research project aims to evaluate the effectiveness and cost-effectiveness of seasonal, multiannual and unconditional cash transfers (UCT) to prevent acute malnutrition in children under 36 months old living in the Eastern region of Burkina Faso. This study was designed as a two-arm cluster randomized controlled intervention trial, with one preventive arm benefiting from cash transfers and one comparison group.

The global hypotheses linked with this study are the following ones:

- Hypothesis 1: A seasonal and multiannual UCT program is effective to prevent acute malnutrition in young children living in poor or very poor households in rural areas of Burkina Faso.
- Hypothesis 2: Interventions are well accepted by the target population.
- Hypothesis 3: Seasonal and multiannual UCTs influence nutrition status through a range of pathways, such as improved food security, improved access to health services and/or by limiting the resort to erosive coping strategies.
- Hypothesis 4: Seasonal and multiannual UCTs are cost-effective to prevent acute malnutrition.

In this PhD thesis, results related to hypotheses 1 and 2 will be presented. Hypothesis 3 is very broad and will be reduced in this work to:

- Hypothesis 3a: Seasonal and multiannual UCT allow increasing children's dietary diversity, energy intake and micro- and macronutrients via an enhanced food access.
- Hypothesis 3b: Seasonal and multiannual UCT positively influence gender equality and women's status, a core pathway to better nutritional status.

The other aspects of hypothesis 3 and hypothesis 4 will be the subjects of other works to come.

2. PRESENTATION OF THE MAM'OUT RESEARCH AREA

2.1. BURKINA FASO

With more than 18 million inhabitants in 2015 (World Health Organization) and 274 000 km², Burkina Faso is one of the poorest countries in the world: the human development index ranks it 183 out of 188 countries (United Nations development Program, 2015a). The country is landlocked, as showed in Figure 5, without important natural resource. Only 30% of the population live in urban areas (United Nations Development Program). Poverty is predominant in rural areas, where almost all households live from agricultural work and animal breeding. In 2012, the three major crops produced in term of quantity were sorghum, maize and millet, while cotton is the main exported commodity (Food and Agriculture Organization). The Burkinabe population is extremely vulnerable to price fluctuations of agricultural products. Two seasons characterize Burkina Faso's tropical climate: a rainy season from May/June to September and a dry season during which the harmattan blows. Recurrent droughts and floods weaken even more the country's agricultural production and people's livelihoods.



FIGURE 5: BURKINA FASO MAP AND THE TAPOA REGION (ORANGE CIRCLE). ADAPTED FROM THE FRENCH FOREIGN MINISTRY'S MAP OF BURKINA FASO, 2015

From a social perspective, numerous ethnic groups cohabit in the country: Mossi, representing almost the half of the population, Touareg, Peulh, Lobi, Gourmantche and Bobo. All have their own language and traditional customs. Different religions also coexist peacefully in Burkina Faso: Islamism, Christianity and animism.

Facilities and road infrastructures are weak in the country: some localities are cut from the rest of the country during the rainy season. This situation limits the organization of an efficient agricultural network; food transfers from surplus to under-served regions are not optimal. This participates to the high rates of food insecurity among rural households. At the national level, only 3% of children aged 6-23 months old had a minimum acceptable diet in 2013! (UNICEF, 2015) In 2012, the Burkinabe government, supported by a group of technical and financial partners, launched a national policy on social protection, with an action plan identifying as a priority the improvement of social transfer mechanisms for the poorest and the most vulnerable in order to ensure food security (Gouvernement du Burkina Faso, 2012).

Moreover, population growth is very high and uncontrolled. The fertility rate reaches 5.6 (UNICEF, 2015) and the population's median age is 17.4 years old (United Nations Development Program). The country's economic growth is insufficient to follow this rise. 45% of the population live under the national poverty line (World Food Program) and the gross national income per capita was estimated at 670 US\$ in 2013 (UNICEF, 2015). Hence the population's standards of living are very basic and the quality of basic services, such as education and health, is far below international standards. In 2014, the mean years of schooling was estimated at 1.4 years, not distinguishing sexes (United Nations development Program, 2015a), and only 29% of adults were literate in 2013 (UNICEF, 2015). Big inequalities exist in terms of education, reproductive health, empowerment and gross national income per capita between gender, women being disfavoured (United Nations development Program, 2015a). Women's access to basic services is limited and men are taking economic decision in households (World Food Program). In 2013, child labour was estimated at 39% (UNICEF, 2015).

6.4% of the gross domestic product is dedicated to public health (United Nations Development Program). Even though efforts are made at national level to improve the number of medical facilities and access to health care, this is not sufficient. Life expectancy at birth is 58.7 years old (United Nations development Program, 2015a) and the under 5 mortality rate is 97.6 per thousand live births (United Nations Development Program). Regarding health care, a lot of people rely on traditional medicine for economic and cultural reasons. This leads to insufficient health care and patients not treated adequately. For example, only 21% of children suffering from diarrhoea were treated with oral rehydration salts in 2013 (UNICEF, 2015). In order to protect maternal and child health, preventive consultations for pregnant women and children under 5 have been free since 2004. However, quality of care and access to health centres remain barriers of care seeking for many rural families. From a sanitation perspective, only 7% of rural households used improved sanitation facilities in 2012 and 76% used improved drinking water sources (UNICEF, 2015)

From a nutritional point of view, results of the national nutrition survey lead by the government in August/September 2011 showed global undernutrition prevalence similar to the one of August 2010. Among children under 5, the prevalence of global acute malnutrition was 10.2% (95%CI: 9.6 – 16.7), with 2.4% of severe acute malnutrition (2006 WHO growth standard). Prevalence of stunting was 31.4% (95%CI: 33.2 – 35.0) and of underweight 24.4% (95%CI: 23.6 – 25.2) (Ministère de la Santé - Direction de la Nutrition, 2011). According to the last available data from UNICEF, this trend remained the same in 2013: 24.4% of children under 5 were underweight, 32.9% stunted and 10.9% wasted. 14% of children were also low birth weight (UNICEF, 2015). The nutritional situation in Burkina Faso is thus worrying and humanitarian attention is requested.

2.2. THE TAPOA PROVINCE

Burkina Faso is divided into thirteen administrative regions. The East region includes five provinces, one of which the Tapoa (cf orange circle in Figure 5). This province is approximately 14 800 km² large and is bordered by Niger at Northern and Eastern sides and Benin at the South-Western side. The Tapoa province is formed by eight municipalities: seven rural (Botou, Kantchari, Logobou, Namounou, Partiaga, Tambaga, Tansarga) and one urban (Diapaga). The province has a mainly rural population: 93.4% households were reported to live in rural villages in 2006 (Dakuyo, Ouedraogo, & Somda, 2009). Agriculture and livestock farming, with poultry, goats, cattle, sheep and pigs in decreasing order of importance are the main economic activities (Alfred Bouya Sambou, 2009). More than 80% of the household's revenues comes from agriculture (Loada & Nikiema, 2009). In this province, Gourmantche people are the main ethnicity.

The East region shows the highest proportion of people living at more than 10 km from the first health centre in the whole country (42.7% vs 21.2% at the national level) (Ministère de la Santé - Direction de la Nutrition, 2011). In the Tapoa province, only two doctors are present for around 400 000 inhabitants! Together with the North, the East region is also a priority area in terms of combatting under-nutrition. Results of a cross-sectional survey (SMART) organized by Action Contre la Faim (ACF) in the Tapoa province in April 2012 showed a prevalence of global acute malnutrition of 17.3% (95%CI: 15.2 – 19.7) among children aged 6 to 59 months (2006 WHO growth standards) (Nikiema, 2012). The yearly hunger gap (from May/June to September) might even further exacerbate the humanitarian and nutritional vulnerability of the population. Indeed, this period is critical for food and health expenses. Households usually meet the end of their cereal stocks (Janin, 2004) ((Janin & Martin-Prével, 2006) and are dependent on the

market for staple foods while price are at the highest. Moreover, adults' energetic needs are important due to intense agricultural activities and time dedicated to the child is reduced. According the Tapoa women interviewed during the cash assessment led in October 2012 by ACF, this period is also the most difficult to fulfil child's needs. Thus, a mitigation intervention, and especially interventions dealing with the prevention of under-nutrition, is needed in this area and at this specific period of the year.

As seen previously, undernutrition is a complex and a multifactorial problem, with a varied range of causes. In order to adapt preventive strategies to the local context, ACF has been gathering since 2009 qualitative and quantitative data on food security, care practices and dietary habits in the area. A Nutritional Causal Analysis (NCA) was also carried out in November 2012 in the Tapoa province. It consists in a standardized investigation of the direct and indirect causes of child wasting in this area through quantitative and qualitative data collection (Lysette Boucher-Castel & Julien Chalimbaud, 2013b). Results showed that children have to face numerous inadequate food practices: non-exclusive breastfeeding, low dietary diversity after the age of 1 year, insufficient number of meals per day... Moreover, based on the synthesis of previous studies available, 24 hypotheses of the causes of undernutrition in the Tapoa were proposed and tested. Results of the NCA showed that 6 hypotheses were considered as having a major role in childhood undernutrition. Two of them were related to water, sanitation and hygiene practices: difficult access to drinking water and inadequate sanitation practices are real problems faced by the population. Two other hypotheses validated as major ones were linked with household poverty: lack of money to buy food and to access basic services such as health care, water and education are closely linked to child undernutrition. Finally, women's workload and small interpregnancy intervals also participate in an important way to the burden of child undernutrition in the Tapoa province. Thus, humanitarian intervention answering some of the major cited causes of undernutrition in this area, and especially targeting young children, is needed.

3. THE MAM'OUT PROJECT: A RANDOMIZED CONTROLLED TRIAL TO ASSESS MULTIANNUAL AND SEASONAL CASH TRANSFERS FOR THE PREVENTION OF ACUTE MALNUTRITION IN CHILDREN UNDER 36 MONTHS IN BURKINA FASO

Tonguet-Papucci A., Huybregts L., Ait Aissa M., Huneau J-F., Kolsteren P., The MAM'Out project: a randomized controlled trial to assess multiannual and seasonal cash transfers for the prevention of acute malnutrition in children under 36 months in Burkina Faso. BMC Public Health (2015) 15:762

3.1. ABSTRACT

Background. Wasting is a public health issue but evidence gaps remain concerning preventive strategies not primarily based on food products. Cash transfers, as part of safety net approach, have potential to prevent under-nutrition. However, most of the cash transfer programs implemented and scientifically evaluated do not have a clear nutritional objective, which leads to a lack of evidence regarding their nutritional benefits.

Methods/Design. The MAM'Out research project aims at evaluating a seasonal and multiannual cash transfer program to prevent acute malnutrition in children under 36 months, in terms of effectiveness and cost-effectiveness in the Tapoa province (Eastern region of Burkina Faso, Africa). The program is targeted to economically vulnerable households with children less than

1 year old at the time of inclusion. Cash is distributed to mothers and the transfers are unconditional, leading to beneficiaries' self-determination on the use of cash. The study is designed as a two-arm cluster randomized intervention trial, based on the randomization of rural villages. One group receives cash transfers via mobile phones and one is a control group. The main outcomes are the cumulative incidence of acute malnutrition and the cost-effectiveness. Child anthropometry (height, weight and MUAC) is followed, as well as indicators related to dietary diversity, food security, health center utilization, families' expenses, women empowerment and morbidities. 24h-food recalls are also carried out. Individual interviews and focus group discussions allow collecting qualitative data. Finally, based on a theory framework built a priori, the pathways used by the cash to have an effect on the prevention of under-nutrition will be assessed.

Discussion. The design chosen will lead to a robust assessment of the effectiveness of the proposed intervention. Several challenges appeared while implementing the study and discrepancies with the research protocol, mainly due to unforeseen events, can be highlighted, such as delay in project implementation, switch to e-data collection and implementation of a supervision process.

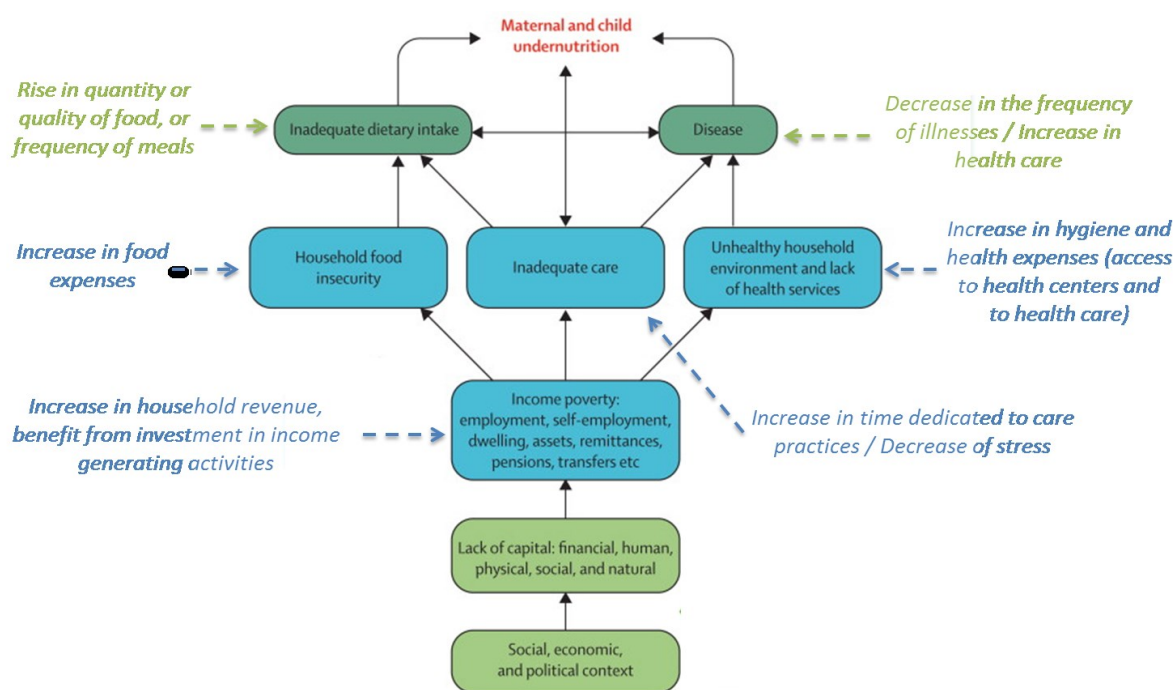
Trial registration. ClinicalTrials.gov, identifier: NCT01866124, registered May 7, 2013.

3.2. BACKGROUND

With at least 52 million wasted children in the world (Black, Victora, Walker, Bhutta, Christian, de Onis, Ezzati, Grantham-McGregor, Katz, Martorell, Uauy, Bhutta, et al., 2013), wasting is a crucial public health issue. Although treatments for severely acute malnourished children exist and have proven their efficacy (Bhutta et al., 2008; WHO, 2013), curative approaches remain very expensive (Webb et al., 2011) and more evidence is needed concerning strategies related to the management of moderate acute malnutrition (Bhutta et al., 2013). The second Lancet Series on Maternal and Child Under-nutrition (Bhutta et al., 2013) and the Scaling-Up Nutrition Initiative (ScalingUpNutrition, 2011) give some recommendations on selected effective approaches for the management and prevention of under-nutrition, such as breastfeeding counselling or micronutrient supplementation, but evidence gaps still remain, particularly concerning indirect interventions. The World Health Organization highlighted in 2010 the need to consider prevention strategies when implementing programs aiming at reducing acute malnutrition rates (WHO, UNICEF, WFP, & UNHCR, 2010). There is also evidence showing that preventive programs, such as supplementation, can be more effective to reduce childhood under-nutrition than nutrition rehabilitation (Ruel et al., 2008). Most scientific evaluations of nutrition rehabilitation are based on product distribution (Hendricks, 2010; Huybregts et al., 2012; Imdad, Sadiq, & Bhutta, 2011; Isanaka et al., 2009; Parikh et al., 2010). However, products are not always locally available nor affordable for the target population. Considering the paucity of data pertaining to alternative context-adapted strategies for the prevention of acute malnutrition, research studies must be developed in order to produce evidence on effective, reproducible and cost-effective approaches (Cattaneo et al., 2008).

Cash transfers, as part of a safety net approach, are relatively new in fragile states. Only a few safety net experiences for very poor and hunger vulnerable households have been implemented to date (Fan, 2010). Indeed, humanitarian agencies have longstanding experiences with one-shot cash transfer interventions in emergency situations, but multiannual cash transfer is usually not implemented in countries exposed to acute malnutrition. Reviews on cash transfer experiences show that this type of intervention has the potential to prevent undernutrition (O. Attanasio et

al., 2005; Jef L. Leroy et al., 2008). However, most of the cash transfer programs implemented and scientifically evaluated do not have a clear nutritional objective, which leads to inconclusive evidence regarding their nutritional benefits (Ruel & Alderman, 2013). Hence, the MAM'Out (Moderate Acute Malnutrition Out) research project aims at assessing a context-adapted preventive approach, which is likely to influence several underlying causes of under-nutrition and not primarily based on food supplementation: seasonal and multiannual cash transfers. Indeed, as shown in figure 6, cash transfers can have an effect on all underlying causes of undernutrition. They have proven to be effective in removing financial barriers to health centers and nutritious food (Adato & Bassett, 2009; Lagarde et al., 2009; Jef L. Leroy et al., 2009), especially in Latin America countries. Positive effects of cash transfer programs on poverty reduction and food security (Fiszbein, Schady, Ferreira, et al., 2009), diet quality (Wall et al., 2006) and child health (Adato & Bassett, 2009; Lagarde et al., 2009) have also been documented. Some reports also suggest benefices on maternal mental health (Fenn et al., 2014). One can also hypothesize that benefiting from cash transfers can allow mothers to reduce their income generating activities, leading to more time for child's care. Most of the cited evidence comes from conditional cash transfers. However, the conditional aspect of cash transfer can be associated with several disadvantages or constraints (M. Gaarder, 2012) and was sometimes shown not to be appropriated, especially in African countries (Davis, Gaarder, c, & Yablonski, 2012). The MAM'Out project will thus evaluate the effects of unconditional cash transfers on the prevention of undernutrition.



Original scheme from Black and al. 2008

FIGURE 6: PROPOSED EFFECTS OF CASH TRANSFERS ON THE PREVENTION OF CHILD UNDERNUTRITION

Furthermore, there is a lack of evidence related to the pathways by which cash transfers can improve child nutrition outcomes. In their review's conclusion, Gentilini and Omamo (Gentilini & Omamo, 2011) highlight the need for more targeted study designs that could attribute effects to specific processes. From an intended impact pathways model, Adato and al (Adato & Bassett, 2009) already evaluated qualitative field studies in middle income countries to explain why expected nutrition and health outcomes do or do not occur: poverty, sociocultural norms and beliefs on health care practices seem to compete with cash. This research will follow the proposition made by some authors (M. M. Gaarder, Amanda, & E., 2010; Jef L. Leroy et al., 2009)

to use a program theory framework to analyze the way in which different components interact in order to have an effect.

3.3. METHODS / DESIGN

Objectives of the research

The primary objective of the MAM'Out research project is to evaluate the effectiveness and cost-effectiveness of multiannual and seasonal cash transfers (MCTs) to prevent acute malnutrition in children under 36 months in the East region of Burkina Faso.

The specific objectives of this project are: 1. To measure the contribution of MCTs to the reduction of the incidence of acute malnutrition and morbidity for the young children; 2. To evaluate the input of MCTs in the young children's growth and development; 3. To contribute to the creation of an evidence base on efficient preventing activities for child wasting; 4. To assess the influence of MCTs on determinants of acute malnutrition, such as food security and access to health center; 5. To evaluate the cost-effectiveness of MCTs for the prevention of acute malnutrition in order to improve their sustainability.

Study population

The target populations are inhabitants of the Eastern region of Burkina Faso, and more specifically the Tapoa province, where Gourmanche people are in the majority. This population faces the highest fertility rate in the country, with 8.6 children per woman (Dakuyo et al., 2009). This leads to small interpregnancy intervals that negatively impact maternal nutritional status, leading to poor birth outcome. Results of a cross-sectional survey (SMART) aiming at estimating malnutrition prevalence in the Tapoa province in April 2012 also showed a prevalence of global acute malnutrition of 17.3% (95%CI: 15.2 – 19.7) among children aged 6 to 59 months (2006 WHO growth references). In this context, the MAM'Out research project specifically targets households with children under 12 months at the time of inclusion.

Thirty two (32) villages, situated in the northern part of the Tapoa province and belonging to the same livelihood zone are included in the study. Villages were selected within three municipalities, based on their geographic localization and other operational criteria, such as accessibility.

To be included in the study, households had to meet two criteria: to be classified as poor or very poor according to the Household Economy Approach (Tanya Boudreau et al., 2008) and to have at least one child under 1 year old at the time of inclusion, independently of his/her nutritional status. All households present in the selected villages and meeting both criteria were included in the study.

Intervention

The proposed approach is based on monthly seasonal cash transfers for 5 months, from July to November, and for two years (2013 and 2014). A monthly 10 000 FCFA is transferred to the selected households. The amount was determined during a cash assessment study, implemented in collaboration with Action Contre la Faim operational team in Burkina Faso in October 2012 and with reference to other experiences of cash transfers in the Sahel area (Kauffmann, Novembre 2012). Mothers, as the primary responsible for children's health and nutrition, are the recipient of the cash transfer. In order to avoid destabilizing the family organization or

leading to a misuse of the money, the project includes a sensitization strategy for heads of household, mothers-in-law and important people in the villages on the objectives of the project and the reasons of the choice of women as cash recipient. Cash transfers are done via mobile phones, in collaboration with a private mobile phone company chosen according to ethical criteria defined by Action Contre la Faim's procurement department. This is a quite innovative method in Burkina Faso, as the first mobile payment system was developed only in July 2012 in the country. This way of transfer was chosen for practical and security reasons: it represents much less risks for the staff and beneficiaries. Mobile phones and SIM cards are provided to mothers.

Besides, in order to reduce the risk of drop out in the control group, compensations for the time people spent for the project are offered to all participants of this group.

Study design and randomization

The study is designed as a two-arm clustered randomized controlled trial in the Tapoa province (Eastern region of Burkina Faso), with one group benefiting from cash transfers and one being a comparison group. The unit of randomization is the village. Subjects are assigned to the study groups according to where they live. The random assignment of the interventions is done through a ceremonial gathering with officials and community members, as well as a representative of each of the concerned villages (mainly the heads of the village). Thirty-two (32) papers with a word corresponding to one group ("cash" for the intervention group and "pas cash" for the control group) are put in a bag. Each representative of the 32 villages is asked to draw blindly from the bag a paper. The village is allocated to one of the groups according to the word on the drawn paper.

Recruitment and informed consent

A first oral agreement is sought collectively at the community level before the beginning of the study. A representative of each village involved in the study (mainly the heads of villages and their committees) is asked to give his consent for the village participation into this research, as suggested by the WHO CIOMS Guidelines (CIOMS, 2002). Once this first acknowledgement received, a second informed consent is sought individually. Before being enrolled in the study, heads of households and mothers are explained the aim of the research, the expected duration of their participation and the measurements that will be done. According to allocated group, each participant also receives a global explanation on the sequence of the activities and procedures. Risks and benefits associated with his/her participation are also presented. Families that refuse consent are not forced into the study because of the collective agreement. As the major part of the population is illiterate, care is taken to give all these explanations orally in the local language. Written informed consent is sought individually by a local officer part of the research team before the beginning of the study. Mothers who agree to take part in the research are asked to write down their name or make a mark with their finger print. In the second case, a second research officer or the head of the village is asked to witness the process.

Data collection

Data collection is performed quarterly for two years by trained staff under the supervision of a field study coordinator. All participants of the study are visited every three months at home and asked to answer various questions. The collected data is immediately coded. None of the paper records includes the child's name or addresses. Each field staff member has a separate register in which the correspondence between the name and address of children and the unique identification number (UIN) of children is made. In addition, heads of families are given a trial card containing information about their name and address as well as their UIN. This is to ensure

that records can be accessed even in case of accidental destruction of the registers. Missing data is defined as being absent during two consecutive three-monthly visits. In such case, a home visit is organized to document the reason of the absence.

Model theory framework

A nutritional causal analysis was conducted in the Tapoa province in November-December 2012. In addition to the already available data and context analyses, this survey allowed defining more deeply the pathways by which cash transfers can have an effect on acute malnutrition according to the local context. A model theory framework was then built and was the basis for the choice of most of the indicators followed during the study.

Outcome measures

The primary outcomes of the study are the cumulative incidence of child wasting and the incremental cost-effectiveness ratio. Secondary outcomes are the cumulative incidence of the state of stunting, mean height-for-age Z-score, mean weight-for-length Z-score, mid-upper arm circumference (MUAC), edema, as well as rates of diarrhea, acute respiratory infections and measles.

Upon inclusion, the mother is interviewed to obtain baseline information including household composition, socio-economic status, dietary habits, child's age, breastfeeding practices and a history of child and maternal illnesses. Intermediate factors such as food security, water access, dietary diversity scores, mother-child relationship, women's role and health center frequentation are also asked for. During the follow up, the same information collected at inclusion time is collected again at different time points. All questionnaires were translated in local language during the training session of the data collection staff, back translated in French and pretested locally. Figure 7 summarizes the quantitative data collection throughout the two years of the study. Two 24h-food recalls are also planned as part of children nutritional assessment.

	Years	2013												2014												2015			
	Months	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4			
	Time	T0	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20	T21	T22	T23	T24			
	MCTs																												
Indicators to follow																													
Incidence rate of child wasting and rate of stunting	Weight																												
	Lenght																												
	MUAC																												
	Child's age																												
Morbidity	Edema																												
	Diarrhea																												
	Acute respiratory infections																												
	History of child and maternal illnesses																												
Health center frequentation	Measles																												
	Health center frequentation during the last month																												
	Barriers from going to the health center																												
	Vaccination																												
Food security	Severity of Household Food Insecurity																												
	Dietary Diversity on Household level																												
	Availability of Sufficient Food on Household level																												
	Dietary habits																												
Infant and young child feeding	Breastfeeding practices																												
	Complementary feeding practices																												
Households livelihood sources and expenditure patterns	Households livelihood sources																												
	Food sources pattern																												
Care practices	Expenditure patterns																												
	Mother-child relationship																												
	Mother's activities																												
	Mother's use of time																												
	Child care																												
Cost of diet	Hygiene																												
	Available food																												
Women empowerment	Food prices																												
	Women empowerment																												
other information	Household composition																												
	Socio-economic status																												
	Access to water and sanitation																												
	Cash transfers follow up																												

FIGURE 7: INDICATORS AND CHRONOGRAM OF MEASUREMENT AS INITIALLY FORECASTED IN THE RESEARCH PROTOCOL

Qualitative data is also collected via focus group discussions and individual interviews. Systematic focus groups are organized in all villages of the intervention group. The primary aim is to allow participants to exchange experiences of usage of the cash transfer which is part of the intervention program. Simultaneously these focus groups offer a possibility to evaluate the hypothesized action theory model of cash transfers to prevent acute malnutrition. A semi-structured questionnaire is used to assess the experiences related to all possible cash pathways. All discussions are recorded on tape. Observations made during the interviews are also reported.

Measurement instruments

The child's weight is recorded using an electronic mother-child weighting scale (Model 876, SECA, Germany). Length is recorded to the nearest 1 mm using foldable length boards (Model 417, SECA, Germany). MUAC is recorded using a non-stretchable plastic tape (model 201, SECA, Germany). All measurements are taken in duplicate during each home visit.

Research teams also interview for disease episodes during the last week using a standardized and tested questionnaire (acute respiratory infections, diarrhea, fever, malnutrition, malaria and measles). Diarrhea is defined as "the passage of 3 or more loose or liquid stools per day" (WHO definition). The symptoms detailed by Roth (Roth, Richard, & Black, 2010) are used to define acute respiratory infections: "At least one lower respiratory tract sign reported by a caregiver and/or observed by study personnel (fast or difficulty breathing, chest wall indrawing) and/or abnormal findings on pulmonary auscultation (crackles/crepitation and/or bronchial breath sounds)". Fever is defined as a temperature superior or equal to 38°C.

Standardization procedure

Data collectors are trained in all procedures in order to minimize the bias linked to the data collection officers. Standardization exercises for anthropometric measures and interview techniques are organized before the beginning of the study. Questionnaires are standardized and pre-tested. Animators of the focus groups are also trained by qualified people, so that all discussion groups and individual interviews are handled in the same way.

Sample size calculation

In order to detect a decrease with 33% in the cumulative incidence of wasting assuming a baseline incidence rate of wasting of 0.26 per child-year (Isanaka et al., 2009) with a Type I error of 5%, a statistical power of 90% and a minimum follow-up time of 24 months, assuming a coefficient of variation K of 0.25, we calculated that 16 clusters of 50 households per cluster are necessary per study arm (Hayes & Bennett, 1999). This calculation takes into account an anticipated 25% drop-out.

Statistical and qualitative analyses

Descriptive analysis will compare changes in endpoints and intermediate indicators between study groups. Cumulative incidence of wasting will be analyzed using mixed-effects Poisson regression accounting for the clustered design by village. The hypothesized change in mean weight-for-height/weight-for-length z-score will be analyzed using a linear mixed model accounting for clustering by village (random intercept). The addition of a random slope (per child) to the analysis model will be tested using a restricted maximum likelihood ratio test. Models will be adjusted for important covariates related to the child wasting incidence, namely child's sex, child's age, baseline nutritional status and household socio-economic score, to gain precision of model estimates. In addition, if important baseline imbalances are noticed, a sensitivity analysis will be conducted adding these imbalances to the aforementioned models. To assess the influence of missing data, a sensitivity analysis will be carried using a multiple imputation strategy to account for missing data.

Cumulative incidence of stunting and morbidity will be analyzed using mixed-effects Poisson regression accounting for the clustered design. Continuous outcomes like mean length-for-age/height-for-age z-scores, mean length/height, mean weight, mean MUAC, will be analyzed using linear mixed models adjusted for child's sex, age and baseline condition of the outcome of interest. As a sub-analysis we will analyze the intermediate endpoints, ie after the first intervention period (2013) and the second intervention period (2014).

Cost-effectiveness will be evaluated through the calculation of cost-effectiveness ratios in terms of cost per new case of acute malnutrition averted (thanks to the cash transfer), and incremental differences in costs and outcomes between intervention and control groups (Drummond, 2005; Muenning, 2007). This will allow for the evaluation of the program effect. The measurement of total cost to achieve outcomes will be done through the ABC (Activity Based Costing) approach: ingredient costs are grouped by "cost centers" based on activities and support costs are allocated to activities based on activity time allocation from staff interviews. A separate protocol was developed in order to detail all the procedures related to the calculation of the cost-effectiveness.

Qualitative analyzes will also be conducted with data from focus groups and individual meetings with women. All recorded audio will be transcribed and translated in French into a Word document. Data obtained from these discussions will be coded using NVIVO 10.0 software. The coding will be performed by pathway corresponding to the interview guide, but also using an

iterative method to integrate emerging pathways (open coding). This will allow modifying and/or validating the model theory framework constructed a priori and working on the pathways taken by cash transfers in order to have an impact of the prevention of acute malnutrition. Moreover, explorative pathway analysis will be conducted to identify the most important changes in intermediate covariates responsible for the hypothesized change in the outcome (incidence of wasting). Mediation analysis/pathway analysis will finally be performed to identify in a quantitative manner the most important pathways through which the hypothesized change in primary outcomes is mediated.

Ethical considerations

The protocol was submitted to two independent ethics committees. The study was approved in April 2013 by the Ethical Committee of the University Hospital of Ghent and in May 2013 by the Burkinabe National Ethical Committee. Official documents are available on requests. This study is also registered in ClinicalTrials.gov: NCT01866124 since May 7, 2013.

Collaborating organizations

This study is implemented by Action Contre la Faim – France, with the scientific support of Ghent University (Belgium), the Institute of Tropical Medicine Antwerp (Belgium), AgroParisTech (France), the Center for Disease Control (United States of America) and the Institut de Recherche en Sciences de la Santé (Burkina Faso). It is funded by Action Contre la Faim – France and the Center for Disease Control. The cash transfer program was made possible thanks to ECHO funds. The cost-effectiveness analysis is co-funded by Action Contre la Faim and the Nutrition Embedding Evaluation Program (NEEP, PATH-DFID).

3.4. DISCUSSION

The MAM'Out research project is a two-arm cluster randomized controlled trial aiming at assessing the effectiveness and the cost-effectiveness of seasonal and multiannual cash transfers to prevent acute malnutrition in Burkinabe children under 36 months.

Studies implemented in humanitarian situations are often merely observational with mostly a pre vs. post evaluation (Sarah Bailey & Kerren Hedlund, 2012) and thus do not allow for a robust assessment of the effectiveness of the implemented activities. The design chosen here will lead to an evidence-based evaluation of the proposed intervention. The presence of a control group seems acceptable as the activities implemented are preventive and not curative ones. Moreover, the children included in the control group benefit from a regular and intensive follow-up allowing for an early detection of acute malnutrition cases. In such events, children are referred and managed by the nearest health center supported by Action Contre la Faim. Additionally, efforts are made to collect high quality data on intermediate process parameters (such as food security or access to health facilities) which will allow for the identification and understanding of the changes activated during cash transfer programs.

This study has been implemented in the field since June 2013. Up to date care has been taken to rigorously follow the research protocol. However some discrepancies mainly due to unforeseen events can be highlighted. First, waiting for ethical clearances, the project faced a two-month delay compared to the timeline presented in figure 7: the baseline measurements started in June instead of April 2013. This led to a two-month postponement of the beginning of the cash transfers which are therefore implemented from July to November. Secondly, after one year of project implementation, there was a switch from a standard paper data collection to e-data

collection via tablets. This solution responds to delays in data entry and allows for real time follow up of the data collected. Thirdly, a supervision process not described initially in the research protocol has been implemented. It ensures the quality of data collection and homogeneity between the four groups of data collectors. Finally, an evaluation of the cost of a local and balanced diet according to the season (cost of the diet) was planned in the protocol. This study won't be carried out but the price of the major staple food is monthly followed in the field.

Several challenges may still arise regarding the implementation of the study. However, to stick to the nine rounds of data collection planned in the research protocol, the end of the project is forecasted for September 2015. With a design based on a cluster randomized controlled trial, this study will lead to a strong evaluation of the effects of multiannual and seasonal cash transfers for the prevention of children acute malnutrition.

4. METHODOLOGICAL PRECISIONS

As mentioned above, due to operational constraints the research began with a two-month delay compared to the initial forecast. All activities were thus postponed by two months. Figure 8 is a synthesis of data collection as it really happened in the field. Each blue spot corresponds to the beginning of a round of quantitative data collection. Each visit (V1, V2, V3...) lasted approximately 2.5 to 3 months in order to investigate all households in the control and intervention groups. Therefore there were very few days between two rounds of quantitative data collection. Qualitative data collection occurred during the five months of yearly cash transfer. Two 24h-food recalls were also carried out during the second cash transfer period. More precisions on both qualitative data collection and 24h-food recall sub-study are given in the related chapters of this thesis (respectively chapter 3 and chapter 4). Besides, in order to be able to assess the cost-effectiveness of the implemented approach, data collection regarding costs of the program (including expenses, opportunity costs and time allocation of staff) was performed in November/December 2014. However, these data won't be presented here.

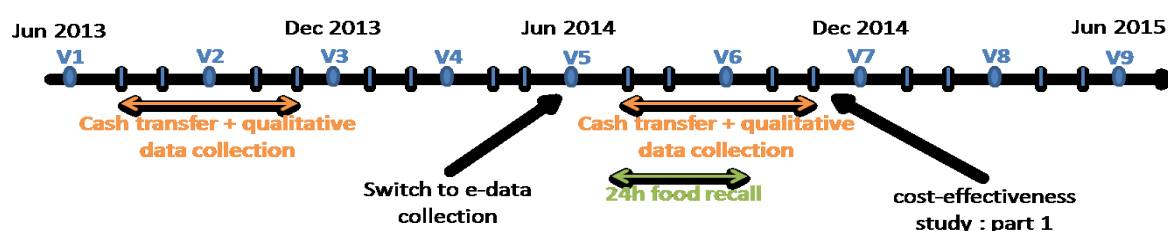


FIGURE 8: REVIEWED CHRONOGRAM OF QUALITATIVE AND QUANTITATIVE DATA COLLECTION AS REALLY IMPLEMENTED IN THE FIELD

The switch from traditional to e-data collection occurred at the middle of the research. This decision was based on several reasons. The major one was linked to data entry which faced important delays due to numerous power cuts in the Kantchari office (Tapoa province). Although additional data entry officers were recruited, they didn't manage to catch up this delay. Thus, it was very difficult to follow data collected in the field and to ensure a good quality of data collection. An analysis of the strengths, weaknesses, opportunities and threats of such a change was carried out before taking a final decision. Once implemented, data collection via tablets was closely monitored. In order to limit bias due to a change in methodology of data collection, a comparison of traditional versus e-data collection was performed: two surveyors collected the same data at the same time, one on tablet and one on paper. This sub-study didn't reveal

substantial differences between the two methods. Therefore, e-data collection was applied until the end of the study.

A supervision process was also implemented from December 2013 until the end of the research in the field. This was a mean of assessing the quality of data collection on a monthly basis. It also allowed stimulating and supporting data collectors and ensuring they do home-visits. Each month, ten different questions were chosen by the supervisor who randomly surveyed again 5 households per data collector, leading to a total of 40 households per month that were visited twice. Answers collected by the supervisor were then compared to the ones collected by the surveyors. A score going from 0 (no disparity between answers) to 10 (all answers were different) was calculated. All along the research period, the supervision score per data collector didn't go beyond 1, translating a good quality of data collection and an adequate performance of data collector both before and during e-data collection.

The choice of implementing a randomized controlled trial in a vulnerable context can be questionable. However, this design allows for a strong evaluation of the effectiveness of unconditional and seasonal cash transfers to prevent undernutrition, contrarily to most of the studies implemented in humanitarian context, which are mostly observational. Moreover, this specific study was implemented in the framework of a preventive program for acute malnutrition and not a curative one. The regular follow-up offered to all children also allowed for an early detection of acute malnutrition cases and some children received a closer follow-up of their nutritional status than they would have without the study.

From an ethical perspective, numerous precautions were taken. First, anthropometric measures of all children were taken every three months. In case a child was detected as acutely malnourished, he/she was referred to the nearest health center supported by Action Contre la Faim, but remained in the study and continued to benefit from the cash transfers if he/she was in the intervention group. An inclusion on a one-shot basis (and not continuously) was chosen in order not to favor supplementary births in the area. Informed consent was also sought with the heads of villages and with each family participating in the study. Caution was taken that enough time and human resources were put during the acceptability phase, with a sensitization of all heads of villages and explanation of the aims of the study.

The study was approved by two distinct ethical committees (in Belgium and in Burkina Faso), who prior asked for some clarifications and/or changes on:

- The exclusion criteria for the villages situated in the Tapoa province
- The compensations initially proposed in the research protocol for the control group (need to reduce the compensations offered)
- The acceptability phase
- The after-study and the use of the results
- The potential misuse of cash: how and how quickly researchers will react if abuse of cash is noticed?

Finally, the targeting process and inclusion criteria of households were also strongly debated prior the final choice was made. First, the choice of including children under 1 year old was mainly based on the scientific available evidence stating that the window of opportunity during which actions to prevent undernutrition are the most efficient goes from conception to 2 years old. Prevalence surveys (like the SMART survey of 2011) also usually show peaks of acute malnutrition in children aged 6-24 months, which is especially true in Africa where weight-for-height ratio decreases continuously until one year old (Victora et al., 2010). It is also known that the first two years of life correspond to the period when the risks of having durable mental and physical negative effects are at the highest. The cash transfers being made on two consecutive

years, this allows to cover part of the most critical period for child development. Secondly, we chose to include only poor and very poor households according to HEA criteria. According to the HEA conducted in December 2011 in the Tapoa province, 40% of the inhabitants were considered as poor or very poor. These households face a survival deficit in a normal year: the households' own production only cover 50 to 60% of the energetic needs, corresponding only to 6 - 8 months of the year. The main part of the revenue of poor households is used to purchase food, with very little available money to invest in basic services such as health. Moreover, the quantitative results of the nutritional causal analysis conducted end 2012 in the province revealed that poor and very poor households are vulnerable to child undernutrition. For women participating in focus group discussions, the lack of revenue is one of the causes of undernutrition, without distinction of the socio-economic status of the household.

4.

CHAPTER 4: BENEFICIARIES' PERCEPTIONS AND REPORTED USE OF UNCONDITIONAL CASH TRANSFERS INTENDED TO PREVENT ACUTE MALNUTRITION IN CHILDREN IN POOR RURAL COMMUNITIES IN BURKINA FASO: QUALITATIVE RESULTS FROM THE MAM'OUT RANDOMIZED CONTROLLED TRIAL

1. ABSTRACT

Background: Acute malnutrition is a public health issue worldwide, and particularly in the Eastern region of Burkina Faso. Following a needs assessment, unconditional seasonal, multiannual cash transfers were implemented as a safety net to prevent childhood undernutrition. The objectives of this study were to explore the types of purchases made by beneficiaries of this cash transfer program and to understand the perceived effects of and changes induced by regular cash transfers in the daily lives of women, and at the household and community level.

Methods: The design of this study was a two-arm cluster randomized controlled trial. Qualitative data were collected each month during the cash transfer period for two years, leading to a total of more than 300 interviews and focus group discussions with various participants: beneficiary mothers, heads of households, mothers-in-law, co-wives, key members of the community, and participants of the control group.

Results: The two main types of expenses reported were food and health care for the child and the whole family. The program was also associated with positive perceived changes at the household level, mainly related to gender equality and improvement of women's status, and has promoted an increase in dignity and social integration of the poorest at the community level through cash sharing. Unexpected effects of this program included some women planning new pregnancies and some individuals not expecting the transfers to end.

Conclusion: Although the transfers were unconditional, the cash was mainly used to improve the children's and households' food security and health, which correspond to two main underlying causes of undernutrition. Therefore, spending mainly in these areas can help to prevent undernutrition in children.

Trial registration: ClinicalTrials.gov, identifier: NCT01866124, registered May 7, 2013.

2. BACKGROUND

For several decades, humanitarian agencies have implemented food assistance programs for populations in need, as part of development and/or humanitarian responses. These programs can take various forms, from direct food distribution when no food is available in the affected area to, more recently, vouchers or cash transfers when markets are functional and food is available locally. These vouchers and transfers are often restricted to specific items or to food, and come with guidance on how to use the money. However, needs vary greatly between families, depending on their individual situations and the composition of their households. In this respect, unconditional and unrestricted cash transfers allow beneficiaries to spend the cash that they receive according to their own priorities and needs. This approach was chosen in the Eastern region of Burkina Faso, within the framework of the MAM'Out (Moderate Acute

Malnutrition Out) research project (Tonguet-Papucci, Huybregts, Ait Aissa, Huneau, & Kolsteren, 2015).

With around 17 million inhabitants, Burkina Faso is one of the poorest countries in the world. On the human development index, it ranks 181 out of 187 nations (UNDP, 2014). The prevalence of wasting is high: at the country level, 10.2% of children under 5 years old were acutely malnourished (2006 WHO growth standard) in August/September 2011 (which corresponds to the end of the hungry season) (Ministère de la Santé - Direction de la Nutrition, 2011), and this prevalence reached 17.3% in April 2012 in the Tapoa Province in the Eastern region of Burkina Faso (Nikiema, 2012), which makes the region a priority area in terms of tackling undernutrition. The main ethnic group in the Tapoa province is the Gourmantché, with Pulaar people represented to a lesser extent. Most of the Gourmantché people live in villages run by key male members of the community, namely the village head, supported by members of the village development council. A village is comprised of numerous concessions. A concession is a group of huts linked together by a fence forming a round courtyard where an extended patrilineal family lives, i.e. the “old” parents and their sons with their entire family (wives and children), and sometimes other family members (Cartry, 1966b). Each concession contains several households, and each household has a head of household (usually the husband). The households are predominantly polygamous. The husband is usually the principal decision-maker for the household, although he remains under the influence of his father. The husband is in charge of providing millet to feed his wives and children, and is responsible for his wives’ actions. Each wife has a separate hut where she raises her children and keeps some of the food assigned to them. Two situations may occur. If each household within the concession has its own field and produces grains and vegetables, then each household is independent, and when the co-wives prepare meals, they have to give some to their parents-in-law. However, if all of the sons work in their father’s fields, the granary is shared and handled by the head of the concession. In this case, meals are taken together, and the wives from each household take turns preparing meals for the whole concession. Traditional meals are based on grains eaten along with a sauce. Rivalry and tensions between co-wives may arise, even if the husband supposedly has to treat them equally. The first wife assists her husband with ritual functions during ceremonies and supervises the sharing out of the cooking tasks. However, she does not have absolute authority over her co-wives (Cartry, 1966a). The relationship between co-wives, as well as gender practices (the relationship between and roles and responsibilities of men and women) are thus crucial when implementing and monitoring a program within the Gourmantché community.

In 2012, the Burkinabe national government, supported by a group of technical and financial partners, launched a national policy for social protection, with an action plan that identified the improvement of social transfer mechanisms for the poorest and the most vulnerable, in order to ensure food security, as a priority (Gouvernement du Burkina Faso, 2012). In this context, the MAM’Out project tested the distribution of unconditional multiannual, seasonal cash transfers, which are intended to act as safety nets to conserve household resources, at an appropriate, predictable and guaranteed level. It was assumed that, during the hungry season, household expenditures would exceed income, leading to the implementation of damaging coping strategies that increase the risk of child malnutrition. Presumably, predictable cash transfers during this key period would prevent the implementation of these negative strategies, and could even support longer term investment in productive assets and/or positive practices.

Cash transfers have already been proven to be effective in reducing poverty, and have the potential to support livelihoods and promote food security (Ruel & Alderman, 2013). However, how cash transfer programs affect the daily life of communities benefiting from these transfers is rarely explored in depth. In the MAM’Out study, our aim was to obtain a more comprehensive understanding of how cash transfers were perceived and used, and to identify any unexpected

effects of these transfers. More specifically, we sought to describe the types of purchases made to prevent undernutrition in children and to understand the effects and changes induced by regular cash transfers in the daily lives of women, the household, and the community, with regard to preventing undernutrition in children. For this reason, the qualitative study nested within the MAM'Out trial focused mainly on the cash group, although data were also collected from women in the control group in order to receive their feedback on the program and any unanticipated effects. Given the asymmetry in data collection between the two arms of the study, and the objectives of the qualitative study, the control and intervention groups were not compared in this study.

3. METHODS

Ethics statement

Qualitative data were collected between July 2013 and November 2014. The qualitative study was performed within the framework of a larger research study (the MAM'Out research project), which received ethical approval from two separate ethics committees. The study was approved in April 2013 by the Ethical Committee of the University Hospital of Ghent, and in May 2013 by the Burkinabe National Ethical Committee. The study was registered with ClinicalTrials.gov (trial number: NCT01866124) on May 7, 2013. Mothers of children included in the MAM'Out study provided written informed consent prior to the enrollment of their children in the program. The different participants involved in the qualitative data collection also provided oral consent.

The MAM'Out study: a mixed-method approach

The aim of the MAM'Out research project was to evaluate a seasonal, multiannual cash transfer program that was implemented to provide a safety net for preventing acute malnutrition in children under 36 months of age in the Tapoa province (Eastern region of Burkina Faso) (Tonguet-Papucci, Huybregts, Ait Aissa, et al., 2015). The program began in May 2013, and targeted economically vulnerable households (i.e. poor and very poor households, as defined by the Household Economy Approach (Tanya Boudreau et al., 2008)) with children younger than one year old at the time of inclusion. All households meeting both criteria and belonging to the selected villages were invited to participate in the project. In total, 1178 children were included in the study. Cash was distributed during two consecutive hunger gaps to mothers via mobile phones, in collaboration with a mobile phone company. After receiving a text message informing them that the cash was available, the mothers had to take their mobile phone and SIM card to the nearest cash point to withdraw the money within a week's time. The transfers were unrestricted, so the beneficiaries could decide how to use them. Women were chosen as the primary recipients of the transfers, as they are the primary child caregivers. The design of the study was a two-arm cluster randomized intervention trial. The randomized units were rural villages in the Tapoa province. In sixteen villages that were included in the intervention group, mothers received 10,000 FCFA (around €15) every month from July 2013 to November 2013 and from July 2014 to November 2014 for each child included in the study. Sixteen other villages were included in the control group. All families were followed up for two years. The main outcomes were the cumulative incidence of acute malnutrition (or wasting) and the cost-effectiveness of the program. Clinical outcomes of the trial will be reported elsewhere.

Quantitative data were collected quarterly from June 2013 to September 2015, based on a conceptual framework of actions of cash transfers to prevent acute malnutrition in children.

Qualitative data were also collected. This mixed methods approach will allow for a more comprehensive understanding of the results and will help assess the validity of the findings (Bryman, 2006). Comparing qualitative findings between the control and the intervention groups is beyond the scope of this article, so the results will focus on the data collected from the intervention group. The important aspects of the qualitative study are reported according to the COREQ checklist (Tong, Sainsbury, & Craig, 2007).

Theoretical framework of action of cash transfers

While designing the study, a theoretical framework was constructed of how the cash transfers would work (Fig. 9), based primarily on existing literature and reports on the study area. A nutrition causal analysis conducted in the Tapoa province from November 2012 to December 2012 provided more detailed information about the pathways through which cash transfers can address acute malnutrition in the local context (Lysette Boucher-Castel & Julien Chalimbaud, 2013b). Three main hypotheses were generated. First, cash transfers can increase the household's budget, leading to an increase in purchasing power, investment in productive assets, and improvement in the family's psychosocial well-being. Secondly, cash transfers may help the household stay within its budget, preventing the family from taking out additional credit, selling productive assets, or migrating for work. Thirdly, cash transfers were hypothesized to increase female empowerment through the women's control over the income and increased decision-making power.

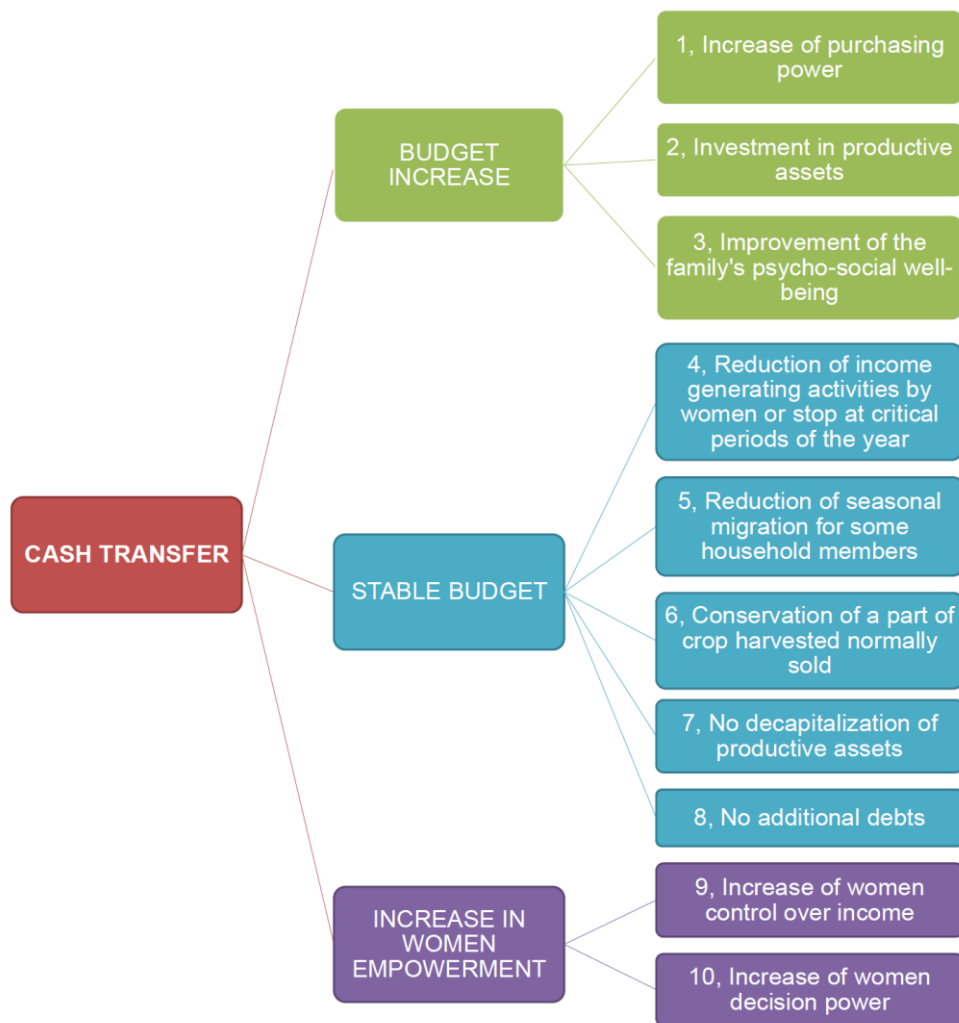


FIGURE 9: SIMPLIFIED THEORETICAL FRAMEWORK OF ACTION OF CASH TRANSFERS

This theoretical framework was used to analyze and organize the qualitative data collected. Individual interviews and focus group discussions offered an opportunity to evaluate this hypothesized model of the effects of cash transfers on preventing acute malnutrition in children. For this purpose, a semi-structured questionnaire administered in the local language was used to assess the experiences related to all possible cash pathways. Interview guides were designed based on the conceptual framework of how the transfers work, and were improved by adding new themes as they arose. More details on these questionnaires are provided later in the paper.

Participants

In total, 397 people from the villages that received cash transfers participated in the qualitative data collection during the first year of the program. The second year, 483 people from the villages that received cash transfers and 92 people from the control villages were involved (Fig. 10).

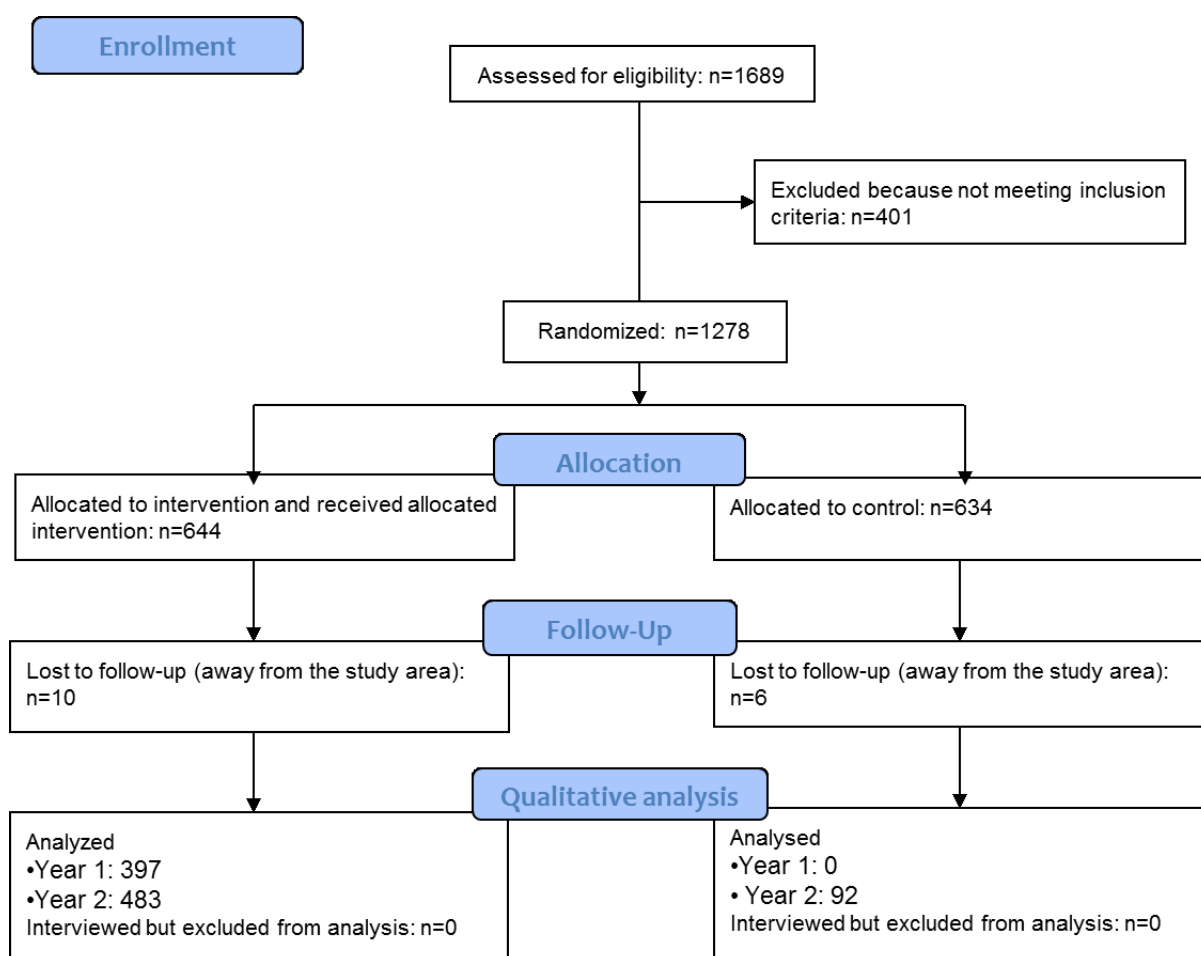


FIGURE 10: CONSORT FLOW DIAGRAM OF THE MAM'OUT PROJECT QUALITATIVE DATA COLLECTION

The choice of participants depended on the interviewers, who randomly selected families to interview. Lists of all the mothers from the different villages were obtained and completed with additional columns for husbands, co-wives, mother-in-law, etc. Participants were randomly selected by trained interviewers on a weekly basis. Once a participant was interviewed, his or her name was marked accordingly, and the lists were updated for reference for further randomization sessions. No individuals were interviewed twice in the same year. Seven to twelve participants were involved in each focus group discussion. Three groups of participants were included: 1/ Direct beneficiaries of the cash transfers, i.e. mothers of the children who were followed up within the intervention group; 2/ Indirect beneficiaries of the transfers: other households members benefiting from cash transfers (heads of household, co-wives, mothers-in-law) and key members of beneficiary villages (members of complaint committees and targeting committees, members of the village development councils); 3/ Control group participants; more precisely, the mothers and heads of households of children who were followed up with as part of the study.

In total, 306 discussions were carried out, recorded and analyzed over the two-year program: 77 focus groups and 188 individual interviews from the intervention group, and 41 individual interviews from the control group. Table 1 summarizes the distribution of these discussions by category of interviewee, type of discussion and time of data collection. Most of the discussions occurred within the intervention group: 46% with indirect beneficiaries of the transfers and 41% with the cash recipients (the mothers). Only 13% of the discussions were held in the control villages.

	Type of participants	Intervention group		Control group	
		Year 1*	Year 2*	Year 1	Year 2
Focus group discussions (FGD)	Mothers	215 (25)	270 (25)		
	Heads of households	49 (6)	87 (9)		
	Co-wives	16 (2)	73 (7)		
	Mothers-in-law		26 (3)		
Individual interviews (II)	Mothers	32	43	22	17
	Heads of households	30	18		2
	Co-wives	2	6		
	Mothers-in-law		13		
	Key village members	31	13		
Total number of FGD and II		128	137	22	19

TABLE 2: NUMBER OF PARTICIPANTS IN THE FOCUS GROUPS AND INDIVIDUAL INTERVIEWS CONDUCTED DURING THE TWO-YEAR PROJECT, CLASSIFIED BY TYPE OF PARTICIPANT

Legend: * The numbers in brackets represent the number of focus groups run by type of participants and per year.

The characteristics of the focus group discussions and individual interviews subsamples are similar to those of the MAM'Out population in term of socio-economic and matrimonial status, except for a slightly higher percentage of monogamous households and lower percentage of polygamous households participating in the focus group discussions (Table 3). On this basis, qualitative study subsamples can be considered fairly representative of the whole MAM'Out population.

	Participants in the individual interviews	Participants in the focus group discussions	MAM'Out population (at inclusion)
Matrimonial status of the head of household			
Monogamous, n (%)	98 (60,1)	506 (75,3)	758 (60,7)
Polygamous, n (%)	63 (38,7)	166 (24,7)	476 (38,1)
Widow, n (%)	2 (1,2)	0 (0)	11 (0,9)
Divorced, n (%)	0 (0)	0 (0)	4 (0,3)
Household socio-economic status (HEA criteria)			
Very poor, n (%)	46 (27,5)	155 (23,4)	322 (25,8)
Poor, n (%)	121 (72,5)	507 (76,6)	927 (74,1)
Medium, n(%)	0 (0)	0 (0)	1 (0,1)

TABLE 3: GENERAL CHARACTERISTICS OF PARTICIPANTS IN THE FOCUS GROUP DISCUSSIONS AND INDIVIDUAL INTERVIEWS OVER THE TWO YEARS OF PROJECT IMPLEMENTATION COMPARED TO THE GLOBAL SAMPLE OF THE MAM'OUT STUDY AT INCLUSION

The majority of participants belonged to the Gourmantché ethnic group, and only a few of the participants were Pulaar. When analyzing the results, no distinction was made between these two ethnicities, as very few data were obtained from Pulaar participants.

Systematic focus groups were held in all of the villages belonging to the intervention group. Sixteen villages received cash transfers, and focus groups were held in eight of these villages every other month, from July to November 2013 and July to November 2014, corresponding to the cash transfer periods. Hence, at least two focus groups were carried out each year in each

village benefiting from the transfers. In parallel, individual interviews were conducted in the intervention and control villages to obtain a more detailed understanding of the cash utilization and any unexpected and/or negative aspects associated with these transfers.

Focus groups and individual interviews

Qualitative data were collected monthly during the cash transfer periods via focus group discussions and individual interviews conducted by two interviewers (one male and one female) each year, who were employed full time by the study. All interviewers were Gourmantché from the Eastern region of Burkina Faso, had at least completed the final year of high school, and had at least one year of professional experience conducting focus groups. During the second year of the project, one interviewer had a master's degree in sociology and had received a formal education in qualitative data collection. For both years of the study, the interviewers were trained for one week by skilled sociologists in qualitative data collection methods, and particularly in techniques used to conduct focus group discussions and individual interviews. Questionnaires were pilot-tested, and role-playing exercises were organized in order to identify potential difficulties and ways in which the interviewers could improve. The main difficulties that were encountered were the interviewers' ability to follow up on interviewees' answers and keep discussions going, and ensuring that all participants, particularly those who were shy about talking, were heard "equally". The interviewers improved their skills in these areas primarily through additional practice. During the second year of the study, a sociologist supervised the process to improve the quality of data collection in the field.

Focus groups and individual interviews were conducted based on discussion guides that were designed prior to the beginning of the qualitative data collection and were based on the theoretical model of action of cash transfers. These discussion guides were first written in French, then translated into the local language (Gourmanchema) to ensure that they were understood by the interviewers (Annex 1). Among the themes addressed during each focus group and individual interview were the definition of undernutrition and its causes, the interviewees' knowledge and perception of the MAM'Out project, the positive and negative changes induced by the program, and their perception of the use of the mobile phones by women. Participants from the intervention groups were also asked about the types of purchases made with the cash that they received.

One to three days before each interview or focus group, an appointment was made with the participants to ensure their availability. All discussions were conducted in the local language (Gourmanchema for the majority of participants; the discussions were translated into Pulaar in a few cases) and took place in a specifically chosen, quiet location, at home or in the village. Care was taken to ensure the confidentiality of what was reported; only the interviewer(s) and the respondent(s) were present during the interview or the focus group discussion. Each focus group discussion and individual interview lasted between 30 and 45 minutes. None of the participants were interviewed more than once.

Data coding and analyses

After participants gave verbal consent, the discussions were recorded, transcribed, and translated into French by a third person skilled in sociology. Due to the high illiteracy rate among women in this rural community, transcripts were not returned to them for comments. Observations made during the interviews were also reported by the interviewers and summarized in written documents. Data obtained from the focus groups and the individual interviews were coded using N-Vivo software (QSR international – version 10) and a written codebook. The coding was performed by combining a deductive approach based on pathways corresponding to the interview guide and the theoretical framework of action of cash transfers,

and an inductive approach using an iterative method to integrate emerging pathways (open coding). This enabled us to identify new factors of interest and perceived effects of the cash transfer. Specific attributes of the focus groups and individual interviews were also entered into the N-Vivo software program, such as the socio-economic group that the participants belonged to (very poor versus poor, according to the Household Economy Approach (Tanya Boudreau et al., 2008)), marital status, and the type of interviewee.

A content data analysis was performed to analyze the results (Bardin, 2003). Summary reports from the two years of data collection were written up based on the identified themes and pathways. The qualitative findings were organized around the main themes described above. Data are presented for all factors of interests, and related quotes are shown in Tables S1, S2, and S3 (Annex 2). The differences between these factors according to the attributes are only presented when relevant.

Quantification of expenses

All mothers in the intervention group were asked three times over the course of the two year project (during the quantitative data collection) how they spent the cash they received and how much they spent. These data were collected at different points during the project: 1/ from December 2013 to March 2014, after the first five months of the cash transfer program; 2/ from June 2014 to September 2014, during the second round of cash transfers; and 3/ from October 2014 to January 2015, corresponding to the end of the second year of the cash transfer program. The interviewers used a questionnaire with seven yes-or-no questions, such as “Did you use the money you received from ACF to buy food for your household?” or “Did you use the money you received from ACF to invest in an income-generating activity?” When participants answered “yes” to a question, they were asked to state the approximate amount spent on this specific activity, using a proportional piling method. Two additional open-ended questions gave participants the chance to report whether they spent the money on other items, and how much. For analysis purposes, the answers to these two additional questions were grouped into one of the following themes: health care, savings, and other.

4. RESULTS

What are the types of purchases made by the beneficiaries of multiannual and seasonal cash transfers?

Results from the qualitative data collection

The most commonly reported use of the cash was to purchase food. This can be linked with the words used by the interviewees to describe “malnutrition”. In the Gourmanchema language, this word is defined by various terms. One of the terms used most often by the participants was “tidjepuari”, meaning “lack of meal”. Even though families were informed at the beginning of the program that the money that was distributed was intended to prevent their youngest children from suffering from acute malnutrition, all participants agreed that most of the money received was spent on food for the child as well as the whole family. This allowed households to improve the quality of the child’s diet and to increase the overall food stores in the house at times when resources were tight, especially from July to September, a period of time corresponding to the hungry period.

The second most commonly reported type of expense was health care; once again, the money was used to support the child's health, as well as the family's health. This was indicated by the words used by the interviewees to describe malnutrition in their children, for example: "li muli", meaning hemorrhoids, or "djiérigoji", meaning worms. Participants also used terms referring to symptoms such as "bloated belly" or "skinny arms" that related to their child's health status.

Interviewees also indicated that part of the money could have been spent on hygiene products, clothes, and cooking utensils, which can be linked to the term "ti djuanguidi" (in relation to dirtiness), which is also used to describe malnutrition.

Very little investment in income-generating activities was reported in this study. In cases where this was reported (for example, selling bean fritters), it involved the wealthier families included in the study, i.e. the "poor" families. Participants explained that they perceived the monthly cash transfers to have low value in this regard, based on the households' size and vulnerability. Nevertheless, some beneficiary households reported using part of the money to buy agricultural products and cattle, which can serve as a buffer in times of significant financial constraints.

People also described sharing the money within the household and externally. Generally, once the women reached home with the cash, they gave part of it to their husbands for their private use. A small portion was sometimes shared with the women's co-wives or mothers-in-law. In some cases, money was shared with individuals who were not part of the household, to maintain inter-household cohesiveness and in keeping with local practices. Participants explained that if a family with sufficient income helps their neighbor, then when the family has resource issues itself, it is likely to receive help in return.

Finally, the focus groups and individual interviews revealed an unexpected type of expenditure. Interviewees reported using some of the money they received to charge the batteries of the mobile phone given to them for cash transfer purposes. They also reported spending some money on phone credits. The amount spent varied between households and depended on how the mobile phone was used.

Results from the quantitative data collection

Table 4 summarizes the amount of money spent and types of purchases made with the cash received within the framework of the MAM'Out project. Increasing the household's food stores and buying food for the child were the two main areas of expenses for the majority of the beneficiary mothers. They estimated that the amount spent each month to increase the household's food stores was around 5000 – 6000 FCFA (8-9€) (out of the 10,000 FCFA received), and that around 2800 FCFA (4€) was spent on food for the child. Several of the mothers also reported that they used some of the cash to buy materials for the child's care (around 1600 FCFA (2.5€)) and for health care for the child and the whole family (around 4500 – 5000 FCFA (7€)). Money sharing (between 1500 and 3300 FCFA (2-5€)) and savings (2700 – 4000 FCFA (4-6 €)) also represented a non-negligible part of the 10,000 FCFA that the families received, although this was reported by fewer households. Investment in productive goods and income-generating activities was nearly nonexistent, but when it occurred, the amount spent could be significant.

		Data collection from December 2013 - March 2014		Data collection from June 2014 - September 2014		Data collection from October 2014 - January 2015	
		Number of individuals investing*	Mean amount spent (FCFA)	Number of individuals investing**	Mean amount spent (FCFA)	Number of individuals investing***	Mean amount spent (FCFA)
Type of expense	Increase food stores for the household	484	4 724	390	6 391	449	5 451
	Buy food for the child	531	2 919	315	2 787	372	2 715
	Invest in another activity (1)	391	3 659	163	4 693	291	4 832
	Buy materials for child care	324	1 396	128	1 597	288	1 844
	Buy non-productive goods	143	1 388	24	2 392	111	2 159
	Invest in another activity (2)	82	2 041	31	4 064	38	3 780
	Share money with husband/parents/neighbor	53	1 611	34	3 306	26	2 973
	Buy productive goods	15	2 537	7	5 429	14	4 071
	Invest in income-generating activities	4	3 000	0		1	10 000
Details of other activities (1)	Health care	295	3 998	101	5 410	228	4 824
	Savings	58	2 714	48	3 258	47	4 104
	Other	36		12		16	

TABLE 4: DECLARED AMOUNTS AND TYPES OF PURCHASES MADE BY THE INTERVENTION GROUP USING THE CASH RECEIVED – RESULTS FROM THE QUANTITATIVE DATA COLLECTION

Legend: The number of individuals presented in the table corresponds to the number of mothers who reported making various types of purchases. * out of 616 respondents. ** out of 596 respondents. *** out of 592 respondents

Did the cash transfers induce perceived changes in the daily life of women?

Overall, the heads of households and key members of the community reported that the cash transfers received by the women were well-tolerated.

In terms of changes, both men and women reported that women had an increased participation in decision-making concerning purchases for food and health, as well as in households' charges, improving communication between husbands and wives. However, beneficiary women reported no change in decision-making regarding traditional health care (i.e. seeking care from traditional healers) for the child: the head of household remained the principal decision-maker in this respect.

Heads of household also expressed being positively surprised by the support they received from their wives, especially regarding purchasing grain for the family. In some cases, this was associated with an encouraging change in the husband's perception of his wife and of her capacity to make accurate decisions or suggestions. Some participants reported intra-household jealousy from a non-beneficiary woman towards her beneficiary co-wife, as well as misunderstanding between wives and husbands on how the cash should be used.

Most heads of households also reported that their wives managed part of the cash themselves (after giving some to their husbands or other family members) and had increased autonomy. However, traditionally, both men and women have their own "purse" and handle a certain amount of money: men are responsible for buying grain, and women pay for ingredients to make the sauce. However, depending on each household's rules, women may not be allowed to retain more than a certain amount of money, and may therefore need to give the surplus to their husband, mother-in-law, or parents. In some other Gourmanchema households, the husband controls all of the household's money and decides how much can be spent on what.

At the community level, social cohesiveness appeared to be reinforced through cash-sharing outside the household and the granting of loans. Participants also reported enhanced communication between women; for example, women who were not included in the study sometimes asked beneficiary women for advice on caring for their children. Some beneficiary women also stated that their relationship with shopkeepers improved due to the cash transfers.

What are the perceived positive and negative effects of the cash transfer program?

Overall, the MAM'Out program received positive feedback from the beneficiaries and from the community as a whole. At the household level, participants in the focus group discussions reported that the cash transfers increased their purchasing power and reduced the stress and shame that occur when the family is hungry. Families also described having fewer debts or not needing to sell their productive goods and assets. Key village members also reported perceiving positive changes at the community level, particularly the fact that the poorest families did not request financial aid from the richest families. Similarly, members of beneficiary households reported reducing their seasonal migration and paid work on other farmers' fields in favor of cultivating their own lands.

The MAM'Out research team paid particular attention to any tension that may have arisen due to the program. However, no conflict was reported between beneficiary and non-beneficiary households, both of which perceived the situation as the result of a divine will. Having an

intervention and a control group did not seem to create tension or violence between communities, and participants did not describe it as problematic. When control group participants were asked how they felt about not receiving money, they indicated that they hoped to also become beneficiaries.

The participants in the focus group discussions and individual interviews also suggested ways of improving the program. Beneficiary households reported a desire for continuous (not seasonal) cash transfers, and, above all, that the program and the cash transfers would not stop. Participants mentioned that the monetary value of the monthly transfers (around 15€/month) was low, given the households' size and vulnerability. During the first year, women also expressed dissatisfaction with the distance between their villages and the cash collection points, as well as the amount of time they had to wait before receiving the money. Due to improvements in program management, this was not reported as a weakness during the second year of the program. Misunderstanding of the inclusion criteria for the program, as well as potential corruption within the targeting committee responsible for establishing a list of eligible households, were also reported.

Unexpected effects of the program were also described by some participants, particularly beneficiary women. Some reported not having expected the cash transfers to end, and hoped that the program would continue. Even though the duration of the cash transfer program was made clear to all participants from the beginning of the project, some beneficiary households wondered how they would continue without help. Reduced financial support of beneficiary wives by their husbands was also reported.

Finally, several women, namely mothers and mothers-in-law from both intervention and control villages, reported having heard of non-beneficiary women getting pregnant in order to be part of the cash transfer program the following year, although no further cash transfers are planned. However, no data were available to compare the birth rate in the MAM'Out families to the rest of the population.

5. DISCUSSION

The findings regarding expenses from the qualitative data of the study are consistent with the quantitative data. The main uses of the received cash were associated with terms for malnutrition in the local language: money was primarily spent on food and health care for the child and the whole family. Part of the cash was also spent on hygiene and domestic products, and some was shared within the household and with other families. These three types of expenses (food, health care, and products for personal and environmental hygiene) correspond to the three main underlying causes of undernutrition described in the framework of undernutrition reported in the 2008 Lancet series (Black, Allen, Bhutta, Caulfield, de Onis, Ezzati, Mathers, & Rivera, 2008). In this regard, spending mainly in these areas can help prevent undernutrition, and particularly acute malnutrition, in children.

The effects of cash transfer programs are usually assessed using quantifiable indicators. One of the first effects of a cash transfer program is an increase in the household's income and purchasing power, which in turn has positive effects on food security, through increased

spending on food (Jef L. Leroy et al., 2009; Vincent & Cull, 2009b). In Kenya, unconditional cash transfers were associated with greater spending on food, health, and clothing (CT-OVC, 2012). Cash transfers were also shown to increase access to health care (Lagarde et al., 2009; Vincent & Cull, 2009b). The qualitative results presented here regarding the purchases made with the distributed cash are thus consistent with results from other studies.

It was hypothesized that transferring cash to women, who do not typically manage household finances in poor rural Burkinabe communities (which are usually led by men), could have effects on their daily lives. One of the major concerns of the MAM'Out research team was the acceptability of this process to male members of the household, who appeared to be satisfied with the women receiving the money.

The cash transfer program led to several changes in the daily lives of women: they seemed to take on a larger role in decision-making (with regards to health and food purchases), and managed part of the cash that was received, increasing their autonomy. Enhanced communication within the household was also reported, although in some cases, jealousy and misunderstanding arose. At the community level, social cohesiveness appeared to be reinforced through cash-sharing outside the household, and relationships with shopkeepers improved for some families. Increased dignity for the poorest families and a reduction in taking on paid work in other farmers' fields for some households were also highlighted. Similar results have been reported by other studies. In Malawi, unconditional cash transfers were associated with a drop in income from low-skilled agricultural work (Covarrubias et al., 2012). The positive effects of cash transfers on women's empowerment and personal status have also been described several times. Cash transfers allow recipients to become active members of their households or communities, promoting their self-esteem and empowerment (Vincent & Cull, 2009b). As mentioned in the 2013 Lancet series, Latin American cash transfer programs were also associated with improvements in women's control over income and provided opportunities for them to strengthen their social networks (Ruel & Alderman, 2013). Promotion of women's empowerment due to cash incentives was also reported in the review by van den Bold et al. (Bold et al., 2013).

Overall, the MAM'Out program did not create tension between villages, and allowed households to protect their livelihoods and feed family members during the hungry period. However, unexpected perceived effects of the program were also highlighted during the discussions, such as some beneficiaries not expecting the cash transfers to end, and the plans of some women to become pregnant in order to become beneficiaries of the project. This possibility was considered when creating the inclusion criteria and designing the project. In order to reduce this risk of increasing the birth rate, all beneficiaries were chosen on a one-time basis and not continuously. The aim of the program and its duration (two years) were also clearly explained to the women, as a basic ethical consideration, and regular communication about the program occurred throughout the two years. However, these precautions were not sufficient to prevent some women from planning new pregnancies; this point should be investigated further in future research on cash transfers. Pregnancy risks were also analyzed in Fiszbein's review of conditional cash transfers, which found that these programs had a modest impact on birth rates: some Latin American programs resulted in slightly increased birth rates, while some had no effect (Fiszbein, Schady, Ferreira, et al., 2009).

Some other studies have highlighted unexpected effects of such programs, such as misunderstanding of the cash transfer rules, the tensions that these money transfers can create, the perception that less money has been received due to redistribution (Olivier de Sardan & Oumarou, 2013), or even dangerous mystic interpretations that beneficiaries may have of the program (Piccoli, 2014). Although misunderstanding of the inclusion criteria and potential corruption were also reported during the interviews, no major security issue or tension was described by the MAM'Out participants. This can be ascribed to the organization of Gourmantché society, in which inter-household solidarity is crucial, unlike in competitive communities. As explained by the participants of the interviews and focus group discussions, an individual who has money now should help his neighbor in need if he wants to be helped in return one day. However, the reported unexpected effects of the transfers may be underestimated. This study only reports the feedback given by participants during the cash transfer program. Thus, they may not have had the necessary perspective to report on potential dependencies that the program could have created, new habits beneficiaries would have to lose, or disillusion after the end of the project.

The concerns and expectations raised by the interviewees bring into question the appropriateness of randomized controlled trials. One of the major aims of this study was to provide evidence for the effectiveness of unconditional, seasonal cash transfers in preventing acute malnutrition in children, so that the Burkinabe government could be petitioned to include this type of strategy in their social protection plan. The qualitative findings are encouraging, and favor longer-term intervention plans. However, solid quantitative results are still needed to provide a more complete understanding of this type of program. The design of this trial will generate reliable evidence.

The significant number of individual interviews and focus group discussions carried out and analyzed over two years lends credence to the results presented here. The variety of participants included in the qualitative data collection provided a broad understanding of different points of view, as well as how they confirmed and/or contradicted each other. From a methodological aspect, the semi-structured questionnaire ensured that accurate information was obtained, while leaving the interviewers and participants free to express their ideas. Desirability bias could be a limitation of the study. However, the significant number of focus groups and individual interviews that were carried out led to saturation: what participants stated in one focus group was generally corroborated by the following one, which suggests that the reported statements were of high quality. Moreover, the topics discussed during the focus groups were confirmed by the individual interviews. Care was also taken to emphasize the potential negative effects of the program, especially during the second year of the program.

The data were collected by trained interviewers each year, although they were not sociologists. This could have resulted in a lower quality of data collection during the first few weeks, particularly during the first year, during which the interviewers did not follow up on many of the participants' statements. To address this situation, close supervision by a sociologist was implemented during the second year.

The codebook used for analyzing the data was developed by the MAM'Out research team based on a model of how cash transfers could prevent undernutrition in children (Fig. 9) and modified with new themes as they arose. However, it was not peer-reviewed externally. Analyzing the qualitative results in the context of the theoretical framework confirms several pathways. First,

cash transfers increased household budgets, and led to an increase in purchasing power, increased spending on food and health, and improved the psychosocial well-being of families (pathways 1 and 3). However, very few investments were made in productive assets. Secondly, the cash transfer program stabilized family budgets, which lead to a decrease in seasonal migration for some families, the retention of productive assets, and repayment of debts and credits (pathways 5, 7 and 8). None of the participants commented on any reduction in income-generating activities at critical points of the year or retaining a portion of the crops that would usually be sold. Therefore, no conclusions can be drawn about these aspects, which should be investigated in future studies. Thirdly, the cash transfer program was associated with a positive change in the role of women, which was also positively perceived by the community. The position of women improved due to the receipt of cash transfers, and women experienced greater control over income and greater decision-making power (pathways 9 and 10). The qualitative data presented in this report thus validate some pathways of the theoretical framework of how cash transfers could prevent undernutrition in children in poor, rural Burkinabe communities. However, these results still need to be confirmed with quantitative indicators.

6. CONCLUSION

Although the cash transfers were unconditional, the money was mainly used to improve the food security and health of children and households, which correspond to two main underlying causes of undernutrition. Spending mainly on these areas can thus help prevent childhood acute malnutrition. The program was also associated with positive perceived changes at the household level, mainly related to gender equality and improvement in women's status, and promoted social integration of the poorest families at the community level through cash-sharing. Unexpected reported effects associated with this program included some women planning new pregnancies and some individuals not expecting the transfers to end.

5.

CHAPTER 5: UNCONDITIONAL SEASONAL CASH TRANSFER INCREASES INTAKE OF HIGH NUTRITIONAL VALUE FOODS IN YOUNG BURKINABE CHILDREN: RESULTS OF 24-H DIETARY RECALL SURVEYS WITHIN THE MAM'OUT RANDOMIZED CONTROLLED TRIAL

1. ABSTRACT

Background: Cash transfer programs have the potential to improve dietary intake by improving accessibility to food. However, quantitative data on the impact of cash transfer programs on children's energy and nutrient intake is lacking.

Objective: The aim of this study was to evaluate the effect of seasonal unconditional cash transfer on children's energy, micro and macronutrient and food group intake during the lean season in Burkina Faso.

Methods: Within the framework of the MAM'Out study, a cluster randomized controlled trial, two 24-h dietary recall surveys were conducted in July and August 2014. Daily energy, macro- and micronutrient intake, breastfeeding practices, as well as food group consumption, were analyzed for 322 children aged 14 to 27 months from the intervention group (benefiting from unconditional cash transfer during the lean season 2013 and 2014) and the control group, using mixed linear/logistic/Poisson regression models or a gamma-generalized linear model with log-link. A dietary diversity score was calculated based on seven food groups.

Results: Unconditional cash transfers during the lean season improved the diets of rural children through higher consumption of eggs ($11.3 \text{ g} \pm 1.55$ vs $3.25 \text{ g} \pm 0.79$, $p < 0.001$), fat ($20.6 \text{ g} \pm 0.80$ vs $16.5 \text{ g} \pm 0.89$, $p < 0.01$) and vitamin B12 ($0.40 \text{ mg} \pm 0.02$ vs $0.34 \text{ mg} \pm 0.02$, $p < 0.001$) compared to controls, and higher proportions of children eating dairy products (OR: 4.14 (1.48, 11.6), $p < 0.05$), flesh food (OR: 2.09 (1.18, 3.70), $p < 0.05$), eggs (OR: 3.61 (1.56, 8.37), $p < 0.05$) and iron rich or iron fortified food (OR: 2.23 (1.20, 4.13), $p < 0.05$). No difference was found in energy intake between the two groups. The minimum dietary diversity of two thirds of the children who benefited from cash transfers was adequate compared to that of only one third in the control group ($p < 0.001$).

Conclusion: Unconditional seasonal cash transfer increases children's dietary diversity and intake of high nutritional value foods in Burkinabe children aged 14 to 27 months. As such, their use can be recommended in actions addressing children's dietary intake during the lean season. Study registered in ClinicalTrials.gov (NCT01866124).

2. INTRODUCTION

Although progress has been made in the fight against child undernutrition in recent years, it is still a public health issue worldwide (Black, Victora, Walker, Bhutta, Christian, de Onis, Ezzati, Grantham-McGregor, Katz, Martorell, Uauy, Bhutta, et al., 2013). Nutritional disorders, including wasting, stunting, vitamin A and zinc deficiencies, fetal growth restriction and inadequate breastfeeding are responsible for 45% of all deaths among children under 5 years old, or 3.1 million deaths annually (World Health Organization, 2016a). In Burkina Faso, West Africa, child nutritional status is particularly worrying: 32.9% of all children under 5 are stunted, 10.9%

wasted and 14% suffered from low birth weight in 2013 (UNICEF, 2015). A recent study in rural Burkina Faso using biomarkers also found high deficiency rates for zinc (25.6–73.5%) and moderate deficiency rates for vitamin A (6.0–30.6%), as well as high rates of anemia (29.4–72.3%) among women and preschool children (Martin-Prevel et al., 2016).

To date, various strategies have been implemented in humanitarian contexts to tackle children's undernutrition, including nutrition specific interventions such as food based strategies (Bhutta et al., 2013; Huybregts et al., 2012; Sayyad-Neerkorn et al., 2015; Tomedi et al., 2012) to address its direct causes, and nutrition sensitive activities to address its underlying determinants (Ruel & Alderman, 2013). Among nutrition sensitive activities, social safety nets, mainly implemented as cash transfer programs, have been shown to have positive effects on food security (Fenn et al., 2014; Fiszbein, Schady, & Ferreira, 2009; Vincent & Cull, 2009a) and on household expenditures on food (Alderman, 2014; The Kenya CT-OVC Evaluation Team, 2012). However, most studies that have evaluated the impact of cash transfer on child nutritional status used proxies such as dietary diversity scores (Baye, Retta, & Abuye, 2014; Fenn et al., 2014; Miller et al., 2011) that do not enable assessment of whether energy and nutrient intake in the child's diet are adequate. There is thus a lack of quantitative data on the effect of cash transfer programs on children's dietary intake.

A multiannual seasonal and unconditional cash transfer program was implemented in 2013 and 2014 in Tapoa Province, in the Eastern Region of Burkina Faso, in the framework of the MAM'Out study. We designed a cluster randomized controlled trial to evaluate the effect of the program on the prevention of child acute malnutrition (Tonguet-Papucci, Huybregts, Ait Aissa, et al., 2015). The main objective of this 24-h dietary recall sub-study was to assess the impact of the cash transfer program in the first place on the energy intake of beneficiary children aged between 14 and 27 months during the 2014 annual lean season, corresponding to the period between harvests May to September when people rely on market for their food needs. We further compared the micro- and macronutrient intakes between intervention and control groups.

3. METHODS

The MAM'Out study

The Moderate Acute Malnutrition Out (MAM'Out) study (Tonguet-Papucci, Huybregts, Ait Aissa, et al., 2015) was implemented from June 2013 to October 2015 in Tapoa Province, in the Eastern Region of Burkina Faso. The aim was to evaluate whether multiannual seasonal unconditional cash transfers helped prevent acute malnutrition in young children. It was designed as a cluster randomized controlled trial, in which 16 villages received monthly cash payments from July to November in both 2013 and 2014, and 16 other villages were used as the control group. The cash (10,000 FCFA/month, approx. US\$17) was distributed to mothers via mobile phone, with no conditions or restrictions on use. As cash transfers were unconditional, beneficiaries didn't have to fulfill conditions other than the inclusion criteria in order to receive cash. In June 2013, 1,278 children under 1 year of age and living in poor or very poor households according to the Household Economy Approach (T Boudreau et al., 2008) were included in the study and followed up for up to two years. The study, including the 24-h dietary recall survey, was

registered in ClinicalTrials.gov (NCT01866124) on May 7, 2013, and received ethical approval from two separate ethics committees: in April 2013 from the Ethical Committee of the University Hospital of Gent and in May 2013 from the Burkinabe National Ethical Committee.

Study population and sample size

The Eastern Region of Burkina Faso has a Sudan-Sahelian climate, characterized by two distinct seasons: a hot and dry period from October to May and a rainy season from June to September. The 24-h dietary recall was a cross-sectional sub-study nested within the MAM'Out study. Due to limited access in the rainy season, six remote clusters were purposely excluded from this sub-study: three in the control group and three in the intervention group. A subsample of children included in the MAM'Out study was then randomly chosen among the 26 remaining villages to be part of the 24-h dietary recall study. No restriction was put on the children's age or nutritional status. Children in both arms were randomly selected using the computer random number generator in Stata 12.0 (Statacorp, USA). With a Type I error of 5% and a statistical power of 80%, assuming a size effect of 0.4 and a design effect of 1.5 (Arsenault et al., 2014), with 13 clusters per study arms, 156 children per study arm were required. Allowing for 5-10% non-response we increased the sample size to 166 per study arm.

Data collection

Four teams of two data collectors received one week of training on the multi-pass 24-h dietary recall method (Gibson & Ferguson, 2008). Standardization exercises for food weight measurements and interview techniques were taught and questionnaires pre-tested. All data collectors spoke Gulmancema (the main local language) and two also spoke Pulaar fluently. Two of the data collectors were selected to be supervisors during data collection to check the quality of data collection and coordinate awareness raising activities on the 24-h dietary recall study. These activities took place one or two days prior to data collection and consisted in a visit to the selected household and the presentation of the data collection procedure. The caregiver was also given a standard 24-h recall kit comprising a plate and a bowl to estimate the quantities eaten by the child. Caregivers were asked to set aside a small quantity of the food eaten by the child the day before the visit to facilitate the recall and to take note of the ingredients used to prepare the food.

Data were collected during the lean season and the cash transfer period (July and August 2014). It consisted of two interactive 24-h dietary recalls (Annex 4) and two questionnaires on breastfeeding practices (Annex 3) per child on two non-consecutive days. This was meant to reduce bias due to dependency of intake on two consecutive days due to the possible consumption of leftovers. On the day of data collection, data collectors asked the caregiver to describe the food consumed by the child on the previous day. Information was recorded on a classic 24-hour food recall form as proposed by Gibson and Ferguson (Gibson & Ferguson, 2008). To minimize recall bias, interviews were held using a standardized three pass method adapted from Gibson and Ferguson's manual for developing countries (Gibson & Ferguson, 2008). First, the caregiver was asked to recall all the foods the child ate the previous day, including snacks and drinks, from the moment the caregiver woke up the day before until the moment they woke up on the day of the recall interview. The caregivers were then asked to describe the composition of the enlisted composite foods and beverages. The next step was estimating the amounts of foods and beverages consumed using the recall kit. Tanita digital

scales, model KD-400 (Tanita Corporation, USA) (precision 1 g) were used to weigh the food. The scales were calibrated daily. In the final step, the data collectors read back all the answers to check no answers had been omitted. Each interview lasted between 45 minutes and one hour.

Recalled composite food and beverage intakes were converted to single ingredients using standardized recipes. A list of the main composite dishes was then extracted from preliminary analysis of the 24-h dietary recall data. For each composite dish, five caregivers living in the study area were asked to prepare the composite food to identify its main ingredients. Raw ingredients, their amounts, the total cooked weight and volume were recorded to compile standardized recipes.

As the children randomly selected to participate in the 24-h dietary recall surveys were between 14 and 27 months old, many of them were still breastfed. Hence breastfeeding practices were evaluated in addition to the quantity of food eaten using a detailed questionnaire. The number of times a child was breastfed, the time of the day and the approximate duration of each session were recalled. Data collectors asked the caregiver to recall their previous day, beginning when they woke up the previous day and ending when they woke up on the day of the interview. Each breastfeed was then recorded in a table with its approximate duration (0-10 minutes, 11-20 minutes or 21-30 minutes).

The data collected in the 24-h dietary recalls and breastfeeding questionnaires were coded with the unique identification number allocated to each child in the MAM'Out study (Tonguet-Papucci, Huybregts, Ait Aissa, et al., 2015). None of the paper records included the child's name or address.

In addition, data concerning the children's nutritional status and date of birth, level of education of the caregiver and the households' socio-economic status (SES) were imported from the MAM'Out database for the purpose of analysis. For SES, tertiles were created among the poor and very poor household included in the study based on the first component arising from principal component analysis of declared assets ownership. Stunting is defined by a height-for-age Z-score inferior to -2 (according to the 2006 WHO growth standards (World Health Organization, 2006)) and wasting as a weight-for-height Z-score inferior to -2 or presence of bilateral pitting edema. These data were collected from June 23 to September 26, 2014, thus including the 24-h dietary recall period.

Data analyses

Data on the 24-h dietary recalls were entered in Lucille®, a computer program conceived by Ghent University, Belgium, and analyzed using Stata 12.0. The food composition table used to describe the quality of the intake was a combination of three sources. The West African food composition table endorsed and developed by the Food and Agriculture Organization and the International Network of Food Data System (Stadlmayr et al., 2012) was used as the primary data source to obtain energy and nutrient concentrations per food. However, a check of the 24-h dietary recall questionnaires revealed that some food products consumed by the children were missing. Information on the missing products was taken from the food composition table for Burkina Faso also used by Arsenault and al. (Arsenault et al., 2014). If no information was available on a given food (e.g. sparrow hawk meat and djonkin juice) in the Burkinabe table, an Internet search was conducted or the information (for Yonhanma flour, Plumpy'nut and Supplementary Plumpy) was taken from the label on the food product. The composition of 73%

of the ingredients of the consumed food were obtained from the West African food composition table (Stadlmayr et al., 2012), 20% from the Burkina Faso food composition table (Arsenault et al., 2014), 3% from Internet and 4% from food product labels.

The absorption of certain micronutrients such as iron, calcium and zinc by the human body depends on their chemical forms and on the presence of anti-nutrients that inhibit absorption (Gibson & Ferguson, 2008). To account for differences related to the different food sources, absorbed iron was calculated based on the bioavailability factors of iron and 6% of iron bioavailability was applied to plant food sources and 11% to animal ones (G. Kennedy & Nantel, 2006; G. L. Kennedy, Pedro, Seghieri, Nantel, & Brouwer, 2007). For absorbed calcium, 25% was applied to roots, tubers, legumes and grains, 45% to fruits and vegetables, 32% to all other food groups (G. Kennedy & Nantel, 2006). As phytate concentrations were not available, it was not possible to calculate the phytate to zinc molar ratio. The absorption level for zinc derived from the 2004 working group of the International Zinc Nutrition Consultative Group was used instead. The 15% zinc bioavailability is based on a diet based on unrefined cereals (Brown et al., 2004).

Data obtained from the breastfeeding questionnaires were entered in Epidata software and analyzed using Stata 12.0. The mean duration of breastfeeding was calculated by summing the approximate durations of each breastfeeding session over the recalled day: 5 minutes was used if the mother said breastfeeding lasted between 1 and 10 minutes, 15 minutes if the answer was between 11 and 20 minutes, and 25 minutes if the answer was 21-30 minutes. The mean number of breastfeeding sessions, the mean duration of a breastfeeding session and the percentage of children still breastfed were also calculated.

A dietary diversity score (DDS) was calculated based on seven food groups, namely (1) Grains, roots and tubers; (2) Legumes and nuts; (3) Dairy products; (4) Flesh food; (5) Eggs; (6) Vitamin A rich fruits and vegetables; (7) Other fruits and vegetables (U. World Health Organization, USAID, AED, UCDAVIS, IFPRI, 2008). DDS were calculated by summing the number of unique food groups eaten by the child during the 24h dietary recall period. Meal frequency was calculated by summing the number of time each a child ate solid, semi-solid or soft foods (even a snack), during the day. The minimum acceptable diet was defined by the World Health Organization as having a DDS equal to or above 4 and a sufficient meal frequency (e.g. 3 and 4 meals/24 h for breastfed and non-breastfed children, respectively) (U. World Health Organization, USAID, AED, UCDAVIS, IFPRI, 2008). The proportion of children consuming iron-rich or iron-fortified food was also calculated including the consumption of flesh food and commercial or homemade fortified foods.

The 2005 estimated energy requirement (EER) by age group and sex published by the Institute of Medicine (Institute of Medicine of the National Academies, 2005) were used to identify outliers for energy intakes. An arbitrary over-reporting threshold was established when the mean energy intake of a child was more than twice the EER for his/her sex and age group. In the same way, underreporting was considered when the mean energy intake was less than 30% of the EER for the child's age group and sex. A total of eight children were excluded from the study: three for over-reporting in the control group, four for over-reporting in the cash group and one for under-reporting in the control group. Two children aged more than 27 months old were also excluded from the study because they were outliers in age. Data were analyzed with and without exclusion of these 10 children and the overall results did not differ.

The primary outcome of the study was child energy intake. Usual intake distributions of nutrients and energy were generated using the Multiple Source Method (MSM) (Harttig, Haubrock, Knüppel, & Boeing, 2011) based on the two dietary recalls collected per child. No covariate was added to the model. The usual intake distributions obtained were subsequently used to calculate means and standard deviations to describe the children's intakes. Differences in energy and nutrient intakes between the intervention and the control groups were analyzed using linear mixed models including village as random effect to account for clustered observations. Fixed effects included in the models were the child's age at recall, child's sex, mother's literacy rate and household's socio-economic status. When the distribution was not bell shaped, variables were first log-transformed and then analyzed. Mixed-effects Poisson regression models were used to analyze differences in the dietary diversity score and the number of meals per day. Random and fixed effects were the same as the ones described above. Differences in the quantities of each food group consumed by children in the intervention and control groups were analyzed using a gamma generalized linear model (GLM) with log link (Nichols, 2010) adjusted for village as random effect and adjusted for all the above mentioned co-variables. This model was chosen to take into account the high frequencies of non-consumption among the data, resulting in many zeros in the dataset. All the tests were two-sided and a statistical significance level of 5% was used for all analyses.

4. RESULTS

General characteristics

The data available for analysis included two dietary recalls from 322 children aged 14 to 27 months (figure 11). All children sampled were surveyed. The child characteristics (table 5) were balanced between children in the intervention and control group for age and breastfeeding practices. Children were on average 20.5 ± 0.16 months old and 72% were still partially breastfed. The mean duration of breastfeeding per day was 52.3 ± 2.18 minutes and each breastfeeding session lasted 6.86 ± 0.28 minutes. The intra-class correlation between the two recalls for the duration of each breastfeeding session was 0.80 (95% CI: 0.76, 0.84) ($p < 0.0001$), for the total duration of breastfeeding per day 0.80 (95% CI: 0.76, 0.84) ($p < 0.0001$) and for the mean number of breastfeeding session per day 0.56 (95% CI: 0.48, 0.65) ($p < 0.0001$). Child nutritional status was also balanced between the intervention and control group with the exception of the mean weight-for-height Z-score, which was slightly lower in the control group than in the intervention group (-0.89 ± 0.07 vs. -0.77 ± 0.07). The socio-economic status also slightly differed between households benefiting from cash transfers and control households, with more intervention households being classified as having a medium socio-economic status (40.9 % vs 32.9 %).

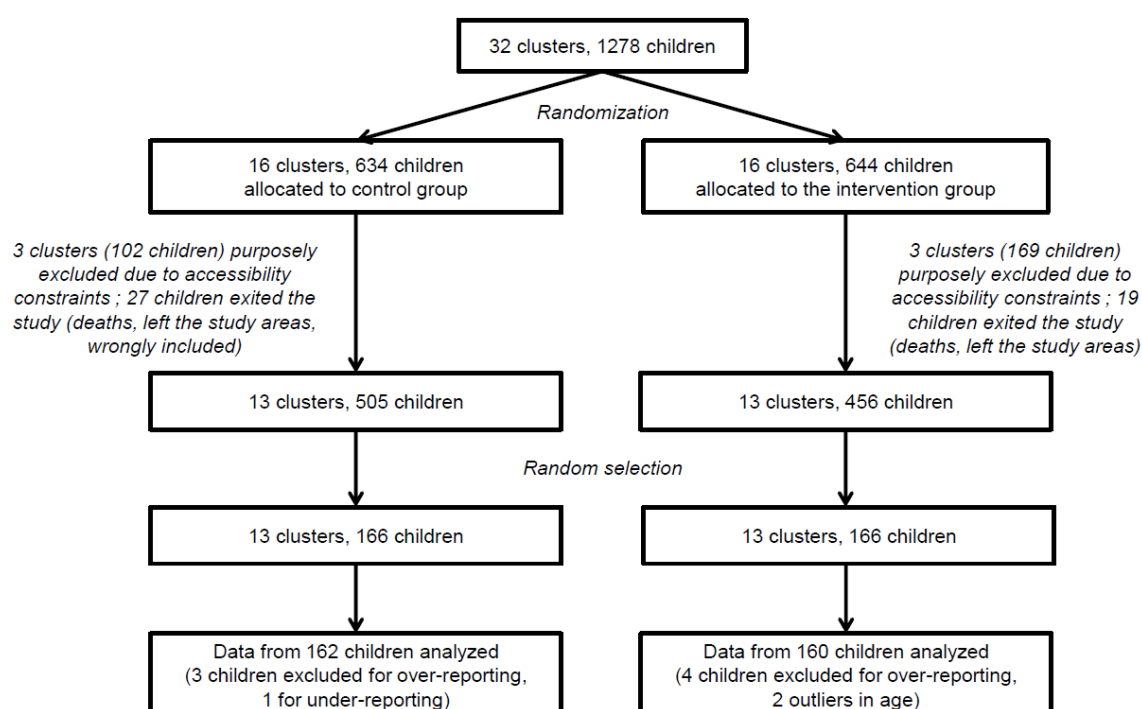


FIGURE 11: FLOW CHART OF THE 24-H DIETARY RECALL STUDY

	Control (n=162)	Intervention (n=160)
Clusters, n	13	13
Children's age, mo	20.6 ± 0.22	20.4 ± 0.23
Male children, n (%)	79 (48.8)	91 (56.9)
Children still breastfed, %	74.1	70.6
Breastfeeding sessions, n /d	7.88 ± 0.15	7.73 ± 0.18
Duration of one breastfeed session, min	7.14 ± 0.30	6.32 ± 0.29
Total duration of breastfeeding, min/d	55.8 ± 3.05	48.7 ± 3.10
Child weight-for-height z-score ^a	-0.89 ± 0.07	-0.77 ± 0.07
Child height-for-age z-score ^a	-1.96 ± 0.09	-1.97 ± 0.08
Wasted children, % ^a	9.88	8.23
Stunted children, % ^a	46.9	48.7
Literate mothers, % ^c	24.7	20.1
Households socio-economic status: low / medium / high, % ^b	35.4 / 32.9 / 31.7	30.8 / 40.9 / 28.3

TABLE 5: GENERAL CHARACTERISTICS OF BURKINABE CHILDREN OF 14 – 27 MONTHS OF AGE

Values presented in this table are means (± SD when applicable) and percentages.

^a Nutritional status data were available for 162 children in the control group and for 158 in the intervention group

^b Socio-economic data were available for 161 children in the control group and 159 in the intervention group. Tertiles were created among the poor and very poor households included in the study using principal component analysis (PCA) based on declared assets ownership.

^c Education data were available for 162 children in the control group and 159 in the intervention group

Indicators for food diversity and infant and young child feeding practices

After the cash transfer, the 24-h dietary recall surveys identified that a bigger proportion of children in the intervention group ate milk and dairy products (25.0 % vs 7.41%; $p=0.007$), flesh food (26.3% vs 14.8%; $p=0.01$) and eggs (31.3% vs 11.1%; $p=0.003$) compared to children in the control group (Table 6). In terms of quantities, children in the intervention group ate on average more eggs ($p<0.001$) than children in the control group (Table 7).

	Control arm	Intervention arm	Odd ratios (95% CI) ^d	P-value
Grains, roots and tubers (%)	100 ± 0.00	99.4 ± 0.63	NA	NA
Legumes and nuts (%)	66.0 ± 3.73	72.5 ± 3.54	1.40 (0.57, 3.43)	0.47
Milk and dairy products (not including breastfeeding) (%)	7.41 ± 2.06	25.0 ± 3.43	4.14 (1.48, 11.6)	0.007
Flesh food (meat, fish, poultry) (%)	14.8 ± 2.80	26.3 ± 3.49	2.09 (1.18, 3.70)	0.01
Eggs (%)	11.1 ± 2.48	31.3 ± 3.68	3.61 (1.56, 8.37)	0.003
Vitamin A rich fruits and vegetables (%)	98.8 ± 0.87	96.3 ± 1.51	0.36 (0.07, 1.83)	0.22
Other fruits and vegetables (%)	1.23 ± 0.87	2.50 ± 1.24	2.32 (0.38, 14.1)	0.36

TABLE 6: PROPORTIONS OF 14-27 MONTHS OLD BURKINABE CHILDREN CONSUMING EACH OF THE SEVEN FOOD GROUPS DURING THE LAST 24 HOURS

Values presented in this table are proportions (\pm SD).

^d Analyzed using a mixed logistic regression model with village as random effect and adjusted for child's sex, age, household's SES and mother's literacy rate

	Control arm	Intervention arm	P-value ^e
Grains, roots and tubers (g/d)	158.6 ± 5.26	163.5 ± 5.53	0.49
Legumes and nuts (g/d)	12.6 ± 1.37	14.7 ± 1.35	0.28
Milk and dairy products (not including breastfeeding) (g/d)	18.7 ± 7.49	46.3 ± 9.37	0.33
Flesh food (meat, fish, poultry) (g/d)	2.02 ± 0.54	4.00 ± 0.79	0.12
Eggs (g/d)	3.25 ± 0.79	11.3 ± 1.55	<0.001
Vitamin A rich fruits and vegetables (g/d)	38.4 ± 2.68	33.6 ± 2.17	0.29
Other fruits and vegetables (g/d)	0.44 ± 0.42	0.33 ± 0.25	NA ^f

TABLE 7: MEAN DAILY INTAKE OF SEVEN FOOD GROUPS OF 14-27 MONTHS OLD BURKINABE CHILDREN

Values presented in this table are means (± SD).

^e Analyzed using a gamma generalized linear model with log link, with village as random effect and adjusted for child's sex, age, household's SES and mother literacy rate

^f Non applicable. Only 6 consumers in total

There was a trend towards a higher mean diet diversity score for the children in the intervention group (4.02 ± 0.06) compared to that of the children in the control group (3.61 ± 0.05) ($p=0.07$) (Table 8). Approximately two thirds of the children in the intervention group had adequate minimum dietary diversity compared with one third in the control group ($p<0.001$). We did not observe a difference in the frequency of meals between the groups and almost all children in both groups had an adequate minimum meal frequency. The percentage of children who consumed iron-rich or iron-fortified food was also higher in the intervention group (35.6%) than in the control group (21.1%) ($p<0.05$).

	Control arm	Intervention arm	Odds ratio (95% CI)	P-value
Dietary diversity score (7 food groups) ^g	3.61 ± 0.05	4.01 ± 0.06	NA	0.07
Children with adequate minimum dietary diversity, n (%) ^h	64 (39.5)	105 (65.6)	2.95 (1.86, 4.68)	<0.001
Mean number of meals / day for breastfed children ^g	4.76 ± 0.06	4.92 ± 0.06	NA	0.66
Mean number of meals / day for non-breastfed children ^g	4.72 ± 0.10	4.95 ± 0.09	NA	0.65
Children with adequate minimum meal frequency, n (%) ^h	160 (98.8)	159 (99.4)	1.72 (0.12, 25.5)	0.69
Children with minimum acceptable diet, n (%) ^h	64 (39.5)	105 (65.6)	2.95 (1.86, 4.68)	<0.001
Children consuming iron rich or iron fortified food, n (%) ^h	33 (20.4)	58 (36.3)	2.23 (1.20, 4.13)	0.01

TABLE 8: INFANTS' AND YOUNG CHILDREN'S FEEDING INDICATORS FOR 14-27 MONTHS OLD BURKINABE CHILDREN

Values presented in this table are means (± SD) or number of children (and the corresponding percentages).

^g Analyzed using a mixed Poisson regression model with village as random effect and adjusted for child's sex, age, household's SES and mother's literacy rate

^h Analyzed using a mixed logistic model with village as random effect and adjusted for child's sex, age, household's SES and mother's literacy rate

Energy and nutrient intakes

We didn't find any significant difference in mean energy intake from complementary food (defined as all solid, semi-solid and soft foods given to the children in addition to breastfeeding) between the intervention and the control groups (Table 9). However, we measured that children in the intervention group ate more fat ($p<0.01$) than children in the control group and had a tendency of consuming more protein ($p=0.06$). Considering the contribution of macronutrients to energy intake, children who benefited from cash transfers consumed more energy from fats ($p<0.01$) and less from carbohydrates ($p<0.01$) than children in the control group.

	Control Arm	Intervention Arm	P-value
Energy (kcal / day) ⁱ	915 ± 24.1	962 ± 23.6	0.20
Energy (kJ / day) ⁱ	3828 ± 101.0	4026 ± 98.7	0.20
Complementary food energy density (kcal/g) ⁱ	0.78 ± 0.15	0.79 ± 0.14	0.57
Fat (g/day) ⁱ	16.5 ± 0.89	20.6 ± 0.80	0.001
Carbohydrates (g/day) ⁱ	169 ± 4.33	169 ± 5.01	0.59
Protein (g/day) ⁱ	20.1 ± 0.60	21.7 ± 0.55	0.06
Fiber (g/day) ⁱ	13.5 ± 0.45	12.2 ± 0.39	0.10
Fat (% of total energy) ⁱ	15.7 ± 0.60	19.7 ± 0.71	0.004
Carbohydrates (% of total energy) ^j	74.5 ± 0.72	69.8 ± 0.89	0.006
Protein (% of total energy) ⁱ	8.87 ± 0.16	9.29 ± 0.23	0.34

TABLE 9: ENERGY AND MACRONUTRIENT INTAKE FROM COMPLEMENTARY FOODS OF 14-27 MONTHS OLD BURKINABE CHILDREN

Values presented in this table are means (± SD).

ⁱ Analyzed using a mixed linear model (after log transformation) with village as random effect and adjusted for child's sex, age, household's SES and mother's literacy rate

^j Analyzed using a mixed linear model with village as random effect and adjusted for child's sex, age, household's SES and mother's literacy rate

Children in the intervention group had a statistically significant higher vitamin B12 (p<0.001), riboflavin (p<0.05) and vitamin E (p<0.05) intake than children in the control group (Table 10).

	Control arm	Intervention arm	P-value ^k
Minerals			
Ca (mg/d)	248.7 ± 10.9	263.0 ± 9.60	0.31
Available Ca (mg/d)	86.8 ± 3.26	89.6 ± 2.83	0.45
Fe (mg/d)	19.7 ± 0.79	19.4 ± 0.64	0.79
Available Fe (mg/d)	0.47 ± 0.02	0.52 ± 0.02	0.46
Mg (mg/d)	165.9 ± 5.86	153.5 ± 4.90	0.28
Zn (mg/d)	4.31 ± 0.16	4.51 ± 0.15	0.33
Available Zn (mg/d)	0.65 ± 0.02	0.68 ± 0.02	0.33
Vitamins			
Vitamin A (µg/d)	96.3 ± 5.55	111.7 ± 5.51	0.13
Vitamin C (mg/d)	219.4 ± 8.75	215.2 ± 11.3	0.23
Vitamin E (mg/d)	4.50 ± 0.33	5.55 ± 0.31	0.01
Thiamin (mg/d)	0.34 ± 0.01	0.36 ± 0.01	0.25
Riboflavin (mg/d)	0.34 ± 0.02	0.40 ± 0.02	0.04
Nicotinic acid (mg/d)	3.38 ± 0.10	3.31 ± 0.10	0.82
Vitamin B6 (mg/d)	0.42 ± 0.01	0.40 ± 0.01	0.74
Folic acid (µg/d)	60.7 ± 2.18	66.4 ± 2.17	0.19
Vitamin B12 (µg/d)	0.21 ± 0.04	0.52 ± 0.06	<0.001

TABLE 10: MICRONUTRIENT INTAKE FROM COMPLEMENTARY FOODS OF 14-27 MONTHS OLD BURKINABE CHILDREN

Values presented in this table are means (± SD).

^k Analyzed using a mixed linear model (after log transformation) with village as random effect and adjusted for child's sex, age, household's SES and mother's literacy rate

5. DISCUSSION

Our study aimed to assess the effects of seasonal unconditional cash transfers on energy, micro- and macronutrient intake of young Burkinabe children using the strong design of a randomized controlled trial. The results of the 24-h dietary recall surveys showed that cash transfer during the lean season improved the diet of 14 to 27-month old children. We observed positive effects on the quantity of eggs consumed as well as on the percentage of children consuming meat, eggs and dairy products.

Our results of the impact of an unconditional cash transfer on children's dietary diversity and frequency of food group consumption are in line with those of two other studies that investigated the effect of unconditional cash transfers on children's diet. The Malawi Social Cash Transfer Scheme led to a more diverse diet in beneficiary households with more people eating meat, fish and dairy products compared to households in the control group (Miller et al., 2011). In Kenya, Haushofer and al. found that households benefiting from unconditional cash transfers ate meat and fish more frequently than households in the control group (Haushofer & Shapiro, 2013c). Approximately two thirds of the children in the intervention group benefited from adequate minimum dietary diversity compared to only one third in the control group. This is a significant improvement over the figures cited in the most recent demographic and health

survey conducted in Burkina Faso, which reported that only 6.2% of children aged 6-23 months living in the Eastern Region consumed at least four food groups (INSD & Macro, 2011). It is however noteworthy to mention that 13.4% of the children in our study are 24 months old or above, and that we surveyed children from 2 municipalities out of 27 of the Eastern Region.

We did not observe a difference in mean energy intake between children in the intervention group and in the control group. However, the source of energy differed between the two groups: energy originated mainly from fat in children in the intervention group and to a lesser extent from carbohydrates as compared to children in the control group. Nevertheless, relative fat intake remained to the lower end of the recommended complementary food fat intake values (between 21% to 43% of the energy intake in case of medium level of energy intake from breastmilk (Dewey & Brown, 2003)).

Children in the present study had a mean complementary food density of 0.77 kcal/g and ate an average of 4.8 meals per day. According to Dewey and Brown (Dewey & Brown, 2003) children aged 12 to 23 months with a low level of energy intake from breastmilk should eat a minimum of 5 meals per day if the complementary food density is 0.6 kcal/g, and 3.7 meals per day if the density reaches 0.8 kcal/g. This number is based on the definition of meal frequency including both meals and snacks, as defined by the World Health Organization (U. World Health Organization, USAID, AED, UCDAVIS, IFPRI, 2008). Therefore, our results show that the complementary food density was adequate during the lean season and corresponded to international recommendations. This result was quite unexpected during the lean season, given the high carbohydrate and low fat content of the complementary food the children received. This outcome is partly due to the number of meals or snacks each child consumed each day. In our study, the meal frequency of 99% of all children was adequate, compared to that of only 39% of all children aged 6-23 months and living in the Eastern Region of Burkina Faso (INSD & Macro, 2011). One possible explanation could be linked to the age of the children we surveyed, who are in average 20.5 months old, with 13% of the children above 24 months old.

Vitamin B12, riboflavin and vitamin E intakes were significantly higher in children in the intervention group. This is encouraging given the important role of vitamins B12 and E in immune system (Kau, Ahern, Griffin, Goodman, & Gordon, 2011). The higher intake of vitamin B12 may be the consequence of the larger quantity of eggs eaten by children in the intervention group. However, despite the larger quantities of iron-rich food consumed, we found no difference in iron intake between the two groups.

Several strengths can be highlighted for this study. The 24-h dietary recalls were implemented in the framework of a cluster randomized controlled trial and took advantage of its strong design. All the basic characteristics of the intervention and control groups, including height-for-height Z-score, were comparable, except for the slightly lower mean weight-for-height Z-score of children in the control group. However, as adjusting the analyses for the nutritional status and breastfeeding practices, which may both have changed as a result of the cash transfer program, holds a risk of bias, we did not adjust the analyses for these two factors. The one week training the data collectors underwent on the 24-h food recall methodology allowed for the standardization and pretesting of the method of data collection. In addition, the two month period of data collection was supervised: every week, two of the children visited by each data collector were visited a second time by the supervisor to check on the data collected. A number of study limitations also need to be addressed. First, we were unable to adjust analyses for data

collectors, due to an error during data entry. Collector bias was nevertheless limited by the fact that two different data collectors systematically conducted the two recalls in the same household. Secondly, the six clusters excluded from data collection due to difficult access may have had higher prevalence of acute malnutrition, compared to those included. The effect of the intervention might also have been lower in these villages due to limited access to market. Thirdly, two thirds of the children in the study were still breastfed at the time of the evaluation. To our knowledge, no precise technique to evaluate the quantity of milk consumed by children is currently available beyond weighing the baby before and after breastfeeding or giving isotopic labeled water to mothers. In the MAM'Out study area, it was not possible to use either of these techniques due to operational constraints. We tried to overcome this problem by designing a detailed questionnaire on breastfeeding practices to estimate the number of times a child was breastfed during the day and the corresponding duration, but this was still not sufficient to estimate energy intake from breastmilk. One possible solution would have been to hypothesize average breast milk intake as has been done in previous studies (Wondafrash, Huybregts, Lachat, Bouckaert, & Kolsteren, 2016). However, this is still an estimation and does not measure the breastmilk intake precisely. Since the same estimation method was used in both groups, we assume that the measurement error was similar for the two groups. Fourthly, we did not adjust our analyses for multiple hypothesis testing. Although this is still an ongoing debate (Streiner, 2015), concerns may be raised about the need to reevaluate the p-value used for the significance of results, which may decrease the number of significant differences we found between groups. However, the results presented here tend to go in the same direction (with higher number of children consuming animal products in the intervention group, more eggs intake in term of quantities and more B12 intake), which strengthen confidence in them (Streiner, 2015). Finally, no measurement of body composition or biomarkers before and after the intervention was performed. As such, it is hard to see the direct health benefits of the intervention. However, our results demonstrate first of all that unrestricted and unconditional cash was used for food purposes and allow improving children's diet quality. Yet, the amount distributed may have been too low with respect to the family size in order to have a positive effect on child's health via an improved diet quality.

6. CONCLUSION

Unconditional cash transfers during the lean season did not lead to a higher energy intake, but improved the intake of mainly animal source foods amongst 14 to 27-month old Burkinabe children living in rural areas. Two thirds of the children who benefited from cash transfers also had an adequate minimum dietary diversity score compared to only one third in the control group. Our results support the implementation of unconditional seasonal cash transfer programs to improve children's diet and nutritional intake during the lean season. We therefore recommend their use in actions addressing children's dietary intake during this difficult period.

6.

CHAPTER 6: UNCONDITIONAL CASH TRANSFERS DO NOT PREVENT CHILDREN'S UNDERNUTRITION IN THE MAM'OUT CLUSTER RANDOMIZED CONTROLLED TRIAL IN RURAL BURKINA FASO

1. ABSTRACT

Background: Limited evidence is available on the impact unconditional cash transfer programs can have on child nutrition, particularly in West Africa where child undernutrition is still a public health challenge.

Objective: This study examined the impact of a multiannual seasonal unconditional cash transfer program to reduce the occurrence of wasting (weight-for-height, mid upper arm circumference), stunting (height-for-age) and morbidity among children under 36 months old in Tapoa Province, Eastern region of Burkina Faso.

Methods: The study was designed as a two-arm cluster randomized controlled trial, with 32 villages randomly assigned to either the intervention or control group. The study population consisted of households classified as poor or very poor according to household economy approach criteria and having at least one child under one-year of age at inclusion. The intervention consisted of seasonal unconditional cash transfers, provided monthly from July to November, over two years (2013 and 2014). A monthly allowance of 10,000 XOF (≈US\$17) was given by mobile phone to mothers in participating households. Anthropometric measurements and morbidity were recorded on quarterly basis.

Results: We found no evidence that multiannual seasonal unconditional cash transfers reduced the cumulative incidence of wasting among young children (incidence rate ratio: 0.92, 95% CI: 0.64, 1.32; $p=0.66$). We observed no significant difference ($p>0.05$) in children's anthropometric measurements and stunting at end point, between the two groups. However, children in the intervention group had a lower risk (21%, 95%CI: 18.6, 21.3; $p<0.001$) of self-reported respiratory tract infections compared to children in the control group.

Conclusion: We found that seasonal unconditional cash transfers in the framework of safety nets did not result in a significant decrease in the incidence of child acute malnutrition in Tapoa Province. Cash transfers combined with complementary interventions targeted on child nutrition and health should be further investigated. This trial was registered at clinicaltrials.gov as NCT01866124.

2. INTRODUCTION

Child undernutrition remains a serious health problem in developing countries, especially in West Africa where it is still a public health challenge (Black, Victora, Walker, Bhutta, Christian, de Onis, Ezzati, Grantham-McGregor, Katz, Martorell, Uauy, Maternal, et al., 2013). Although encouraging progress has been made in reducing the proportion of hungry people and the number of undernourished people in the past two decades, 31.5 million people in West Africa are still undernourished (Food and Agriculture Organization, 2015). West African countries with a sub-Saharan tropical climate have a wet season from June to September and a dry season during the remaining eight months. Trends in children's morbidity and nutritional status vary according to these seasons, with increased rates during the rainy season (de Pee et al., 2015b; Vaitla, Devereux, & Swan, 2009a). Twenty percent of West African children under age 5 are

underweight (Food and Agriculture Organization, 2015) and the prevalence of acute malnutrition is 9%, nearly reaching the public health emergency range (UNICEF, WHO, & WorldBankGroup). Given that acute malnutrition is associated with increased morbidity and mortality risks (Black, Allen, Bhutta, Caulfield, de Onis, Ezzati, Mathers, Rivera, & Study, 2008), effective interventions are urgently needed. The introduction of the community-based management of acute malnutrition (CMAM) model in many Sub-Sahara African countries, including the use of ready-to-use therapeutic foods, made the treatment of acute malnutrition more accessible and convenient to beneficiaries (World Health Organization, 2013a). However, low coverage of scaled-up CMAM programs in a number of countries implies that there remains room for improvement (Rogers, Myatt, Woodhead, Guerrero, & Alvarez, 2015). Complementary strategies aimed at preventing acute malnutrition can therefore play an important role.

During the last decade, social safety nets and cash based interventions have gained attention in developing countries. Cash transfer programs are increasingly implemented in emergencies (S. Bailey & K. Hedlund, 2012; Langendorf et al., 2014b; Polastro et al., 2011; Sibson et al., 2015) and in developing contexts (Alviar et al., 2012; Miller et al., 2011; Ng et al., 2014) to alleviate poverty and food insecurity in vulnerable households. Large scale conditional cash-transfer programs first showed their efficacy in Latin America to improve food security (Lignani, Sichieri, Burlandy, & Salles-Costa, 2011), health care utilization (O. P. Attanasio, Gomez, Heredia, & Vera-Hernandez, 2005; Shei, Costa, Reis, & Ko, 2014; Sosa-Rubi et al., 2011), health outcomes (Barber & Gertler, 2008) and child nutritional status (L. C. H. Fernald, Gertler, & Neufeld, 2008; J. L. Leroy, M. Ruel, & E. Verhofstadt, 2009). Less evidence is available regarding unconditional cash transfers (UCTs). Only a few studies showed positive effects on food access and diversity (Alviar et al., 2012; Miller et al., 2011), health expenditures (Alviar et al., 2012) and preventive visits to health centers (Luseno, Singh, Handa, & Suchindran, 2014). In the 2013 Lancet Series on Child and Maternal Health, cash transfer programs designed with a nutritional objective were highlighted as having a potential to prevent child undernutrition (Ruel, Alderman, & Grp, 2013). However, to date, few rigorous studies have evaluated the impact of UCTs on child nutrition. On the basis of the comprehensive conceptual model of under-nutrition proposed by Black RE et al. (Black, Allen, Bhutta, Caulfield, de Onis, Ezzati, Mathers, Rivera, Maternal, et al., 2008), the "moderate acute malnutrition Out" (MAM'Out) study, implemented in rural Burkina Faso, intended to influence several underlying causes of undernutrition during the lean season when the prevalence of undernutrition is high, by delivering a cost-efficient intervention. The study aimed to assess the impact of cash transfer program in reducing the incidence of acute malnutrition and morbidity, and the prevalence of stunting among children under 36 months old.

3. METHODS

Study design and Participants

Burkina Faso is a landlocked country located in the Sahel region in West Africa. A national social protection policy which promotes social transfer mechanisms to the poorest and most vulnerable was adopted in 2012 to enhance population food security (PNPS, 2012). The study was carried out in the North of Tapoa province which is characterized by inappropriate child feeding practices (such as non-exclusive breastfeeding and low diet diversity after one year of age), insufficient access to sanitation and safe water (Action Contre la Faim, 2013; Lysette Boucher-Castel & Julien Chalimbaud, 2013).

The study was designed as a two-arm cluster randomized controlled trial, in which 32 villages in three municipalities were randomly assigned to either the intervention or control group. With a type I error of 5%, a statistical power of 90% and a minimum follow-up time of 24 months,

assuming a 33% reduction in the cumulative incidence of wasting, a coefficient of variation K of 0.25 and an anticipated 25% drop-out, 16 clusters with 50 children were required in each study group (Tonguet-Papucci, Huybregts, Aissa, Huneau, & Kolsteren, 2015). Randomization of villages to the intervention and control groups was performed during a ceremony, to keep the allocation of cash transparent and fair. Representatives of each of the 32 villages drew blindly from a bag one of the 32 identical papers with “cash” or “no cash” written on it from the bag. Sixteen villages were assigned to the intervention group and 16 others to the control group.

Within villages, household participation in the study was voluntary and based on the following inclusion criteria: household classified as poor or very poor according to household economy approach criteria (Bargo et al., 2011) and having at least one child under 1 year old at inclusion regardless of his/her nutritional status. Study objectives and implementation were explained to both wives and husbands and informed consent obtained from the heads of household by signature or fingerprint.

Intervention

Prior to the MAM'Out study, a needs assessment was conducted in two steps at the end of 2012: an analysis of the causes of undernutrition using nutrition causal analysis (NCA) methodology (Chalimbaud, Coates, & Collaiezzi, 2015) and formative research related to the cash transfer intervention. Results of the NCA showed that financial insecurity of women, birth spacing and access to potable water were perceived causes of malnutrition (Lysette Boucher-Castel & Julien Chalimbaud, 2013a). Based on the existing literature and reports from the study area, a theoretical framework of pathways through which cash transfers can impact acute malnutrition was constructed. The hypothesized framework was that handing out cash during the lean season can ensure that the direct determinants to child nutrition (child food intake, child care and child morbidity) are safeguarded (Tonguet-Papucci, Huybregts, Aissa, et al., 2015). The formative research assessed the relevance of a cash based intervention and provided detailed operational guidance on the study area, the target population, the type of cash transfer, the seasonality, the amount of the cash transfer and the delivery mechanism.

The intervention consisted of seasonal UCTs, provided monthly from July to November, over two years (2013 and 2014) (Tonguet-Papucci, Huybregts, Aissa, et al., 2015). This period partly overlapped with the annual rainy season (May to August) perceived as the “hunger” season because of the cereal shortage observed at household level (Savy, Martin-Prevel, Traissac, Eymard-Duvernay, & Delpeuch, 2006a; Vaitla et al., 2009a). As there was no national transfer size defined for cash transfer programs in Burkina Faso, the MAM'Out transfer size was defined during a formative research jointly with Action Contre la Faim operational team in Burkina Faso, based on previous cash transfer experiences in Burkina Faso and in the sub-Saharan African countries. A monthly allowance of 10,000 XOF (≈US\$17) was given by mobile phone (offered by the project) to participating households. Over a year, a total amount of 50,000 XOF (≈US\$85) was transferred to each eligible household, representing about 33% of the 2014 annual national poverty line estimated at 153,530 XOF (≈US\$260) (Institut National de la Statistique et de la Démographie, 2015). The grant value allowed to cover on average the survival gap and 85% of the livelihoods gap for the very poor households, and the entire livelihoods gap of poor households. We specifically designated mothers as primary recipients of the transfer since they are usually in charge of child care (Duflo, 2003). Mothers were told that the cash was given to them to support their child's development and to prevent malnutrition.

A dedicated team supervised and followed up cash transfers activities jointly with the research team. A partnership with a mobile phone company enabled cash distribution via mobile phone. Prior to the intervention, all mothers in the intervention group received an identity card provided by the field teams, a mobile phone and a sim card linked to an electronic account. At

the time of distribution, mothers received a text message with a code number notifying them that their account was credited. Mothers were thus invited to visit cash withdrawal points to collect their money. Presentation of the identity card and the code number granted access to the money. Mothers confirmed the cash withdrawal by signing follow-up lists. All study participants in the intervention group (100%) received their monthly allowance within a week time. Operational constraints such as limited mothers' knowledge about the use of mobile phones, difficulty in charging the mobile phones because of the lack of electricity, low literacy rate of mothers, were encountered during the delivery of cash. Demonstrations sessions on basic uses of a mobile phone, home visits by cash transfers supervisors to inform about scheduled dates for cash transfers, switch of sim cards from one phone to another at cash withdrawal points and direct transfers in remote villages were mitigations strategies that were put in place to tackle these difficulties.

Mothers of children in the control group did not receive a cash grant. Incentives (cooking kit, fabrics, etc.) were given to households in the control group to compensate for the time they spent answering the MAM'Out questionnaires. Next to the approval by the ethical committee of the Ghent University Hospital (Belgium) and the Burkinabe national ethics committee, administrative authorities as well as all heads of villages gave their consent prior to the start of the study. The trial was registered at clinicaltrials.gov as NCT01866124.

Measurements

Trained fieldworkers performed quarterly home visits to collect data. A pretested questionnaire was used to collect socioeconomic (education, occupation and asset ownership) and demographic data on a half-yearly basis, whereas anthropometrics and morbidity (diarrhea, fever and respiratory tract infections) data were collected on a quarterly basis (annex 5 and annex 6). All anthropometric measurements were taken in duplicate by team members. The average of the two values was used for analysis. A diarrheal episode was defined as having at least three loose stools within a day. Tactile assessment technique was used to identify fever. Respiratory tract infection episode was defined as persistent cough and/or fast or difficult breathing. Morbidity episodes were recalled by mothers over the last seven days. Child age at recruitment was estimated from a birth certificate or using a locally adapted special events calendar. The protocol provides more details on measurement tools and standardization procedures used to ensure good quality of data (Tonguet-Papucci, Huybregts, Aissa, et al., 2015). Baseline data were collected one month earlier in the intervention group than in the control group, to enable cash transfer to start in due time. Follow up visits were performed at the same time in the two groups. Data collection lasted 29 months (June 2013 to October 2015).

Weight-for-height Z-score (WHZ), height-for-age Z-score (HAZ) and weight-for-age Z-score (WAZ) were calculated according to 2006 WHO growth standards to conform with the Burkinabe national protocols for the management of acute malnutrition. Wasting was defined as WHZ <-2 or presence of bilateral pitting edema, stunting as HAZ <-2 and underweight as WAZ <-2 (Ministère de la Santé, 2014). All children identified as wasted were referred to the nearest health centers for adequate nutritional care as per national protocol. If a child was absent from home, another home visit was planned within the round of data collection to ensure complete measurements of the child. In case of a child's death, a verbal autopsy was adapted from WHO standards (Coldham, Ross, Quigley, Segura, & Chandramohan, 2000; Mobley et al., 1996).

In the first round, data were collected on paper forms and entered in double using EpiData version 3.1 (EpiData Association) by two groups of data clerks. From the fifth round on, we switched to computer assisted personal interviews with tablets using open data kit application (Core ODK, UW-CSE) to allow real time follow-up of collected data. The lot quality assurance

sampling method was applied on a monthly basis to ensure both good quality data collection and data entry.

Statistical analysis

Our primary outcome was the cumulative incidence of wasting. Secondary outcomes included the mean WHZ change over time, the mean HAZ change over time, the mean mid-upper arm circumference (MUAC) change over time, the prevalence of stunting at end point, and the cumulative incidence of morbidity episodes (Tonguet-Papucci, Huybregts, Aissa, et al., 2015). Z-scores were calculated using the `zscore06` command in Stata 14.2 (J. Leroy).

We described baseline characteristics using proportions, means and standards deviations. A household socioeconomic status (SES) proxy was created using a principal component analysis (PCA) based on declared asset ownership recorded as a binary variable (possessed or not) and collected throughout the intervention. A PCA was applied to 20 asset indicator variables, which showed a relevant contribution (>10% of the variability of the component) to the combined SES score factor. The first principal component (explaining 18% of the variation in the dataset) with the highest eigenvalue (3.61) was categorized into tertiles (low, middle and high) and used as proxy indicator for the household socioeconomic status (Vyas & Kumaranayake, 2006).

All analyses were conducted on intention-to-treat basis and children were analyzed as from the initial group assignment. We used 2-sided tests for all analyses with statistical significance set at 5%.

The intervention effect on continuous growth outcomes (weight, length, WHZ, HAZ, WAZ and MUAC) was analyzed using linear mixed-effect models with cluster, household and children as random effects. Because of the time difference at baseline, the month of data collection was used to harmonize the unit of time for the follow-up measurements between the two groups. A likelihood ratio test was used to test if the addition of the month of data collection (as random slope) and the addition of a quadratic term of the month of data collection (fixed effect) improved the model fit.

We examined the intervention effect on the incidence of wasting and self-reported morbidity outcomes (diarrhea, fever and respiratory tract infections) using a multilevel mixed-effects Poisson regression model adjusted for clustering by village, household and child. For binary morbidity outcomes, we used a robust estimation of standard errors to relax the assumption for a Poisson distribution (Cummings, 2009). We adjusted these models for the number of recalls that were recorded. We analyzed the effect of the intervention on the prevalence of stunting at endpoint using mixed-effects logistic regression model with cluster and household as random effects. Fixed effects included in all of the models were child's sex, child's age, SES at baseline and the outcome at inclusion.

Finally, we used Kenward-Roger adjustment for continuous outcomes and bootstrap methods for binary outcomes, to provide reasonable estimates that account for the relatively small number of clusters (McNeish & Stapleton, 2016)

4. RESULTS

A total of 1,278 children from the 32 selected villages were enrolled in the study in May 2013, after their parents gave their informed consent at home. During the course of the study, 99

children of which 57.6% in the intervention group, dropped out from the study for different reasons, mainly related to child death or leaving the study area (Figure 12).

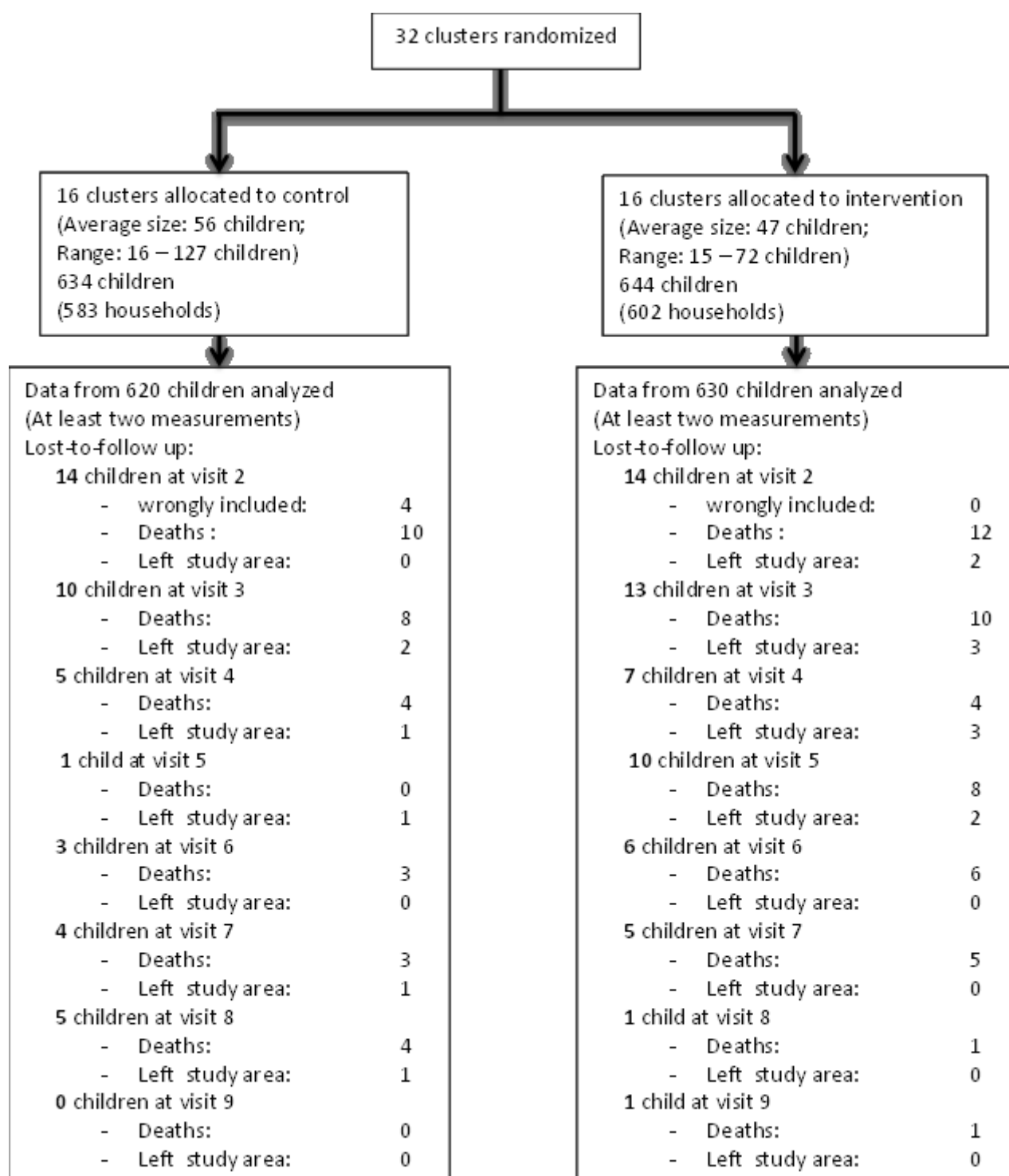


FIGURE 12: MAM'OUT STUDY FLOW DIAGRAM

A total of 1,250 children aged 0 to 15 months from 1,162 households (630 children in the intervention group and 620 children in the control group) provided at least two measurements and were accounted for in the analyses. This sample size was equivalent to the necessary size required to ensure enough statistical power. Overall, baseline characteristics were balanced between the intervention and the control groups (Table 11). Children in the intervention group were more likely to be one month younger and wasted. About 31.7% of all children were less than 6 months old and 8% were aged 12 months or older at study inclusion.

Characteristics	Control arm (620)	Intervention arm (630)
Children's age in months, mean \pm SD	7.79 \pm 2.93	6.83 \pm 3.29
Children's age category, frequency (percent)		
Children aged < 6 months	161 (26.0)	236 (37.5)
Children aged 6 – 11 months	396 (63.8)	358 (56.8)
Children aged 12 – 15 months	63 (10.2)	36 (5.7)
Children's gender categories, frequency (percent)		
Male children	313 (50.5)	349 (55.4)
Female children	307 (49.5)	281 (44.6)
Children's anthropometric measurements, mean \pm SD		
Children's weight, kg	6.7 \pm 1.12	6.3 \pm 1.22
Children's height, cm	65.8 \pm 4.25	64.4 \pm 5.10
Children's MUAC, mm ^a	133.1 \pm 11.7	131.3 \pm 12.8
Children's weight-for-height z-score	-1.07 \pm 1.12	-1.24 \pm 1.23
Children's height-for-age z-score	-1.33 \pm 1.24	-1.18 \pm 1.44
Children's wasting forms, frequency (percent)		
Wasted children with weight-for-height z-score < -2	119 (19.2)	164 (26.0)
Severely wasted children with weight-for-height z-score < -3	22 (3.55)	44 (7.00)
Wasted children with mid upper arm circumference < 125 mm	82 (18.2)	115 (29.2)
Severely wasted children with mid upper arm circumference < 115 mm	19 (4.23)	39 (9.92)
Children's stunting forms, frequency (percent)		
Stunted children with height-for-age < -2	169 (27.2)	175 (27.7)
Severely stunted children with height-for-age z-score < -3	56 (9.03)	64 (10.1)
Households' socio-economic status categories, frequency (percent) ^b		
Low category	248 (40.1)	288 (45.7)
Middle category	205 (33.1)	224 (35.6)
High category	166 (26.8)	118 (18.7)

TABLE 11: BASELINE CHARACTERISTICS OF CHILDREN ENROLLED IN THE MAM'OUT STUDY

Data are frequency (percent) or mean \pm SD.

^a Mid upper arm circumference was measured for children \geq 6months

^b Socio-economic status data was not completed for one child in the control group

Children contributed to 15,394 and 14,458 months of follow-up in the intervention and control groups respectively (Table 12). Non-response rate was rather similar (2.17% vs. 2.21%; $p=0.93$) in the intervention and the control group respectively. We observed no difference in the mean change in WHZ in the intervention and the control groups over the 24 months of follow-up. We found no difference in the incidence of wasting episodes in the intervention and the control groups (incidence rate ratio: 0.92, 95% CI: 0.64, 1.32; $p=0.66$). Similar results were obtained when we broke down the analysis for moderate and severe wasting, and also by sex (data not shown). The longitudinal analysis of child's MUAC showed similar results as for WHZ with absence of difference in the mean MUAC change over time (-0.02 mm/month; 95% CI: -0.08, 0.02; $p=0.33$). The mean change in HAZ was similar ($p=0.78$) in the control and the intervention groups over the 24 months of follow up. The odds of stunting at the end of the intervention in the two groups (OR: 0.73, 95%CI: 0.47, 1.14; $p=0.17$) was comparable.

Outcome	Control arm (n=620)	Intervention arm (n=630)	p-Value
Child wasting			
End point mean weight-for-height z-score, mean \pm SD	-0.61 \pm 0.93	-0.56 \pm 0.95	
Intervention effect (95% CI) on weight-for-height z-score, z-score/month ^a	Reference	-0.003 (-0.008 ; 0.0003)	0.07
Cumulative episodes of weight-for-height z-score < -2	542	537	
Number of observed child-months	14,458	15,394	
Number of episodes per child-month (95%CI) ^b	0.045 (0.036 ; 0.057)	0.039 (0.031 ; 0.051)	
Incidence rate ratio (95% CI) ^c	Reference	0.92 (0.64 ; 1.32)	0.66
Child stunting			
End point mean height-for-age z-score, mean \pm SD	-1.99 \pm 1.04	-1.96 \pm 1.03	
Intervention effect (95% CI) on height-for-age z-score, z-score/month ^a	Reference	-0.0005 (-0.004 ; 0.003)	0.78
Odds ratio of the end point stunting (95% CI) ^d	Reference	0.73 (0.47 ; 1.14)	0.17
Mid upper arm circumference			
End point mean mid upper arm circumference in mm, mean \pm SD	144.2 \pm 10.3	144.3 \pm 11.0	
Intervention effect (95% CI) on mid upper arm circumference, mm/month ^a	Reference	-0.02 (-0.08 ; 0.02)	0.33

TABLE 12: EFFECT OF MULTIANNUL SEASONAL UCTS ON CHILDREN'S ANTHROPOMETRIC MEASUREMENTS AND THEIR NUTRITIONAL STATUS

^a Analyzed using a linear mixed model with cluster, household and children as random effects, adjusted for child's age at baseline, child's sex, socio-economic status at inclusion and the baseline value of the outcome under analysis.

^b Confidence intervals were estimated from a mixed Poisson model with random effects cluster, household and child.

^c Analyzed using a mixed Poisson regression model with cluster, household and children as random effects, adjusted for child's age at baseline, child's sex, socio-economic status at inclusion and weight-for-height z-score baseline value.

^d Analyzed using a mixed logistic model with cluster and household as random effects, adjusted for child's age at baseline, child's sex, socio-economic status at inclusion and baseline value

Children in the intervention group had a lower risk (21%, 95%CI: 18.6, 21.3; $p < 0.001$) of self-reported respiratory tract infections compared to children in the control group (Table 13). No difference in other self-reported morbidity outcomes was observed between the study groups. Death incidence rate is similar in the two groups (incidence rate ratio: 0.97, 95% CI: 0.92, 1.02; $p = 0.308$) (data not shown).

Outcome	Control arm (n=620)	Intervention arm (n=630)	p-Value
Number of child-months recalled a	1261	1266	
Diarrhea			
Number of diarrhea episodes	1049	1083	
Number of diarrhea episodes per child-month (95% CI) ^b	0.83 (0.80 ; 0.85)	0.85 (0.82 ; 0.88)	
Incidence rate ratio (95% CI) ^c	Reference	1.00 (0.97 ; 1.03)	0.89
Fever			
Number of fever episodes	2574	2302	
Number of fever episodes per child-month (95% CI) ^b	2.03 (1.99 ; 2.08)	1.81 (1.78 ; 1.85)	
Incidence rate ratio (95% CI) ^c	Reference	0.98 (0.96 ; 1.03)	0.31
Respiratory tract infections			
Number of respiratory tract infections episodes	1198	1106	
Number of respiratory tract infections episodes per child-month (95% CI) ^b	0.95 (0.92 ; 0.97)	0.87 (0.84 ; 0.89)	
Incidence rate ratio (95% CI) ^c	Reference	0.79 (0.78 ; 0.81)	<0.001

TABLE 13: EFFECT OF MULTIANNUAL SEASONAL UCTS ON CHILDREN'S SELF-REPORTED MORBIDITY

^a Calculated by number of recalls x recall duration

^b Confidence intervals are estimated from a mixed Poisson model with cluster, household and child random effects.

^c Analyzed using a mixed Poisson regression model with cluster, household and child as random effects, adjusted for child's age at baseline, child's sex, socio-economic status at inclusion and morbidity status at baseline.

5. DISCUSSION

This study assessed the effectiveness of multiannual seasonal UCTs to prevent acute malnutrition in young children in Tapoa province, Eastern region of Burkina Faso. We were unable to demonstrate a significant reduction in the incidence of wasting children belonging to

households that received the seasonal cash transfers as compared to control children. In addition, we did not find any intervention effect on child linear growth, resulting in similar odds of stunting at the end of the intervention. However, distributing cash reduced the incidence of self-reported episodes of respiratory tract infections.

The absence of evidence on the impact of the intervention on children's anthropometrics is consistent with results reported in the few available impact studies of UCTs. Previous randomized controlled intervention studies of UCTs in Zambia, Kenya and Burkina Faso have recently (after the inception of the MAM'Out study) reported the absence of significant improvements on wasting, stunting and mean HAZ of children under five years of age (R Akresh, de, & Kazianga, 2016; Haushofer & Shapiro, 2013b; Pega, Liu, Walter, & Lhachimi, 2015b; Seidenfeld et al., 2014).

Different reasons could explain the absence of evidence about the MAM'Out intervention effect on child anthropometrics. First, the money received by the participating mothers was not (only) used for the child's needs. Although during cash distributions and home visits, program staff emphasized that the money should be used for the targeted child, there was no mechanism or conditions imposed to guarantee the exclusive use of the money for the targeted child. Qualitative and study expenditure data collected during the MAM'Out intervention revealed that the two first investment domains for the cash received were food and health, not only for the child, but for the whole family. Women reported using approximately one quarter of the monthly allowance to buy food for the child while the main part was used to increase the household food stock (unpublished data). This situation may have been worsened by the stressful "hunger" season during which additional household budget is required to counter the dwindling granary supplies and to cover expenses related to the seasonal increase in disease (Vaitla et al., 2009a). Presumably, the cash transfer benefited all household members which, as consequence, might have diluted the cash related impact on child nutrition and health outcomes. The total value of the cash transfer may not have been enough to cater for both the child's specific needs and the households' needs altogether. On the other hand, the intervention related improvement might have been insufficient to translate into a sustained improvement in their nutritional status. A quantitative 24-hour dietary recall carried out during the UCT study reported better dietary quality in children belonging to the intervention group as compared to the control group. More specifically, intervention children consumed animal source foods more frequently and demonstrated higher intakes in vitamin B12 and E. However, no difference in energy and protein intake between the intervention and the control groups was observed (unpublished data). The positive intervention effect on diet quality might have been too small (both in the percentage of children and nutrient quantity) to affect child anthropometry. Furthermore, the high number of cumulative morbidity episodes emphasizes the high frequency of illness (table 3). The cyclic interaction between undernutrition and infections is widely recognized (Black, Victora, Walker, Bhutta, Christian, de Onis, Ezzati, Grantham-McGregor, Katz, Martorell, Uauy, Maternal, et al., 2013; Macallan, 2005; Tomkins & Watson, 1993). Previous studies showed that diarrheal illnesses can prevent weight gain as well as height gain, with the greatest effects when illnesses are recurrent (Guerrant, Schorling, Mcauliffe, & Desouza, 1992). Infections can further reduce food intake and increase energy and nutrient needs to fight infection, maintaining tissue repair and constraining body resources to be used for basic maintenance (U. E. Schaible & S. H. E. Kaufmann, 2007; Sridhar, 2008). The cumulative growth faltering may have hampered the improvement in the children's nutritional status in both groups. Finally, seasonal UCT may not have been a sufficient intervention to prevent child acute malnutrition. Future studies on the prevention of child malnutrition should evaluate cash transfer interventions combined with other child nutrition sensitive interventions with or without conditionalities. One possible complementary intervention could be the behavior change communication (BCC) for better nutrition and health, which fosters behavior change at the individual household and community

levels through behavior change trainings, monitoring and evaluation and a sustainability component (USAID, 2011). The effectiveness of a similar approach (combining cash transfers with nutrition BCC) for the prevention of undernutrition is currently being assessed by the transfer modality research initiative (TMRI) in Bangladesh (ClinicalTrials.gov, identifier: NCT02237144).

Multiannual seasonal UCTs that targeted mothers in vulnerable households in Tapoa province significantly reduced episodes of respiratory tract infection in the seven days before the interview, as reported by mothers. As methods vary among studies, we found it difficult to compare our findings with the relatively small body of literature on UCTs. Most studies reported an effect of UCTs on overall children's well-being and health outcomes, but few looked at the child morbidity indicators as defined by our study. After 24 months of implementation, the Zambian child grant program reported the intervention group of children had a 4.9 percentage points lower diarrheal prevalence compared to the control group, but did not find any intervention effect on cough (American Institutes for Research, 2013). After two years of cash transfers in an orphans and vulnerable children's program in Kenya, the evaluation team reported no intervention effect on morbidity indicators (diarrhea, fever and cough) among children under 5 years old who sought care when sick compared to children belonging to a control group (Ward et al., 2010). A randomized controlled trial in Malawi did find that children 6-17 years (therefore older than ours) included in a cash transfer program were less likely to be sick (with respiratory infections, malaria and abdominal pain as the most common reported illnesses), but does not provide insights on the pathways (Luseno et al., 2014). Although there was an apparent reduction in child's respiratory tract infections episodes in our study, it is difficult to support our findings with previous evidence. Therefore, the impact pathway for such an effect remains to be elucidated.

Our study has some limitations that need to be addressed. First, the sample size attained was smaller than foreseen, mainly due to logistical constraints (security, accessibility). Lost to follow-up was however lower than expected and the proportion of missing data was small thanks to the extra time invested in additional home visits when the participant was absent. In addition, adjustment for important prognostic covariates pre-specified in the protocol likely outweighed the loss of power due to the reduction in the sample size (Kahan, Jairath, Dore, & Morris, 2014). Secondly, child morbidity was recalled by mothers, which could have resulted in under or over-estimation. Finally, concerns about contamination between individuals are often present when it comes to the distribution of cash or food supplements. We chose a prospective interventional study with randomization at village level to limit these biases. However, we could not blind the study participants and the fieldworkers with respect to the intervention assignment because of the nature of the intervention (cash).

6. CONCLUSION

We did not find evidence of the effectiveness of multiannual seasonal unconditional cash transfers in preventing acute malnutrition in young children in Tapoa province. However, they resulted in a reduction in respiratory tract infection episodes. A cash-based program combined with a child nutrition and health behavior change communication component is a good compromise that requires further investigation.

7.

CHAPTER 7: GENERAL DISCUSSION AND CONCLUSION

1. INTRODUCTION

The MAM'Out project is one of the first rigorous studies to assess the preventive effects of seasonal UCTs on child acute malnutrition and its underlying causes in an area where seasonality has an important role in illnesses, food insecurity and undernutrition. The objective of this PhD thesis was to add evidence on the effects of these seasonal UCTs on the prevention of child undernutrition, and more particularly to verify four hypotheses (cf chapter 3, part 1) related to:

- The acceptance of these transfers by the population (hypothesis 2),
- The positive effects of seasonal multiannual UCTs on child nutritional status (hypothesis 1) and dietary intake via an enhanced food access (hypothesis 3a),
- The positive influences of seasonal multiannual UCTs on women's status (hypothesis 3b).

This chapter synthesizes the qualitative and quantitative findings of the research and evaluate the extent to which these four hypotheses were confirmed. It also presents the strengths and limitations of this research and discusses its public health implication. Finally, further research perspectives are proposed.

2. MAIN FINDINGS

2.1. QUALITATIVE RESULTS

The qualitative study (chapter 4) implemented within the MAM'Out project showed that:

- The cash transfer program was welcomed by the local population, including beneficiary and non-beneficiary households of the MAM'Out study. Having women as recipients of the transfers was also well tolerated by their husbands and key male members of the communities. No violence or tension arose between the intervention and the comparison groups, or between beneficiary and non-beneficiary households within the same village. However, some cases of intra-household jealousy between the beneficiary woman and her co-wives were reported.
- The cash was declared to be mainly spent to purchase food and to pay for health care for the child and the whole family. Some utensils for personal hygiene and care were also bought, but in a lesser extent. Sharing money within the household and externally was described as leverage to social cohesion and allowed for an increase in dignity and integration of the poorest at the community level.
- At the household level, the cash transfer program was associated with an enhanced participation of women in decision making concerning purchases for food and health. It also led to positive perceived changes mainly related to gender equality. When looking at the unexpected reported effects of this program, increased pregnancy plans of some women and the non-anticipation of the end of the transfers can be cited.
- Finally, the results from the qualitative study are in favor of validating some pathways of the theoretical framework of actions of cash transfers (figure 9) to prevent child's undernutrition in rural Burkina Faso, particularly: increase in purchasing power (pathways 1), improvement of the family's psycho-social well-being (pathway 3), reduction of seasonal migration for some families (pathways 5), non-decapitalization of productive assets (pathways 7), reimbursement of debts and credits (pathway 8), increase in women's control over income and decision power (pathways 9 and 10). However, these results still need to be confirmed with quantitative indicators.

In light of these qualitative results, hypothesis 2 is validated: UCTs were well accepted by the local population. Multiannual seasonal UCTs also had positive influence on women decision making but seemed to be associated with unexpected pregnancy plans: hypothesis 3b is partly validated.

2.2. QUANTITATIVE RESULTS

In parallel to the qualitative results, quantitative data of this research (chapters 5 and 6) showed that:

- Unconditional and multiannual cash transfers given at the end of the lean season are associated with improved child's diet among 14 to 29-month old Burkinabe children living in rural areas. Children in the intervention group had a higher consumption of animal products (eggs) and more children in the intervention group ate flesh food, eggs, dairy products and iron-rich or iron-fortified foods than children in the comparison group. Moreover, two third of the children from the cash group reported an adequate minimum dietary diversity compared to only one third in the comparison group.
- As far as macronutrients are concerned, fat intake is higher among children benefiting from cash transfers. However, no difference was observed for the energy intake between groups. The contribution of the three macronutrients to energy is also inadequate for both arms but slightly better for children in the intervention group, with more energy coming from fat and less from carbohydrates.
- Intake of vitamin B12 and E is higher among the intervention group.
- Multiannual seasonal UCTs had no effect on child wasting and stunting after two years of project implementation.
- The cash transfer program was associated with a lower risk of self-reported respiratory tract infections in children compared to the control group, but had no effect on other self-reported morbidity outcomes.

Given these quantitative findings, hypothesis 1 is rejected: these UCTs didn't affect positively children's nutritional status. Hypothesis 3a is at the contrary validated: UCTs allowed improvement of children's dietary intake (quantitative findings) via an enhanced food access (qualitative results).

3. STRENGTHS AND LIMITATIONS OF THE RESEARCH

Several strengths can be highlighted regarding the present work. First, it combines three sub-studies methodologically different and of high quality: a qualitative analysis (chapter 4) and two quantitative ones based on a cluster randomized controlled trial, namely a cross-sectional study (chapter 5) and a longitudinal analysis (chapter 6). These three analyses complement themselves and allow for a comprehensive interpretation of the results. The high number of people interviewed throughout the two years of project implementation ensures having reliable qualitative results. The randomized controlled trial design allows for high grade evidence and strong conclusions. Indeed, it reduces the risk of selection bias and of systematic differences between beneficiary and non-beneficiary households. Thus, if results show an effect, this latter is due to the intervention and not only associated to it. Care was also taken to elaborate a program theory framework from the beginning of the project in order to collect data on intermediate pathways leading to child wasting, which helps improving the interpretation of the results.

Moreover, the collected data is of good quality. Trainings were organized for data collectors before the beginning of data collection and between each round of it in order to check their practices and improve them when necessary. A supervision process was also implemented all over the data collection period and allows verification of the data on a very regular basis. If mistakes or omissions were detected, data collectors were sent again to the household to complete the work. When not taking into account deaths, very few loss of follow-up were recorded after more than two years of project implementation (less than 2% out of the 1250 children who provided at least two measurements).

This study also faces some weaknesses. In addition to the ones already mentioned in the discussion part of chapters 4, 5 and 6, further limitations can be highlighted. First, we didn't manage to assess the medical and nutritional follow up of children referred to health centers for acute malnutrition. Thus, it is impossible to know whether the intervention affected the length of stay of children in health center or their recovery time. Moreover, we may have missed some episodes of acute malnutrition between two rounds of data collection, although questions were asked to the mother about her child's frequentation of health center between two visits of data collector.

Secondly, for ethical and operational reasons, we chose not to include in the study any invasive measure, such as HemoCue to analyze the hemoglobin level of children. Such measure would have brought some more information on the nutritional status of children.

Thirdly, we only performed follow-up measurements during nine to ten months after the end of the second period of cash transfer. We are therefore not able to detect any medium and long-term effect of the intervention. In that sense, we can't say if the observed effects are going to last or to disappear in the following months. In the same way, the appearance of any other positive or negative effect can't be monitored.

Fourthly, more in depth analyses should be conducted with regards to the qualitative data collected. Indeed, some sub-groups analyses could be performed in order to see whether some differences appear. Other themes could also be analyzed, as the reasons given by the mothers for having an acutely malnourished child, the effects of having a mobile phone for women, or even the effect of the introduction of this new technology to people not used to having one.

Finally, the theoretical framework of action of cash transfers could be enriched by adding supplementary pathways in link with the results of the study.

4. PUBLIC HEALTH IMPLICATION OF THE RESEARCH

4.1. SEASONAL UCT TO IMPROVE CHILD DIETS

The results of the 24h dietary recalls showed a suboptimal quality of child diet in rural Burkina Faso, especially when considering the relative sources of energy intake (fat/carbohydrates/protein) for children in both groups during the lean season (chapter 5). Implementation of actions aiming at improving child diet are thus needed. The evaluation of the MAM'Out project showed that seasonal UCTs weren't efficient to prevent child wasting (chapter 6). However, they had positive effects on the quality of children's diet, particularly regarding the intake of high nutritional value products such as flesh food and iron-rich food (chapter 5). Moreover cash transfers were well accepted by the target population and didn't create any particular tension among communities (chapter 4). These results are very encouraging to

advocate for the consideration of seasonal UCT program when looking at actions to improve child's diet.

This conclusion is in line with the recommendations formulated in 2014, during the second International Conference on Nutrition held in Rome, Italy. This intergovernmental meeting focused on actions implemented all over the world to fight against malnutrition. Among its outputs, the Framework for Actions, endorsed by representatives of more than 170 governments, highlighted the importance of social protection to address undernutrition. Two recommendations can particularly be cited: "Incorporate nutrition objectives into social protection programs and into humanitarian assistance safety net programs" and "Use cash and food transfers, including school feeding programs and other forms of social protection for vulnerable populations to improve diets through better access to food" (Food and Agriculture Organization & World Health Organization, 2014).

In Burkina Faso, a national policy for social protection was adopted in September 2012 by the council of ministers. One year later, in November 2013, the first meeting of the National Council for Social Protection in charge of taking decision and organizing the implementation of this national policy took place. Among its action plan, the improvement of social transfer mechanisms for the poorest and the most vulnerable in order to ensure food security was considered as a priority (Gouvernement du Burkina Faso, 2012). As the budget allocated to social protection is limited, choice has to be made on who to consider as vulnerable households. Numerous discussions have been carried out to date in order to agree on the definition of vulnerable people. Household Economy Approach (HEA) criteria, also used in the MAM'Out study, were among the selected options. From a nutritional perspective, children under 5 years old are the most vulnerable. As such, social protection program aiming at improving vulnerable people's diet should prioritize households having children under 5 years old.

Seasonal transfers were shown to be efficient to improve child's diet during the lean season, the most critical period of the year in terms of food security. With limited available budget at the national level, one option to reach more households can be to transfer money only during specific months on the year, ideally the lean season (April to September).

The MAM'Out study was carried out in 32 villages and cash only distributed in 16 rural villages. When speaking of the national policy of social protection, the scale is totally different. We are aware of the operational and technical difficulties to implement such transfers at large scale. However, some facilitators were already tested within the project.

First, no conditionality was associated to the transfers. It is well known that monitoring the compliance to behaviour-related conditions to benefit from the cash intervention is very time-consuming and requires important logistic, human and budgetary means. Manley's systematic review found that the impact on nutritional status of UCT and cash transfers with health and education conditions are globally the same (Manley, Gitter, & Slavchevska, 2011). Moreover, the conditionality can induce beneficiaries to attend a service that can be of poor quality or comply with conditions not considered a priority for the household (M. Gaarder, 2012). This was particularly the case in rural Mexico, where conditional cash transfers reduced the free time available for mothers, as they were required to attend education sessions or to travel to receive the money (Jef L. Leroy et al., 2008). Conditionality might also not always be possible or suitable, especially in some African rural settings where public services are often weak (Davis et al., 2012). Furthermore, if a cash transfer is offered during a specific season only, during which basic needs in terms of food security and medical care are the most difficult to fulfill, the conditionality aimed at improving health and nutritional status on the use of cash might be less relevant. Indeed, during the annual hunger gap beneficiaries of a cash program are expected to use cash primarily to invest in nutrition-oriented activities and purchase elementary services,

goods or food they need. The qualitative data collected within the MAM'Out project confirmed this hypothesis, as cash offered from July to November was primarily spent on food and medical care for the child and the whole family. Unconditional seasonal cash transfers can thus be a relevant option in Burkina Faso when considering social transfers to improve child's diet at large scale.

Secondly, cash transfers within the MAM'Out study were implemented via mobile phones. Globally, two modalities of transfer are possible when implementing a cash transfer program: direct and indirect transfers. Direct transfers refer to the distribution of cash by local or international aid agencies, local shopkeepers or associations (The Cash Learning Partnership). This option was quasi exclusively used at the beginning of cash transfer programming in emergencies by international non-governmental organizations, and is still used for distribution at small scale. However, hand to hand distribution requires a lot of staff, materials and is not easily conceivable at large scale. Indirect transfers via banks or financial institutions are thus more and more considered and implemented in developmental and humanitarian settings (The Cash Learning Partnership). With the emergence of new technologies, cash transfers via mobile phones or electronic payment systems have also become very popular since a few years (Smith, MacAuslan, Butters, & Trommé, 2011). All indirect forms of cash transfers have the advantage, among other, of being more secure for the beneficiaries and providers. The MAM'Out project was one of the first programs to transfer money via mobile phones in Burkina Faso. As the project was implemented near the Nigerian border, some adaptations had to be made for a few villages, which got the Nigerian telecommunication network and not the Burkinabe one. High illiteracy rates among rural villages may have questioned the appropriateness of mobile phones for this program. In order to ensure an adequate reception of the transfers, sensitization sessions were organized among women on how to use mobile phones. Staff was also present at the cash withdrawal points to help the beneficiaries in case of problem. Qualitative data collected during the focus group discussions and individual interviews revealed that beneficiary women were very happy to receive a mobile phone. They appreciated this means of transfer and felt more secure. They also declared using the mobile phone to reach their families living in remote villages (data not presented). The negative points raised were the expenses linked with the maintenance of the phone, and its charge in terms of communication credits and electricity (chapter 4). When considering large scale social transfers, mobile phones could be a very efficient way to reach a large number of households. It takes time at the beginning to prepare and start the transfers, but once begun, they are easy to monitor.

To improve the child's diet, various strategies can be implemented. The first one that comes in mind is obviously food related actions, such as food distribution or fortification of food. Compared to food distribution, cash transfers have various potential benefits, as in part described in the Cash Learning Partnership's guide to field advocacy (The Cash Learning Partnership). Distributing cash instead of specific food allows beneficiaries to choose freely the food they prefer according to their own needs. When needs come from a loss in revenue and not from unavailability of food, cash can directly answer to the needs and be very efficient to improve diets. Cash transfer may also empower people living in critical financial conditions and to a certain extent empower women if they are recipients of the money (cf chapter 4). Transfers via bank or mobile phones allow protecting beneficiaries' dignity and can reduce the risk of stigmatization during the targeting process. From a cost perspective, cash transfers may be a good solution as no storage or transportation are required and it involves a reduced amount of staff for the distribution process. It is thus logistically easier than food distribution. Moreover, cash doesn't only affect the beneficiaries but can touch more globally the whole community. Indeed, beneficiaries will inject cash in the local economy, stimulating markets and possibly other activities. As mentioned previously, a last important aspect is the fact that cash transfers can be implemented at large scale and adapt rapidly to an evolution of context (Paul Harvey,

Katherine Haver, Jenny Hoffmann, & Murphy, 2010), at the opposite of food distribution. For example, the transferred amount can easily be changed according to the needs.

As with all actions, cash transfers can also have disadvantages (The Cash Learning Partnership). Additionally to the transferred amount, other costs are associated to cash programs, such as the cost of the transfer itself and opportunity cost for the beneficiaries (understood as all the activities the beneficiary has to give up while she/he spends time for the cash transfer program). However, the same is true for food distribution. From a security point of view, if cash transfer is not made by indirect means, manipulating and transporting cash creates risks for providers, recipients and traders. At the economic level, cash can generate price inflations. Furthermore, nobody can exclude a misuse of the money by beneficiaries for non-priority goods. From a gender related perspective, the choice of cash recipients is thus essential: while money is often handle by men, women are the ones in charge of food preparation and children's care. At the contrary, distributing food allows answering directly to the dietary needs and avoids the misuse issue. As shown in the MAM'Out study, cash may also create expectations for continuous transfers or may favor fertility among vulnerable households (chapter 4). However, despite all these potential negative effects, when looking at large scale solutions to improve young children's diet, cash transfers stay a relevant and non-negligible option.

Burkina Faso is part of the Sub-Saharan countries facing an annual hunger gap, food insecurity and high rates of nutritional disorders among children under 5. The above presented results may thus be considered when discussions around safety nets to improve children's diet arise in similar countries. These results are not directly transferable to other regions, but are still very encouraging and in favor of testing similar approaches in comparable contexts. However, before opting for the implementation of cash transfer programs, a set of necessary prerequisites must be fulfilled. First, various economic and market conditions must be satisfied (World Food Program, 2014). Indeed, cash transfers can only be considered in areas having a monetary economy, and not an economy based on barter. In food insecure areas, a special attention must be paid at markets: they have to be functional and food has to be available locally. Markets also have to be (easily) accessible both by beneficiaries and suppliers and need the capacity and will to handle supplementary activity. Another crucial point to consider is the broad economical context, and particularly price inflation. Cash transfers shouldn't be considered in case of hyper-inflation, as beneficiaries wouldn't be able to use the full potential of the money they received (Karen Thome et al., 2014; Taylor, Kagit, Filipski, & Thome, 2013). Operational settings should also be carefully looked at and a security assessment should be conducted in order to ensure appropriate conditions.

4.2. INTEGRATED APPROACH FOR THE PREVENTION OF CHILD WASTING

The results of the MAM'Out study showed that seasonal UCTs had no impact on child wasting after two years of project implementation (chapter 6), which is consistent with the findings of the literature review presented in chapter 2. One possible explanation is the fact that before having an effect on wasting, cash transfers must address its immediate and underlying causes, as described in chapter 1. In this PhD thesis, we showed that seasonal UCT allowed consuming food of better nutritional quality. They thus had a positive effect on the food intake pathway, which corresponds to one of the two immediate cause of undernutrition. However, the cash transfer program wasn't associated with a higher protein or energy intake (chapter 5). The positive effect on the quality of the diet may also be too small in terms of quantity to be able to affect children's anthropometry. Moreover, beneficiary households declared spending the amount received to buy primarily food: food for the child and for the whole family (chapter 4). Thus, children only

benefited from part of the transfers, which may also have lessened the impact of UCT on children's dietary intake, and subsequently on children's anthropometry.

Moreover, the positive effect on children's food intake may not be sufficient to impact their nutritional status if no other change occurred in parallel, particularly on the health side, the second immediate cause of undernutrition. Indeed, as described in chapter 1, health status and nutritional status are interrelated and forms a vicious circle. As far as morbidity is concerned, UCT was associated with a decrease in self-reported respiratory tract infection episodes, but had no effect on other major morbidities, such as fever or diarrhea (chapter 6). Yet, this latter is strongly associated with wasting (chapter 1). This may be another possible explanation of the absence of effect of UCT on children's nutritional status.

Multiannual seasonal UCT didn't have the expected effect on the prevention of child acute malnutrition. Another potential hypothesis could be that the seasonal aspect of the transfers didn't allow creating stable and sustainable positive effects on child nutrition. Indeed, cash was distributed in a period of financial stress and high needs and was thus quickly spent. This allowed answering the immediate food and/or health care needs (chapters 4 and 5). However, the amount distributed was considered too small by beneficiaries to invest in medium to long term activities, like income generating ones (chapter 4). As such, once cash spent and the distribution period completed, benefiting households went back to their previous situation, with restricted resources. Moreover, some field observations from the Listening Post study conducted by Action Contre la Faim in the Tapoa province found that peaks of acute malnutrition and frequentation of health centers occur in April/May, so before the beginning of the lean season. Savy et al also showed that women food diversity rise during the hunger gap period in the Eastern region of Burkina Faso, due to the consumption of wild food (Savy, Martin-Prevel, Traissac, Eymard-Duvernay, & Delpeuch, 2006b). Continuous cash transfers could thus be an option to consider when aiming at preventing child undernutrition.

We can also wonder whether adding additional components to the program would have changed something. In other words, would an integrated approach be the right solution to fulfil side conditions and thus prevent child wasting? A randomized trial in Bangladesh compared five approaches: 1. Cash, 2. Food, 3. Cash and food, 4. Cash and nutrition behavior change component (BCC), 5. Food and nutrition BCC. Results showed that cash and nutrition BCC was the most effective approach to increase daily food energy acquisition, improve diet quality and to decrease stunting in the poorest region of the country (Akhter Ahmed et al., 2013). Except from this study, little solid evidence is available on the subject. A prospective intervention study carried out in Niger suggests that a combined preventive distribution of cash and food was more effective to prevent acute malnutrition among young children than cash alone (Langendorf et al., 2014a). Two literature reviews including numerous field reports and evaluations also suggested that adding a side component to the cash program, such as food, BCC or treatment of acute malnutrition, has the highest potential to affect children's nutritional status (Sarah Bailey & Kerren Hedlund, 2012; Bridget Fenn & REFANI research team, 2015). In light of these findings and suggestions, an integrated approach combining cash and one or several other components identified as a key factors leading to acute malnutrition in the region should be considered.

5. FURTHER RESEARCH PERSPECTIVES

This PhD thesis only presents part of the data collected within the MAM'Out project. Many analyses still have to be performed in order to have a broader comprehension of the effects of

seasonal UCTs on the prevention of child acute malnutrition. Among them, the following topics can be highlighted:

- In the framework of the qualitative data collection, data on the perceived change induced by the introduction of mobile phone in households and the community level were collected. They still need to be analyzed in depth in order to assess any positive or negative effects that the distribution of mobile phones to women may have had.
- From a quantitative point of view, we only presented the effects of UCTs on child nutritional status and intake. However, many more data were collected and still need to be analyzed in order to assess the effects of seasonal UCT on:
 - household and individual food security,
 - child development
 - health center frequentation
 - women empowerment and activities
 - water, hygiene and sanitation practices.
- Once all data will be analyzed and published, we will be able to make a global analysis on the impact pathways for better child nutrition and therefore to see which pathway(s) have the most potential for a change in child nutrition. This will allow better understanding why the seasonal UCT didn't have an effect on children's nutritional status.
- Data for cost-effectiveness analysis was also collected during the project implementation. This will allow evaluating the cost-effectiveness of seasonal UCTs with regards to food security indicators and the improvement of children's diet. This is a key aspect, especially when thinking at public health implication of the results and at large scale social safety nets. Indeed, only a reduced budget is dedicated to social protection at national level; it must therefore be used in the most-efficient way.

Next to these research subjects that still need to be developed within the MAM'Out project, further research questions can be derived from this PhD thesis:

- First, the objective of the MAM'Out study was to assess the effects of multiannual cash transfers on the prevention of child acute malnutrition. However, due to budgetary constraints, cash transfers were provided only for two years. Does distributing cash for additional years lead to positive effects on children's nutritional status?
- Initially, we planned to distribute cash from May to September, corresponding to the hunger gap period for the households. However, due to budgetary and operational constraints, distribution only began in July. Does distributing cash from May to September have better effect on the prevention of child wasting?
- As already mentioned above, data collection ended nine months after the last cash transfer; thus, the long-lasting effects of the program couldn't be assessed. Collecting data several years after the end of the project implementation would allow answering the following question: what are the long term effects of seasonal and multiannual UCT on child acute malnutrition and its underlying causes?
- As discussed above, should other components be added to seasonal UCTs to make them more effective regarding child nutritional status? Is an integrated approach combining seasonal UCTs and a context-adapted component more effective to prevent child wasting?
- One feedback received during the focus group discussions and individual interviews was related to the small amount of cash distributed with regards to the family size and the needs. Does transferring a higher monthly amount of cash have stronger effects on child's intake and/or more effects on child's nutritional status?

- In the framework of the MAM'Out project, cash was purposely transferred only during five months of the year. Is a continuous cash transfer more effective to prevent child acute malnutrition than transfers carried out only during the lean season?
- Qualitative data also revealed that some women had pregnancy plans in the hope of becoming beneficiaries of the UCT program. This should really be monitored, especially when thinking at large scale interventions. Does a cash transfer program targeted at young children increase fertility rate and child births?
- The inclusion criteria to be included in the MAM'Out project were to be classified as poor or very poor households according to the HEA criteria and to have at least one child under one year old. Yet, the period considered to be the most crucial for the prevention of child wasting begins in utero, during pregnancy. Could targeting pregnant women from the second trimester until their child is 5 years old have positive effect on the prevention of child acute malnutrition?

The present work is already very instructive. However, a lot still need to be done in order to fully exploit data and learn all lessons from it.

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ANNEX

ANNEX

ANNEX 1: FOCUS GROUP AND INDIVIDUAL INTERVIEW GUIDE

Guide d'entretien individuel et focus group

(A destination des Bénéficiaires Cash)

Identification

Date: / /

Nom du village : _____

Heure du DEBUT de l'entretien: |__|__| H |__|__|mn

Heure de FIN de l'entretien: |__|__| H |__|__|mn

Durée : |__|__|

Nom et prénom de l'enquêté : _____

Fonction/rôle de l'enquêté : _____

Lieu: _____

ID Animateur : |__|__|

Bien préciser avant de démarrer l'entretien que tout ce qui sera dit restera confidentiel et qu'aucune réponse n'est ni bonne ni mauvaise. Demander à enregistrer vos échanges. Le but de cet entretien est d'avoir l'avis des participants du projet, pour ensuite pouvoir l'améliorer.

1. Perception de la malnutrition

- Selon vous à quoi renvoie le terme malnutrition? A quoi cela vous fait-il penser ?
- Y a-t-il d'autres appellations que vous utilisez pour parler de malnutrition ?
- Comment se manifeste la malnutrition ?
- Selon vous pourquoi existe-il plus de malnutris garçons que de filles?
- Comment la prévenir selon vous?

2. Connaissance et contribution du projet

- Avez-vous été informés du démarrage de la deuxième période de transferts monétaires ?
- Pensez-vous que les bénéficiaires ont été bien prévenues de la reprise ?
- Comment trouvez-vous l'organisation des transferts monétaires ?
- Avez-vous des remarques sur la manière dont cela se passe d'un point de vue pratique (exemple : en termes d'attente, de personnes pour vous aider/servir...) ?
- Que pensez-vous du projet en général (mesures régulières des enfants, questions...) ?
- Avez-vous entendu des commentaires à propos de ce projet (positifs ou négatifs) ? si oui, lesquels ?

3. Utilisation de l'argent transférés

- Comment avez-vous utilisé l'argent qui vous a été donné ? A quoi a servi cet argent?
- Pourquoi avoir utilisé cet argent pour ces dépenses ?

- Qui a décidé de l'utilisation de l'argent pour ces différentes dépenses ? (Sonder femmes, époux, belles-mères ...)
- Comment avez-vous entretenu vos enfants pendant la période de suspension du cash?
- Pendant cette période, avez-vous été confrontés à des difficultés ? si oui, lesquelles ?

4. Perception des changements

- Qu'est-ce que cet argent a apporté de positif dans la vie de votre ménage ? (Sonder Changement au niveau alimentaire, soins,)
- Qu'est-ce que cet argent a apporté de négatif dans la vie de votre ménage ? (Sonder conflits internes liés à la gestion, le choix des postes de dépenses)
- Qu'est-ce que cet argent a apporté de positif dans le village ? (Sonder Changement au niveau alimentaire, soins,...)
- Qu'est-ce que cet argent a apporté de négatif dans vos relations avec le voisinage? (Sonder conflits entre ménages, avec les commerçants)
- Que pensez-vous des changements que cet argent a apportés dans votre ménage?
- Le cash a-t-il contribué à rendre favorable / améliorer les conditions de vie des femmes? (comparaison des conditions de vie de la bénéficiaire avec sa vie antérieure ou avec la sienne)
- Vous êtes-vous déjà senti mal à l'aise ou en insécurité à cause de ce projet?

5. Perception de l'utilisation du téléphone portable

- Quelle appréciation faites-vous de la possession du téléphone portable par les femmes?
- Selon vous, quelles sont les utilisations qu'elles en font?
- Quels sont les avantages liés à son utilisation pour les femmes?
- Selon vous, le téléphone portable pourrait-il être la source de problèmes dans certains ménages ? (exemple : mésentente entre époux et épouse)
- Si oui, pouvez-vous nous décrire les problèmes survenus suite à l'apparition du téléphone portable dans le foyer ?
- A votre avis, quelle est la place que la femme acquiert dans le ménage ou dans le village en possédant le téléphone portable?
- Quel lien faites-vous entre le téléphone portable et le transfert monétaire?
- Que pensez-vous du moyen de transfert utilisé ? Quels sont les avantages ? quels sont les inconvénients ?
- Avez-vous d'autres points que vous souhaiteriez ajouter à la discussion ?

Merci pour votre collaboration!

ANNEX 2: QUOTES FROM THE QUALITATIVE DATA COLLECTION

Table S1: Quotes related to the first question: “What types of purchases were made by the beneficiaries of cash transfers intended to prevent acute malnutrition in children?”

Types of purchases/expenses	Quotes
Food	<ul style="list-style-type: none"> “In this period of famine, you use it to buy millet in order to survive the famine and for planting. But I leave a part for the child’s needs: 5000 F. The other 5000 F, it’s for the purchase of millet.” Beneficiary woman “We can’t only spend it on the child. We lack food; we can’t only feed the child and starve.” Beneficiary woman
Health care	<ul style="list-style-type: none"> “At the time I took my money, the child I am in charge of was sick and his brother too. I brought them both to consultation. I bought medicines for 3500 F and 4000 F for the younger child and older child, respectively.” Beneficiary woman
Hygiene products, clothes, and cooking utensils	<ul style="list-style-type: none"> “Often our clothes get dirty and we wear them without having washed them. Now, we have something to buy soap to wash them, for us, for our children and for our husband.” Beneficiary women “She first bought a cooking pot for the kitchen... During the celebrations, she bought clothes for her child.” Co-wife of a beneficiary woman
Investment in income-generating activities	<ul style="list-style-type: none"> “The money is insufficient to meet the family’s needs. Therefore we don’t think about investing it in business.” Beneficiary woman “I told my wife: ‘As we are lucky that the child isn’t ill, we will pay for animals.’ We bought two rams that are there. [...] It could be the child’s needs or ours that will lead us to sell them.” Head of a beneficiary household
Money sharing	<ul style="list-style-type: none"> “I didn’t go over 500 F. This money belongs to the head of household. Even if Action Contre la Faim asks me, it’s my money and I spend it for my needs. The rest, I told her to handle it for the child.” Key village member of the intervention group (and also head of a beneficiary household) “At home, she gave me 2000 F to buy things for my child.” Co-wife of a beneficiary woman “When she comes back, she usually gives me 1000 F to buy kola.” Mother-in-law of a beneficiary woman “Once, she lent 5000 F to another woman who came to tell her about a problem.” Head of a beneficiary household
Phone charging	<ul style="list-style-type: none"> “We buy phone credits. For me, it’s 500 F per month. I charge the battery three times a month, it costs 300 F. My battery wasn’t good, I bought a new one for 2000 F.” Beneficiary woman

Table S2: Quotes related to the second question: “What perceived changes were induced in the daily lives of women by the cash transfers?”

Perceived changes	Quotes
Acceptance of women as cash transfer recipients	<ul style="list-style-type: none"> • “I don’t have any problem with my wife. However, the cash transfers improve our love. She hardly bothers me about the little things that the child needs.” Head of a beneficiary household
Decision-making	<ul style="list-style-type: none"> • “We realized that we support our husbands very well. This also makes the women proud to know that they are respected by the family. You know that if you often make gestures, you can’t be ignored during discussions.” Beneficiary woman • “There is a clear improvement. The woman doesn’t wait for her husband’s point of view about her child’s care anymore, except if there isn’t enough money. In that case, she calls me by phone to inform me. That’s what is going on at home. For the household’s maintenance too, there is a clear change.” Head of a beneficiary household • “For Gourmantché people, the husband first has to consult the sand. Then, if there is a sacrifice to be made, he makes it, and if the child isn’t healed, we take him to the health center. So I go through my husband if it is for traditional health care, but if it is the health center I don’t necessarily wait for my husband. I decide to take the child there myself.” Beneficiary woman
Men’s perception of their wives	<ul style="list-style-type: none"> • “When she got the money, she came to tell me: ‘That’s it, there’s no more millet. I suggest that we pay for some millet.’ But I couldn’t open my mouth because for me, it was like a dream that she had such an idea.” Head of beneficiary household • “My husband congratulated me last time because I supported him during the hunger gap.” Beneficiary woman
Jealousy / misunderstanding	<ul style="list-style-type: none"> • “My husband told me to buy an animal for the child and me; I told him that I would rather invest in the child’s food and health. He threatened me by saying that he would report that to Action Contre la Faim, because he said I wasn’t saving any money for the child.” Beneficiary woman • “I would even say that the project didn’t help the child, but helped me. Imagine if I took all the money I should have given to the mother, and used it for other needs. In that case, you know that this small support I give to her co-wife’s children softens the jealousy that her co-wife could express.” Head of a beneficiary household
Increased autonomy and management of cash	<ul style="list-style-type: none"> • “When she came back, she gave me the money and I told her that I travel a lot. I would rather have her keep the money. Since then, it’s my wife who holds the money.” Head of beneficiary household • “Today, the woman supports the man. Instead of bothering us for money, as soon as her money arrives, she can do whatever she wishes without our support. This really pleases us.” Head of beneficiary household
Social cohesiveness	<ul style="list-style-type: none"> • “There is a big change, because a lot of women ask me how I take care of my child and I tell them.” Beneficiary woman • “There is good collaboration, because when money comes, you go to buy something and don’t have to use credit. What

	shopkeeper doesn't like such a client!" Beneficiary woman
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Table S3: Quotes related to the third question: "What are the perceived positive and negative effects of the cash transfer program?"

Perceived positive and negative effects of the program	Quotes
Decreased feelings of shame	<ul style="list-style-type: none"> "It's a support to our husbands. Our husbands relied on animals breeding to buy millet, but today, because of diseases, the animals aren't here anymore. With this money, we support our husbands; we cleanse our household of shame." Beneficiary woman
Fewer debts or less selling of productive assets	<ul style="list-style-type: none"> "We don't take out any more loans. Before, you would suffer to get credit and then you suffered to pay it back." Beneficiary woman "When I received money, I didn't sell my goods. But during this break period, I was obliged to sell my chicken to care for him." Beneficiary woman
Positive changes at the community level	<ul style="list-style-type: none"> "The money created many changes because the poorest don't bother the people who manage things anymore. So this helps; everybody takes advantage of it." Key member of the community "Some parents, without this money, would be forced to work on other peoples' farms to earn money or take out credit to cover their children's needs. Thanks to this money, many of them stay to take care of their fields or carry out their own activities." Key member of the community
No reported conflict	<ul style="list-style-type: none"> "All the people who receive money enjoy it, and those who don't benefit pray to God to be included the next time." Non-beneficiary woman
Ways of improving the program	<ul style="list-style-type: none"> "If I am reminded that the distribution will end next year, I'm not happy at all." Beneficiary woman "It takes 5000 F to buy millet for all eight of us, and this lasts four to five days maximum." Beneficiary woman "For me, it's to ask you to increase the amount of money. Instead of 10,000 F, 15,000 F would be good. For some children's illnesses, 10,000 F is not enough." Beneficiary woman "Last year it was complicated. But this year no one had to stay in the place, except the ones who had problems with their mobile phones. Last year, sometimes they had to spend two days there." Beneficiary woman
Misunderstanding of inclusion criteria	<ul style="list-style-type: none"> "There were some people who said that the village advisor made deals; some others said they enrolled people based on some criteria. So there are people who understand and other who don't." Head of beneficiary household
Not expecting the transfers to end	<ul style="list-style-type: none"> "We became like children today. If a mother goes to the market and brings back biscuits for her child, the child will beg for them next time. So it's the same for us. If you leave us, we will suffer because we were used to getting money, and that's it." Beneficiary woman "For us, the women, it's complicated. We don't have the means; we didn't do anything to get the money. When I received money,

	I didn't wait to take my child to the health center. However, since the distribution stopped, I don't have anything." Beneficiary woman
Reduced financial support	<ul style="list-style-type: none"> • "Our husband doesn't give her any more money now. She already has something and I don't, so he provides support to me so I can meet my children's needs." Co-wife of a beneficiary woman
New pregnancy plans	<ul style="list-style-type: none"> • "What I heard from the neighbor, it's that she was saying that next year she will also have a new-born in order to benefit from this money." Beneficiary woman

ANNEX 3: BREASTFEEDING QUESTIONNAIRE

QUESTIONNAIRE ALLAITEMENT DANS LE CADRE DU RAPPEL DE 24H EN DIRECTION DES ENFANTS DE PLUS DE 6 MOIS

Date: / /

Enquêteur ID : |__|__|

Cluster ID : |__|__| IDM : |__|__|__|__| IDE: |__|__|__|__|

Nom de l'enfant : _____ RAPPEL NUMERO : |__| (1 ou 2)

N°	QUESTIONS	OPTIONS DE REPONSE	CODE
1	Votre enfant est-il encore mis au sein /allaité ?	0 = Non 1 = Oui, chaque jour 2 = Oui, mais pas tous les jours	__
<i>Si la réponse à la question 1 est « non », arrêter le questionnaire. Sinon continuer.</i>			
2	Combien de fois votre enfant a-t-il été mis au sein hier (dans la journée et pendant la nuit) ? Demander à la maman de se rappeler de la journée d'hier, en commençant par la nuit et en finissant quand elle est allée se coucher. Lui faire ensuite décrire chaque mise au sein et noter les réponses dans le tableau page 2.		

3	En général, les mise au sein sont-elles plus à la demande de l'enfant ou à votre convenance ?	1 = A la demande de l'enfant 2 = A la convenance de la maman 9 = Ne sait pas	__
4	Est-ce que vous pensez que maintenant, pour votre enfant, l'allaitement est moins / plus / tout aussi nourrissant que l'alimentation ?	1 = Moins nourrissant 2 = Plus nourrissant 3 = Tout aussi nourrissant 9 = Ne sait pas	__
5	Est-ce toujours vous qui allaitez votre enfant ?	0 = Non 1 = Oui 9 = Ne sait pas	__
6	Quand avez-vous commencé à donner une alimentation complémentaire à votre enfant ?	Age de l'enfant en mois __ __ mois	

N° de la mise au sein	Moment de la mise au sein	Fonction de la mise au sein	Durée de la mise au sein
1	__	__	__ 0-10 min __ 11-20 min __ 21-30 min
2	__	__	__ 0-10 min __ 11-20 min __ 21-30 min
3	__	__	__ 0-10 min __ 11-20 min __ 21-30 min
4	__	__	__ 0-10 min __ 11-20 min __ 21-30 min
5	__	__	__ 0-10 min __ 11-20 min __ 21-30 min
6	__	__	__ 0-10 min __ 11-20 min __ 21-30 min
7	__	__	__ 0-10 min __ 11-20 min __ 21-30 min
8	__	__	__ 0-10 min __ 11-20 min __ 21-30 min
9	__	__	__ 0-10 min __ 11-20 min __ 21-30 min
10	__	__	__ 0-10 min __ 11-20 min __ 21-30 min
11	__	__	__ 0-10 min __ 11-20 min __ 21-30 min
12	__	__	__ 0-10 min __ 11-20 min __ 21-30 min
13	__	__	__ 0-10 min __ 11-20 min __ 21-30 min
14	__	__	__ 0-10 min __ 11-20 min __ 21-30 min
15	__	__	__ 0-10 min __ 11-20 min __ 21-30 min

OPTIONS DE REPONSES :

- Moment de la mise au sein:

1- Pendant la nuit	2- Avant le repas du matin
3- En remplacement du repas du matin	4- Après le repas du matin
5- Dans la matinée / Le matin	6- Avant le repas de midi
7- En remplacement du repas de midi	8- Après le repas de midi
9- Dans l'après midi	10- Avant le repas du soir
11- En remplacement du repas du soir	12- Après le repas du soir
13- Au coucher de l'enfant	

- Fonction de la mise au sein:

1- Nourrir mon enfant	2- Calmer/occuper mon enfant
3- Autre	

ANNEX 4: QUANTITATIVE QUESTIONNAIRE FOR THE 24H DIETARY RECALL SURVEYS

QUESTIONNAIRE DE RAPPEL DE 24H EN DIRECTION DES ENFANTS DE 12 A 24 MOIS

Date: / /

Enquêteur ID : |__|__|

Cluster ID : |__|__|

IDM : |__|__|__|__|

IDE: |__|__|__|__|

Nom de l'enfant : _____

RAPPEL NUMERO : |__| (1 ou 2)

Moment du repas (Matin-Midi- Ap midi- Soir-Nuit)	Type d'aliment	Description de l'aliment	Quantité		Volume (ml)	Prix (F CFA)	Poids (g)
			Unité	Nombre d'unités			

Type de jour (**hier**) :

Jour ordinaire []

jour spécial [], pourquoi : _____

OBSERVATIONS:

QUESTIONNAIRE SUR LA MORBIDITE

Date:/...../.....

Enquêteur ID: | | | | |

Cluster ID: | | | | |

DM: | | | | | IDE: | | | | |

Nom de l'enfant : _____

Poser à la mère les questions suivantes sur l'état de santé de son enfant pendant les 7 jours précédant l'enquête.

Réponses: 0 = Non / 1 = oui / 9 = Ne sait pas ou ne veut pas répondre

[illegible]

* Un épisode de diarrhée est défini comme 3 selles liquides en un jour ou des selles avec du sang.

Symptôme de la rougeole : petits point blanchâtres à l'intérieur de la bouche et des éruptions cutanées sur le visage et qui s'étendent progressivement vers le bas du corps

ANNEX 6: ANTHROPOMETRIC QUESTIONNAIRE

ACF – MAM Out

Fiche suivi anthropométrique (Tous les 3 mois)

PREMIERE (I) MESURE

Date: / /

Enquêteur ID : | | | | |

Cluster ID : | | | | |

IDM : | | | | |

IDE: | | | | |

Nom de l'enfant : _____

Date de naissance : | | | | | / | | | | | / | | | | |

Age de l'enfant : | | | | | mois

Sexe (1. Garçon / 2. Filles): | | |

Ordre de naissance : | | | | |

	Date	Poids (kg)	Taille (cm)	(<, = ou >) Z score	pB (mm)	Gdèmes bilatéraux (0=non / 1=oui)	ID enquêteur
1	/ /	,	,	Z-score			
2	/ /	,	,	Z-score			
3	/ /	,	,	Z-score			
4	/ /	,	,	Z-score			
5	/ /	,	,	Z-score			
6	/ /	,	,	Z-score			
7	/ /	,	,	Z-score			
8	/ /	,	,	Z-score			
9	/ /	,	,	Z-score			

Date de fin : | | | | | / | | | | | / | | | | |

Raison : | | |

1 = Toutes les visites réalisées, 2 = Mort
3 = déménagé/perdu de vue, 4 = Refus des mesures

DEUXIEME (II) MESURE

Date: / / Enquêteur ID : |_|_|_|_|_| Cluster ID : |_|_|_|_|_|

IDM : |_|_|_|_|_| IDE: |_|_|_|_|_|

Nom de l'enfant : _____ Date de naissance : |_|_|_|_|/|_|_|_|_|/|_|_|_|_|

Age de l'enfant : |_|_|_|_| mois Sexe (1. Garçon / 2. Filles): |_|_| Ordre de naissance : |_|_|_|_|

	Date	Poids (kg)	Taille (cm)	(<, = ou >) Z score	PB (mm)	Œdèmes bilatéraux (0=non / 1=oui)	ID enquêteur
1	_ _ _ / _ _ _ / _ _ _ _ _	_ _ _ , _ _ _ _	_ _ _ _ , _ _ _ _	_ _ _ Z-score	_ _ _ _	_ _	_ _ _ _
2	_ _ _ / _ _ _ / _ _ _ _ _	_ _ _ , _ _ _ _	_ _ _ _ , _ _ _ _	_ _ _ Z-score	_ _ _ _	_ _	_ _ _ _
3	_ _ _ / _ _ _ / _ _ _ _ _	_ _ _ , _ _ _ _	_ _ _ _ , _ _ _ _	_ _ _ Z-score	_ _ _ _	_ _	_ _ _ _
4	_ _ _ / _ _ _ / _ _ _ _ _	_ _ _ , _ _ _ _	_ _ _ _ , _ _ _ _	_ _ _ Z-score	_ _ _ _	_ _	_ _ _ _
5	_ _ _ / _ _ _ / _ _ _ _ _	_ _ _ , _ _ _ _	_ _ _ _ , _ _ _ _	_ _ _ Z-score	_ _ _ _	_ _	_ _ _ _
6	_ _ _ / _ _ _ / _ _ _ _ _	_ _ _ , _ _ _ _	_ _ _ _ , _ _ _ _	_ _ _ Z-score	_ _ _ _	_ _	_ _ _ _
7	_ _ _ / _ _ _ / _ _ _ _ _	_ _ _ , _ _ _ _	_ _ _ _ , _ _ _ _	_ _ _ Z-score	_ _ _ _	_ _	_ _ _ _
8	_ _ _ / _ _ _ / _ _ _ _ _	_ _ _ , _ _ _ _	_ _ _ _ , _ _ _ _	_ _ _ Z-score	_ _ _ _	_ _	_ _ _ _
9	_ _ _ / _ _ _ / _ _ _ _ _	_ _ _ , _ _ _ _	_ _ _ _ , _ _ _ _	_ _ _ Z-score	_ _ _ _	_ _	_ _ _ _

Date de fin : |_|_|_|_|/|_|_|_|_|/|_|_|_|_|

Raison : |_|_|_|

1 = Toutes les visites réalisées, 2 = Mort
3 = déménagé/perdu de vue, 4 = Refus des mesures

CURRICULUM VITAE

Audrey Tonguet-Papucci was born in May 14th, 1986.

EDUCATION		
AGRONOMIST AND NUTRITIONIST ENGINEER & PhD STUDENT (Child under- nutrition)	2012-2016	PhD student in AgroParisTech Paris, France PhD student in Gent University Gent, Belgium PhD subject: « Evaluation of the effectiveness and cost-effectiveness of multi-annual and seasonal cash transfers to prevent acute malnutrition »
	2006-2010	Agronomist engineering school, AgroParisTech Paris, France Specialization « Biology and Human Nutrition » In-depth study: Under-nutrition in developing countries & Experimental research in human nutrition
	2004-2006	Preparatory classes for a highly competitive national exam Biology, Chemistry, Physics and Mathematics Marseille, France
	Jun 2004	Scientific Baccalaureate Monaco, Monaco Distinction "very good" and "European (English)"
PROFESSIONAL EXPERIENCES		
Jan 12 - ... Paris, France & Burkina Faso	Action Against Hunger, Research Project coordinator <ul style="list-style-type: none"> - Coordination of the MAM'Out study: evaluation of cash transfers to prevent child acute malnutrition in Burkina Faso - Development of research protocols - Fund raising - Implementation and follow up of four scientific collaborations - Coordination between technical, operational and scientific partners - Coordination of HR, administrative and budgetary aspects - Statistical analysis of data - Elaboration of scientific reports and articles, and of capitalization reports 	
Mar 11 – Dec 11 Paris, France	Action Against Hunger, Scientific studies officer <ul style="list-style-type: none"> - Participation to the improvement of the scientific watch process - Development of the MAM'Out research project 	
Nov 10 – Mar 11 Paris, France	Action Against Hunger, Research officer <ul style="list-style-type: none"> - Support to the implementation of quality assurance tools - Inventory and update of trans-sectorial research projects - Participation to the elaboration of the research strategy (bibliographic watch) 	
Oct 10 – Nov 10 Dijon, France	Centre Européen des Sciences du Goût, Research engineer <ul style="list-style-type: none"> - Development of a research protocol on pupil reaction when stimulated by food - Bibliographic study 	

Peer reviewed publications

- **Tonguet-Papucci A.**, Huybregts L., Ait Aissa M., Huneau J-F., Kolsteren P., The MAM'Out project: a randomized controlled trial to assess multiannual and seasonal cash transfers for the prevention of acute malnutrition in children under 36 months in Burkina Faso. BMC Public Health (2015) 15:762
- **Tonguet-Papucci A.**, HOUNGBE F., LOMPO P., YAMAEGO M., HUYBREGTS L., HUNEAU J-F., AIT AISSA M., KOLSTEREN P., Beneficiaries' Perceptions and Reported Use of Unconditional Cash Transfers Intended to Prevent Acute Malnutrition in Children in Poor Rural Communities in Burkina Faso: Qualitative Results from the MAM'Out Randomized Controlled Trial. Accepted by BMC Public Health, 2017
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- HOUNGBE F., **Tonguet-Papucci A.**, ALTARE C., AIT-AISSA M., HUNEAU J-H, HUYBREGTS L., KOLSTEREN P. Unconditional cash transfers do not prevent children's undernutrition in the MAM'Out cluster randomized controlled trial in rural Burkina Faso. Accepted by The Journal of Nutrition, 2017

Abstracts

- HOUNGBE F., **Tonguet-Papucci A.**, ALTARE C, AIT-AISSA M, HUNEAU JF., HUYBREGTS L., KOLSTEREN P. Effects of multiannual unconditional and seasonal cash transfers on young children's nutritional status and morbidity: the MAM'Out cluster randomized controlled trial. Research for Nutrition: Operational challenges and research uptake in the prevention and treatment of undernutrition, Paris, France, November 2016. [Oral presentation](#)
- **Tonguet-Papucci A.**, HOUNGBE H., DE VILLE D'AVRAY E., KOLSTEREN P., HUNEAU JF. Projet MAM'Out : des transferts monétaires inconditionnels participent à l'amélioration de l'apport alimentaire de jeunes enfants au Burkina Faso. Journées francophones de nutrition. Marseille, France, December 2015. [Oral presentation](#)
- **Tonguet-Papucci A.**, MOREL J., AIT AISSA M., KOLSTEREN P. Multiannual and seasonal cash transfers to prevent acute malnutrition and food insecurity – the MAM'Out project. 2nd International Conference on Global Food Security, Ithaca, USA, October 2015. [Poster presentation](#)
- **Tonguet-Papucci A.**, AIT AISSA MYRIAM. The MAM'Out project: use of new technologies for the implementation and evaluation of a multi-annual and seasonal cash transfer program. Humanitarian Technology: Science, Systems and Global Impact. Boston, USA, May 2015. [Oral presentation](#)
- **Tonguet-Papucci A.**, HOUNGBE H., LOMPO P., YAMEOGO M., AIT AISSA M., KOLSTEREN P. The MAM'Out project: impact and community's perception of the use of mobile phones in a cash transfer program, Boston, USA, May 2015. Humanitarian Technology: Science, Systems and Global Impact. Boston, USA, May 2015. [Oral presentation](#)
- **Tonguet-Papucci A.**, HOUNGBE H., LOMPO P., YAMEOGO M., AIT AISSA M., KOLSTEREN P. Acceptabilité et effets de transferts monétaires inconditionnels au sein de communautés rurales pauvres du Burkina Faso – Données qualitatives du projet MAM'Out. Singleton Chair 2015 : Ethnography of social and development policies in the context of global commodification. Louvain, Belgium, May 2015. [Oral presentation](#)

- **Papucci A.**, Hougbe H., Lompo P., Yameogo M., Ait Aissa M., Kolsteren P. Impact of Cash Transfers on Children's Undernutrition – Qualitative Data from the MAM'out Project. American Anthropological Association annual meeting : 'Producing anthropology', Washington DC, USA, December 2014. Oral presentation
- **Papucci A.**, Huybregts L., Ait Aissa M., Huneau J-F., Kolsteren P. MAM'Out project: Evaluation of multiannual and seasonal cash transfer to prevent acute malnutrition. Technical meeting on Nutrition, Oxford, UK, October 2014. Poster presentation
- **Papucci A.**, Morel J. Ait Aissa M. Atelier Régional de Leçons Apprises, Cash Learning Partnership, Dakar, Senegal, March 2013. Oral presentation

Training

- Scientific writing (Daphne Goodfellow, 2016)
- Creative group leader and trainings (Eureka!, 2015)
- Communication on the PhD thesis: oral presentations (AgroParisTech, 2015)
- Negotiations and behaviors (Coaptis, 2013)
- International Course in Evidence Based Nutrition (ITM Anvers, 2013)
- Ethics of young researchers and ethic committees (AgroParisTech, 2012)
- Meeting facilitation (Théâtre à la carte, 2012)
- Project follow-up and evaluation (Bioforce, 2010)

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Avec environ 50 millions d'enfants de moins de 5 ans souffrant de malnutrition aigüe dans le monde en 2015, dont la plupart en Asie du Sud-Est, en Afrique sub-saharienne et en Afrique de l'est, la malnutrition aigüe est un problème de santé publique. Cependant, des manques de preuves persistent en ce qui concerne les stratégies préventives non basées principalement sur des produits alimentaires (**chapitre 1**). Les transferts monétaires, dans le cadre de filets de protection sociale, ont le potentiel de prévenir la sous-nutrition. Durant la dernière décennie, ils ont été de plus en plus mis en œuvre dans des contextes d'urgence et de développement. En Amérique latine, des transferts monétaires conditionnels (c'est-à-dire conditionnés à une action préalable imposée aux bénéficiaires) mis en œuvre à grande échelle ont montré leur efficacité pour améliorer la sécurité alimentaire des ménages, la santé des enfants et leur statut nutritionnel. Cependant, beaucoup moins de preuves sont disponibles en ce qui concerne les transferts monétaires inconditionnels (TMI).

Le **chapitre 2** est une revue de la littérature sur les effets des TMI saisonniers sur la prévention de la malnutrition aigüe et ses causes sous-jacentes : alimentation, pratiques de soin et santé. Treize articles rapportant des évaluations de TMI basées sur des essais contrôlés randomisés ont été pris en compte. Des preuves concordantes d'effets positifs des TMI ont été trouvées pour la disponibilité alimentaire et l'accès à la nourriture. Cependant, plus de preuves sont nécessaires afin de pouvoir évaluer les effets sur la qualité de l'alimentation des enfants. Les résultats sur la santé sont inconsistants. Des résultats divergents ont également été rapportés pour la santé mentale et le bien-être psychologique d'adultes bénéficiant des TMI. Les données concernant le lien entre TMI et pratiques de soin et l'émancipation des femmes sont de faible qualité. Parmi les études évaluant l'effet de TMI sur l'anthropométrie des enfants, aucune n'a trouvé d'effet positif. De plus, aucune étude n'a été trouvée sur le lien entre TMI saisonniers et la prévention de la malnutrition aigüe. Ainsi, des études basées sur des évaluations rigoureuses devraient être menées afin d'évaluer les chemins par lesquels les TMI peuvent avoir un effet sur le statut nutritionnel des enfants. Ces études devraient en outre être fondées sur un cadre théorique d'action adapté au contexte local.

C'est dans ce cadre que le projet MAM'Out a été élaboré. Son objectif est d'évaluer les effets de TMI saisonniers et pluriannuels sur la prévention de la malnutrition aigüe infantile en zones rurales burkinabés (**chapitre 3**). Cette étude a pris la forme d'un essai contrôlé randomisé à deux bras, basé sur la randomisation de 32 villages de la province de la Tapoa (région Est du Burkina Faso). Un groupe a bénéficié de transferts monétaires par téléphone portable pendant 5 mois par an, de juillet à novembre, sur deux années consécutives (2013 et 2014). L'autre groupe était un groupe de comparaison ne bénéficiant pas de ces transferts réceptionnés par les femmes. Le programme ciblait des ménages économiquement vulnérables ayant au moins un enfant de moins d'un an au moment de l'inclusion, quelque soit son statut nutritionnel. Les principaux résultats étaient l'incidence cumulative de la malnutrition aigüe (ou émaciation) et le ratio coût-efficacité. Des mesures anthropométriques (taille, poids et périmètre brachial) ont été collectées trimestriellement, ainsi que des données de diversité alimentaire, sécurité alimentaire, fréquentation des centres de santé, dépenses des ménages, morbidité, etc. Des entretiens individuels, des groupes de discussions ainsi que deux rappels alimentaires de 24h ont également été menés. Cette conception de l'étude permet ainsi une évaluation solide de l'efficacité de l'intervention proposée.

Des données qualitatives ont été collectées mensuellement pendant la période de transferts monétaires sur les deux années, dans le but de mieux comprendre le type de dépenses effectuées

grâce aux TMI reçus et d'évaluer les changements positifs et négatifs induits par le programme sur la vie quotidienne des femmes, des ménages et des communautés (**chapitre 4**). Plus de 300 entretiens individuels et discussions de groupe ont été conduits avec divers participants : les mères bénéficiant des TMI, les chefs de ménage, les belles-mères, les coépouses, certains membres clés de la communauté et des participants du groupe contrôle. Les deux domaines majeurs déclarés de dépenses concernaient la nourriture et les soins de santé pour l'enfant et la famille au globale, ce qui correspond aux deux principales causes sous-jacentes de la sous-nutrition. Le programme a aussi été associé avec des changements positifs perçus au niveau du ménage, principalement en lien avec l'égalité des genres et l'amélioration du statut de la femme, et a favorisé une augmentation de la dignité des plus pauvres ainsi que leur intégration sociale au sein de la communauté à travers un partage de l'argent reçu. Parmi les effets inattendus rapportés se trouvent les futurs plans de grossesse de certaines femmes du groupe contrôle et la non-anticipation de la fin des transferts monétaires.

Comme la plupart des études évaluant l'impact des transferts monétaires sur le statut nutritionnel des enfants se basent sur des scores de diversité alimentaire, il y a très peu de données quantitatives sur les effets des programmes de transferts monétaires sur la consommation alimentaire des enfants. Le **chapitre 5** présente les résultats de deux rappels alimentaires de 24h menés en juillet et août 2014 sur un sous-échantillon d'enfants appartenant aux groupes contrôle et intervention. La consommation quotidienne en énergie, macro- et micronutriments et les pratiques d'allaitement maternel ont été collectées et analysées. Les résultats montrent que les TMI distribués pendant la période de soudure sont associés à une amélioration de l'alimentation des enfants burkinabés de 14 à 27 mois vivant en zone rurale, particulièrement grâce à une consommation accrue d'œufs ($p < 0.001$), d'aliments riches ou enrichis en fer ($p < 0.05$), de lipides ($p < 0.01$) et de vitamines B12 ($p < 0.001$) comparée au groupe contrôle, ainsi qu'une plus grande fréquence de consommation de produits laitiers ($p < 0.05$), d'aliments d'origine animale ($p < 0.05$) et d'œufs ($p < 0.05$). De plus, deux tiers des enfants bénéficiant des transferts monétaires avaient un score de diversité alimentaire minimum adéquat comparé à seulement un tiers dans le groupe contrôle ($p < 0.001$). Aucune différence n'a été trouvée entre les deux groupes en termes de consommation énergétique. Les TMI saisonniers peuvent donc être un moyen efficace pour améliorer la diversité alimentaire des enfants et la consommation d'aliments à forte valeur nutritionnelles en période de soudure. Leur utilisation peut donc être recommandée dans les actions ciblant la consommation alimentaire des enfants en période de soudure.

Les résultats concernant l'émaciation des enfants sont présentés dans le **chapitre 6**. Des mesures anthropométriques et de morbidité ont été collectées trimestriellement pendant plus de deux ans afin d'évaluer l'effet des TMI saisonniers et pluriannuels sur l'incidence de la malnutrition aigüe, de la malnutrition chronique et de la morbidité chez les enfants de moins de 36 mois. Les enfants bénéficiant des transferts monétaires avaient un risque plus faible (21%, 95%CI: 18.6, 21.3; $p < 0.001$) d'infections respiratoires auto-déclarées en comparaison des enfants du groupe contrôle. Aucune autre différence n'a été observée entre les deux groupes pour les autres morbidités ou le statut nutritionnel ($p > 0.05$). Une possible explication pourrait résider dans le fait qu'avant d'avoir un effet sur le statut nutritionnel, les transferts monétaires doivent répondre à ses causes immédiates et sous-jacentes, telles que décrites dans le **chapitre 1**.

Enfin, le **chapitre 7** synthétise les résultats qualitatifs et quantitatifs, souligne les forces et faiblesses de cette recherche et discute de ses implications de santé publique. Les TMI saisonniers peuvent être envisagés lorsque des actions visant à améliorer l'alimentation des enfants sont discutées dans le cadre de filets de protection sociale. En ce qui concerne la prévention de la malnutrition aigüe, une approche intégrée combinant transferts monétaires et une ou plusieurs autres interventions ciblant

les facteurs clés de la sous-nutrition dans la zone en question devrait être préférée. Des perspectives de futures recherches sont également proposées.

Title: Evaluation of multi-annual and seasonal cash transfers to prevent acute malnutrition: the MAM'Out project

Keywords: seasonal unconditional cash transfers, acute malnutrition, children, Burkina Faso, dietary intake, randomized controlled trial

Abstract:

Child wasting is a public health issue but evidence gaps remain concerning preventive strategies not primarily based on food products. Cash transfers, increasingly implemented in emergency and developing contexts, have the potential to prevent under-nutrition by acting on several underlying causes including food insecurity, access to basic services and goods. However, to date, no study with a strong design explored the link between seasonal unconditional cash transfers (UCTs) and the prevention of acute malnutrition. UCTs were proven to have positive effects on food availability and food access. Inconsistent evidence was reported concerning the effects of UCTs on the quality of children's diet, health care and psychosocial well-being of families benefiting from UCTs.

In this framework, the MAM'Out research project was launched to assess the effects of multiannual seasonal UCT targeted to women on the prevention of child acute malnutrition in rural areas of Burkina Faso. In this two-arm cluster randomized controlled trial, one group benefited from cash transfers via mobile phones during 5 months yearly and the other arm was a comparison group. Qualitative data were collected each month of the cash transfer period for two years among various participants. The two main declared domains of expenses were food and health care for the child and the whole family. The program was also associated with positive perceived changes at the household level, mainly related to gender equality and improvement of women's status, and favored the social integration of the poorest at the community level through cash sharing. Unexpected reported effects of this program included increased pregnancy plans of some women.

The effect of cash transfer on diet quality was assessed using two 24h-dietary recall surveys carried out in July and August 2014 on a subsample of children from both arms. Results showed that seasonal UCT are associated with improved child's diet among 14 to 29-month old children, particularly higher consumption of animal products, higher intake of iron rich or iron fortified food and higher fat and vitamins B12 intake compared to the control group. No difference was found for energy and protein intake between both groups. Moreover, two third of the children from the cash group had an adequate minimum dietary diversity compared to only one third in the control group. However, children from both groups had a suboptimal quality of diet during the lean season. Besides, anthropometric measurements and morbidity were recorded on quarterly basis for more than two years. Children in the intervention group had a lower risk of self-reported respiratory tract infection compared to children in the control group. However, neither the number of cumulative episode of wasting nor the end point anthropometric markers of nutritional status differ between children from the intervention and control group.

Seasonal UCT should be considered when looking at actions to improve child's diet in the framework of safety net programs. As far as the reduction of child wasting is concerned, an integrated approach combining cash and one or several other components identified as a key factors leading to acute malnutrition in the region should be preferred.

Titre : Evaluation de transferts monétaires saisonniers et pluriannuels pour la prévention de la malnutrition aiguë: le projet MAM'Out

Mots-clés : transferts monétaires inconditionnels et saisonniers, malnutrition aiguë, enfants, Burkina Faso, apports alimentaires, essai contrôlé randomisé

Résumé :

La malnutrition aiguë est un problème de santé publique. Cependant un manque de preuves persiste en ce qui concerne les stratégies préventives ne se fondant pas principalement sur des produits alimentaires. Les transferts monétaires sont de plus en plus mis en œuvre en contextes d'urgence et de développement et ont le potentiel de prévenir la sous-nutrition en agissant sur plusieurs de ses causes sous-jacentes, dont l'insécurité alimentaire et l'accès aux services et produits de base. Cependant, à ce jour, aucune étude de conception solide et rigoureuse n'a exploré le lien entre transferts monétaires inconditionnels (TMI) saisonniers et malnutrition aiguë. Il a par contre été prouvé que les TMI ont un effet positif sur la disponibilité alimentaire et l'accès à la nourriture. Cependant, les résultats des effets des TMI sur la qualité de l'alimentation des enfants, les soins de santé et le bien-être psychosocial des familles bénéficiant de ces transferts sont contradictoires.

Le projet de recherche MAM'Out a été mis en œuvre dans ce contexte afin d'évaluer les effets de TMI saisonniers, pluriannuels et ciblés sur les femmes, sur la prévention de la malnutrition aiguë dans des zones rurales du Burkina Faso. Dans cet essai contrôlé randomisé à deux bras, un groupe a bénéficié de transferts monétaires par téléphone portable pendant 5 mois par an, et l'autre groupe servait de comparaison. Des données qualitatives ont été récoltées mensuellement pendant la période de transferts monétaires sur les deux années auprès de participants divers. Les interviewés ont déclaré dépenser l'argent dans deux domaines principaux : la nourriture et les soins de santé pour l'enfant et la famille. Le programme a également été associé à des changements positifs au niveau du ménage, essentiellement en lien avec l'égalité des genres et l'amélioration du statut de la femme. Il a de même favorisé l'intégration sociale des plus pauvres au niveau de la communauté via un partage de l'argent reçu. Parmi les effets inattendus du programme, les plans de grossesse de certaines femmes peuvent être cités.

L'effet des transferts monétaire sur la qualité de l'alimentation a été évalué via deux rappels alimentaires de 24h conduits en juillet et août 2014 sur un sous-échantillon d'enfants appartenant aux deux groupes. Les résultats montrent que les TMI saisonniers sont associés à une amélioration de l'alimentation des enfants de 14 à 27 mois, et plus particulièrement à une consommation accrue de produits animaux, d'aliments riches ou enrichis en fer, de lipides et de vitamine B12 comparé au groupe contrôle. Aucune différence n'a été trouvée pour la consommation énergétique et en protéines entre les deux groupes. De plus, deux tiers des enfants du groupe d'intervention présentaient une diversité alimentaire minimum adéquate alors que cette proportion n'était que d'un tiers dans le groupe contrôle. Cependant la qualité de l'alimentation des enfants dans les deux groupes reste sous-optimale pendant la période de soudure. Par ailleurs, des mesures anthropométriques et de morbidité ont été effectuées tous les trimestres pendant plus de deux ans. Les enfants du groupe d'intervention avaient un risque auto-déclaré plus faible de développer des infections respiratoires comparé au groupe contrôle. Cependant ni le nombre d'épisodes cumulatifs de malnutrition aiguë ni les marqueurs anthropométriques de statut nutritionnel à la fin de l'étude ne diffèrent entre les enfants du groupe intervention et contrôle.

Les TMI saisonniers devraient être pris en compte lors de programmes de protection sociale visant à améliorer l'alimentation des enfants. En ce qui concerne la réduction de la malnutrition aiguë infantile, une approche intégrée combinant argent et un ou plusieurs autres composants identifiés comme un contributeur clé de la malnutrition aiguë localement devrait être préférée.