Nutrition and Child Survival in Ghana

Realist Evaluation of a Community-based Model used to Treat Children with Severe Acute Malnutrition in Non-emergency Context in Ghana

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DECLARATION

I, Robert Akparibo, hereby declare that no part or whole of the work referred to in this thesis has been submitted to any other University or institution of learning other than the University of Sheffield, for the purpose of award of an academic degree or any qualification of that sort.

Date: January, 2014

Robert Akparibo

DEDICATION

I dedicate this work to my loving and supportive wife; Mrs Sussana Akparibo and my little princess Miss Petra Akparibo

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ABSTRACT

Background: The effectiveness of community-based programmes to treat children suffering from Severe-Acute Malnutrition (SAM) is well documented following their implementation in emergency situations. However, little evidence exists to understand whether these programmes when implemented in non-emergency situation can also achieve successful outcomes. It is only recently (2007) that the community-based approach was approved by the WHO, and adopted by governments of developing countries to be implemented as part of routine health care services. Since then little or no organised research has explored whether the approach has achieved success or not in non-emergency context. It is for this reasons that this research was designed to evaluate the effectiveness of the implementation of the approach in a non-emergency context in Ghana. The aim was to understand the potential impact of community-based programme to treat children suffering from acute malnutrition, as well as identify factors within the Ghanaian context that could potentially influence community-based programmes effectiveness.

Method: we adopted a realist mixed method approach to evaluate the effectiveness of the community-based SAM management programme in Ghana. This approach incorporates quantitative and qualitative methods to understand what works, how and why. Quantitative methods were used to retrospectively collect and analyse data of children who attended the programme between July 2010 and January 2011 in Upper East Region. STATA version 11 was used to analyse the data to estimate the proportion of children who recovered, died and defaulted. Multiple backwards logistic regression was used to assess possible predictors of the outcomes achieved. Contextual factors (barriers and facilitators of programme impact) were assessed using qualitative investigation approach. Using this method, semi-structured interviews and focus groups were conducted with stakeholders, including services providers and beneficiaries of the programme to collect in-depth data. The data were transcribed and analysed using a framework approach.

Findings: A total of 525 children were enrolled in the programme within the study period. However, only 488 children data were analysed because incomplete data were recorded for 37 children. Of 488 children data analysed, 30% (n=146) did not complete the programme. Of the non-completers, 28% (n=138) has dropped out, and 1.6% (n=8) died. 72% (n=350) of the children recovered from SAM. This proportion include 2% (n=8) of the children who dropped out. Recovery and mortality rates

compared favourably with the Sphere acceptable indicators[1]. Default rate however was comparatively higher and nearly double the Sphere acceptable indicators. The regression analysis suggests no correlation between the variables tested and higher dropouts. However, the qualitative findings, suggest that contextual factors: distance to treatment centre, lack of support from husbands, busy schedule of women, community believes in traditional medicine as a cure for malnutrition, and health system factors: lack of incentives for health workers and volunteers, and inadequate health workers leading to insufficient monitoring of the programme and lack of counselling of caregivers, were potential reasons for the higher dropouts rates recorded.

Conclusion: The findings suggest that community-based programme can achieve success when mainstreamed within routine health services and implemented in non-emergency context. However, success in this context can be diluted by higher default, if factors causing this are not identified and addressed. Health systems strengthening could also be a sure way to ensure success, as well as improve impact of community-based programmes in Ghana.

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[1] Sphere indicators: recovery >75%, mortality <10% and default <15% (Sphere, 2011)

LIST OF ABBREVIATIONS

CSB	Corn-Soy Blend
CHPS	Community Health Planning and Services
CHVs	Community Health Volunteers
C-IMCI	Community-Integrated Management of Childhood Illnesses
CMAM	Community Management of Acute Malnutrition
CHOs	Community Health Officers
ID	Identification Number
FAO	Food and Agricultural Organisation
GHS	Ghana Health Service
GSS	Ghana Statistical Service
HIV	Human Immuno Deficiency Virus
KND	Kassena Nankana District
LBW	Low Birth Weight
MDG	Millennium Development Goals
MoH	Ministry of Health
MUAC	Mid-Upper Arm Circumference
NGO	Non-Governmental Organisation
NCHS	National Centre for Health and Statistics
NRC	Nutrition Rehabilitation Centres
OPT	Outpatient Treatment Centre
PEM	Protein Energy Malnutrition
PICO	Population, Intervention, Comparator and Outcome
PHC	Primary Health Care
RCT	Randomised Controlled Trials
RUTF	Ready-to-use Therapeutic Food
RWG	Rate of Weight Gain
SAM	SAM Malnutrition
SD	Standard Deviation
SE	Standard Error
UNICEF	United Nations Children Fund
USAID	United States Agency for International Development
UER	Upper East Region
UN	United Nations
WHO	World Health Organisation
WH	Weight for Height
WFP	World Food Programme

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PUBLICATIONS FROM THIS PHD

Akparibo R (2013) Scaling-up Nutrition in Ghana: *The Lancet Global*, October 4, 2013
http://globalhealth.thelancet.com/2013/10/14/scaling-nutrition-ghana

Akparibo R, Harris J, Blank L, Adu-Afarwuah S. Community-based Management of Severe-Acute Malnutrition in children in non-emergency context: evidence from a retrospective study in Ghana. *Annals of Nutrition and Metabolism 63:1061-1061 2013*

Akparibo R, Harris J, Blank L, Adu-Afarwuah S, Holdsworth M (2013) Effectiveness of therapeutic care programmes, designed to use ready-to-use foods to treat children suffering from SAM at community-based. *Systematic Synthesis and Narrative Review of Research Evidence: Submitted to Global Health: Science and Practice Journal*

Presentation in Conferences

Akparibo R, Harris J, Blank L, Holdsworth M (2012) Effectiveness of Community-Based Management of childhood Severe-acute Malnutrition: *Systematic Review of Research Evidence, African Nutrition epidemiology Conference, September 2012 in South Africa*

Akparibo R, Harris J, Blank L, Holdsworth M (2012) Conducting Research in a Development context**:** dealing with high level government-led projects gatekeepers - The case for Ghana: *Research in Development Network (RIDNET) Conference, September 2012 at University of Leeds (UK)*

Akparibo R, Dryden C, Blank L (2010) Effect of consumption of plumpy'nut on weight, height and muscle mass gain during recovery from SAM malnutrition among children under five years. *African Nutrition* Epidemiology *Conference, October 2010 in Kenya*

Plans to publish the following papers

Akparibo R, Harris J, Blank L, Adu-Afarwuah S, Holdsworth M (2013) Seasonality of childhood malnutrition in the Upper East Region of Ghana. Retrospective analysis of routine data collected over 3 years. Target journal - *Public Health Nutrition* Journal

Akparibo R, Harris J, Blank L, Adu-Afarwuah S, Holdsworth M (2013) Community-Based Management of Severe-Acute Malnutrition in children in non-emergency context: evidence from a retrospective analysis of programme monitoring data in Ghana. Target Journal – *American Journal of Clinical Nutrition*

Akparibo R, Harris J, Blank L, Adu-Afarwuah S, Holdsworth M (2013) Barriers and facilitators towards sustainability of community-based management of SAM programme in Ghana. Target Journal – *Nutrition Journal*

Akparibo R, Harris J, Blank L, Adu-Afarwuah S, Holdsworth M (2013) Challenges in the integration and implementation of community-based management of SAM malnutrition treatment programmes into routine health care systems. Lessons from the field: *Implementation Science Journal*

PREFACE

This thesis is based on a pilot implementation of a community-based malnutrition management programme to treat children with SAM in Ghana. It is an empirical study adopting a realist evaluation approach to understand what worked, how and why of the programme. My interest in this topic is partly influenced by my background and previous involvement in child nutrition work in Africa, and partly because of the need to understand how and why community-based nutrition intervention work or fail in different contexts.

Prior to starting my research career, I had worked with various developmental Non-governmental organisations including Family Health International (Senegal), Helen Keller International (Burkina Faso), Faith-based Developmental Organisations (Ghana), the United Nations Children Fund (UNICEF), as well as the World Health Organisation (Denmark). I have also coordinated nutrition programmes within governmental public health organisations, including the Ghana Health Service (Ghana) and the Ministry of Health (Burkina Faso). During these times I actively participated in identifying and developing strategies to address child malnutrition in sub-Saharan Africa.

Although significant progress is reported to have been made over the last few years in light of reducing the prevalence of undernutrition in children, severe-acute undernutrition has remained a challenge in the sub region. This is partly attributed to the fact that the children suffering from severe undernutrition have not been prioritised and addressed in until recently (Collins, 2001). Arguably, there is little evidence of effectiveness of the current WHO biomedical model to treat this severe malnutrition conditions. In many countries, the WHO biomedical model has failed to

achieve targets positive outcomes. According to Collins (2007), the coverage rate of interventions using the biomedical approach has remained only at 15%. In 2007, I took part in the development of a pilot community-based therapeutic programme in Ghana to treat children with severe undernutrition. Shortly after that I left for the UK to further my studies. However my interest in following this programme, to understand what has worked as well as identify factors likely to influence the effectiveness and sustainability of the programme within the local context through research, has remained high.

ORGANISATION OF THE THESIS

The thesis is organised into six broad chapters: **Chapter one** presents background literature to understand the concept of child undernutrition. Specifically, the literature will explore the evidence available to understand the global impact of undernutrition in children in general and SAM in particular, as well as how undernutrition affects children survival and development. The treatment of SAM using a community-based model, which is the subject matter of the research, is also described. Using evidence from the literature, the need for the adoption of the community-based model to treat children with SAM is justified. The study aim and objectives are also outlined in the concluding part of the chapter.

Chapter two presents evidence explored from the literature using a systematic and narrative evidence synthesis approach. The aim of the review was to understand the magnitude of the evidence that exist regarding impact of community-based severe acute malnutrition treatment programmes, and to identify gaps that can be addressed in this current study.

Chapter three describes the methodological approach adopted in this study to evaluate the community-based malnutrition treatment pilot programme in Ghana. First, the philosophical underpinning of the approach is discussed followed by a justification for using the approach.

Chapter four and five describes the two components of the evaluation study that were carried out, including the methods used to collect and analyse data, as well as the findings of these studies.

Chapter six summarises the key results of the different study components, as well as an interpretation of how the two studies findings were integrated to provide an explanation of what worked, how and why of the community-based programmes. The limitations and strengths of the study are also presented in this chapter. Some recommendation for policy and practice are presented at the concluding part of the chapter. Key relevant documents and statements are attached as appendices.

CHAPTER ONE: UNDERSTANDING CHILD MALNUTRITION

1.0 Introduction

This chapter presents the background and rationale of the study. First, a general discussion, explaining the concept of malnutrition is presented. This is followed by a review of the literature to understand the global burden of child malnutrition, determinants of malnutrition, as well as the consequences of malnutrition on children survival and development. Second, a description of the study rationale and justification is presented, followed by a statement of the research aims and objectives.

1.1 Understanding malnutrition

The World Health Organization (WHO) has defined malnutrition[2] as a 'cellular imbalance between the synthesis of nutrients and the body's demands for them to ensure growth, maintenance and specific function (WHO, 1999). In other literature sources however, malnutrition is being described as deficiency or excess consumption of one or more essential nutrients in the diet (Waterlow, 1972; Golden, 2000; Smith & Haddad, 2000; Ahmed et al., 2001; Michael et al., 2004; Black et al., 2008). In the later definition, malnutrition refers to both undernutrition and overnutrition (Darton-Hill & Chopra, 2007). In the developed world, overnutrition (often resulting in obesity) is increasingly high, although this type of malnutrition in recent years has become a growing problem in many developing countries too (Popkin et al., 2011). In developing countries, the term malnutrition is largely associated with undernutrition which affects mostly vulnerable groups (infants and

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[2] In this thesis the term 'malnutrition' is used interchangeably with 'undernutrition' since malnutrition is the term generally used to refer to 'undernutrition' in children.

young children, pregnant women, lactating mothers, adolescent girls, chronically ill people e.g. people suffering from chronic tuberculosis or Human-Immunodeficiency Virus (HIV), and people affected by emergencies such as natural disasters – conflicts, floods and earthquakes) (WHO., 2005; UNICEF., 2006; WHO., 2007; UNICEF, 2009). Among these groups, infants and young children under 5 years old are at the greatest risk of dying from malnutrition (Black et al., 2008).

1.1.1 Malnutrition in children

Childhood undernutrition is "a state in which the physical function of a child from birth to five years old is impaired due to either overnutrition or undernutrition, the latter of which is the result of poor or insufficient nourishment, poor absorption, or poor biological use of nutrients consumed" (WHO, 2006, p24). Two types of undernutrition affect infants and young children, these include Protein Energy Malnutrition (PEM) - which results from inadequate intake of protein and calories, and Micronutrients Deficiency Malnutrition (MDM) - which is caused by a deficiency of vitamins and minerals in the diet (WHO, 2005, Golden, 2000). MDM is often referred to as the 'silent killer' because the condition is often unnoticeable (Black et al., 2013). The three most common anthropometric indicators for measuring PEM are:

- *Underweight, Wasting and Stunting.* The WHO (1999) defined these indicators as follows: Underweight is an indicator of recent weight loss or the combined effect of wasting and stunting, defined as weight-for-age below the − 2 z score line, based on the WHO child growth reference standard.

- Stunting is the best indicator for long-term and chronic undernutrition in children, defined as height-for-age below the - 2 z score line based on the WHO child growth reference standard.

- Wasting (also known as acute malnutrition), indicates acute deficiency in nutrient intake or disease, and is defined as weight-for-height below the - 2 z score line. Children with values below the -3 z score line or standard deviation below the mean reference are considered severely malnourished. For instance, a weight-for-height below the - 3 z score line is referred to as severe wasting.

In emergency situations, severe wasting, also known as SAM malnutrition, is used to assess the severity of the emergency because of its strong association with mortality in children under 5.

1.1.2 Understanding Severe Acute Malnutrition

In recent years humanitarian organisations have redefined the classifications of malnutrition to ensure better coverage of children needing treatment in emergency situations. They now include other indicators such as the Mid-Upper Arm Circumference (MUAC) and presence of bilateral pitting oedema of nutritional origin as methods of classifying malnutrition in children. This facilitates the classification of children suffering from acute malnutrition into those with marasmus or kwashiorkor (Waterlow, 1972). Marasmus is more commonly associated with young infants below 2 years, whereas kwashiorkor is more often observed among older children 2 years and above (Brewster et al., 1997, Waterlow, 1972; Waterlow, 1976; Waterlow, 1984). Clinical signs for Marasmus are severe body wasting or massive loss of body fat, muscles and subcutaneous tissue. These signs are more

associated with inadequate intake of protein, calories and micronutrients (Gernaat, 1999; Golden, 2000; Michael et al., 2006). Kwashiorkor on the other hand is characterised by the presence of bilateral pitting oedema[3] of nutritional origin, and children suffering from this condition usually have 'pot belly' and show signs of skin lesions, hair changes, apathy and anorexia (Waterlow, 1984; Waterlow, 1976).

The history of Kwashiorkor can be traced back to the days of Dr Cecil Williams (1933), and has now been discussed by several authors (Golden, 2000; Michael et al., 2006). The differentiation between kwashiorkor and marasmus can be blurred however, the symptoms and progression of both conditions largely depends on the degree to which protein and calories are absent (Myatt et al., 2006). To date scientists believe that a child suffering from kwashiorkor is consuming too little protein, whereas those suffering from marasmus consume no protein at all (Brewster et al., 1997; Hendrickse, 1985). Sometimes kwashiorkor can be overlaid onto marasmus and in that instance, the condition is known as marasmic-kwashiorkor (Golden, 2000). The epidemiology of kwashiorkor and marasmus is still unclear. However, reports indicate that kwashiorkor has a much more restricted geographical distribution, and that marasmus can be found in all areas where there is severe lack of protein, as well as adequate micronutrients in the diet (Hendrickse, 1985).

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[3] Bilateral pitting oedema is a clinical manifestation of acute undernutrition caused by abnormal infiltration and excess accumulation of serous fluid in connective tissue or in a serious cavity. Bilateral pitting oedema is usually present on the lower limbs and is verified when thumb pressure is applied on both feat for 3 seconds leaves a pit or indentation in the foot, after the thumb is lifted. The fluid may eventually spread to the legs and face, and the child appears pitting and is usually irritable, weak and lethargic (c)

1.1.3 The burden malnutrition in children

The burden of malnutrition is defined as the estimation of the total number of malnourished cases in a population over a specified time period (UNICEF 2013). Black et al (2013), in their recent publication in the Lancet Series of Maternal and Child Nutrition indicated that, the burden (in terms of prevalence) of child underweight, wasting and stunting has declined since 1990. In 1990, the number of children who suffered from underweight, wasting and stunting were 159 million, 58 million and 235 million respectively (UNICEF, 2009). These numbers have dropped by end of 2012 e.g. underweight levels have dropped by 36%, wasting by 11% and stunting by 35% (Black et al., 2013). According Gretchen et al (2012) the largest reduction in stunting rate was reported in Asian countries (Gretchen et al, 2012). Africa remains the only region in the world where progress has been slow, and reports in the last 10 years indicates that the prevalence of stunting and severe wasting has been increasing in sub-Saharan African (Gretchen et al, 2012; SCN, 2012).

In spite of these reductions, malnutrition prevalence levels (all indicators combined) still remain high, and the WHO (2013) has described the situation as unacceptable. It is estimated that, globally around 20 million children under five years of age are currently suffering from the severest form of malnutrition (UNICEF, 2009). The majority of the cases are concentrated in 36 countries, and two regions: South Asia and Sub-Saharan Africa countries have more than 90% of the cases (WHO, 2013; UNICEF, 2009). In India alone, nearly 6 million children were severely wasted in 2008 (UNICEF, 2009). The current prevalence could double again by 2015 if measures are not taken to address the severe acute malnutrition in these continents. Table 1.1 provide estimates of the globally prevalence of child malnutrition.

Table 1.1: Prevalence and numbers of children younger than 5 years with stunting, wasting, severe wasting, and underweight using estimates from United Nations and National Information Management Systems, by United Nations regions for 2011 (Black et al., 2013)

	Stunting (HAZ <-2)				Wasting (WHZ <-2)				Severe wasting (WHZ <-3)				Underweight (WAZ <-2)			
	UN[155]		NIMS[158]		UN		NIMS		UN		NIM		UN		NIM	
	Prop (%)	No (millions)	Prop (%)	No (millions)	Prop (%)	No (millions)	Prop (%)	No (millions)	Prop (%)	No (millions)	Prop (%)	No (millions)	Prop (%)	No (millions)	Prop (%)	No (millions)
Africa	35.6 (33.3-38.0)	56.3 (52.5-60.0)	35.5 (34.4-36.6)	56.6 (54.3-57.8)	8.5 (7.4-9.6)	13.4 (11.6-15.2)	7.9 (7.3-8.6)	12.5 (11.5-13.6)	3.5 (2.9-4.1)	5.5 (4.5-6.4)	2.8 (2.5-3.3)	4.4 (4.0-5.2)	17.7 (15.7-19.7)	27.9 (24.7-31.1)	18.4 (17.4-19.1)	29.0 (27.5-30.1)
Asia	26.8 (23.2-30.5)	95.8 (82.8-108.8)	29.5 (26.4-31.3)	103.5 (92.5-109.8)	10.1 (7.9-12.3)	36.1 (28.2-44.0)	11.2 (9.5-12.7)	39.2 (33.4-44.6)	3.6 (2.4-4.8)	12.9 (8.4-17.3)	3.6 (2.7-4.7)	12.7 (9.4-16.4)	19.3 (14.6-24.1)	69.1 (52.1-86.1)	21.9 (18.8-24.0)	76.6 (65.9-84.1)
LAMC	13.4 (9.4-17.7)	7.1 (4.8-9.4)	14.6 (13.6-15.5)	7.8 (7.3-8.2)	1.4 (0.9-1.9)	0.7 (0.5-1.0)	1.5 (1.3-1.8)	0.8 (0.7-1.0)	0.3 (0.2-0.4)	0.2 (0.1-0.2)	0.4 (0.4-0.4)	0.2 (0.2-0.3)	3.4 (2.3-4.5)	1.8 (1.2-2.4)	3.7 (3.5-4.1)	2.0 (1.8-2.2)
Oceania	35.5 (16.0-61.4)	0.5 (0.2-0.8)	34.7 (27.8-39.5)	0.4 (0.3-0.5)	4.3 (3.0-6.2)	0.1 (0.0-0.1)	5.1 (3.3-6.8)	0.1 (0.0-0.1)	0.7 (0.5-1.1)	0.0 (0.0-0.0)	1.5 (0.9-2.4)	0.0 (0.0-0.0)	14.0 (8.0-23.2)	0.2 (0.1-0.3)	13.9 (10.7-16.8)	0.2 (0.1-0.2)
LMICs	28 (25.6-30.4)	159.7 (145.9-173.4)	29.9 (27.9-31.0)	168.3 (157.3-174.6)	8.8 (7.4-10.3)	50.3 (42.1-58.4)	9.3 (8.4-10.4)	52.6 (47.4-58.5)	3.3 (2.5-4.0)	18.5 (14.0-23.1)	3.1 (2.6-3.8)	17.3 (14.4-21.5)	17.4 (20.4)	99.0 (81.7-116.3)	19.4 (17.3-20.5)	109.1 (97.2-115.4)
HICs	7.2 (4.1-12.6)	5.1 (2.9-8.9)	..	..	1.7 (0.8-3.5)	1.2 (0.6-2.5)	..	..	0.3 (0.0-1.3)	0.2 (0.0-0.9)	..	..	2.4 (1.7-3.4)	1.7 (1.2-2.4)	..	..
Global	25.7 (23.5-27-9)	164.8 (150.8-178.8)	..	..	8.0 (6.8-9.3)	51.5 (43.3-59.6)	..	..	2.9 (2.2-3.6)	18.7 (14.2-23.2)	..	..	15.7 (13.0-18.4)	100.7 (83.3-118.0)	..	..

Data are %(95%CI). HAZ=height-for-age Z score. WHZ=weight-for-height Z score. WAZ=weight-for-age Z score. LAMC=Latin America and the Caribbean. LMICs=Low and middle income countries

1.1.4 Consequences of malnutrition in children

If not treated, malnutrition can have detrimental consequences on children's health and development. Kauffmann and colleagues in the mid-80s noted that malnutrition could limit children's ability to respond to stress, and make them more vulnerable to infectious diseases (Kauffmann et al., 1986). Golden (2000) added that severe malnutrition exposes children to high morbidity and mortality risk, and explained that children's resistance to infections is lowered when they are severely wasted, putting them at increased risk of death from common ailments like diarrhoea, respiratory tract infections and other infectious diseases. Kaufmann and colleagues further pointed out that early change in the immune system response can also occur. These include impaired lymphocyte response, impaired phagocytosis secondary to decreased complement of certain cytokines, as well as decreased secretory immunoglobulin A (IgA). These changes further predispose children to severe and chronic infections (Kaufmann et al., 1986). Pipes and Trahms (1993) take this further and state that chronic infections as a result of a weak immune system lead to a compromised nutritional status in children, resulting in anorexia, decreased nutrient absorption, increased metabolic needs and direct nutrient loss. According to the WHO (2005), when children are malnourished prior to their second birthday, they suffer irreversible physical and cognitive damage, which could have an impact on their health and development in later life. Black and others are of the view that severely malnourished children who survive the condition are more likely to be below average height when they reach adulthood, and to give birth to smaller or low birth weight children (Black et al., 2008; Bennett, 2009; Saul et al., 2008; Schubl, 2010).

Malnutrition also has some social, behavioural and psychological consequences. Studies conducted in Jamaica in the early 80s by Graham-McGregor and colleagues found that children who are affected by malnutrition exhibit marked behavioural changes in the acute stages (Graham-McGregor et al., 1983). They found that malnourished children are more apathetic and less active compared to their counterparts who are normally nourished, and are also irritable when disturbed. The findings also show that such children explore their environment less, using few types of manipulation compared to well-nourished children. According to Tomkins and Watson (1993), when such children have iron deficiencies in addition, they tend to have learning difficulties in later life.

1.1.5 Impact of malnutrition on child morbidity and mortality

Morbidity due to malnutrition depends on the nature and severity of the illness. In 2005, Collins and colleagues estimated that 16% of pneumonia, diarrhoea and malaria morbidity in children under 5 was attributed to severe underweight (Collins et al., 2006). The risk of mortality associated with underweight is directly related to the severity of the condition. Children who are moderately malnourished (below -2 z scores) are associated with mortality rates between 30 and 148 per 1000 children per year, whilst those with severe underweight (below - 3 z score line) have mortality between 73 and 187 per 1000 per year (Black et al., 2008). Children who suffer from SAM are up to 20 times more likely to die compared with well-nourished children, and the condition directly causes around 2 million deaths of children under 5 annually (WHO et al., 2007; Black et al., 2008). In addition to mortality, Black et al. (2008) estimated that malnutrition alone was responsible for nearly 22% of overall global disability adjusted life years in children under 5.

1.1.6 Determinants of malnutrition in children

The causes of malnutrition in children are multi-faceted (Smith & Haddad, 2000). A cross-country analysis of malnutrition and its determinants in children in developing countries carried out by Smith and Haddad (2000) concluded that malnutrition results from multiple factors from wide ranging situations such as political instability and slow economic growth, to specific individual factors such as infections. The spectrum is best captured in the UNICEF conceptual framework which gives an in-depth analysis of the causes of malnutrition (Fig. 1.1).

Developed in the early 1990s, the UNICEF framework has become the most recognised conceptual framework in understanding the main factors influencing undernutrition in children. It comprehensively incorporates and explains biological and social causes of malnutrition, and encompasses causes at both the micro and macro levels. The framework was consensually adopted and incorporated into the original Sphere minimum standards for humanitarian response as a conceptual basis for all nutrition related assessment and analysis (Sphere 2000). Since then it has remained the main model for the assessment and analysis of malnutrition within nutritionally vulnerable populations (Sadler, 2000; Ashworth et al., 2004). It presents a generalised understanding of the main causes and shows how malnutrition is the outcome of specific development problems related directly to dietary intake. The model groups the causes of malnutrition into immediate, underlying and basic. It also links the availability of nutrition resources to a set of basic determinants, "which are themselves a function of how society is organised in regards to economic structures, political and ideological expectation, and the institutions through which activities within society are regulated, social values are met, and potential resources are converted into actual resources" (Tomkins and Watson, 1989, p.51).

Figure 1.1: Framework of causes of malnutrition (Adapted from UNICEF, 1990)
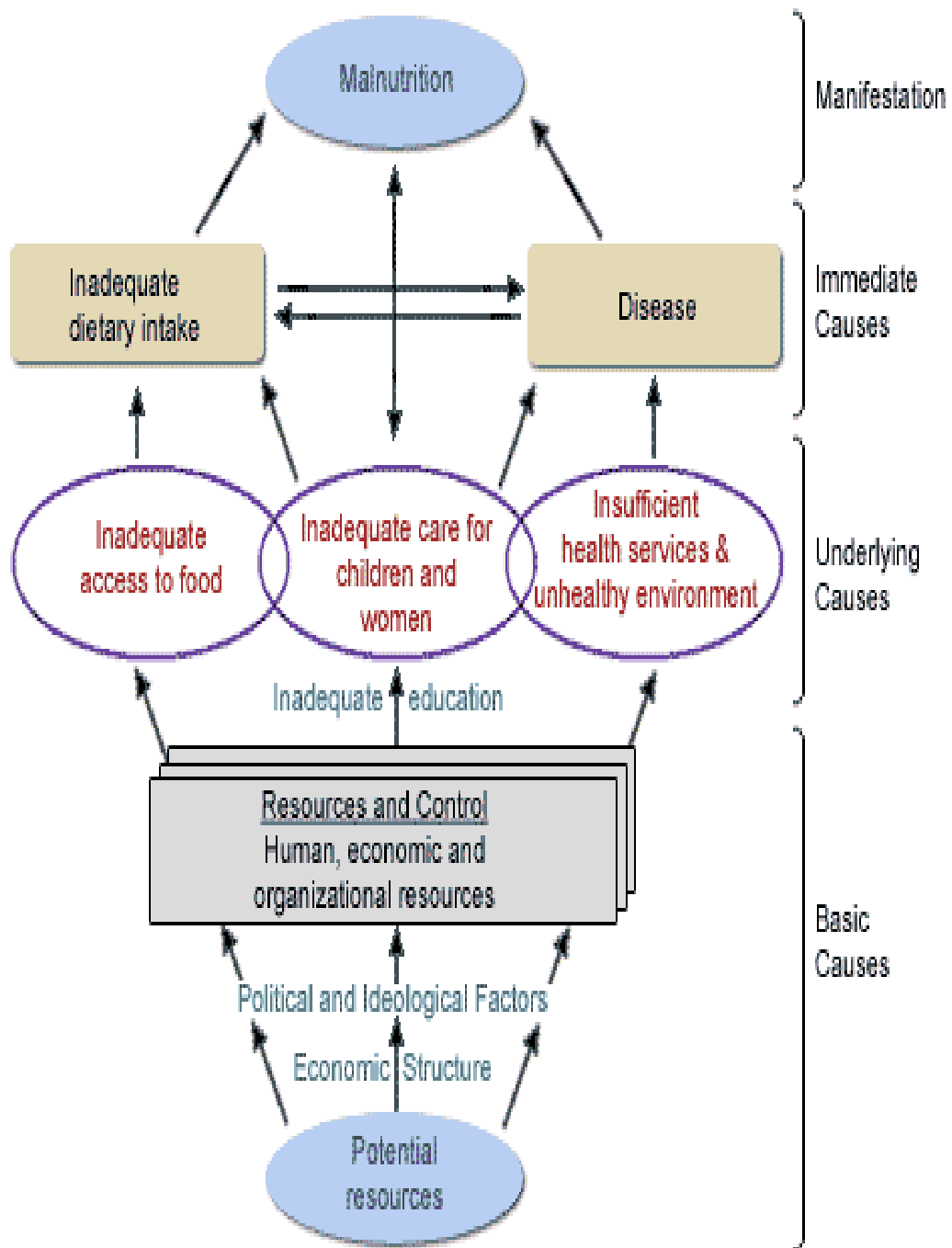
Immediate causes

The immediate determinants of malnutrition manifest themselves at the level of the individual. They include dietary consumption (macronutrients such as protein,

energy and fats, and micronutrients) and health status (disease). These factors are themselves interdependent (Kaufmann et al., 2007). A less well-nourished child is highly prone to infections, and, in turn, infection will reduce the child's appetite, inhibit the absorption of nutrients in food they consume, and compete with the body for energy, creating a malnutrition-infection cycle (Smith & Haddad, 2000, Brundtland, 2000; Macallan, 2005).

Underlying causes

The immediate causes in turn are influenced by underlying determinants that manifest themselves at the level of the household in which the child resides. These are availability of food (food security), care and health services. Food insecurity[4] leads to inadequate access to food within the home, consequently resulting in low or deficient intake of essential nutrients (WHO, 1996). This combined with an unhealthy environment and non-availability of adequate health services, including quality of care to children, consequently causes malnutrition among children who are unable to get enough food to eat to meet their nutrient requirements (WFP, 2005; WHO, 1996). The resources necessary for gaining access to food include food production, income for food purchase or in-kind transfers of food. In most sub-Saharan African countries, inadequate food production, which is usually caused by lack of access to fertile land, availability of labour, appropriate farming tools and seeds needed to cultivate food in large quantity, is the main cause of frequent food security problem in rural area (WFP, 2005).

Care giving behaviour, which is the second underlying cause of child malnutrition identified in this context, is related to poor quality food provided to children, as well

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[4] Food security is defined as, "when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life". Commonly, the concept of food security is defined as including both physical and economic access to food that meets people's dietary needs as well as their food preferences" (WHO, 1996).

as the support they need to grow and develop properly. This factor has a direct impact on child growth through its indirect effect on dietary intake (Flax 2013). Clearly, adequate care and nutrition are necessary ingredients for proper child growth and development (Eagle et al., 2000). According to Eagle et al (1997, p.2) 'care involves the provision in the household and community of time, attention and support to meet the physical, mental and social needs particularly for the growing child'. The adequacy of such care is determined by the caregiver's control of economic resources, autonomy in decision-making and physical and mental status (Madhava et al., 2002; Kruger and Vorster, 2007; Whyte and Kiriuki, 1991). The important elements of care for infants and young children are related to breastfeeding and appropriate complementary feeding, psychosocial and cognitive stimulation of the growing child, good personal hygiene and appropriate feeding during illness (Eagle et al 1997). All these have been captured in the conceptual model illustrated in Figure 1.1, which shows the factors that interrelate to influence child growth and development.

Key to all these underlying factors is the influence of poverty (Kruger & Vorster, 2007). A person is considered to be in absolute poverty when he or she is unable to satisfy adequately his or her basic needs – such as food, health, water, shelter, primary education and community participation (Delisle, 2008; Kruger & Vorster, 2007). The effects of poverty on child malnutrition are pervasive (Delisle, 2008). Poverty affects malnutrition in so many ways, it impairs intellectual development, individual working capacity and increases the cost of health care, which are also predetermining factors of poverty (Michelson et al., 2004). Poverty causes overcrowding and lack of food. Overcrowding leads to increased numbers of infants and children who are exposed to infection, this in turn leads to increased food

requirements and to the development of malnutrition (Dana et al., 1990; Jackson 2008). As stated by Delisle (2008) poverty goes beyond income inequality, encompassing health, social and gender inequality. It also means various types of deprivation and exclusion. Poor households and individuals are unable to achieve food security, have inadequate resources for care, and are unable to utilise or contribute to the creation of resources for health on a sustainable basis (Madhava et al., 2002; Kruger & Vorster, 2007).

Basic causes

The underlying determinants of malnutrition are, in turn, influenced by a set of basic determinants. These include the potential resources available to a country or community, which are usually limited by the country or the community natural environment, access to technology, and the quality of human resources available. Political, economic, cultural and social factors affect the utilisation of these potential resources and how they are translated into resources for food security, care and health environment and services (UNICEF, 1990).

Policymakers seem to have very little knowledge and understanding that improved nutrition relates to socio-economic development and overall achievement of national and social goals, as a result nutrition is not a top priority to most national development policy agendas in most nations (UNICEF, 2009). In many developing nations, nutritional problems are not often noticed until they reach a state of severity, and in some countries nutrition has no clear institutional mandate (UNICEF 2009). In most sub-Saharan African countries, nutritional problems are often addressed in part by various ministries or departments, an arrangement that tends to affect effective planning and management of nutrition programmes (UNICEF, 2007; FAO, 2012). In

least developed countries where the burden of malnutrition is of concern, governments are faced with multiple challenges such as economic crises, endemic poverty, conflict, disasters and inequity – all of them very urgent, and competing for priority attention. Malnutrition often does not feature prominently among these problems unless it becomes very severe and widespread (WHO 2005). Some leaders may not consider nutrition to be politically expedient because it requires investment over the long term and the results are not always immediately visible. Further, the interests of donor agencies, with limited budgetary allocations for aid in general are often focused elsewhere where they can get immediate results. These factors, 'political ignorance' or lack of political will and commitments, plus not paying priority attention to nutrition are major contributory factors to the widespread prevalence of malnutrition in many developing nations.

Conclusion

From the literature presented, it is obvious that the prevalence of malnutrition remains high globally, and has a resulting impact on national health systems of developing countries. If not treated the impact of SAM can be devastating, and, as can be seen from the data presented above, many countries in Sub-Saharan Africa and South Asia are unlikely to meet the Millennium Development Goal to reduce under-five mortality by three-quarters by 2015 because of the threat posed by SAM. This therefore justifies the need for governments in these countries to tackle SAM more seriously.

1.2 Treating severe acute malnutrition in children: A historical perspective

Between 1999 and 2000 the WHO developed a manual to standardise the treatment of SAM (WHO, 1999 & 2000). Prior to this, four different guidelines existed, two of

which were developed by the WHO between 1978 and 1981 whilst the other two were developed between 1978 and 1987 by non-governmental organisations (Golden 2002). The need for the standardisation of treatment of SAM was necessitated by the fact that, although these guidelines existed, the mortality rate recorded in hospitals had remained high; 20-30% for marasmus and up to 60% for kwashiorkor children (Ashworth & Schofield, 1996). The standardised guidelines thus recommended that all children diagnosed with SAM be admitted to paediatric wards in hospital or specialised Therapeutic Feeding Centres (TFC) to be treated (WHO, 1999). The guidelines contained 10 steps in two treatment phases:

- The initial stabilisation phase where children receive medical resuscitation therapy for life-threatening conditions e.g. children suffering from hypoglycaemia, hypothermia and underlying infections such as severe diarrhoea and micronutrient deficiencies
- Nutrition rehabilitation phase where children receive a therapeutic diet (called F-100/75).

Evaluation studies reported that in hospitals where the guidelines were adhered to, success rates in terms of nutritional recovery and lower mortality were achieved (Ahmed et al., 1999; Collins & Saddler 2002). In Bangladesh, 47% mortality reduction was achieved (Ahmed et al., 1999). In Brazil, up to 50% mortality reduction was reported (Ashworth et al., 2004). However, treatment in hospital has been described as expensive and 'anti-poor' (Ashworth 2004). The model has also been described as efficacious but not effective as it could only deliver results under ideal conditions (Collins, 2001). In least-resourced hospital settings, especially in countries in sub-Saharan Africa, mortality rates have only slightly declined (Ashworth et al., 2006; Puoane et al, 2001; Briend, 2001; Collins, 2010).

Observational studies conducted in South African hospitals found that where resources are limited, mortality rate has remained high. For instance, in a rural hospital in South Africa where doctors were untrained in treating SAM, the mortality rate was 38% (Ashworth et al., 2006). A similar study in rural hospital in western South Africa (Puoane et al., 2001) also reported a 32% case fatality rate among children under treatment for SAM. In Niger, the mortality rate reported had reached 40% (Tectonidis, 2006), and in Kenya out of 920 SAM children treated in hospital 176 (19%) of them died, with 33% of the deaths occurring within 48 hours (Maitland et al., 2006). In Uganda, Bachou and others reported an overall mortality rate of 24% among children treated in hospitals, with 70% of the deaths occurring within the first week on admission (Bachou et al., 2006). In Ghana only 18% reduction in mortality rate has been documented (Deen et al., (2003).

Besides the high mortality, low coverage has also been reported in hospital programmes (Collins 2001). Data published by Collins and Sadler (2002) show that between 1992 and 1998, hospital treatment coverage had only reached 15% in many sub-Saharan African countries. Reasons for poor coverage of hospital treatment has been linked to lack of access including distance to treatment sites, long duration of stay in hospital, high opportunity cost for carers, high cost of stay in hospital and increased risk of infections (Guerrero & Gallagher, 2013). Furthermore, Collin and Yates recently argued that the hospital treatment model is biomedical, and does not account for the socio-cultural aspects of the condition (Collins & Yates, 2010).

1.2.1 Recent recommendation

As a result of the limitations and weaknesses of the biomedical approach to address severe malnutrition, the WHO has recently recommended the adoption of a community-based model to treat children suffering from severe acute malnutrition. In this section, the focus is to provide a description of the community-based model and its operational components. During the discussing I will use available data published by humanitarian organisations to argue that the community-based model has proven effective in emergency context in the management of children suffering from SAM. This argument is later supported by evidence from the systematic review of researches carried out to evaluate the clinical effectiveness of community-based programmes to treat children with severe acute malnutrition (chapter two).

1.2.1.1 The community-based therapeutic model – what is it?

The community-based management of malnutrition model is a public health model which has been designed to provide effective care to the majority of severely malnourished children as outpatients, using techniques of community mobilisation to engage families of affected children in order to maximise coverage and treatment compliance (WHO, 2007; Collins et al., 2006). It employs the technique of early detection of cases, and treatment of the severely malnourished children who have been diagnosed with no medical complication using ready-to-use therapeutic foods, as well as routine medication (Collins et al., 2006). Researchers and humanitarian health workers including Collins and others, have argued that more than 90% of malnourished children admitted in hospital for treatment come with no medical complications, and therefore do need special hospital care since they can be treated at home with simple energy dense foods (Collins et al., , 2001). According these researchers, home-based care for these children can help avoid the risk of cross or

nosocomial infections, which is common in hospital wards, and this could contribute to reduce mortality resulting from severe acute malnutrition. The community-based approach can thus be seen as an alternative to the biomedical hospital care where children, regardless of whether they have medical conditions or not, are confined to paediatric wards for therapy (ibid).

The approach allows only children aged 6-59 months and diagnosed with no medical complication to be enrolled directly into community-based treatment programmes. Those diagnosed with medical complications such as bilateral pitting oedema (of grade three origin), severe anaemia palmer pallor, hyperglycaemia, hypothermia, anorexia, lower respiratory tract infection, high fever and severe dehydration are treated in an inpatient stabilisation centres according to the WHO protocol until they are well enough to be transferred to community-based programmes (WHO, 2009). The approach is based on the principle that all people suffering from malnutrition should receive appropriate care and assistance and timely, regardless of their geographical location (Collins et al., 2006). It takes into accounts the socio-economic realities of families caring for their malnourished children, as well as barriers to accessing hospital care (Briend 2001). Under this approach, therapeutic programmes are decentralised to reduce geographical barriers, and include intensive community consultation and mobilisation to maximised understanding and participation (Briend 2001, Briend et al., 2006; Collins 2006).

A summary of the key components of the community-based approach are (Collins, 2006):

1. Mobilisation of community members in order to encourage early presentation and compliance

2. Outpatient therapeutic care for children aged 6-59 months and suffering from SAM,

3. Inpatient therapeutic care for children aged 0-59 months and suffering from SAM,

4. Outpatient supplementary feeding for children age 6-59 months and suffering from moderate malnutrition to prevent them from graduating to SAM

1.2.1.2 Ready-to-use foods and community-based management of SAM

Previous treatment of children with SAM in hospital relied on F-100, a water-based therapeutic diet formulated using milk powder and sugar and enriched with micronutrients to rehabilitate malnourished children (WHO, 1999). Although this therapeutic diet has been effective in promoting rapid nutritional recovery among malnourished children, it is associated with numerous challenges. For instance, it needs to be prepared under good hygiene conditions to avoid bacteria contamination. Clean purified water is required for preparation, and after preparation the diet must be consumed within a couple of hours, and all of it. Leftover must be stored in a refrigerator, if not must be discarded (Andre 2001; Collins 2006). In practice, this means, the use of liquid F-100 is possible in confined hospital settings where children had to stay until their recovery is achieved, or where there are clean storage facilities available. These requirements restrict the use of F-100 in community-based programmes to treat children because many rural communities in the developing world are unable to follow the basic preparation and storage requirement due to lack of access to safe drinking water, electricity, as well as proper hygiene conditions (UNICEF, 2006).

The development of Ready-to-Use Therapeutic Food (RUTF) has largely addressed the problems associated with providing appropriate high energy, nutrient-dense diet that is safe to use in community-based programmes to treat children with SAM. RUTFs are lipid-based nutrient-dense solid diet, with similar nutrient profile but greater energy and nutrient density than F-100 (See nutrient composition in Table 1.2, Briend et al., 1999). It is made from a combination of peanut butter, powdered milk, powdered sugar, vegetable oil with vitamins and mineral enriched. Because RUTF is an oil-based paste diet, it has low water activity, and therefore has a shelf-life of 3-5 months when opened with no danger of bacteria growth even when accidentally contaminated (Briend 1997; Briend, 2001). There is no need for any special storage facility to preserve RUTF, and careers do not also need any special skills to administer them to their children (MSF, 2008). They are made such that children can eat by themselves without assistance, except for young infants who need to be assisted to eat. Finally, the production of RUTF is simply and the ingredients used are produce by local people using basic technology. The final product requires no cooking or heating before eating (Nutriset, 2000).

1.2.1.3 Background to RUTF discovery

RUTF was discovered by Dr Andre Briend, a Nutrition Scientist working at the French Institute of Research and Development. In collaboration with a French Nutrition Company called Nutriset and other humanitarian NGOs, Briend in 1997 discovered that the use of F-100 in the treatment of SAM in hospital could not be used in communities because of the mode of preparation and the ingredients requirements. As described before, F-100 therapeutic diet is liquid based, and mode of preparation requires very clean water, milk powder, sugar, mineral and vitamins in a hygienic condition. When prepared it needs to be stored in very low temperature in

a refrigerator. In developing countries these facilities are lacking in many rural communities. Therefore, the use of F100 in rural homes to treat SAM posed a danger to the health of children. Briend therefore conceived the idea to develop an alternative diet similar to F100 but which is solid-based and can be used in rural households to treat children without fear of pathogenic infections. He said;

> "About 10 years ago WHO made a recommendation for treatment of children with SAM using a diet that was prepared with milk powder, oil, sugar, vitamins and minerals. This diet was working well but had a problem in that it had to be prepared with clean water, which means it was possible only to use in hospitals. A few years – it was in 1997, I think – I had the idea of changing slightly the recipe. Actually, I had the idea by looking at a jar of chocolate spread when I noticed that the balance between protein, energy and lipids were more or less the same in this chocolate spreads in the diet recommended by the WHO. So, then I changed a little bit the recipe by replacing part of the dry skim milk with peanut butter and getting something that the child could eat directly without additions of water" (WHO, podcast transcript October 22, 2007).

The composition of RUTF (Table 1.2) contains the same nutrient content as F100. The advantage of this therapeutic food compared with F-100 is that it has less risk of bacterial contamination (Briend 2001). The invention of RUTF as an alternative to F100 diet has thus, made the implementation of community-based programmes to treat children with SAM very possible.

Table 1.2: Nutritional composition of ready-to-use therapeutic foods

Nutrients	For 100g	Per sachet of 92g	Nutrients	For 100g	Per sachets of 92g
Energy	545kcal	500kcal	Vitamin A	910ug	840ug
Protein	13.6g	12.5g	Vitamin D	16ug	15ug
Lipids	35.7g	32.86g	Vitamin E	20mg	18.4mg
Calcium	300mg	276mg	Vitamin B1	53mg	49mg
Phosphorus	300mg	276mg	Vitamin B2	0.6mg	0.55mg
Potassium	1,111mg	1,022mg	Vitamin B6	1.8mg	1.66mg
Magnesium	92mg	84.6mg	Vitamin B12	0.6mg	0.55mg
Zinc	14mg	12.9mg	Vitamin K	1.8ug	1.7ug
Copper	1.8mg	1.6mg	Vitamin	21ug	19.3ug
Iron	11.5mg	10.6mg	Biotin	65ug	60ug
Iodine	100ug	92ug	Folic acid	210ug	193ug
Selenium	30ug	27.6ug	Pantothenic acid	3.1mg	2.85mg
Sodium	<290mg	267mg	Niacin	5.3mg	4.88mg

Source: Briend et al, 1999

1.2.1.3 Efficacy and effectiveness trials of the therapeutic model using RUTFs

Efficacy trials are usually designed to test whether a technology, treatment, procedure, or programme does more good than harm when delivered under optimum conditions (Office of Technology Assessment, 1978; Sackett, 1980; Starfield, 1977). Because the primary aim of these trials is to measure safety and treatment reliability (Starfield, 1977), early efficacy trials of the community-based approach has focused on exploring whether the use of RUTF to treat severe acute malnutrition in children is safe and efficacious. The trials were implemented in a confined hospital environment and supervised by clinical staff (Diop et al., 2003; Manary et al., 2004; Ndekha et al. 2005). In Senegal, these trials have shown that the majority of children who received the RUTFs survived, with significant weight gain of 15.6 vs 10.1 g/kg/day (p<0.001) (Diop et al., 2003). Similar trials in Malawi have also successfully used RUTF as a take home ration given to children in the recovery phase of the treatment of SAM (Manary et al., 2004).

Although efficacy trials are necessary to roll out new interventions, they are not sufficient to understand effectiveness (Flay and Phil, 1986). Therefore, to gain a better understanding of whether a particular intervention has, or will work in real life situation effectiveness trials are needed (Flay, 1986). In real life situation the community-based intervention involves the delivery of different interactive service components, including; community mobilisation and sensitisation services to create awareness among community members, outpatient supplementary feeding service for children with moderate malnutrition and no serious medical complication; outpatient therapeutic care using RUTF and routine medication for children severely malnourished and no medical complication, and inpatient care service for children with severe malnutrition and complicated medical condition (Collins 2006). These different components of the intervention make it a complex intervention (Craig et al., 2008; Grant et al., 2013; Foster, 2002012).

Between 2000 and 2003 12 effectiveness trials, implemented exclusively at community-based, were completed by humanitarian organisations in real life emergency situations (Collins et al., 2006). The trials were implemented by VALID International and Concern Worldwide in response to emergency (food crisis) situations in Ethiopia, Sudan and Malawi (Collins 2005). Outcomes from the trials show that coverage rate exceeded 74% (ENN; 2004), which is nearly four times the coverage rate (15%) reported for exclusive hospital-based interventions implemented between 1992 and 1998 (Valid International, 2006). Table 1.3 provides a summary of the overall outcomes reported between 2000 and 2003. These results compares favourably with international standards for therapeutic programme effectiveness (Box 1).

Table 1.3: Outcomes from all CMAM programmes monitored by VALID up to 2003 in Malawi, Sudan and Ethiopia (Valid, 2006)

Country, date and agency	No. SAM treated (OPT) (*n*)	Direction admission from OPT *(%)*	Recovered (%)	Default	dead	Transferred	Non-recovered
Ethiopia, 2000, Concern WW	170	100	85.0	4.7	4.1	-	6.5
N. Sudan, 2001, SC UK	836	98	81.4	10.1	2.9	5.6	-
N. Sudan, 2002, SC UK	299	69	65.1	6.5	7.9	20.5	-
Malawi, 2002, Concern WW	1,900	19	69.4	15.0	8.9	3.0	2.8
Ethiopia, 2003, Concern WW	794	95	75.0	9.7	7.5	-	8.3
Ethiopia, 2003, Concern WW	194	24	69.6	5.2	7.3	10.5	-
Ethiopia, 2003, Concern WW	445	94	83.5	5.3	1.5	9.6	-
Ethiopia, 2003, SC US	1,232	81	83.8	4.4	1.3	10.1	0.5
Ethiopia, 2003, SC UK	232	99	85.8	6.0	4.9	3.3	-
N. Sudan, 2001, SC UK	610	92	73.4	17.3	1.4	4.2	3.7
N. Sudan, 2002, SC UK	696	71	81.8	15.4	1.4	1.4	0.0
Total	7,408	68	77	11	4.7	5.3	2.1

Sources: EEN (2004)

As shown in the above Table 1.3, the outcomes reported in the majority of the programmes have met the international standards for therapeutic programme effectiveness despite failure of some of the programme to meet the acceptable default and mortality outcomes. Nutritional recovery rates reported by 8 programmes were within the international accepted Sphere outcome indicators. As shown in box 1, the recommended minimum mortality rate upon completion of therapeutic programme is <10%. This rate was achieved in all 12 programmes. Only 3 programmes reported higher default rates above the Sphere standard (Northern Sudan programme, SC, UK

2001& 2002). Daily weight gain reported for non-HIV infected children was up to 5g/kg/day, although this rate falls below the Sphere weight gain requirement.

The general conclusions from these trials therefore have been that community-based approach can achieve acceptable outcomes in emergency context. However, more evidence is needed to understand how community based approach might work in real life non-emergency contexts. The long term impact of community-based programmes also needs to be investigated. So far only two studies have reported post-treatment relapsed of 9% and 3% of children who recovered from non-emergency community-based treatment programme (Collins et al., 2006). A robust review, using a systematic review and narrative synthesis of available evidence for us to understand the outcome documented of community-based programmes implementation since 1999 is presented in Chapter two. The gaps identified through the review, which justifies the need for further research, is also presented.

Box 1: The Sphere guidelines [5] for nutrition therapeutic programme or effectiveness (2011)

- From onset, clearly define and agree criteria for set-up and closure of therapeutic programme

- Coverage rate is >50% in rural areas, 70% in urban areas and 90% in refugee camps

- The proportion of exits from the therapeutic programme who died is <10%, recovered is >75% and defaulted is <15%.

- Minimum mean rate of weight gain is >8g/kg/day

- Length of stay (days) 30-40

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[5] The Sphere guidelines for nutrition were developed in 2000 by a Steering Community for Humanitarian Response (SCHR). The guidelines have since been updated to reflect current trends in the humanitarian sector (Sphere, 2011).

1.3 Rationale and justification of the present study

From the systematic review of the literature (chapter 2), and the data from humanitarian organisation presented in Table 1.3, have demonstrated that emergency community-based treatment programmes are effective in reducing child mortality related to malnutrition. The United Nations (UN) in 2005, based on the evidence available, endorsed the approach as an alternative strategy in the treatment of children in emergency situation, where malnutrition is the main killer of children underage five years (WHO, UNICEF, WFP, UN/SCN, 2007). However, community-based programme approach to treat malnutrition is a relatively new concept in non-humanitarian context in the management of SAM. As such, little evidence does exist to understand their effectiveness and overall impact of implementation in this context. Although some pilot programmes are being implemented in many countries with high burden of malnutrition in non-humanitarian contexts (EEN, 2011), there have not been any organised studies to evaluate what works, how and why these programmes might work or fail.

In a non-emergency context, the implementation of community-based programmes needs to be integrated within the national health system (UNICEF, 2012; WHO, 2009). According UNICEF (2012) implementation through national health systems could produce better outcomes and is likely to be more sustainable if governments are committed. However, in development countries many national health systems are already weak, and ion some countries health systems are nearly 'non-existence' (WHO, 2008). This could have overacting influence on the outcomes that may be documented from community-based programmes implemented in an integrated health system. In an international conference held in Addis-Ababa Ethiopia in 2011, all 11 countries (South Asia and sub-Saharan Africa) that started pilot community-

based programmes in non-humanitarian context shared their experiences and lessons learnt. According to the conference report published by the Emergency Nutrition Network (EEN, 2011) positive outcomes were being reported by these countries. Notwithstanding, no research findings has been published from these programmes to inform large scale-up at country level implementation. As of 2013, only few reports were published following operational evaluation of pilot community-based programmes implemented in Malawi (Guerrero and Rogers 2013), Ethiopia (Gebremedhin et al., 2013), Nepal, Kenya and Pakistan (UNICEF 2012), demonstrating success of delivery within routine health care context. However, these reports were silent on how success were achieved, and only evaluated nutritional status, mortality and default among the children who participated in these programme according to the community-based protocol. This therefore justifies the need for studies to go beyond what has worked to find answers that could help explain factors influencing success in non-humanitarian context.

The government of Ghana, with support from development partners working in the public health sector adopted the approach in 2010. The same year pilot programmes were started in selected regions with high prevalence of child malnutrition (Upper East, Upper West and Northern regions) according to data drawn from the Ghana demographic and Health survey (2008). The current research was therefore based on the community-based programme implementation in non-humanitarian context in Ghana in order to evaluate what has worked, how and how. The research will provide insight into issues that need to be addressed to improve community-based malnutrition treatment programme delivery and ensure sustainability within the local context.

The study contributes to knowledge by addressing the current research gaps regarding CMAM delivery in a non-emergency context. The findings on how the programme outcomes occurred, using the Ghana pilot programme, will be particularly useful to the Ghana Health Service to develop evidence-based educational messages aimed at the prevention of malnutrition in children in Ghana and in planning long-term scale up of the approach.

1.4 Background to adopting a community-based programme in Ghana

Ghana is a small country situated in West Africa along the coast of the Gulf of Guinea with a population size of approximately 24 million in 2010. The country shares borders with Côte d'Ivoire to the West, Burkina Faso to the North and Togo to the East. It has a coastline of more than 565 km and a total land area of 238 538 km^2 (FAO, 2009). The country is divided into 10 administrative regions and 138 districts (Government of Ghana, 2011). Although Ghana is currently classified by the World Bank as a middle income country (GSS, 2010), the current health indictors do not reflect this middle income status. For instance, poor access to adequate health services, safe drinking water, good sanitation and hygiene facilities, as well as a high incidence of malaria and malnutrition remain the underlying causes of mortality in children (FAO, 2009). In addition, inadequate maternal health services such as antenatal care coverage and unsupervised deliveries entail a high level of maternal and neonatal mortality in Ghana (FAO, 2009).

The 2008 Demographic and Health Survey reported that 40% of children in Ghana suffer from underweight, 9% are acutely wasted, and nearly 3% are at risk of dying from SAM (Ghana Statistical Service et al., 2008). In deprived regions of Ghana, the prevalence of SAM is rising, ranging from 2.2% in the Western region to 3.9% in the

Upper West region. The situation is worse in the rural areas (6%), compared with about 2% in urban areas (Ghana Statistical Service et al., 2008). Figure 1.2 summarises the prevalence of SAM in Ghana.

Figure 1.2: Map of Ghana showing the distribution of SAM prevalence across the country

Source: (Ghana Statistical Service (GSS) et al., 2008)

Recognising the huge burden of child malnutrition on socio-economic development and in weakening the national health system, the government in collaboration with development partners have, in the past 2 decades initiated programmes in an attempt to address child malnutrition. A significant step was the paradigm shift in the national health policy in 2006, recognizing nutrition as a foundation to health improvement (MoH, 2006). The policy hypothesized that improvement of health and

nutritional status of the Ghanaian population would lead to improved productivity, economic development and wealth creation. It further recognizes that failure to prioritize and address childhood malnutrition is likely to perpetuate poverty and ill health among future generations. Hence "malnutrition should remain a priority of the GHS" (MoH, 2006, p26).

Since then, emphasis has been placed on improving the nutritional wellbeing of Ghanaian children, to address the malnutrition burden in children < 5 years. Past initiatives include the 'imagine Ghana free of malnutrition' project - a multi-sectoral strategy focusing on addressing malnutrition as a development problem in the broad context of the Ghana Poverty Reduction Strategy (GHS, 2009), the community component of the Integrated Management of Childhood Illness (c-IMCI) strategy, as well as the introduction of the High Impact Rapid Delivery (HIRD) strategies in 2006 (GHS, 2007).

Although these actions contributed to lowering underweight rates from 18% in 2003 to 14% in 2008, and stunting rates from 35% in 2003 to 28% in 2008 (GSS et al., 2008), these efforts are not being reflected in reduction of SAM. Severe wasting among children has not diminished since 1998 (GHS et al., 2008; GHS et al., 1998). This is because these past initiatives were not suitable for addressing the problem. For instance, until now there was no indicator in malnutrition monitoring forms for tracking invisible forms of SAM wasting. Secondly, all children < 5 years who suffered from the severest form of malnutrition were confined in hospital and treated based on WHO standardised guidelines. Although there are limited data within Ghana to understand the impact of the implementation of the WHO protocol to address SAM, the stagnating rate of acute wasting over the past 15 years

demonstrates that the approach has not been effective in dealing with the problem on a wider scale. This explains the current high prevalence of infant and under-five mortality rates in the country, which is now threatening Ghana's efforts to achieve the Millennium Development Goals for child health (Goal 4), with targets to reduce child mortality by two-thirds between 1990 and 2015 (UNDP, 2008). On the basis of this problem, it became necessary to adopt alternative approach to identify and treat children with SAM in Ghana more seriously. Consequently in 2007, the Ghana Health Service (GHS) in partnership with Civil Society Organisations (CSOs), such as USAID, CRS, UNICEF, and WHO introduced the CMAM approach in Ghana to address SAM in children.

1.4.1 Enabling environment for programme development and implementation

The development of the community-based programme (also called "The CMAM" programme in Ghana) began with a study conducted in 2009 to explore the feasibility of introducing the approach within the national health care system (FANTA, USAID, UNICEF, WHO and the GHS, 2009). The study explored among others issues, the capacity of the Ghana Health Service (GHS) to integrate the approach into its existing primary health services. Following recommendations from the study, three districts (Bawku west, Kasena-Nankana, and Bolgatanaga) in the Upper East region were prioritised to start pilot implementation of the CMAM programme in 2010. The selection of the Upper East region to start the programme was based on a number of factors. The region has one of the highest child malnutrition rates (GDHS, 2008). The national Community-Based Health Planning and Services (CHPS) programme is also widely rolled-out in the region, thereby making the integration of the CMAM programme into existing community health services easier.

Briefly, the CHPS concept is a national health policy initiative which was introduced by the government of Ghana in 1999 to relocate primary health care services from the sub-district health centres to a more convenient community location (Nyonator et al., 2005). The policy goal is to transform the dynamics of rural health service delivery from community health care providers who passively wait for patients, into outreach workers who actively search and provide care for patients within communities and homes environment (Philips et al., 2013). Under the CHPS strategy, a category of health workers' called – the Community Health Officers (CHOs) are deployed to work in collaboration with community members to deliver primary preventive, curative and promotional health services (Philips et al., 2013). That is, trusted community volunteers are nominated by their community leaders to support service delivery (GHS, 2002). The volunteers re then trained with basic skills such as how to mobilise and engage local community members to participate in community health promotion, education and curative programmes. They are also trained to be able to recognise basic signs and symptom of diseases, including malnutrition in children for referral to the CHOs to take appropriate. All other existing forms of social (men and women) organisation and networks are mobilised under this initiative to support CHO work at the community level. This arrangement allows clinical staff (nurses and midwives) to stay at the district and sub-districts hospitals and polyclinics to attend to patient in need of critical clinical care. This re-arranged stricture of the primary health care system created an enabling environment for CMAM to be integrated and piloted in the Upper East Region.

1.4.2 Description and contextual analysis of the pilot site

The Upper East Region is located in the North-Eastern corridors of Ghana, and shares borders with Burkina Faso to the North, Togo to the East and the Upper West

and Northern regions to the West and South respectively. Administratively the region is divided into 8 districts: Bolgatanga, Bawku West, Kassena-Nankana and Builsa, Talesi-Nabdam and Bongo and Bawku Municipal, Kassesna-Nanka West and Garu-Tempane (GSS, 2011). Three of these districts were selected as pilot sites to start the programme (Bolgatanga, Bawku West and Kassena-Nankana). According to the GHS-Multi-Indicator Cluster Survey (MICS, 2010), child health and nutrition indicators in these districts are poor. Malnutrition, malaria and diarrheal diseases remain the only reason for paediatric hospitals overcrowding in the area (GHS, 2011). Culturally, the people in these districts share common beliefs and practices, some of which pose as a challenge to successful health care delivery (LINKAGES, 2003). Farming remains the main occupation for the majority of the youth, as illiteracy rate remains high (GHS et al., 2008). Health care delivery in the entire regions is structured based on the national health care system: public, private, private non-for profit and traditional systems. Public health delivery is operated by the regional branch of the GHS.

1.4.3 The programme theory of change and evaluation of the programme

All intervention programmes have explicit and implicit theories of change (Weiss, 1995). These theories refer to the casual processes through which change comes about as a result of a programme's strategies and actions (Weiss, 1972; Funnel and Rogers, 2011). Understanding these theories of change – that is, how the programme is expected to work – can influence the overall design of the evaluation to ensure that it assess whether the theories have worked, why and how (Bickman, 1987). Brickman adds that the approach reconciles process and outcomes measurements, and ensures that both programme or service providers and evaluators draw on the established theory and their own observation about how change will happen.

The CMAM programme theories of change (figure 1.3) provide an explanation of the actions that were expected to trigger change. The theories were identified with inputs from the programme implementers. Prior to the evaluation, the researcher noted that the theories underpinning the implementation of the programme were not explicitly stated. According to Belle et al (2010) making these clear prior to any evaluation allows the evaluators to understand what is being implemented and why. To make the CMAM programme theories explicit, the researcher held a series of meetings with all the relevant stakeholders of the programme. The key stakeholders include; Ghana Health Service, United Nations Children Fund (UNICEF), United States Agency for International Development and World food programme (WFP) During the meetings the initial set of assumptions that were made during the programme design, regarding what might influenced change were discussed and agreed. These were then used to construct the programme theoretical model (figure 1.3) to explain how the programme is expected to work. This framework was then used to guide the evaluation of the programme to measure what work, why, how and under what circumstance. This is important to describe how the planned intervention has been implemented, and to check whether the success or failure of the intervention is due to the implementation failure or programme design failure (Belle et al., 2010).

Table 1.4 The initial programme theory of actions of the CMAM programme

Initial action model: *What did the programme providers plan to and expected to attain?*	Initial change model: *How was the programme supposed to work based on the programme designer's assumptions?*	Summary of intermediary process
1. Training health workers and community members can contribute to enhanced their knowledge about malnutrition and the CMAM protocol 2. Sensitisation of community members about malnutrition and the programme can contribute to increased awareness about malnutrition causes, treatment and prevention, as well as the CMAM programme to treat the condition 3. Conducting screening at the community level can contribute to early identification of cases for prompt treatment 4. Distribution of RUTFs to carers to treat children at home will increased acceptance and intake **5.** Frequent monitoring of children receiving treatment at home, as well as providing counselling to caregivers contribute to address barriers to utilisation 6. Collaboration with local community members to deliver service will increase their interest in the programme.	• Increased knowledge will increase confidence, commitment and improve quality of the service • Increased awareness will lead to participation and utilisation of services • Early identification and prompt treatment will increase compliance to treatment and results in rapid nutrition recovery. • Increased intake will improve nutritional status and subsequently reduce risks of death. • Reduced barriers to utilisation will results in less than 15% dropouts' rates • Increase interest will led to participation	• To train health workers and volunteers • To sensitise community members • To carry out screening at community level • To distribute RUTF and medication • To conduct follow up visits to monitor treatment and counsel caregivers. • To mobilise community to take part

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1.5 Research aim

To evaluate CMAM programme outcomes to measure potential impact in non-emergency situations, and to explore programme –related and contextual factors influencing outcome in this context

1.5.1 Research specific objectives

1. To undertake a retrospective analysis of treatment outcome data collected on children who completed the programme between July 2010 and January 2011, in order to measure impact on recovery, mortality and default

2. To evaluate predictors of recovery, mortality and default using socio-demographic, clinical and nutritional status variables identified in the quantitative data.

3. To evaluate relapse and mortality, one year after children had completed the programme and reintroduced to family routine diets.

4. To explore, from the perspective of service users and providers, the factors that could potentially influenced the programme delivery in Ghana to achieve outcomes.

CHAPTER TWO: EMPIRICAL LITERATURE REVIEW OF EVIDENCE USING A SYSTEMATIC REVIEW APPROACH

2.0 Introduction

The background literature presented in chapter one revealed that the community-based approach to treat and care for children suffering from SAM has been implemented since 2000. The reports reviewed showed that the first community-based treatment programmes were piloted in Ethiopia, Malawi and Sudan to respond to the hunger crisis between 2000 and 2005. These programmes used RUFT alongside appropriate medication to treat severe malnutrition and co-morbidity respectively. A search in electronic databases to identify peer-reviewed literature sources has revealed that nearly 10 years of research work on community-based management of SAM exists. Therefore it was possible to carry out a review to explore whether these programmes have achieved international acceptable standards for nutritional recovery, mortality, dropouts and rate of weight gain, and to determine what influenced the achievement of the outcomes.

2.1 Review aim

The objective of the review was thus, to explore the literature on the management of SAM in children aged 6-59 months using a community-based model, to understand whether the model can achieve successful outcomes based on international recommendations, as well as to identify gaps in the literature for further research.

2.2 Review methodology

The review adopted a systematic review approach to the literature to identify both published and grey literature. This review approach is useful when researchers want to locate, appraise and synthesise evidence from research literature to inform rational policy and programme decision-making (Petticrew, 2001; Bambra, 2009). The approach is particularly useful in establishing whether research findings are consistent and can be generalised across populations, settings and treatment variations (Mulrow, 1994). The review process involves various steps, including using a search strategy to identify relevant literature, defining appropriate search terms and inclusion and exclusion criteria, and extracting key data from the included studies (Yuan et al., 2009; Hemingway and Brereton 2009, Bambra, 2009). It also involves appraising the quality of the data extracted using an appropriate checklist (Hemingway and Brereton 2009).

According to Higgins and Green (2008) systematic review is most appropriate where the central review question is specific with clearly defined outcome measures, which makes the method appropriate for this review. This review addressed the central question "Do community-based programmes using RUTF to treat children <5 years with SAM achieve outcomes that meet the international recommendation for therapeutic programme effectiveness*?* What factors are likely to influence the effectiveness of these programmes to achieve outcomes? Therefore, the decision to use a systematic review approach was influenced by the review question.

2.2.1 Method

2.2.1.1 Search Strategy

A search strategy was developed in consultation with the School of Health and Related Research (ScHARR) information resource group (September 2011). The strategy involves a series of complementary search methods, including searches in key bibliographic databases, hand searches (citation follow-up and ancestry chain referencing) as well as contacts with organisations and individual researchers for unpublished and ongoing research. An initial scoping exercise was performed in selected bibliographic databases to identify keywords that were appropriate to use to carry out the literature search.

2.2.1.2 Scoping exercise

Initially, MeSH (Medical Subject Headings) terms were used to search for published literature in electronic databases. However an initial scan through the bibliographic databases revealed that some of the MeSH terms were not able to locate many of the relevant studies. Therefore a list of search terms was generated by performing the scoping exercise on the databases to identify the most popular keywords indexed in studies related to the effectiveness of community-based management of SAM using RUTFs. The scoping exercise was performed using the subject heading "effectiveness of community-based treatment of SAM malnutrition with ready-to-use foods or RUTF". The keywords generated and used to perform the searches to identify the relevant studies for inclusion in the review were as follows: 'malnutrition*', 'severe-acute', 'child'*, "community-based", "outpatient", "care", "home-based", 'therapeutic foods', "fortified-spread", 'ready-to-use food*',

"influence", "effectiveness", "outcome", "factors" 'RUTF', 'recovery', 'mortality', "default", "coverage", "qualitative", "quantitative" and "mixed methods".

2.2.1.3 Search for relevant literature

Using the above keywords in combination with the MeSH terms, a comprehensive search was conducted of bibliographic databases, selected journals and grey literature sources. The searches were limited to studies published from 1999 till January 2013. The period 1999 was chosen as a starting point because the community-based model using RUTFs to treat children was not developed until early that year (Briend et al., 1999). Therefore research data on the subject are only available online from that period onwards.

Published literature was searched in MEDLINE, CINAHL and EMBASE. These databases house the majority (~90%) of all health and related research literature (Zhang et al., 2006). Citation follow-up or the ancestry referencing technique was used to search for studies that could not be captured through searching in the bibliographic databases.

Grey literature (including reports and conference proceedings) was searched using Google Scholar search engine, as well as in key relevant websites such as the WHO and UNICEF official websites, and the CMAM forum website. Individuals were also contacted for possible unpublished grey literature and research papers under preparation. Duplicates were excluded using Endnote.

2.2.1.4 Study selection: Inclusion and exclusion criteria

 The inclusion criteria outlined below, which were set out based on the Population, Intervention, Comparator and Outcome (PICO) protocol was used to guide the

selection of the studies for inclusion. Only studies that were published in English were selected.

i. *Population*

The target population that was expected to be identified by the studies or programme developed to treat SAM was: children under the age of five years and suffering from SAM. Studies needed to define SAM as fulfilling <u>one or more</u> of the following criteria: severe body wasting less than 70% of the median average (NCHS, 1977), weight-for-height $< - 3$ z score line below the WHO child reference standard or 3 standard deviations below the mean reference, or having MUAC < 11cm. If studies reported that moderately malnourished children (Weight-for-height $< - 2$ z scores line of -2 below the WHO child reference standard) were targeted alongside severely malnourished children as a comparator, they were included in the review. However if the studies reported that only moderately malnourished children were the target of the CMAM programme to prevent deterioration to severe malnutrition, such studies were excluded from the review.

ii. *Intervention/treatment*

The intervention being evaluated in this review is community-based programmes using RUTF to manage children suffering from SAM. Therefore, if studies reported that the primary treatment provided was "Ready-to-Use Therapeutic Foods or RUTF, then the studies were included; otherwise they were excluded.

iii. *Comparator*

Comparators were dietary alternatives other than RUTF used to treat SAM.

iv.   *Outcomes*

The primary outcomes that must be measured in community based therapeutic programmes aiming to correct SAM are: nutritional recovery, mortality, default, rate of daily weight gain and coverage (Sphere, 2004). These outcomes were listed as the primary review outcomes. Therefore the studies were included if they measured one or more of the outcomes. If the studies measured any other outcomes other than these, they were excluded from the review.

v.   *Study Design*

The review included data from observational programmes or research studies that were based on the implementation of community-based SAM treatment. Research trial programmes using experimental designs to test the efficacy of RUTF in the treatment of SAM were also included. In addition, past systematic reviews were also included, as well as studies that used qualitative research methods if such studies were found. Conference abstracts were excluded due to difficulty in obtaining full papers within the time frame of the review. However, proceedings from meetings and conferences were included and used to discuss the results of the review.

vi.   *Study context*

Studies were expected to report that the therapeutic programmes evaluated were implemented at community level in either emergency or non-emergency contexts. Studies or reports were excluded if the authors reported that only hospital or centre-based programmes were evaluated. If programmes were implemented at community level but had a hospital component as comparator then such studies were also included.

2.2.1.5 The selection process

The selection was carried out sequentially, first by screening of all the titles and abstracts of each study retrieved against the research question, as well as the inclusion and exclusion criteria. The questionnaire below was developed and used to guide the selection of the most relevant studies.

Table 2. 1: Questions to guide the selection of papers for inclusion in the review

Question number	Question	Action
1	Did the study/programme target children aged <5 years?	No –exclude Yes – next question
2	Has the population treated met the criteria definition for SAM malnutrition?	No – exclude Yes – next question
3	Did the study/programme use RUTF as main treatment?	No – exclude Yes – next question
4	Was the study/programme implemented at community level or did it have a community-based treatment component?	No-exclude Yes – next question
5	Were the outcomes assessed by the study any of the following: recovery, mortality, default, weight gain and coverage?	No – exclude Yes – next question
6	Does the study use any of the eligible research designs?	No – exclude Yes – include

2.2.1.6 Data extraction

Only the papers meeting the inclusion criteria were printed and read in order to extract data. A data extraction form was developed and used to extract relevant data on all the included peer reviewed studies. The form had the following themes: study details (author, year of publication, country and year of study, study design and details of design), intervention details (description of intervention, including alternative intervention or comparator) and participants (study population including age and sample size), outcomes details, results and some key study limitations.

2.2.1.7 Data analysis

Narrative synthesis was used to analyse and describe the data extracted. The narrative approach employs a textual technique to summarise and explain the evidence synthesised from the multiple studies included in the review. Because of the heterogeneous nature of multiple study designs, as well as the different outcomes measured, meta-analysis was beyond the scope of the review. Where applicable, summary statistics for common measures were synthesized and presented as means, confident intervals and p-values. The results of the synthesis were grouped according to the research designs and implementation context. The summary is presented in Tables 2.1 - 2.3, whilst the details of the results are in appendix 1.

2.2.1.8 Quality assessment of studies

Quality assessment involves critically appraising the methodological quality of included studies against a standard checklist. Because of the variations in designs used by authors of the studies reviewed, the checklist developed by the University of British Columbia Centre for Health Services and Policy Research was used to evaluate the quality of the studies included in the review (UBC/CHSPR, 2011). This checklist was designed for use in the appraisal of intervention studies that used either controlled trials or observational designs. Key reference questions constituting the checklist are as follows:

Table 2.2: Quality evaluation question guide (checklist, *UBC/CHSPR 2011*)

No	Reference Questions	Yes	NO
1	Is sufficient evidence presented to justify the study?		
2	Is there a clear statement of purpose of the study?		
3	Is there a clear statement of hypothesis?		
4	Is it clearly outlined whether the study is of efficacy or effectiveness?		
5	Is the population from which the sample is drawn clearly described?		
6	Are inclusion and exclusion criteria specified and replicable?		
7	Do the inclusion and exclusion criteria match the goals of the study?		
8	Do the authors account for every patient who is eligible for the study but does not enter it?		
9	Is the baseline comparability of the statement and controls groups documented		
10	Is the study method controlled trials, prospective, retrospective, before and after, cross-sectional or a case series?		
11	If it is a controlled trial was the allocation of subjects truly randomised?		

2.3 RESULTS

2.3.1 Search Results

In total, 443 published research and grey reports were retrieved from all three bibliographic databases searched and grey literature sources. These reports included 430 peer reviewed research articles, and 13 grey reports (including 2 commentary reports to the editor, 2 conference/meeting proceedings, 5 technical reports and 3 field reports and 1 consensus statement). None of the retrieved studies examined factors influencing community based programme outcomes. The 430 peer reviewed research articles were screened to identify only those that met the review inclusion criteria to be included in the final review. Prior to the screening, 157 duplicates were removed using EndNote (version-3). Screening using the review title excluded 194 articles. The remaining 79 papers were screened based on the study review inclusion and exclusion criteria. After this stage, only 31 papers potentially qualified to be included in the review. Full versions of the 31 papers were thus printed for reading to determine their relevance, as well as assessment of their quality and data extraction. Thirteen papers were further excluded because either the full paper was not available online or the paper did not directly address the review outcomes.

However, 2 more studies were added after scanning through the reference list of the included studies and undertaking citation follow-up. Attempts to identify unpublished articles or articles under preparation through contacting individual and organisations yielded few results. Overall, 20 primary peer reviewed journal articles were included in the final review of evidence to understand the impact of community based programme using RUTF to treat children suffering from SAM. The PRISMA diagram in figure 2.1 shows the twenty papers that were included in the review.

Figure 2.1: PRISMA Diagram showing studies included in the systematic review
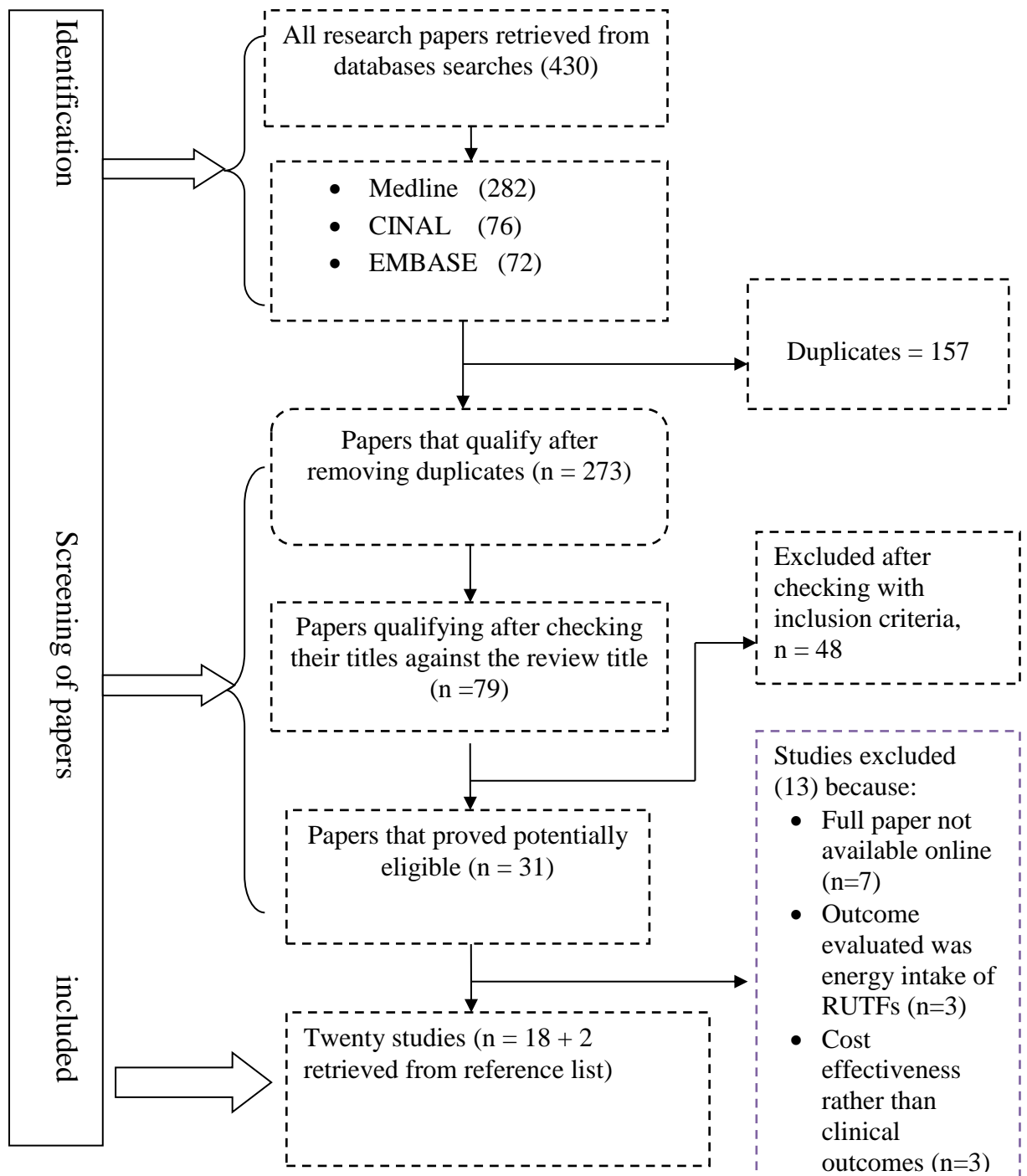
2.3.2 Study setting

The majority of the interventions (11) were implemented in Malawi, 3 in Niger, 2 in Ethiopia, and 1 each in Senegal, India and Pakistan (Figure 2.2). The results of the interventions were published between 1999 and 2010.

Figure 2.2: Pie chart showing countries where the selected studies included in the systematic review were carried out
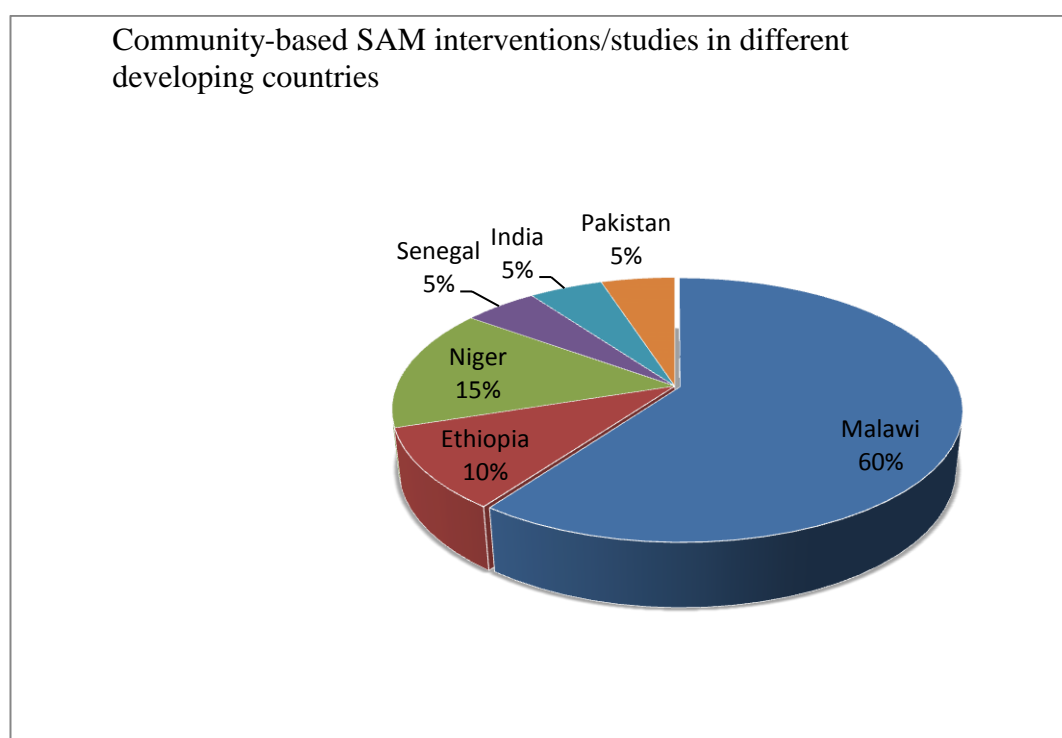
2.3.3 Participants and sample size

All the studies reported that the target participants were children aged 6 to 59 months old, diagnosed with SAM. The definition of SAM varied across studies, and ranged from the WHO definition of weight-for-height < -3 z score and MUAC <11cm with or without oedema of nutritional origin (WHO, 1999) to the NHCS definition of WFH < 70% body weight of the median reference (NHCS, 1977). The sample size recruited in all interventions ranged from 31 to 5799 children.

2.3.4 Description of design, enrolment and treatment

All nine emergency programmes were based on blanket distribution of therapeutic foods to all children identified with SAM. The children were identified through mass screening from local community settings by health workers and community-based volunteers. For ethical reasons these programmes were implemented without any control groups. Therefore, outcomes were measured using before and after data. All the eligible children received the same therapeutic diet (RUTF imported from Nutriset) distributed at outpatient centres and administered at home by the children's caregivers. The children who were diagnosed with uncomplicated co-morbidity, in addition to SAM, also received appropriate medication at home. The children were then followed from baseline until they recovered and were discharged, or died or defaulted from the programme.

The research programmes (efficacy clinical trials) on the other hand (n=11) used either randomised controlled designs (RCTs) (Oakley et al., 2010; Nackers et al., 2010; Matilsky et al., 2009; Diop et al., 2003; Kerac et al., 2009) or quasi-experimental designs (Patel et 2005; Cilberto et al., 2005; Gaboulaud et al., 2005; Manary et al., 2004; Ndekha et al., 2004; Sandige et al., 2004). These trials were either implemented exclusively at community level (Nackers et al., 2010; Oakley et al., 2010; Matilsky et al 2009; Patel et a., 2005; Manary et al., 2004; Ndekha et al., 2004; Sandige et al., 2004) or through a combination of community and hospital based programmes (Gaboulaud et al., 2005; Diop et al., 2003; Cilberto et al., 2004).

In the RCT trials, eligible children were randomly assigned to received RUTF (main) or unfortified corn-soy meal (CSB) or fortified supplementary diet made using locally available ingredients and F100 if the programme had a hospital therapeutic

component. Quasi-experimental trials on the other hand systematically allocated children to receive one of the above therapeutic diets. All the children received prior medical treatment in hospital to address co-morbidities before any dietary therapy at community or hospital level. All the children were followed from baseline until discharge at 8 weeks or early recovery, death or default.

2.3.5 Programme outcomes

The primary outcomes of the review were: nutritional recovery, mortality and default. The secondary outcomes were rate of weight gain. These outcomes were compared to the Sphere minimum standards.

2.3.5.1 Outcomes of emergency implementation of community-based programmes using RUTFs

The results presented in Table 2.1 demonstrate that the majority of the community-based programmes implemented in emergency situations achieved outcomes above the Sphere stipulated minimum standard: recovery rate >75, mortality <10% and default rate <15%. Out of nine studies that explored the impact of the observational free distribution of RUTF to treat children with SAM, only two programmes failed to achieve standard recovery rates above the Sphere minimum target (Akram 2010; Patel 2010). Recovery rates reported in the remaining seven programmes were all > 75% (Cilberto et al., 2006; Defourny et al., 2009; Amthor et al., 2009; Chaiken et al., 2006; Collins and Sadler 2002; and Sadler et al., 2008). On the other hand, mortality rates reported by all nine studies were lower than the Sphere minimum standards with two studies reporting no deaths (Patel et al., 2010, Akram 2010). Default rates reported were significantly lower than the Sphere rate, whilst rate of weight gain reported in six out of the nine studies, was also below the Sphere indicator (Table 2.1).

Table 2.3: Observational peer-reviewed studies, based on CMAM in emergency situations

First author; Year of publication	Country and year of study	Study design	Results
Patel, 2010	India, 2006 & 2008	Observational	Recovery 45%; No death rate recorded RWG: 3.2 ($\pm$ 1.5) g/kg/day
Cilberto, 2006	Malawi, 2003 & 2004	Observational	Recovery (83%); Deaths (5%); Dropouts (4%). RWG (2.8 $\pm$ 3.2g/kg/day);
Defourny 2009	Niger, 2007	Observational	Recovery (92.3%); Deaths (1.8%); Default (4.7%); RWG (5.1 $\pm$ 4.6)/g/kg/day.
Linneman, 2007	Malawi, 2005 & 2006.	Observational	Recovery (89%); Deaths (1%); Default (7%) RWG (3.5$\pm$4.1) g/kg/day;
Amthor, 2009	Malawi, July 2006	Observational	Recovery (93.7%); Deaths (0.9%); Default (3.6%); RWG (2.7$\pm$3.7g/kg/d)
Chaiken 2006	Ethiopia 2002 & 2003	Observational	Recovery (87%); Deaths (<1%); Default (2.3%) No RWG recorded
Collins 2002	Ethiopia, 2000 & 2001	Observational	Recovery (85%); Mortality (4%); Defaults (5%); RWG (3.2g/kg/d)
Akram, 2010	Pakistan (year not stated)	Observational	Recovery rate (45.8%) No death rate recoded No default and RWG
Saddler, 2008	Malawi, 2003 & 2004	Observational	Recovery (58.1%); Mortality (25.7%) Default rate (16.2%)

*The observational programmes included all children with SAM (without controlled group)

2.3.5.2 Outcomes of efficacy trials of RUTF in non-emergency context

The results presented in Tables 2.2 and 2.3 demonstrate that, of the eleven clinical trials implemented to test the efficacy of RUTF treatment of SAM at community level, seven programmes achieved acceptable recovery rates (Oakley et al., 2010; Nackers et al., 2010; Matilsky et al., 2009; Gaboulaud et al., 2005; Manary et al., 2004; Ndekha et a', 2004; Sandige et al., 2004). One study did not report data on recovery (Patel et al., 2005), whilst the remaining three studies reported recovery rates below the Sphere minimum standard (Patel et a., 2005; Cilberto et al., 2005; Kerac et al., 2009). Mortality rates reported in three programmes were higher than the Sphere indicators (Gaboulaud et al., 2005, Sandige et al., 2004, Kerac et al., 2009). Only two studies reported mortality rates that were lower than the Sphere indicators (Cilberto et al., 2005; Matilsky et al., 2009). The remaining six studies did not report on mortality (Oakley et al., 2009; Nackers et al., 2010; Diop et al., 2003; Patel et al., 2005; Manary et al., 2004; Ndekha et a., 2004).

Eight of the studies did not report data on the proportion of children who dropped out of the treatment programmes (Patel et a., 2005; Cilberto et al., 2005; Manary et al., 2004; Ndekha et a., 2004; Oakley et al., 2010; Nackers et al., 2010; Matilsky et al., 2009; Diop et al., 2003). Of the three that presented data on dropout rates, two programmes demonstrated positive impact in lowering dropouts (that is dropout rates were below the Sphere target). The remaining one study reported significantly higher dropout rates than the Sphere cut-off (26.5%) (Gaboulaud et al, 2005). The majority of the studies reported rates of weight gain that ranged from 2 to 5 g/kg/day below the stipulated Sphere rate. On the other hand, acceptable rates of weight gain were achieved in two programmes (Diop et al, 2003; Gaboulaud et al., 2005).

The trials at community level, without hospital treatment components, were more likely to achieve higher recovery and lower default rates. On the other hand, acceptable rates of weight gain were reported in the trials with hospital treatment components (Diop et al, 2003; Gaboulaud et al., 2005). Conversely, these programmes were also more likely to report higher dropouts than the programmes that had no hospital treatment component. Although the two studies (Diop et al, 2003; Gaboulaud et al., 2005) that compared outcomes of community-based and hospital-based programmes, reported higher rate of weight gain, default rates reported were also high above the Sphere standard in hospital treatment component. Lower dropouts and rate of weight gain were reported in the community-based treatment components (Tables 2.2 and 2.3).

Table 2.4: Efficacy trials of RUTF in the treatment of SAM in non-emergency situations

Author; Yr of publication	Country& year of study	Study design	Results
Oakley 2010	Malawi, 2008 and 2009	RCT	Recovery (85% in 25% milk RUTF vs. 81% in 10% milk RUTF groups) No deaths rate recorded No default recoded RWG [2.4±2.8 (in 25% milk RUTF) vs. 1.94±2.7 (in 10% milk RUTF] g/kg/day
Nackers 2010	Niger; 2007 and 2008	RCT	Recovery (79.1% in RUTF group) vs. 64.4% (in CSB group). No data on mortality and default rates reported. RWG: 1.08g/kg/day
Matilsky, 2009	Malawi, 2007 and 2008	RCT	Recovery (79% in RUTF vs. 80% supplement Soy fortified vs. 72% CSB)]; Mortality: 0.6% (RUTF) vs. 0.5% (soy-fortified) vs. 1.1 % (CSB). No default data RWG (2.6 (RUTF) vs. 2.4 (supplement soy fortified) vs. 2.0 (CSB)] g/kg/day.
Diop 2003	Senegal, 200	RC	Recovery, mortality and default rates were not measured RWG [(RUTF and F100 groups) were 15.6 and 10.1] g / kg/day
Kerac , 2009	Malawi, 2006 and 2007	RCT	Recovery (53.9% in RUTF + symbiotic group vs. 51.3% in RUTF with no symbiotic added. Death rates (27.1% in RUTF vs. 30% for no symbiotic added). Defaults rate (6.8% in RUTF + symbiotic vs. 9% in control (no symbiotic added). RWG: 4.18 (±4) in RUTF symbiotic vs. 4.14 (±4.1)g/kg/day.

RCT =Randomised controlled Trials,

Table 2.5: Efficacy trials of RUTF in the treatment of SAM in non-emergency situations

First Author/ yr	Country & year of study	Study design	Results
Patel, 2005	Malawi, 2002-May 2003	nRCT	Recovery (58% in RUTF vs. 22% CSB). Mortality and default not measured RWG (3.1 g/kg/day in RUTF vs. 1.4 g/kg/day in CSB)
Cilberto, 2005	Malawi, 2002 and June 2003	nRCT	Recovery (49% in F100 (centre-based) vs. 72% in F100+RUTF (used in centre + CB) Deaths (5.4% vs. 3.0%) = (centre-based vs. centre + CB) RWG [2.0±6 Vs 3.5±3.7] g/kg/day [F100 (centre-based) vs. F100 +RUTF (centre +CB);
Gaboulaud, 2005	Niger, 2002 and 2003	nRCT	Recovery [55% in F100 (centre-based) vs. 84% F100+RUTF (centre + CB), and 92% in RUTF (CB only); Deaths 6.5% [17.5% (centre-based only), 10% (centre + CB) vs. 1.7% (CB only). Default (26.5 % F100 (centre-based only) vs., 15.7 % F100+RUTF (centre + CB) Vs 5.6 RUTF (CB only). RWG (20.2 F100 (centre-based only) Vs 10.1 F100+RUTF (Centre + CB) vs. 9.8 RUTF (home only)] g/kg/day.
Manary 2004	Malawi, 2001	nRCT	Recovery (95% in RUTF vs. 78% in supplement and CSB groups). No mortality and default rates reported RWG (5.2g/kg/d RUTF group vs. 3.1g//kg/day in the other two groups
Ndekha 2004	Malawi, 2001	nRCT	Recovery (75% in RUTFs vs. 46% supplement vs. 53% CSB). Overall recovery was 56% No mortality and default rates reported RWG [3.1±2.9 in RUTF vs. 2.4±2.6 in supplement and CSB] g/kg/day.
Sandige 2004	Malawi, 2002	nRCT	Recovery (75% in imported RUTF vs. 80% local RUTF)]. Overall recovery was 78%; Mortality (11%); RWG [5.2±4.6 in local vs. 4.8±4.0 imported] g/kg/d; Dropped-out (5 %)

nRCT = Quasi-experimental non randomised trial

2.3.5.3 RUTF outcomes compared with outcomes for other therapeutic diets

As reported earlier, RUTF was used in community-based programmes to treat children suffering from SAM. The eleven clinical trials in non-emergency situations (Tables 2.2 and 2.3) compared the efficacy of RUTF with other therapeutic diets (RUTF supplements and CSB). The two trials that were designed with both community and hospital based treatment components compared outcomes of RUTF therapy at community level with F-100 therapy in hospital.

2.3.5.3.1 RUTF compared with CSB

Five out of the eleven clinical trials (Nackers et al., 2010; Matilsky et al., 2009, Patel et al., 2005; Manary et al., 2004; Ndekha et al., 2004) have compared RUTF with CSB treatment on nutritional recovery, mortality and rate of weight gain. Dropout rates were rarely reported in these studies. Results from four out of the five studies demonstrated that children who received RUTF achieved nutritional recovery rates that matched the Sphere acceptable standard (Manary et al., 2004; Ndekha et al., 2004; Nackers et al., 2010; Matilsky et al., 2009). For those who received CSB therapy, lower recovery rates compared with the Sphere recovery indicators was observed. The recovery rates reported by Manary et al (2004) were similar and met the sphere stanadrds in both treatment groups, whilst (Patel et al., 2005) reported significantly lower nutrition recovery rates for children who followed RUTF (58%) compared with children who received CSB (22%). These rates were lower compared to what the Sphere stanadrds stipulates. Rates of weight gain measured in both treatments groups were similar, and fall below the Sphere standard. According to Manary et al (2004), although the average rates of weight gain reported was lower compared with the Sphere recommended minimum, in both RUTF and CSB

treatment groups, children who received RUTF were more likely to achieve greater weight gain. Mortality rates reported for both RUTF and CSB treatments (in all 5 programmes) were similar, and lower compared with the Sphere expected rate.

2.3.5.3.2 RUTF compared with locally made therapeutic diets

Locally made therapeutic diets included fortified soy flour meal made from local ingredients (local RUTF). Of the eleven trial programmes, only two studies compared the impact of the imported RUTF with the use of fortified supplementary diets made locally (Sandige et al., 2004; Matilsky et al., 2009). The studies compared outcomes in nutritional recovery, mortality, rate of weight gain and default. The reports show that recovery rates did not differ between children who received the imported RUTF and those who were treated with the locally made therapeutic diet. Both studies reported higher recovery rates above the Sphere standards. This demonstrates that the imported RUTF is not superior to the one made locally for the treatment of children with SAM. Mortality rates reported in both groups were also similar, although the overall mortality rate reported by Sandige (2004) was slightly higher than the Sphere recommended minimum (11%). Rates of weight gain were similar between the two therapeutic dietary groups, although the overall weight gain was lower than the Sphere indicators in both programmes. Dropout rates in children who received RUTF and other treatments were also similar.

2.3.5.3.3 RUTF compared with F-100

Three of the eleven studies reviewed were based on trials comparing outcomes of RUTF with F-100 therapeutic diets (Diop et al., 2003; Gaboulaud et al., 2005, Cilberto et al., 2005). The results from these studies demonstrated that children who received F-100 alone in hospital were less likely to achieve recovery rates that met

the Sphere indicators for nutritional recovery (Gaboulaud et al., 2005, Cilberto et al., 2005). Recovery rates reported in these two trials were < 60%, far below the 75% Sphere recommended standard. On the other hand, in the community-based treatment component, the recovery rate achieved was above the 75% Sphere recommended rate. However, where children received F-100 followed by RUTF, nutritional recovery was higher and met the Sphere indicators (Gaboulaud et al., 2005)

Mortality rates reported in the above two trials were significantly higher than the Sphere indicators among the hospital group. Default rates were also likely to be higher among the children treated with F-100 and RUTF compared with RUTF alone. The rate of weight gain was highest and met the Sphere standards indicators among children who received F-100 compared with those who received only RUTF (Gaboulaud et al., 2005, Diop et al., 2003).

2.3 Factors that influenced outcomes

The factors that influenced outcomes of the community-based treatment programmes could not be explored in this review because the studies reviewed lacked detailed explanation of how outcomes were achieved because they were not designed to investigate such factors. The systematic search for literature found no study that identified contextual factors that might have influenced the effectiveness of the programmes to achieve results. High recovery rates were attributed to direct intake of RUTF provided to children. Conversely, poor recovery and weight gain were associated with inadequate dietary intake, possibly due to factors such as sharing of the therapeutic diets or non-adherence to the treatment at home. This was clearly highlighted in the discussion sections of Collins and Sadler (2002) and Matilsky et al (2009), emphasising that sharing of RUTFs with other siblings at home might have affected intake of adequate amounts of the therapeutic diet required to increase

weight and promote recovery. These studies also highlighted deteriorating nutritional status prior to enrolment in the programmes, as well as medical conditions, as possible reasons for poor weight gain and recovery. For instance, children admitted with oedema were less likely to achieve optimum recovery compared with those who were Marasmic (Collins and Sadler, 2002).

The majority of the studies also found a strong association between baseline weight and recovery and weight gain. Co-morbidity such as HIV, malaria and diarrhoea infections diagnosed at baseline were also associated with poor nutritional recovery and weight gain. For instance, in three studies that included children who were seropositive for HIV in the intervention, recovery rates were low with high mortality compared to the Sphere standards (Kerac et al., 2009; Sadler et al., 2008; Ndekha et al., 2004). A few studies reported dropout rates that met the Sphere standard of the programmes for implementation in emergency situation, but were high for clinical trials in non-emergency contexts (e.g. Gaboulaud et al.., 2005). Contextual factors that influenced dropout were not considered in the trials. However, data from conference and meeting proceedings suggest that dropout was likely to be influenced by poor monitoring of children receiving treatment at home (ENN, 2011), and attitudes of community members towards the treatment, as well as long walking distances to the treatment sites (UNICEF, 2012).

2.5 Discussions of key findings

2.5.1 Overview of the review findings

This review explored evidence available from the research literature to understand the impact of programmes using RUTF to treat children suffering from SAM at

community level. The findings demonstrate that community-based treatment of SAM, using RUTF results in better nutritional outcomes with reduced mortality compared with what is internationally acceptable. Overall recovery rates achieved by the majority of the community-based programmes implemented in emergency situations met the Sphere stipulated minimum standards of recovery >75%. Mortality and dropout rates reported by majority of the treatment programmes were also below 5%. However, rate of weight gain reported felt below the Sphere stipulated standard (rate of weight gain >8g/kg/day), except in two studies (Diop et al., 2003, Gaboulaud et al., 2005).

The review also suggests that RUTF can be used in non-emergency situation to treat children with SAM at community level. The majority of clinical trial programmes demonstrated positive impact (rates met Sphere minimum standards for effectiveness) of using RUTF to treat children with SAM in non-emergency contexts (Oakley et al., 2010; Nackers et al., 2010; Matilsky et al., 2009; Diop et al., 2003; Manary et al., 2004; Ndekha et al., 2004; Sandige et al., 2008, Gaboulaud et al., 2005). Although, the review found that only five of the eleven clinical trials programmes reported data on impact of the therapeutic intervention on mortality (Cilberto et al., 2005; Gaboulaud et al., 2005; Sandige et al.,2004; Kerac et al., 2009; Matilsky et al., 2009), compared with the Sphere stipulated standard the mortality outcomes demonstrates positive impact. For instance, the review indicates that overall, the proportion of children who died during the treatment was less than 10% in RUTF treatment groups. In addition, rates of weight gain achieved in both emergency and non-emergency programmes were lower compared with the Sphere rates. The evidence generated from this review therefore, tends to support previous recommendation that a community-based model should be used in emergency

situations to treat children suffering from SAM (WHO et al., 2007). Factors that influenced these programmes to achieve outcomes or fail, such as reasons for default and low weight gain, need to be investigated. Recent reviews indicate that the effectiveness of complex interventions such as the CMAM programme is more likely to be influenced by the implementation process, and/or the context rather than the intervention or treatment itself (Pfadenhauer and Rehfuess, 2013).

2.5.2 Quality of the evidence and limitations

Based on the checklist used to evaluate the quality of the studies reviewed, the studies were graded as excellent, good, fair and poor. Because of the varied designs of the studies, the quality of the studies also varied. It must be noted that this quality grading only satisfies the checklist criteria used but does not suggest that the observational studies were superior to controlled trials and vice versa. The quality grading of the studies is shown in Table 2.6. In summary, all the studies showed sufficient evidence to justify the need. In addition, each study also had a clear statement of purpose. The studies were also differentiated by their designs and did present a clear description of the sample population studied, as well as clearly defined inclusion and exclusion criteria. Five studies (Matilsky et al., 2009; Oakley et al., 2010; Nackers et al., 2010; Kerac et al., 2009; Diop et al., 2003) satisfied all the quality criteria questions and were graded as excellent. Fourteen studies met 80% of the quality criteria and were graded as, good (see table 2.6). Only one paper met about 50% of the criteria and was graded as fair (Akram, 2010).

Table 2.6: Quality ranking of studies included in the review.

No	Studies (first author)	Ranking
1	Patel, 2010	Good
2	Cilberto, 2006	Good
3	Defourny2009	Good
4	Matilsky, 2009	Excellent
5	Linneman, 2007	Good
6	Chaiken 2006	Good
7	Collins 2002	Good
8	Akram, 2010	Fair
9	Saddler,2008	Good
10	Oakley 2010	Excellent
11	Nackers 2010	Excellent
12	Amthor, 2009	Good
13	Kerac , 2009	Excellent
14	Patel et 2005	Good
15	Cilberto 2005	Good
16	Gaboulaud, 2005	Good
17	Manary 2004	Good
18	Diop 2003	Excellent
19	Ndekha 2004	Good
20	Sandige 2004	Good

The main quality issue was related to non-randomisation. A significant proportion of the interventions were not randomised (Cilberto et al., 2006; Defourny et al., 2009; Linneman et al., 2007; Amthor et al., 2009; Chaiken et al., 2006; Collin and Sadler 2002, Akram et al., 2010 and Patel et al., 2010). Furthermore, in some studies the sample sizes used in treatment and control groups were too small to detect statistical significance (Diop et al., 2003, Ndekha et al., 2004; Akram 2010). These differences limited the generalisation of the study findings to the general population of children. Furthermore, the study published by Akram (2010) showed little statistical rigour e.g. data analysis. Finally, it was impossible to make direct comparisons between outcomes measured in hospital treatment groups versus community-based treatment groups, as children did not receive the same level of treatment and regime, and their nutritional status at baseline also varied.

2.6 Conclusions and further research

Evidence generated from the review of the studies based on the implementation of programmes using RUTF to treat children with SAM clearly showed that RUTF can promote rapid nutritional recovery and reduce mortality caused by SAM among severely malnourished children <5 years. In emergency situations, the evidence showed that community-based programmes using RUTF to treat children have achieved nutritional recovery above 75% and mortality below 5%. In non-emergency contexts, efficacy studies reviewed also showed evidence of the positive effects of RUTF on the nutritional status of children. Therefore, the review thus provides an understanding of why a joint statement was made by the WHO (2007) declaring the community-based model as an effective strategy for treating children with SAM.

However gaps exist in this body of evidence where further research is needed in order to provide strong evidence to understand the overall impact of the community-based model. The studies reviewed demonstrated evidence only in terms of the clinical impact of RUTF and the community-based model. Further studies are needed to understand how these clinical outcomes were achieved, i.e. going beyond the intervention provided (RUTF) to exploring the overall programme implementation to identify what contextual factors influenced success or failure.

Furthermore, the current evidence on the impact of community-based programmes in non-emergency situations is only based on a few efficacy trials of RUTF. It is not yet understood whether implementation of community-based programmes in a real health care system contexts will yield similar outcomes to those found in emergency situations. Therefore, studies are needed to evaluate outcomes of the implementation of community-based programmes in non-emergency developmental contexts. It is

only when robust evidence is available that policy and programme decisions can be effectively made on scaling-up community-based programmes in non-emergency settings to address SAM in children.

In summary, the evidence explored in the systematic review of the literature demonstrates that so far no study has explored how outcomes of community-based treatment programmes are achieved in both developmental and emergency contexts. The previous evaluation studies have adopted mainly quantitative approaches, and focused on exploring the clinical effectiveness of RUTF and the community-based model. As discussed before, this method of evaluation only tends to test individual variables and ignores the views held by beneficiaries among other stakeholders about the programme. These gaps exposed in the literature reviewed thus justify the use of mixed methods to generate more robust evidence to understand community-based impact more broadly.

CHAPTER THREE: THE EVALUATION APPROACH

3.0 Introduction

The chapter is focused on providing an overview of the approach considered appropriate to conduct the evaluation of the CMAM programme in Ghana to understand what work, how and why. First, the underlying epistemology of the chosen methodology is discussed, followed by a description and justification of the approach.

3. 1 Overview of the evaluation approach

The study evaluated the implementation of CMAM programme in Ghana to understand what work, how and why. The aim was to measure the potential impact of the programme in treating children with SAM in non-emergency situations, as well as explore factors within this context that could potentially influence the effectiveness of the programme to achieve the intended outcomes. As described in sections 1.3, this programme is a complex intervention because of the different interactive components that needed to be implemented in order to achieve results (ibid).

To evaluate the effectiveness of such a complex intervention, More et al., (2010) suggest the use of an evaluation approach with reasonable explanation on how the programme was delivered and what factors within the local context that could influence outcomes. According to More and colleagues (2010), such evaluation approach is needed to demonstrate that the outcomes achieved were due to the activities carried out. In the seminal work of Pawson and Tilley (1997), the most

suitable approach for evaluating such complex intervention is "realist approach". The theory of change model presented in figure 1.3 provides a description of how the programme was expected to work in order to achieve results. In the next section, the underlying epistemology of realist evaluation approach is discussed.

3.2 Realist epistemology

Realistic evaluation starts with a theory that no social intervention delivers consistent outcomes across an entire population, instead variations in context, the programme delivery mechanisms and individual motivations largely contributes to influence programme impact (Mackenzie et al., 2009; Pawson and Tilley, 1997). The approach is theory-driven, and thus changes the basic evaluation question of what works or does it work, to a more broader question that seeks to explore issues in evaluation beyond what works to why and how programmes work, for whom and in what circumstance? In order words, realist evaluators seeks to find answer to evaluation questions "what is it about this programme that makes it work (WHO, 2011; Pawson 2006; Mackenzie et al., 2009; Westhorp et al., 2011). The approach attempts to explore an intervention in relation to the overall design, implementation, coordination and outcomes (Olsen et al., 2012). The central focus is the mechanisms of change, which Pawson and Tilley (1997) describe as "the choices and capacities of those involved in the programme that leads to regular patterns of social behaviour", and of the key elements in the context that help trigger these mechanisms. That is, the underlying mechanism by which the programme is expected to work and the contextual constrains which may hinder the delivery of the programme and outcomes is the prime interest of realist analysis (Kane et al., 2010; Pawson, 2006; Jagosh et al., 2011). The approach allows evaluators to examine and provide an explanation for the

interaction between the context and the mechanisms that are set in motion by this interaction to produce the outcomes of interest (O'Campo and Dunn, 2012).

3.3 The appropriateness of mixed methods in realist evaluation

Epistemologically, realist evaluation sits between the constructionist thinking that 'we see what we want to see' (Pawson, 2006), and the positivist view that 'facts speak for themselves' (Bowling and Ebrahim, 2009). This means that, realist evaluators must adopt an approach that reflects on both the constructionist and the positivist views about how research data should be collected and analyse to produce evidence. Creswell and others describes such a method as mixed methods approach - where qualitative and quantitative data collection are combined or used in a single research to address specific research questions (Creswell, 2009; Creswell and Plano-Clark, 2010). The use of mixed methods in realist evaluation approach provides a frame work for interrogating programme implementation process to understand what types of context factors and Mechanism interacts to produces outcome (Pawson, 2006; Mackenzie et al., 2009). Bamberger et al (2012) further justifies why mixed methods is appropriate in realist evaluation, arguing that both qualitative and quantitative methods can complements each other to provide a holistic understanding of what works and why. They add that the use of mixed methods in complex programme evaluation helps to strengthen the reliability of data, validity of the finding and recommendation, as well as to broaden and deepen our understanding of the process through which programme outcomes are achieved, and how these are affected by the context within which the programme is implemented. According to Bryman (2008), both quantitative and qualitative methods have their strengths and weaknesses, and mixing them in one study allows for the strength of one method to compensate for the weakness of the other. Early writers of research methods books,

including e.g. Tashakkori and Teddlie (1998), Denzin and Lincoln (2000), argues that mixed methods research can contribute to address specific research questions, which is useful in gaining a holistic picture of what and how interventions work or fail when implemented in a particular context.

Although the use of mixed methods is not new in social science research, it is only recently recognised in health service evaluation research (O'Cathain et al., 2009). The introduction of the Journal of Mixed Methods to help disseminate mixed methods research findings has also engineered growing interest among health care researchers to use the approach to evaluate health care interventions. Furthermore, the increasing evidence demonstrating the strength and usefulness of mixed methods approaches, as well as highlighting the limitations of quantitative and qualitative approaches in complex evaluation has helped mixed methods researchers to gained dominance in health care evaluation of programme and policy (Bamberger, et al., 2012).

3.3.3 Why a single qualitative or quantitative approach not considered?

Prior to the emergent of mixed methods approach, researchers have either adopted quantitative or qualitative research methods to evaluate the effectiveness of intervention programmes (Pops and May, 2006). However, due to the longstanding paradigm war between traditional qualitative and qualitative researchers regarding which methods is best, has further exposed the weaknesses of these single approaches in evaluation of complex interventions such as the CMAM programme. Quantitative researchers often hold a *positivist* worldview about research evidence (Creswell, 2009), whilst qualitative researchers are *interpretivist*. Philosophically, the *positivist* believes that an objective truth exists out there that can only be explored

scientifically using quantitative research methods, which involves empirical investigation of social phenomenon through statistics (Creswell and Clark, 2011; Tashakkori and Teddlie, 1998). This group of researchers are of the opinion that qualitative research methods ignores representative sampling and only base their findings on a single/few case scenario (Fielding et al., 2009).

On the other hand the *interpretivist* uses qualitative research methods, which involves investigating issues or phenomenon from the view point of the participants through in-depth interviews and direct field observations to investigate the truth about the social world (Ebrahim and Bowling, 2009). This group of researchers believe that such methods of data gathering are desirable in social research to understand the cultural values and social behaviours of research participants (Bryman 1988). They have argued that the over reliance of statistics as a basis for scientific evidence, tends to ignore the social and cultural construct of variables which research seeks to create (Bryman 1988). These two research groups have over the years engaged in an endless 'paradigm war' (Bryman 1998) regarding which method is most appropriate in research that seeks to generate evidence to understand the social world.

3.3.3 The realist evaluation (mixed methods) design

The evaluation was originally designed as a quantitative analysis of routinely collected baseline and outcome data to measure the effectiveness of the community-based programme to treat malnourished children. The aim was to measure outcomes in terms of nutritional recovery, mortality and dropouts rates, and to explore reasons for success and failure of the programme to meet internationally acceptable standards for these outcomes. After the initial descriptive and logistic analysis however, the

variations in outcomes compared with the international acceptable standards could not be explained using the outcomes from the logistic analysis. Hence, the design was modified to incorporate qualitative in-depth analysis of variables such as the programme theory of change, and the context factors that were likely to influence the programme delivery and outcomes.

The mixed methods design took a sequential investigation approach, which allowed the researcher to first undertake the quantitative data collection and analysis, followed by the qualitative data collection and analysis. This design is different from a concurrent mixed method design where the researcher collects both qualitative and quantitative data at the same time and analyses them in a complementary manner (Creswell, 2009; Bryman, 2001; Green, 2007). Data collection and analysis in the second qualitative phase was guided by the programme theories of change (figure 1.3). The gaps that were identified from the quantitative results were incorporated in the qualitative phase and addressed. Figure 3.2 shows [process-results] model of what was measured in the qualitative and quantitative phases of the study. Figure 3.1 on the other hand provides a diagrammatic representation of the mixed methods designed and stages of implementation.

Figure 3.1 The PhD development stages/mixed methods design

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┌─────────────────────────┐                          ┌─────────────────────────┐
│ Quantitative analysis of │                          │ Exploring reasons for    │
│ CMAM effectiveness       │                          │ variations               │
└─────────────────────────┘                          └─────────────────────────┘
            ┊                                                       ┊
            ▼                                                       ▼
┌─────────────────────────┐                          ┌─────────────────────────┐
│ Descriptive analysis     │                          ┊ Further qualitative      ┊
└─────────────────────────┘                          ┊ study to explore         ┊
            ┊                                          ┊ reasons                  ┊
            ┊                                          └─────────────────────────┘
            ▼                                                       ┊
┌─────────────────────────┐                                        ▼
│                          │                          ┌─────────────────────────┐
│ Results                  │                          │  • Participant           │
│                          │                          │    observation           │
└─────────────────────────┘                          │  • In-depth              │
            ┊                                          │    interviews            │
            ┊                                          │  • Focus group           │
            ▼                                          │    interviews            │
┌─────────────────────────┐    ┌───────────┐          │  • Document              │
│ Initial   analysis   to  │───▶┊ Results   ┊          │    analysis              │
│ explain  outcome   of    │    └───────────┘          └─────────────────────────┘
│ descriptive analysis     │          ┊                            ┊
└─────────────────────────┘          ┊                            ▼
                                      ┊                ┌─────────────────────────┐
                                      ┊                │ Results                  │
                                      ▼                └─────────────────────────┘
                          ┌─────────────────────────┐              ┊
                          │ Synthesis of qualitative + │◀───────────┘
                          │ quantitative findings       │
                          └─────────────────────────┘
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Figure 3.2: The evaluation model: what was measured?

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┌──────────────────┐              ┌──────────────────┐
│  Quantitative    │              │  Qualitative     │
│  Evaluation      │              │  Evaluation      │
└────────┬─────────┘              └────────┬─────────┘
         │                                 │
         ▼                                 ▼
┌──────────────────┐    ◄───    ┌──────────────────────────┐
│ Impact of        │            │ Programme delivery process│
│ treatment on:    │            │ (theory of change):       │
│  • Recovery      │            │   • Training              │
│  • Default       │            │   • Sensitisation         │
│  • Mortality     │            │   • Screening             │
│                  │            │   • Follow-up             │
│                  │            │   • counselling           │
└──────────────────┘            └────────────▲─────────────┘
                                             │
                                ┌────────────┴─────────────┐
                                │ Contextual and health     │
                                │ system issues that that   │
                                │ might influence service   │
                                │ delivery                  │
                                └───────────────────────────┘
```
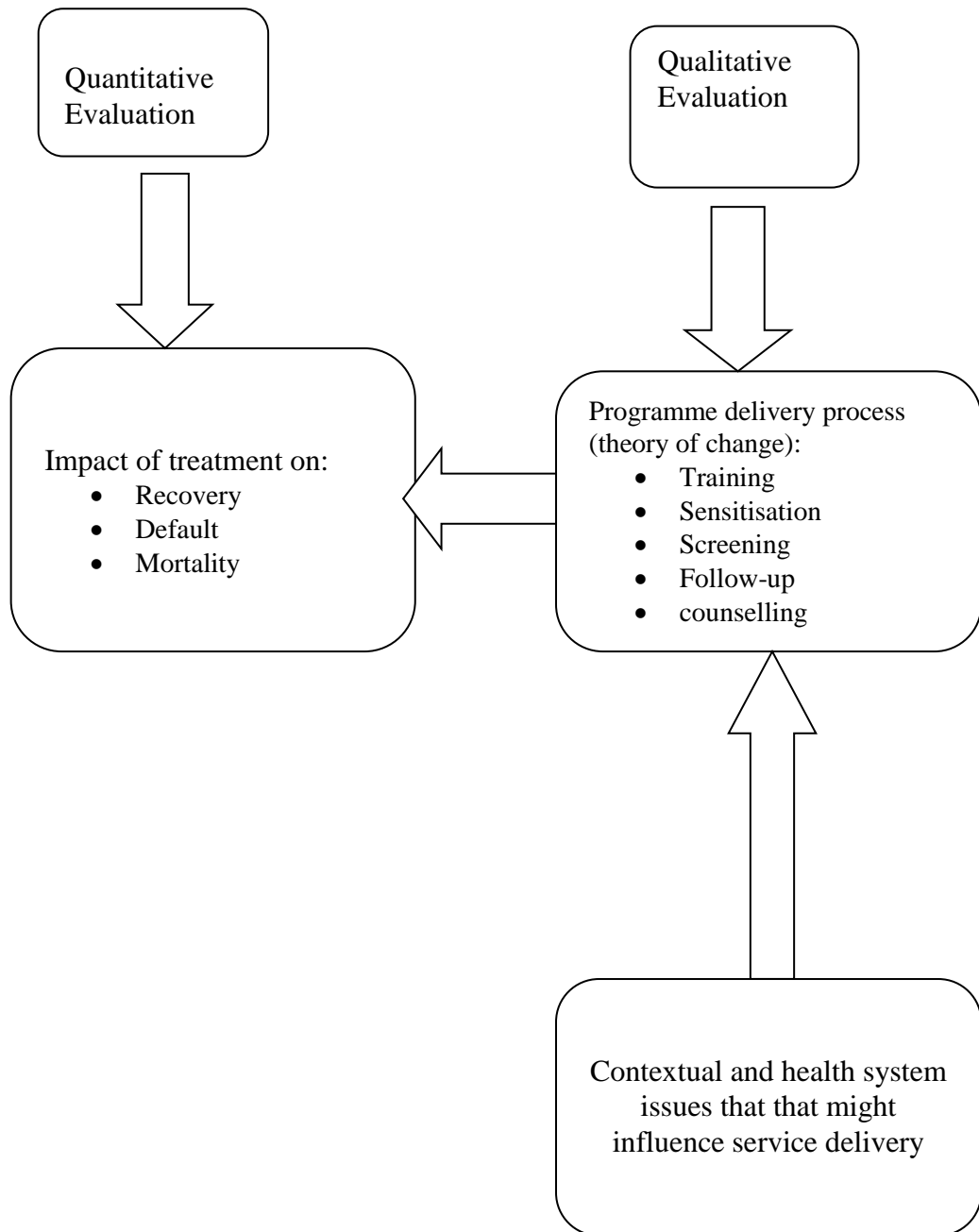
CHAPTER FOUR: EVALUATION OF TREATMENT OUTCOMES USING QUANTITATIVE METHODS

4.0 Introduction

This chapter focuses on the therapeutic care component of the CMAM programme. The aim is to evaluate the clinical outcomes of the treatment of the children with severe acute malnutrition in order to determine therapeutic effects. First, a description of the treatment that was provided to the children suffering is presented in section 4.1. In section 4.2 the baseline, follow up and treatment outcome data that were collected are described. The analysis of the data is described in section 4.3, whilst the results and discussion of the results are presented in section 4.4 and 4.5 respectively.

4.1 Description of the therapeutic care

4.1.1 Recruitment of children to enrol in the treatment

Children aged 6-59 months old diagnosed with severe acute malnutrition were enrolled to take part in the programme. The recommended criteria for diagnosing severe acute malnutrition in children to take part in community based treatment programmes include the physical examination for bilateral pitting oedema, and the used of the Mid-Upper Arm Circumference Measurements (MUAC) criterion (WHO, 2009). The WHO (2005) has recognised MUAC as the single most sensitive predictor of mortality in children with severe malnutrition, better than the traditional z-score criteria. MUAC is simple to use by non-health professionals involved in case findings. Earlier studies carried out by Velzeboer (1983), and more recently by Wangome et al (2012) indicate that the use of MUAC in defining severe acute

malnutrition increases intra and inter-observer reliability, compared with weight-for-height score criteria. Experience from international NGOs show that MUAC is quickest method of assessing children's nutritional status, and the procedure requires no special training for non-health workers to be able to carry out (VALID, 2006; MSF, 2008). These organisations have published data which suggest that MUAC criterion is reliable and produces accurate results. Goossen et al (2012) also recently reported that a MUAC criterion helps to eliminate the errors that are normally created by health workers in busy clinics.

Children < 6 months old were not eligible, as promotion of exclusive breastfeeding until age 6 months is the current global recommendation to prevent malnutrition in this age group (WHO, 2000). After the initial screening, all the children identified to have MUAC < 11.5cm were referred to an Outpatient Treatment Centre (OPC) to be further assessed for confirmation of SAM and enrolment to receive the treatment. At the OPC, the nurse with additional training on diagnosis and treatment of severe acute malnutrition assessed the children and categorised them into whether they had uncomplicated or complicated severe acute malnutrition to enrol them appropriately using the pathway illustrated below in figure 4.1 (Adapted from CMAM protocol, 2009).

**Figure 4.1: recruitment and treatment pathway of CMAM programme
(adopted from CMAM protocol, 2009)**
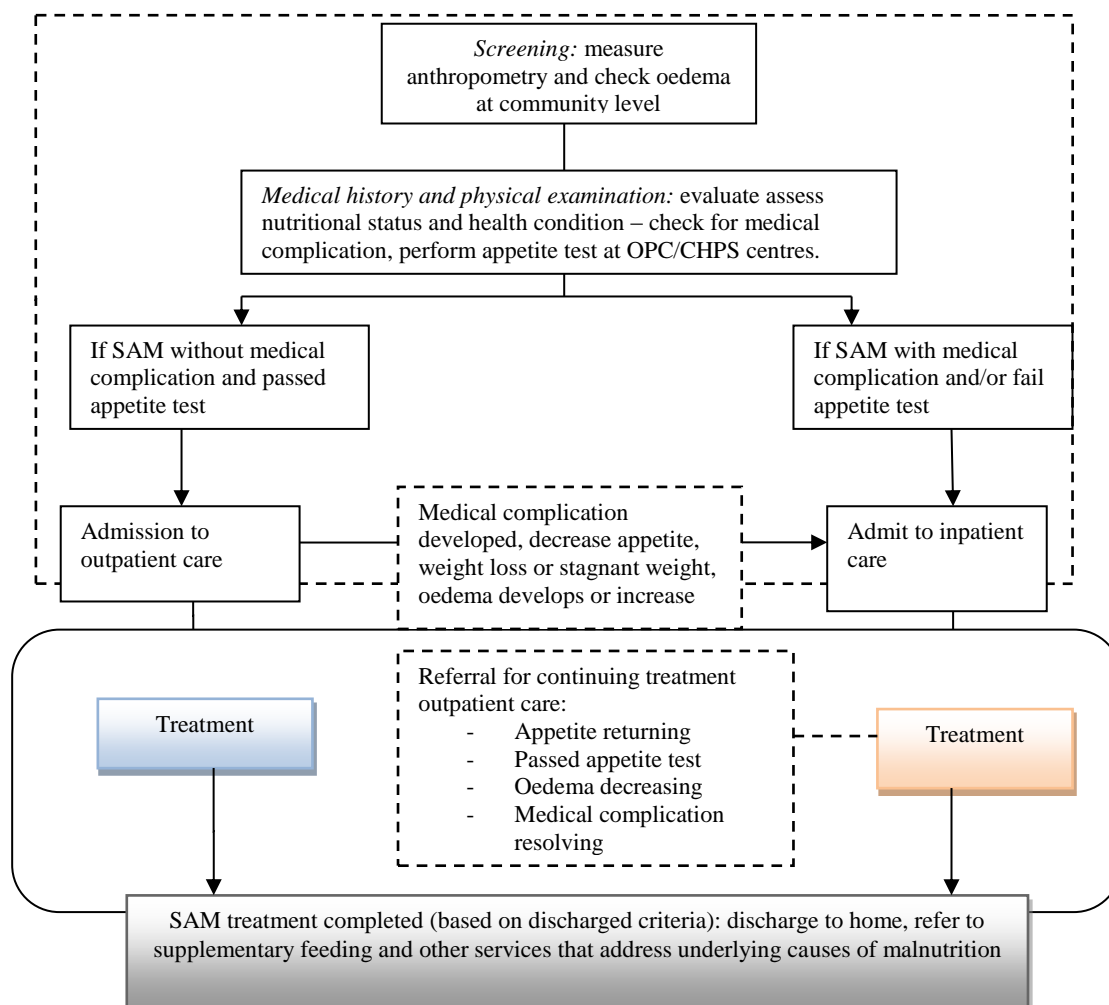
The protocol recommended that SAM children identified with medical complications [6] should first be referred to inpatient hospital paediatric wards to receive medical treatment before being referred back to the community therapeutic programme when they become clinically well and have good appetite. Conversely, children who were identified without severe medical complications were enrolled directly to receive RUTF and routine medication to treat uncomplicated co-morbidity in line with the treatment protocol.

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[6] The following condition are considered complication: anorexia, intractable vomiting, convulsions, lethargy, not alert, unconciousness, hypoglycaemia, high fever (>39 °C axillary and 38.5 for rectal), hypothemia(<35 °C axillary and 35.5 for rectal), severer dehydration, lower respectory tract infection, severe anamia, eye signs of vitamin A, skin lessions (CMAM protocol, 2009)

4.1.2 Nutritional therapy provided

RUTFs were distributed to caregivers weekly depending on the body weight of the children. Each week, the carer of the severely malnourished child was expected to attend a health and nutrition reassessment session, where the nurse measured the child's weight, MUAC and identified clinical signs of co-morbidity and oedema. The nurse then used an RUTF rationing chart to distribute RUTF to the carer to last up to 7 days. The carer was advised to return to the care centre on the 7[th] day for reassessment of the child's health and nutritional status, whether the RUTF was completed or not. The children were treated at home by their carers after receiving the RUTF and advice on how to administer it to treat the children. During the treatment, the children who developed medical complications or were not responding to the RUTF were referred to hospital to receive inpatient care. They were then expected to return to the programme if they became clinically well with a good appetite to receive RUTF (figure 4.1).

4.1.3 Medical therapy for co-morbidity

In addition to dietary treatment, the children also received routine medication to treat possible co-morbidities according to national CMAM and IMCI guidelines (GHS et al., 2009). The health workers followed the guidelines and gave a 7 day course of the antibiotic "Amoxicillin" (60mg/kg/day, 3 times daily) for children diagnosed with a mild form of diarrhoea and other infections. A single dose of Artesunate-amodiaquine combined therapy was given to treat malaria, whereas paracetamol syrup was given to control fever (temp $>37.5^{o}C$). Vitamin A was also given according to current Vitamin A supplementation guidelines, i.e., a single dose of

100,000 IU for children <12 months and 200,000 IU for children aged ≥ 12 months).
The dose was given 4 weeks after commencing nutritional therapy. Mebendazole
(*dewormer*) was also given orally as a single 250mg dosage for children between 12
and 24 months, and 500mg for children older than 24 months after 2 weeks of
commencing nutritional therapy. ResoMal was only given to children that were
dehydrated.

The children were discharged as and when they met the programme discharge
criteria of achieving an early weight gain of 15% of the initial weight which
correspond to a WH < - 2 z scores or better, or after completing the programme cycle
of 16 weeks (GHS, 2009).

4.2 Data collection

The quantitative data collected for this study included data collected by health
workers at baseline and end line (at discharged) and data collected by the research in
collaboration with health workers during following after discharge. The baseline data
was collected and used to monitor and measure changes in how the children
progressed with the treatment, and to decide when the children should be discharged,
referred to hospital or stay in the programme. The process of the data collection at
each point is described as follows:

4.2.1 Baseline data

As indicated the baseline data was collected at point of enrolment and used to
monitor the progression of the children receiving treatment. The key information
collected were; socio-demography (age, sex of children, birth type – single or
multiple births, parental status – mothers or father alive; anthropometric indices

(weight, and MUAC) and clinical information (appetite, oedema, malaria, diarrhoea, fever, cough, vomiting and anaemia).

Socio-demographic data were recorded onto the treatment monitoring form (appendix). Anthropometry data were collected using standard criteria to measure weight and MUAC, and recorded onto the monitoring form. Weight was measured using the Salter scale without the child wearing any clothes, and to the nearest 0.1 of a kg. The scale was calibrated before and after each measurement, using a 1kg weight, and was regularly adjusted to zero before any measurement was carried out. MUAC was measured using the MUAC tape to the nearest 0.1 of a centimetre.

4.2.2 Data collected during the treatment phase

The children nutritional and co-morbidity status were monitored weekly until discharged and the data collected compared with the baseline data to determine whether the child is meeting the discharge criteria. Weight and MUAC measurement were repeated weekly and compared with weight and MUAC collected at baseline until the child achieved the meets the discharged criteria. Co-morbidity was also monitored and the information collected weekly until children declared clinical fit to be discharged (meets the discharged criteria). Children who developed severe condition of co-morbidity, such as severe malaria, diarrhoea etc, as well as losing rather than gaining weight and appetite, they were referred to hospital for medical management (see figure 4.1). After three weeks, if a child's weight or MUAC remained the same as weight and MUAC measured at baseline, the child was classified as not responding to the treatment and therefore was referred to hospital for inpatient care. The cards of such children were labelled as *"referred"*, and if they returned after becoming clinically well the cards were labelled as *"returned from hospital"*. If the children did not attend the weekly sessions for one or two

consecutive times, the nurse wrote *"absent"* on their cards, and if they failed to attend the weekly sessions for three or more consecutive times they were classified as default, and the card labelled *"default"*.

As previously stated, all the children were not discharged at the same time. Children met the criteria if they achieved weight gain of 15% from the baseline weight or complete the 16 weeks of treatment. At discharge, weight and MUAC measurements were repeated, as well as information on co-morbidity and appetite.

4.2.3 Post-discharge data collection

Post-discharge outcomes assessment of all the children who completed the programme between July 2010 and January 2011 was carried out after initial analyses of the programme baseline and monitoring data. The post-discharge data were used to determine outcome, one year after completion of the programme. Because this data were not already collected and available at the programme database, the researcher had to arrange for all the children to return to the outpatient treatment centre for their weight and MUAC to be taken, as well as assessment of their health status. The weight and MUAC assessment was conducted using the same standard assessment criteria that were used at baseline and follow-up (monitoring) phase. Those who failed to return to the programme, the health workers visited them at homes to conduct the assessment.

Permission was first sought from the programme owners i.e. Ghana Health Service, as well as from the sponsors of the programme (e.g. UNICEF) after ethical approval by the Ghana Health Service and University of Sheffield Ethics Review Committees were granted to collect the data. For the post discharge anthropometry survey, mothers gave verbal consent before their children were measured.

4.3 Data analysis

4.3.1 Selection of appropriate variables

The variables included in this analysis were drawn from the records of the children who took part in the programme. Expected outcomes on clinical effectiveness of the programme were: achievement of nutrition recovery, mortality, and default rates meeting the Sphere international standards for therapeutic programme effectiveness. Socio-demographic, clinical and/or co-morbidity and anthropometry indexes were selected as key potential predictor variables (Table 4.1).

The selections of the predictor variables were informed by what previous studies have used, socio-demographic variables selected include: clinical and or co-morbidity variables and anthropometry or nutritional status at baseline. For instance, the literature reviewed demonstrates that there is a strong association between malaria, diarrhoea and HIV diagnosed at baseline (e.g. Collins and Sadler 2002; Manary et al., 2004, Oakley et al., 2009). Anthropometric indices such as weight and MUAC as well as socio-demographic variables such as age, sex, parental and breastfeeding status have also been tested in previous studies to determine predictors of recovery, mortality and default (e.g. Collin et al., 2006, Manary et al, 2004; Manary et al., 2010; Collins and Sadler 2002). Therefore, the study purposefully selected these important variables from the child's outpatient attendance card and included them in the analysis to predict factors that influenced the intervention outcomes. HIV was not included in the analysis because it was not listed in the child's attendance form because of confidentiality issues. Although family size and distance to treatment centre were listed on the form, the health workers did not complete these portions on the form. Therefore, these variables were excluded in the analysis.

Definitions of primary outcome variables

Recovery from the treatment was defined as a child gaining 15% minimum weight and maintaining that for 2 consecutive weeks. Default was defined as a child not attending treatment session for three consecutive weeks.

Table 4.1: Categorisation of variables included in analysis

Explanatory variables	Outcome variables

Socio-demography
 	
Age
Sex
Birth category
   • single
   • multiple
Mother alive
Father alive
Breastfeeding
 	
Anthropometry
Weight (kg)
MUAC (cm)
 	
Clinical
Appetite
Oedema
Malaria
Diarrhoea
Vomiting
Fever
Cough
Dehydration
Anaemia
	Primary
	Recovery $\geq$ 15% of initial weight)
	Defaults (fail to attend $\geq$ 3 consecutive times)
	Deaths
	
	Secondary
	Rate of weight gain ($\geq$ 8g/kg/day)
	Length of stay

4.3.2 Data entry and management

The anonymised dataset containing the key variables were systematically entered into a Microsoft Excel spread sheet and stored in sequential rows against the children's unique Identification Numbers (ID), after which the data were transferred onto STATA version 11 (STATA CORP, USA) for statistical analysis. Exploratory analyses were carried out first to check for consistency, missing data, presence of

outliers, multi-colinearity and normality. Possible outliers for anthropometric data were checked using standard references for weights and MUAC measurements for children <5 years. The aim was to ensure accuracy and reliability of the data and the findings of the study. Units of weight and MUAC were all checked to ensure that 'grams (g)' or 'millimetres (mm)' were not used for some children whereas kilogram (kg)' and 'centimetres (cm)' for others.

4.3.3. Data coding

The children's attendance forms were already labelled as *"recovered"* for children who achieved nutritional recovery, *'died'* for children who died during the treatment, and *'default'* for children who dropped out of the intervention before meeting the discharge criteria. The children who were referred to hospital during the treatment for medical care were coded as *'referred',* whilst children who did not achieve the recovery target after 16 weeks stay in the programme were coded as *'transferred'*. Returned defaulters were coded as *'returndefult,'* whilst children who did not attend the programme for one or two sessions were coded as *'absent'*. The researcher therefore only re-categorised and coded these variables into whether they were categorical or continuous. Binary categorical variables were first coded as 'Yes' or 'No', 'M' and 'F' in EXCEL and relabelled as "1" for YES and "0'' for NO in STATA. For instance, male was entered in EXCEL as "M" and re-label in Stata as "0" and female (F) as "1". The numbers 1, 2 and 3 were used to re-labelled ≥ 2 categorical variables, e.g. 1 = absence from treatment once, 2 = absence twice and 3 for absence three or more times.

4.3.4 Descriptive statistical analysis

Descriptive statistics were performed for the entire study population to determine the proportion of children who recovered, died and defaulted, as well as the rate of weight gain and length of stay in the programme. The percentage of children who were female, male, and breastfeeding, mother alive, father alive, as well as enrolled with co-morbidity and different category of MUAC were also determined.

The mean differences between continuous variables were compared using the student t-test, whereas the Chi-test was used to compare differences between categorical variables, particularly, to determine whether there were any significant differences between any of the outcome variables and the various explanatory variables. The outcome differences across more than two groups of explanatory variables were compared using the Extended Mantel Haenszel Chi-Square test for linear trends.

Further complex relationships between outcomes and explanatory variables were identified through multivariate regression modelling. In this stage of the analysis, all the important variables were combined in one model to identify the most significant predictors of recovery, default and weight gain. Binary logistic regression was performed to identify the predictors of recovery and default. This type of regression analysis is useful when the dependent variables are dichotomous (recovery and default), and the explanatory/independent variables are either continuous or categorical (Agresti, 2013). On the other hand, linear regression was carried out to identify predictors of rate of weight gain. This analysis is the most useful to use when the outcome variables are continuous and the explanatory variables are either continuous or categorical (Agresti, 2013). Because there were many independent variables to test their significance, the regression was performed using a step-wise

backwards approach (Barry 2012, Nathans, 2012). This approach involves starting the regression with all the predictor variables in the model and then removing the least significant ones for each step until only the most significant variables are left in the model (Barry 2012).

The lengths of stay in the programme for all children, as well as length of stay between children enrolled with and without co-morbidities, age categories, sex difference, severity of malnutrition (MUAC categories) and parental and breastfeeding status were also calculated. An independent paired t-test was used to compare difference in length of stay between and across groups. Weight gain was computed for the average daily gain for all children, as well as children who recovered, defaulted during the programme, as well as those who died. Rate of weight gain and length of stay for children who died and defaulted were computed separately to compare results with those who recovered. The rate of weight gain was computed using the formula proposed by Proudhon et al (2006): *(discharge - enrolment weight)/enrolment weight) length of stay (days) between enrolment and discharge weights).*

4.4 RESULTS

Descriptive statistics were presented as proportions in tabulated form. Categorical variables were presented as proportions of the sample within each group, whilst continuous variables were presented as means and standard deviation (SD) or standard errors (SE) where applicable.

4.4.1 Characteristics of the children

Records of 525 children who left the programme between July 2010 and January 2011 were retrieved from 56 outpatients' centres where the children attended. Of these, 37 children were excluded from the analyses because of incomplete /missing enrolment (baseline) and discharge information. Therefore the overall sample included in the analysis was 488 children with accurate and complete information relevant to measure the clinical outcomes of the intervention. Approximately 99% (n = 483) of children were admitted based on their MUAC; the remaining 1% were enrolled based on the presence of bilateral pitting oedema. Nearly all, (98.6%; n = 481) children were enrolled with a passed appetite test, and only 2% (n = 9) of the children enrolled had received medical treatment within the last two weeks in hospital prior to enrolment. The children were characterised on the basis of the districts where they were enrolled or received treatment, as well as their sex, age, birth category (singleton, twin, triplet), parental status (mother is alive, father is alive), breastfeeding status, co-morbidity and nutritional characteristics recorded at baseline for bivariate comparison of differences in proportions and/or means where applicable.

The results show that, of the 488 children, 19.9% (n = 97) were registered in the Kassena-Nankana District (KND), 47.3% (n= 231) were registered in the Bawku West District and the remaining 32.8% (n =160) were registered in the Bolgatanga

District. More than half of the children (57 %, n = 279) were females. Smaller proportions (5%) were multiple births, of which 4% were born twins and the remaining 1% were born triplets. About 37% (n = 182) of the children were enrolled with MUAC < 11cm. A good majority 59% (n = 289) were enrolled with MUAC 11 - 11.5cm, whilst only a small proportion 4% (n = 17) were enrolled with MUAC slightly exceeding the admission criteria (MUAC > 11.5cm ≤ 11.8 cm). Sixteen percent (16%) had stopped or were not breastfeeding at time of enrolment. The mean age in the programme was 17.3 months. Children above 2 years (or 24 months) were comparatively fewer (22%) than the children below this age limit (78%). The baseline demographic characteristics of the 488 children included in the analysis are presented in Table 4.2

Table 4.2: Baseline demographic and nutritional characteristic of 488 children aged 6-59 months discharged from CMAM programme between July 2010 and January 2011.

Variables	N	(%)	M	SD
District				
Kassena-Nankana	97	19.9		
Bawku West	231	47.3		
Bolgatanga	160	32.8		
Sex				
Female	279	57.2	-	-
Male	209	42.8		
Age (months)	488		17.3	4.3
6 to 23	381	78.07	-	-
> 23 above	107	21.93	-	-
Multiple birth				
Single	462	94.7		
twin	20	4.2	-	-
triplet	6	1.1	-	-
Breastfeeding				
Yes	409	83.8	-	-
No	79	16.2		
Mother alive				-
Yes	473	96.9	-	
No	15	3.1		
Father alive				
(Yes)	475	97.3	-	-
No	13	2.1		
Pass appetite				-
test Yes	476	97.5		
No	12	2.5		
Anthropometry				
MUAC (cm)	488	100	11.1	1.8
<11	182	37.3	-	-
11 to 11.5	289	59.2	-	-
>11.5 to 12	17	3.5	-	-
Oedema				
Yes	5	1.4	-	-
No	483	98.6		
Weight (kg)	488	100	7.0	

Note: data are in numbers (N), percentages (%), Mean (M) ± standard Deviation)

4. 4.2 Characteristics of co-morbidities diagnosed

As discussed in the background literature (Chapter 1), untreated SAM carries a higher risk of morbidity which could result in mortality in children <5 years. The risk

is even higher when severely malnourished children have co-morbidity that is not identified and treated early (Black et al., 2008). The analysis of co-morbidity diagnosed at baseline showed that the most frequent co-morbidities reported were malaria and fever, 17.6 % (n = 86) and 18.0% (n=88) respectively. The proportion of children who were enrolled with vomiting, diarrhoea and cough were 14% (n = 67), 8.2% (n = 40) and 6% (n = 28) respectively. Anaemia was the least common illness reported, 0.6% (n = 3). However, the low incidence of anaemia could probably be because of the criteria used to diagnosed the condition' i.e. physical examination of the conjunctiva for pallor or the palm for pallor. This method is subjective as opposed to laboratory analysis to diagnose anaemia, which arguably is the most accurate diagnosis. Four percent (4%) of the proportion of children enrolled were referred to hospital to receive inpatient care during the treatment.

Table 4.3: Prevalence of co-morbidity among children enrolled in community-based therapeutic care programme (n=488) in the Upper East Region

Co-morbidity	n	%
Malaria	86	17.6
Diarrhoea	40	8.2
Fever	88	18.0
Cough	28	5.7
Vomiting	67	13.7
Anaemia	3	0.6
Multiple co-morbidity	86	13.6

Note: data presented in numbers (N) and percentages (%).

When co-morbidity were segregated by geographical distribution, the proportion of children with malaria and fever at baseline was 24% (n = 24) in KND, 20% (n = 46) in Bawku West and 10% (n =16) in Bolgatanga districts. Similar trends in malaria prevalence compared across the districts have been reported by Ghana Health

Service (GHS, 2011). The proportion of children who were vomiting at baseline was also higher 25% (n = 24) in KND compared with 14% (n = 32) and 7% (n = 11) in Bawku West and Bolgatanga districts respectively. Overall, the proportion of children enrolled with diarrhoea and cough compared across the three districts were statistically similar (Table 4.4).

Table 4.4: Prevalence of co-morbidity among children enrolled in community-based therapeutic care programme (n=488) in the Upper East Region by districts

Co-morbidity	Kassena-Nankana (n= 97)	Bawku West (n= 231)	Bolgatanga n=160	χ^2	p
Malaria *n (%)*					
Yes	24 (24.74)	46 (19.91)	16 (10.00)	10.626	0.005
No	73(75.26)	185(80.09)	144(90.00)		
Diarrhoea *n*					
(%)	12 (12.37)	20 (8.66)	8 (5.00)	4.485	0.106
Yes	85(87.63)	211(91.34)	152(95.00)		
No					
Fever *n (%)*					
Yes	24 (24.74)	48(20.78)	16 (10.00)	11.118	0.004
No	73(75.26)	183(79.22)	144(90.00)		
Cough *n (%)*					
Yes	8 (8.25)	13 (5.63)	7 (4.38)	1.684	0.431
No	89(91.75)	218(94.37)	153(95.63)		
Vomiting *n*					
(%)	24 (24.74)	32 (13.85)	11(6.88)	16.282	0.001
Yes	73(75.26)	199(86.15)	149(93.13)		
No					

Notes: descriptive statistical analysis of proportions, data are presented in numbers (n) percentages (%).

Eighty six (86) children were diagnosed with ≥ 2 (multiple) of the co-morbidities (Table 4.5 -4.9).

Table 4.5: Prevalence of multiple co-morbidity among children enrolled in community-based therapeutic care programme (n=488) in the Upper East Region by districts

Co-morbidity	Malaria			
	No	**Yes**	χ**2**	**p**
Diarrhoea				
No	392(97.51)	56(65.12)	98.800	0.001
Yes	10(2.49)	30(34.88)		
Fever				
No	399(99.25)	1(1.16)	461.168	0.001
Yes	3(0.75)	85(98.84)		
Cough				
No	400(99.50)	60(69.77)	115.815	0.001
Yes	2(0.50)	26(30.23)		
Vomiting				
No	382(95.02)	39(45.35)	147.598	0.001
Yes	20(4.98)	47(54.65)		

Note: data presented in numbers (n), percentages (%).

As shown, nearly all the children who were enrolled with malaria also had fever, 98.8% (n = 85). These results strongly suggest a linear relationship between the two co-morbidities.

Table 4.6: Prevalence of multiple co-morbidity among children enrolled in community-based therapeutic care programme (n=488) in the Upper East Region by districts

	Diarrhoea			
Co-morbidity	No	**Yes**	χ**2**	**p**
Malaria				
No	392 (87.50)	10 (25.00)	98.808	0.001
Yes	56 (12.50)	30 (75.00)		
Fever				
No	392(87.50)	8(20.00)	57.6995	0.001
Yes	56(12.50)	32(80.00)		
Cough				
No	433(96.65)	27(67.50)	57.999	0.001
Yes	15(3.35)	13(32.50)		
Vomiting				
No	402(89.73)	19(47.50)	55.295	0.001
Yes	46(10.27)	21(52.50)		

Note: data presented in numbers (n), percentages (%).

Table 4.7: Prevalence of multiple co-morbidity among children enrolled in community-based therapeutic care programme (n=488) in the Upper East Region by districts

	Fever			
Co-morbidity	No	Yes	χ^2	p
Malaria				
No	399(99.75)	3(3.41)	461.168	0.001
yes	1(0.25)	85(96.59)		
Diarrhoea				
No	392(98.00)	56 (63.64)	113.194	0.001
Yes	8(2.00)	32 (36.36)		
Cough				
No	400(100.00)	60(68.18)	135.0198	0.001
Yes	0(0.00)	28(31.82)		
Vomiting				
No	380(95.00)	41(46.59)	142.172	0.001
Yes	20(5.00)	47(53.41)		

Note: data presented in numbers (n), percentages (%).

Table 4.8: Prevalence of multiple co-morbidity among children enrolled in community-based therapeutic care programme (n=488) in the Upper East Region by districts

	Cough			
Co-morbidity	No	Yes	χ^2	p
Malaria				
No	400(86.96)	2(7.14)	115.815	0.001
Yes	60(13.04)	26(92.86)		
Diarrhoea				
No	433(94.13)	15(53.57)	57.6995	0.001
Yes	27(5.87)	13(46.43)		
Fever				
No	400(86.96)	0(0.00)	135.0198	0.001
Yes	60(13.04)	28(100.00)		
Vomiting				
No	407(88.48)	14(50.0)	32.992	0.001
Yes	53(11.52)	14(50.0)		

Note: data presented in numbers (n), percentages (%).

Table 4.9: Prevalence of multiple co-morbidity among children enrolled in community-based therapeutic care programme (n=488) in the Upper East Region by districts

Co-morbidity	Vomiting			
	No	**Yes**	χ^2	**p**
Malaria				
No	382(90.74)	20(29.85)	147.598	0.001
Yes	39(9.26)	47(70.15)		
Diarrhoea				
No	402(95.49)	46(68.66)	55.295	0.001
Yes	19(4.51)	21(31.34)		
fever				
No	380(90.26)	20(29.85)	142.712	0.001
Yes	41(9.74)	47(70.15)		
Cough				
No	407(96.67)	53(79.10)	32.992	0.001
Yes	14(3.33)	14(20.90)		

Note: data presented in numbers (n), percentages (%).

4.4.3 Programme outcomes achieved

Overall, 68.0% (n = 334) completed the programme and 32.0% (n = 154) failed to complete. Completers were those who achieved early nutritional recovery or were discharged after 16 weeks. Non completers include children who defaulted, died and never returned to the programme when they were referred to hospital for medical management.

4.4.3.1 Default rate

The default rate of children from the programme was 28.0% (n = 138). This rate is far above the Sphere default indicator of <15% defaulter rates. About 14% (n = 66) of the children who defaulted returned within an average time of 3.2 weeks. Implying, the majority had failed to return to the programme. Of the children who returned, 72.0 % (n = 48) all recovered completely from SAM within 2 to 3 weeks after re-joining the programme. The rest were lost to follow up.

4.4.3.2 Mortality rate

Deaths were recorded if children died whilst attending the programme, including those who were hospitalised during the treatment. Overall, mortality rates measured was 1.6% (n = 8). This rate is lower and better than the Sphere mortality indicator of <10% (Sphere, 2011).

4.4.3.3 Recovery rate

The recovery rate was estimated for all children, no matter how long they stayed in the programme, including those who completed and those who did not complete (defaulted or died). Overall, 72% (n = 349) of the children recovered from the treatment (met the 15% weight gain from their initial weight criteria). This rate is slightly less than the Sphere minimum recovery indicator (> 75%). However, the upper limit of the confidence interval (95% CI: 68% to 76%) falls within the acceptable rate, suggesting that recovery rate reported has marginally met the Sphere standard. The average recovery rate among the children who completed (n = 329) was 98.6%, higher and better than the Sphere recovery indicator. Only 1% (n = 5) of the children who completed at 16 weeks never achieved nutritional recovery and were transferred to hospital.

Table 4.10: programme results compared with Sphere outcome indicators

Outcome measures	N	(%)	Mean (95% CI)	Sphere indicators (%)
Cured	349	71.52	0.72 (0.68; 0.76)	>75
Died	8	1.64	0.02 (0.01; 0.03)	<10
Default	138	28.48	0.28(0.242; 0.32)	<15
Rate of weight gain (g/kg/day)	488	100	4.70(4.50; 4.80)	8 g/kg/day
Length of stay (weeks)	488	100	6.0 (5.84; 6.21)	30-40days

Note: Data in numbers (N), Percentages (%) Mean (M), Standard Error (SE) and confident interval

Length of stay in the programme

The overall average length of stay in the programme to recover was 6.0 weeks (95% CI 5.84 -6.21). This outcome suggests that about 50% of the children achieved the minimum recovery in less than 6 weeks. The average length of stay before default was 2.5 weeks (95% CI 2.01 - 2.42), and for children who died, the mean length of stay in the programme was 4.8 weeks (95% CI 3.68 - 5.82), meaning that deaths were likely to occur after 4 weeks (or within 28 days) upon enrolment into the programme.

Absenteeism

Absenteeism in the programme was defined as children who failed to attend the programme only once or twice but returned to complete the programme. About 15% were reported absent from one session, 11% were absent for two sessions, 5% were absent for three sessions and 2% were absent more than three sessions.

4.4.3.4 Programme outcome analysed and compared by subgroups

Bivariate analysis was performed to compare the programme clinical outcomes across sub-groups. This analysis was also necessary to identify which variables could be included in further multiple regression analysis to assess predictors of recovery and default. The comparisons were made on the basis of the children's sex, age, parental status (mother is alive or not alive and father is alive and not alive and breastfeeding status), co-morbidity and nutritional status at baseline. Chi-square test was performed to compare differences between sub-groups with two categories, whereas the Mantel Haenszel extension of Chi-Square tests was used to test for linear trend for differences across sub-groups with ≥ 3 categories. Comparisons were not made for subgroups with variables with sample size <10%, i.e. oedema (0.6%) and multiple births: twin (4%) and triplet (1%), since it would not make any statistical sense to make such comparison. The results of the analyses are presented in the next sections (from 4.9.4.2).

4.4.3.5 Programme outcome compared by districts

The proportion of children who achieved recovery in the Bolgatanga district was 67%; the lowest compared with 72% measured in KND and 74% in Bawku West (p = 0.26). Default rate was higher in Bolgatanga district (36.0%) compared with 26% reported in KND and 23% in Bawku West district (p<0.02). The high rate of defaults recorded in the Bolgatanga district might not be a surprise as the Bolgatanga district is an urban area compared with the other two districts, with more opportunity for women to engage in economic activities. Therefore, caregivers were more likely to withdraw because of less time for them to engage in buying and selling in the markets. Similarly, lower recovery rate was achieved in this district possibly because of the same reason. Caregivers were less likely not to adhere to the treatment at home

because of their busy schedule. However, only 0.6% (n = 1) died in the Bolgatanga district compared with 2.1% (n = 2) in KND and 2.2% (n = 5) children in Bawku West.

The proportion of children discharged as not recovered (or did not achieve 15% weight gain from their initial weight) at the end of 16 weeks did not differ across all three districts (p = 0.33). During the treatment, the proportion of children who were referred to hospital in the KND was higher (6.2%) compared with 3.9% in Bawku West district, and 0.6% in Bolgatanga district (p<0.004). This result needs to be interpreted with caution because the sample size for children who were referred and transferred to hospitals was small.

Table 4.11: Programme primary outcomes among children enrolled in community-based therapeutic care programme (n = 488) in the Upper East region compared by districts

Outcome variables	Kassena	Bawku West	Bolgatanga	χ2	p
Recovery, n (%)					
Yes	70(72.16)	172(74.46)	107(66.88)	2.69	0.26
No	27(27.84)	59(25.54)	53(33.13)		
Died, n (%)					
Yes	2(2.06)	5(2.16)	1(0.63)	1.52	0.47
No	95(97.84)	226(97.84)	159(99.38)		
Default, n (%)					
Yes	26(26.80)	54(23.38)	58(36.25)	7.85	<0.02
No	71(73.20	177(76.62)	102(63.75)		

Note: data are in presented in numbers (n), percentages (%) and probability values (p)

4.4.3.6 The outcomes compared by sex

The proportion of boys (72%) compared to girls (71%) who recovered were not significantly different (p = 0.91). Similarly, mortality rate reported for boys (1.9%) compared to girls (1.4%) did not differ statistically (p = 0.68). The same results were reported for default rate segregated between boys (30%) and girls (27%) (p = 0.43). There was no statistical difference between length of stay for girls (5.03 weeks 95% CI 4.77 - 5.313) and boys (4.9 weeks, 95% CI 4.63 - 5.32) (p = 0.387; t-test = 0.29).

During the treatment, 3.9% of boys compared to 2.4% of girls were referred to hospitals (p = 0.34). After 16 weeks, the proportion of boys (1.0%) compared with girls (1.1%) who were discharged as not recovered did not differ (p = 0.90). Referral was due to developing medical complications or complication of illness diagnosed at baseline.

Table 4.12: Programme primary outcomes among children enrolled in community-based therapeutic care programmes (n=488) in the Upper East region compared by sex status.

Outcome variables		Male	Female	χ^2	p
Recovered, n (%)					
	Yes	150 (71.77)	199 (71.33)	0.012	0.91
	No	59(28.23)	80(28.67)		
Died, n (%)					
	Yes	4(1.91)	4(1.43)	0.171	0.68
	No	205(98.09)	275(98.57)		
Default, n (%)					
	Yes	63(30.14)	75(26.88)	0.627	0.43
	No	146(69.86)	204(73.12)		

Note: data are in numbers (n), percentages (%) and probability values (p)

4.4.3.7 Programme outcomes compared by age groups

The results in Table 4.13 show that, of the 381 children age 6 to 23 months who were enrolled in the programme, a significant proportion, 71.4% (n = 272) recovered

compared to 28.61% (n = 109) who failed to recover (defaulted or died). Similar results were reported for children aged 23 months and above. Statistically, the differences in recovery rate between the two age groups were not significant (p = 0.91). The proportion of children who died was higher among children aged 6 to 23 months (1.6%) compared with 1.9% for those aged above 23 months old (p = 0.83). This result should also be interpreted with caution because of the small sample size for the population of children who died overall. The rate of default between children aged 6 to 23 months (28.6%) and those aged above this age (27.1%) was similar (p = 0.76). The proportion of children who were hospitalised, and transferred to hospital after 16 weeks was also similar between the age groups (p = 0.34) and (p = 0.9) respectively. The children aged 6 to 23 months had a longer stay in the programme (5.2 weeks) compared with 4.4 weeks for their older counterparts (p<0.001).

Table 4.13: Programme primary outcomes among children enrolled in community-based therapeutic care programmes (n=488) in the Upper East region compared by age group

Outcome variables	6 to 23 months	>23 months	χ2	P
Recovery, n (%)				
Yes	272(71.39)	77(71.96)	0.134	0.908
No	109(28.61)	30(28.04)		
Died, n (%)				
Yes	6(1.57)	2(1.87)	0.045	0.832
No	375(98.43)	105(98.13)		
Default, n (%)				
Yes	109(28.61)	29(27.10)	0.093	0.760
No	272(71.39)	78(72.90)		

Note: data are presented in numbers (n), percentages (%) and probability values (p)

The results presented in table 4.14 provide details on the length of stay of the children compared by age categories enrolled in the programme. One-way ANOVA was used to estimate the differences in length of stay between the age categories.

Table 4.14: Length of stay compared by age category

	N	Mean (weeks)	SD	p
Age (months)				
6-23	381	5.17	2.55	
> 23	107	4.44	1.72	<0.001

Note: data are presented in numbers (n); mean (M), standard deviation (SD) and probability values (p)

4.4.3.8 The outcomes compared by children parental and breastfeeding status

Within the Ghanaian traditional families, mothers are expected to seek treatment for their children when they are sick, not fathers. Therefore, the assumption for including variables on parents status in the analysis was that, children participation in the programme, their completion of the programme, as well as achieving successful outcomes will largely depend on their mothers being alive.

The results presented in Table 4.15 to 4.17 indicate that the primary outcomes were similar between groups compared by parental status (mother is alive and no mother is alive, father's alive and no father is alive), as well as breastfeeding and no breastfeeding groups. As seen in Table 4.15, the proportion of children whose mothers were alive and they recovered (97%) compared with those who failed to recover although their mothers were alive (96%) were statistically similar (p = 0.87). Similar results were reported for children whose mothers were alive and they defaulted, compared with children who did not default but their mothers were alive (p = 0.47). The mortality rates were also similar in both groups (p = 0.12). This result thus disproves the earlier assumption associating poor outcomes to a child's mother not being alive.

Table 4.15: Programme primary outcomes among children enrolled in community-based therapeutic care programmes (n=488) in the Upper East region compared mother is alive

Outcome variables	Mother Alive			
	No	**Yes**	**χ2**	**p**
Recovered, n (%)				
Yes	11(3.15)	338(96.85)	0.025	0.874
No	4(2.88)	135(97.12)		
Died, n (%)				
Yes	1(12.50)	7(87.50)	2.426	0.119
No	14(2.92)	466(97.08)		
Default, n (%)				
Yes	3(2.17)	135(97.83)	0.523	0.470
No	12(3.43)	338(96.57)		

Note: data are in presented in numbers (n), percentages (%) and probability values (p)

Table 4.16 Programme primary outcomes among children enrolled in community-based therapeutic care programmes (n=488) in the Upper East region compared by father is alive

Outcome variables	Father alive		χ2	P
	No	**Yes**		
Recovered, n (%)				
Yes	8(2.29)	341(97.71)	0.653	0.419
No	5(3.60)	134(96.40)		
Died, n (%)				
Yes	0(0.00)	8(100.00)	0.223	0.637
No	13(2.71)	467(97.29)		
Default, n (%)				
Yes	4(2.90)	134(97.10)	0.041	0.840
No	9(2.57)	341(97.43)		

Note: data are in presented in numbers (n), percentages (%) and probability values (p)

Table 4.17: Programme primary outcomes among children enrolled in community-based therapeutic care programmes (n=488) in the Upper East region compared breastfeeding status of children

Outcome variables	Breastfeeding		χ2	P
	No	Yes		
Recovered, n (%)				
Yes	55(15.76)	294(84.24)	0.166	0.683
No	24(17.27)	115(82.73)		
Died, n (%)				
Yes	1(12.50)	7(87.50)	0.082	0.775
No	78(16.25)	402(83.75)		
Default, n (%)				
Yes	21(15.22)	117(84.78)	0.134	0.715
No	58(16.57)	292(83.43)		

Note: data are in presented in numbers (n), percentages (%) and probability values (p)

Table 4.18: Length of stay in programme compared by parents and breastfeeding status

Independent variables	N	Mean (95% CI) weeks	(p)
Mother alive			
Yes	473	4.9(4.75; 5.19)	0.05
No	15	6.2(4.64; 7.76)	
Father alive			
Yes	475	5.02(4.81; 5.24)	0.55
No	13	4.61(3.27; 5.96)	
Breastfeeding			
Yes	409	5.05(4.82; 5.29)	0.38
No	79	5.00(4.31; 5.29)	

Note: data are presented in numbers (n), mean (M), standard deviation (SD) and probability values (p), analysis were carried out using a t-test

As shown above, length of stay in the programme for children whose fathers were alive compared with children whose fathers were not alive was not statistically different (p = 0.55). Similarly, the results indicate that children who were still breastfeeding whilst in the programme compared to children who were not

breastfeeding had a similar length of stay (p = 0.38). Length of stay was however higher among children whose mothers were not alive in comparison with children whose mothers were alive (p<0.05). This result is as expected because the default rate for children whose mothers were alive is slightly higher, which could have affected length of stay for this group.

4.4.3.9 Programme outcomes compared by MUAC category

As discussed before, MUAC is a good indicator for determining the severity of malnutrition and mortality in children aged 6-59 months (WHO, 1999). Therefore, it is important to assess and compare outcomes among children enrolled with different categories of MUAC in order to understand whether the same treatment duration was applicable to all MUAC groups, or that treatment duration should be based on MUAC status at baseline. The primary results compared by the different MUAC categories are presented in Table 4.19.

As shown in table 4.19, higher nutritional recovery was reported among children who were enrolled with the highest MUAC >11.5cm, 82% (n = 14) compared with children who were enrolled with low MUAC between 11cm -11.5cm, 74% (n = 213) and those enrolled with the lowest MUAC <11.0cm, 67% (n = 122). Statistically, the difference observed showed a borderline significance difference (p = 0.06). The low sample size in the higher MUAC (<11.5cm) group compared with the other two categories of MUAC probably accounted for this less strong significant differences. The proportion of children who were hospitalised during the treatment was higher among children enrolled with MUAC <11cm (5.0%) compared with 2.6% for children with MUAC 11cm to 11.5cm, and those enrolled with MUAC higher than 11.5cm (0%). The proportion of children who defaulted did not differ statistically

compared by MUAC group (p = 0.28). Similar results were reported for the children who died when compared by MUAC differences (p = 0.60). The transfer rate was significantly higher among children with the lowest MUAC category (p<0.001). This suggests that the most severely malnourished children enrolled in the programme were more likely to be those who did not recover at the end of the 16 weeks stay.

Table 4.19: Programme primary outcomes among children enrolled in community-based therapeutic care programmes (n=488) in the Upper East region compared by MUAC categories

Outcome variables	MUAC Category				
	>11cm	11 to 11.5cm	>11.5 to12 cm	$\chi 2$	p
Recovery, n (%)					
Yes	122 (67.03)	213 (73.70)	14 (82.25)	3.09(1)	0.06
No	60 (32.97)	76 (26.30)	3(17.65)		
Died, n (%)					
Yes	3 (1.65)	5 (1.73)	0 (0.00)	0.27(1)	0.60
No	179 (98.35)	284(98.27)	17 (100.0)		
Default, n (%)					
Yes	55(30.22)	80(27.68)	3(17.65)	1.17(1)	0.28
No	127(69.78)	209)72.32)	14(82.35)		

Note: data are in presented in numbers (n), percentages (%) and probability values (p)

Length of stay compared by MUAC showed that those who enrolled with the lowest MUAC (<11cm) had an average one week longer length of stay in the programme (5.4 ± 2.8 weeks) compared with children who were enrolled with MUAC 11 to 11.5cm (4.8 ± 2.1 weeks) and those enrolled with higher MUAC >11.5cm (4.4 ± 1.3, p<0.001). This outcome is not unexpected because the children enrolled with the highest MAUC achieved earlier recovery than children enrolled with MUAC lower than 11.5cm. As clearly illustrated in Table 4.19 , the recovery rate among children

enrolled with MUAC >11.5cm was nearly 10% higher than those enrolled with lower

MUAC 11 to 11.5cm, and about 15% more than those enrolled with MUAC <11cm

(p = 0.07).

Table 4.20: Length of stay among children enrolled in community-based therapeutic care programmes (n=488) in the Upper East region compared by MUAC categories at baseline

Independent variable	N	Mean(weeks)	SD	95% CI	(p)
MUAC (cm)					
<11	182	5.4	0.21	(5.03 - 5.85)	
≥ 11 to 11.5	289	4.8	0.12	(4.53 – 5.02)	<0.001
≥ 11.5 to 12	17	4.4	0.32	(3.73 – 5.09)	

Notes: data in numbers (n), mean (M), standard deviations (SD), and Probability values (p, calculated using t-test

4.4.3.10 Programme outcome compared by co-morbidity status

The results compared by children enrolled with co-morbidity and those without co-morbidity shows that the children without co-morbidity achieved better outcomes for all the outcome variables compared with those enrolled with co-morbidities. In Table 4.21, the proportion of children enrolled without malaria or fever achieved higher recovery rate (74%) than children who enrolled with malaria or fever (58%, p <0.002). The risk difference for non-recovery between malaria versus no malaria groups was -16.5% (RR= 0.78). The proportion of children who were enrolled with diarrhoea, cough and vomiting and recovered did not differ significantly compared with those enrolled without these co-morbidities (Table 4.21).

Mortality occurred more frequently among children who enrolled with malaria, diarrhoea, fever and vomiting compared with those enrolled without these (Table 4.22, p<0.001 to 0.002).

Table 4.21: Risk of not-recovering among children enrolled in community-based therapeutic care programmes (n=488) in the Upper East region compared by co-morbidity status at baseline

Independent variables	Recovery (%)	RD (%)	RR (95% CI)	p
Co-morbidity				
Malaria				
yes	58.1	-16.5	0.78(0.65 - 0.94)	0.002
No	74.6			
Diarrhoea				
Yes	62.5	-10.0	0.86(0.67 - 1.10)	0.177
No	72.5			
Fever				
Yes	58.0	-16.8	0.78(0.64 - 0.93)	0.002
No	74.8			
Cough				
Yes	71.4	-0.3	1.00(0.78 - 1.20)	0.972
No	71.7			
Vomiting				
Yes	65.7	-7.0	0.9(0.75 - 1.00)	0.237
No	72.7			

Note): Data are presented as RD (risk difference), RR (relative risk), percentage (%) and confidence intervals (CI) and probability (p) values.

Table 4.22: Risk of deaths among children enrolled in community-based therapeutic care programmes (n=488) in the Upper East region compared by co-morbidity status at baseline

Independent variables	Case fatality (%)	RD (%)	95% CI	p
Co-morbidity				
Malaria				<0.001
Yes	4.7	-4.7	(1.46 - 11.72)	
No	0.0			
Diarrhoea				0.002
Yes	5.0			
No	0.5	4.6	(-2.23 - 11.34)	
Fever				<0.001
Yes	4.6			
No	0.0	4.5	(0.19 - 8.90)	
Cough				0.096
Yes	3.6			
No	0.7	2.9	(-3.99 - 9.83)	
Vomiting				
Yes	6.0	6.0	(0.31 - 11.64)	<0.001
No	0.0			

Note: The data are presented as RD (risk difference), percentage (%), confidence intervals (CI) and probability values (p), and calculated using chi-square.

In Table 4.22, default rate differences between children enrolled with all types of co-morbidity and those enrolled without co-morbidity were not statistically significant (p=0.22 to 0.66).

Table 4.23: Risk of default from programme among children enrolled in community-based therapeutic care programmes (n=488) in the Upper East region compared by co-morbidity status at baseline

Independent variables	Defaults (%)	RD (%)	RR (95% CI)	p
Co-morbidity				
Malaria				0.57
Yes	22.6	-3.0	0.9(0.60 - 1.32)	
No	28.6			
Diarrhoea				0.24
yes	20.0			
No	28.8	-8.6	0.7(0.37 - 1.32)	
Fever				0.66
Yes	26.1			
No	28.5	-2.4	0.9(0.62 - 1.35)	
Cough				0.22
Yes	17.9			
No	28.7	-10.8	0.6(0.28 - 1.40)	
Vomiting				0.16
yes	20.9			
No	29.2	-8.3	0.7 (0.44 - 1.17)	

Note: Data are presented as RD (Risk Difference), RR (Relative Risk), Percentage (%) and Confidence Intervals

Length of stay results shown in Table 4.24 compared between children enrolled with and without co-morbidity was statistically different. The proportion of children who were enrolled with co-morbidity had a longer stay in the programme 6.09 (95% CI 5.35; 6.83) weeks compared to children enrolled without co-morbidity (4.78 weeks (95% CI 4.58; 4.98; p<0.001). The detailed results are presented in Table 4.24 below.

Table: 4.24: Length of stay of children enrolled in community-based therapeutic care programmes (n=488) in the Upper East region compared by co-morbidity status at baseline

Independent variables	N	Mean (95% CI)/weeks	p
Co-morbidity			
Malaria			<0.001
Yes	86	6.09 (5.35 - 6.83)	
No	402	4.78 (4.58 - 4.98)	
			<0.004
Diarrhoea			
Yes	40	6.05 (5.03 - 7.07)	
No	448	4.92(4.71 - 5.13)	
			<0.001
Fever			
yes	88	6.01(5.28 - 6.74)	
No	400	4.79(4.59 - 5.00)	
			<0.001
Cough			
Yes	28	7.07(5.58 - 8.56)	
No	460	4.89(4.68 - 5.09)	
			<0.001
Vomiting			
yes	67	4.83 (5.32 - 6.95)	
No	421	6.13(4.63 - 5.04)	

Note: Data are presented in numbers (N), mean (M), standard errors (SE), degrees of freedom (df) and probability values (p)

4.4.4 Secondary outcomes

4. 4.4.1 Rate of daily weight gain

A high rate of weight gain is an indication that severely malnourished children are recovering from the condition. The international acceptable standard for rate of weight gain for therapeutic feeding programme aiming to correct SAM is 8g/kg/day or more (Sphere, 2011).

The results of analysis of rate of weight gained daily by children are presented in Table 4.25 below. The overall rate of daily weight gain was as 4.7g/kg/day (95% CI 4.5 - 4.8). The rate of daily weight gain was higher for children who recovered 5.4 g/kg/day (95% CI 5.3 - 5.6) and lowest for children who died 0.6 g/kg/day (95% CI - 0.9 - 2.1).

Table 4.25: Rate of daily weight gain among children enrolled in therapeutic programmes (n=488) in the Upper East region compared by primary outcomes

Outcome variables	Rate of weight gain (g/kg/day)	
	N	Mean (95% CI)
All	488	4.7(4.5 - 4.8)
Recovered	349	5.4(5.3 - 5.6)
Defaulted	138	3.3(2.9 - 3.7)
Died	8	0.6(-0.9 - 2.1)

Note: Data in mean (M), standard error (SE) and confidence interval (CI)

Rate of daily weight gain did not differ between girls, i.e. 4.7g/kg/day (95% CI 4.49 - 4.89), and boys, i.e. 4.5 g/kg/day (95% CI 4.26 - 4.86) (p=0.38). Daily weight gain compared by age group illustrated that younger children aged 6 to 23 months achieved lower weight gain per day 4.6g/kg/day (95% CI 4.33 - 4.78) compared with

5.02g/kg/day (95% CI 4.69 - 5.35) achieved by older children (p<0.05). Low nutrient intake might have influenced low weight gain among the younger age group. The majority of the children in this age group were less likely to eat adequate amounts of therapeutic diet, probably because they were still breastfeeding. Available evidence showed that children aged between 6 and 11 months, transiting from exclusive breastfeeding to solid complementary feeding tend to eat less (LINKAGES, 2003). In this study it was difficult to calculate the exact amount of the therapeutic diet each child consumed, in order to compare intake in both age groups.

The rate of daily weight gain by children enrolled with various categories of MUAC was compared by conducting one way ANOVA test for linear differences. This statistical analysis evaluated whether differences existed in rate of weight gain when the children are stratified by MUAC less than 11cm (most severely malnourished), have MUAC from 11 to 11.5cm (severely malnourished) and MUAC more than 11.5cm (moderate acute malnutrition). The results of this analysis indicated that children enrolled with the most severe form of malnutrition (MUAC <11cm) achieved the highest weight gain (5.84 (95% CI: 5.24 – 6.45)g/kg/day) compared with children who were enrolled with MUAC range 11 to 11.5cm (4.84 (95% CI: 4.59 – 5.08)g/kg/day) and those enrolled with the highest, MUAC >11.5cm (4.27 (95% CI: 3.94 – 4.59)g/kg/day) p<0.02. This result was expected because physiologically, the window to absorb more nutrients in order to recover is wider among the most severely wasted children compared with when children are mildly wasted (Manary et al., 2013).

The rate of weight gain did not differ between children whose mothers were alive and those whose mothers were not alive, as well as children whose fathers were alive compared with those whose fathers were not alive. Similar results were observed for

rate of weight gain between children who were breastfeeding compared with non-

breastfeeding groups (Table 4.26).

Table 4.26: Rate of daily weight gain among children enrolled in therapeutic programmes (n=488) in the Upper east region compared by parents and breastfeeding status

Independent variables	Rate of weight gain (g/kg/day)	Bivariate
Parents and breastfeeding status	Mean (95%CI)	p
Mother's Alive		
Yes	4.68 (4.47 - 4.87)	0.21
No	3.98(3.25 - 4.72)	
Father's Alive		
Yes	4.66(4.47 - 4.85)	0.89
No	4.57(3.55 - 5.60)	
Breastfeeding		
Yes	4.67(4.19 - 5.02)	0.81
No	4.60(4.46 - 4.88)	

Note: Data are presented in mean, confidence intervals (CI) and probability (p) value, calculated using a t-test

The proportion of children who were enrolled with all types of co-morbidity gained

the lowest weight compared with children who were enrolled without any type of co-

morbidity (Table 4.26).

Table 4.27: Rate of daily weight gain among children enrolled in therapeutic programmes (n=488) in the Upper East region compared by co-morbidity status

Independent variables	Rate of weight gain (g/kg/day)		
Co-morbidity			
	N	Mean (95% CI)	p
Malaria			
Yes	86	3.32(2.85 - 3.78)	
No	402	4.94(4.75 - 5.14)	<0.001
Diarrhoea			
Yes	40	3.43(2.66 - 4.19)	
No	448	4.77(4.57 - 4.96)	<0.001
Fever			
Yes	88	3.32(2.86 - 3.78)	
No	400	4.95(4.75 - 5.15)	<0.001
Cough			
Yes	28	3.33(2.60 - 4.07)	
No	460	4.74(4.54 - 4.93)	<0.001
Vomiting			
Yes	67	4.0(3.40 - 4.50)	
No	421	4.8(4.57 - 0.50)	<0.001

Note: data presented in number (N), means (M), confidence intervals and probability (p) values, calculated using a t-test.

4.4.4.2 Post-discharge outcome: Relapse and Mortality after discharged

As revealed by this study, 8 children representing 1.6% of the 488 children enrolled died whilst on treatment under the CMAM programme. This implies, the remaining 480 children exited the programme either recovered (n = 329), transferred to hospital after 16 weeks (n = 5) or defaulted (n = 138). Of this number, 326 children who were assessed after one year of leaving the programme (recovered, n = 264, defaulted, n = 62). The remaining 154 children were lost to follow-up or could not be traced (migrated). Therefore their health and nutritional status could not be determined.

Overall, 3.4% (n=11) of the 326 children, who were surveyed to determine the proportion who had relapsed 12 months after leaving the programme were seen with MUAC <11.5cm. 4.8% (n=15) had MUAC between 11.5cm to 12cm (indicating moderate malnutrition). The remaining 300 children had MUAC >12.5cm, demonstrating that they were well nourished and did not relapse.

More children relapsed among children who defaulted during the programme (n = 7) compared to those who recovered after 16 weeks (n = 4). The difference was not statistically significant (p = 0.46), but that could be because of the low sample size. Overall mortality was 1 child, who died 2 months after leaving the programme. This child was identified as one of the 16 children who were referred to hospital for clinical care who never returned to the CMAM programme to complete the treatment.

4.4.5 Predictors of programme clinical outcomes

Further analyses were carried out to test for predictors of recovery, mortality, default and rate of daily weight gain using multiple regression modelling. The intention was to identify the variables which most predicted the programme outcomes, when all of them (considered important) were included in one regression model.

It did not make statistical sense to run a regression model for mortality because the sample group of children who died was small (n = 8). Therefore, only predictors of recovery, default and rate of daily weight gain were assessed during this stage of the analysis. For predictors of recovery and default (a dichotomous variable) logistic regression was performed, whilst linear regression modelling was used to assess predictors of the rate of weight gain (continuous variables) - See Tables 4.29 & 4.30.

The analysis adopted a backwards step-wise regression approach. This means that from the start, all the predictor variables were put in the regression model and the less significant variables eliminated at each step of the analysis until only the most significant variables were left in the final model, i.e. that is have p-value <0.05.

4.4.5.1 Predictors of recovery

For predictors of recovery, 13 variables (sex, age, weight, MUAC, malaria, diarrhoea, cough fever[7], vomiting, mother alive, father alive, breastfeeding, length of stay and default) were considered, and were included in the regression model. Of these, only 4 variables were left in the final model, indicating strong association with recovery (Table 4.29). The rest were not associated with recovery (p-value was less than 0.05).

Table 4.28: [Step-wise multiple Logistic regression] adjusted for predictors of recovery for children who completed community-based therapeutic care programmes in Upper East region (n=488)

Predictor variable	OR	95%CI	P
Malaria	30.39	(10.02 - 92.13)	<0.001
Admission MUAC	7.35	(2.56 - 21.15)	<0.001
Length of stay	3.28	(2.22 - 4.86)	<0.001
Default	11.30	(3.46 - 36.93)	<0.001

Note: data presented as OR (adjusted odd ratios), confidence intervals at 95% and p (probability values).

The results presented in Table 4.29 show that children who were enrolled without malaria were more likely to achieve better nutritional recovery from SAM under the

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[7] Malaria and fever were strongly correlated [Spearman's correlation coefficient 0.972]. Therefore, only one of these variables [malaria] was included in the model.

CMAM programme than children who were enrolled with malaria (OR=30.385, (10.02 - 92.12) (p<0.001). Similarly, children who did not drop out of the programme were more likely to achieve better nutritional recovery from SAM compared with children who dropped out (OR=11.30, 95%CI: (3.46 - 36.93), (p<0.001). Furthermore, children who had a longer stay in the programme were more likely than children who had a shorter stay to achieve better nutritional recovery rate (OR=3.28, (2.22- 4.86) (p<0.001). The results also indicates that, children who had MUAC > 11cm at baseline were more likely than children who were

4.4.5.2 Predictors of default

This model started with 12 variables, which are: age, sex, weight, MUAC, malaria, diarrhoea, cough**,** vomiting, mother alive, father alive, breastfeeding and weight gain. Of these, only rate of weight gain was strongly associated with default (p<0.001). The odds ratio presented here suggest that carers were more likely to drop out of the programme if children were not gaining weight (OR=0.53 (95% CI 0.45 - 0.62) (p<0.001). The rest of the 11 independent variables were not significantly associated with default (p-value is >0.05).

4. 4.5.3 Predictors of rate of daily weight gain

To determine the variables that predicted rate of daily weight gain, linear regression modelling was performed. Before running the regression model, a correlation analysis was performed to test the following multi-linear regression assumptions: 1) variables have no linear relationships, 2) residuals are independent, 3) residuals are normally distributed and 4) variance of residuals does not differ by predicted value (homoscedasticity). In Figure 4.2, the results demonstrate that the residual followed a normal distribution pattern.

Figure 4.2: normal distribution plot of dependent variables
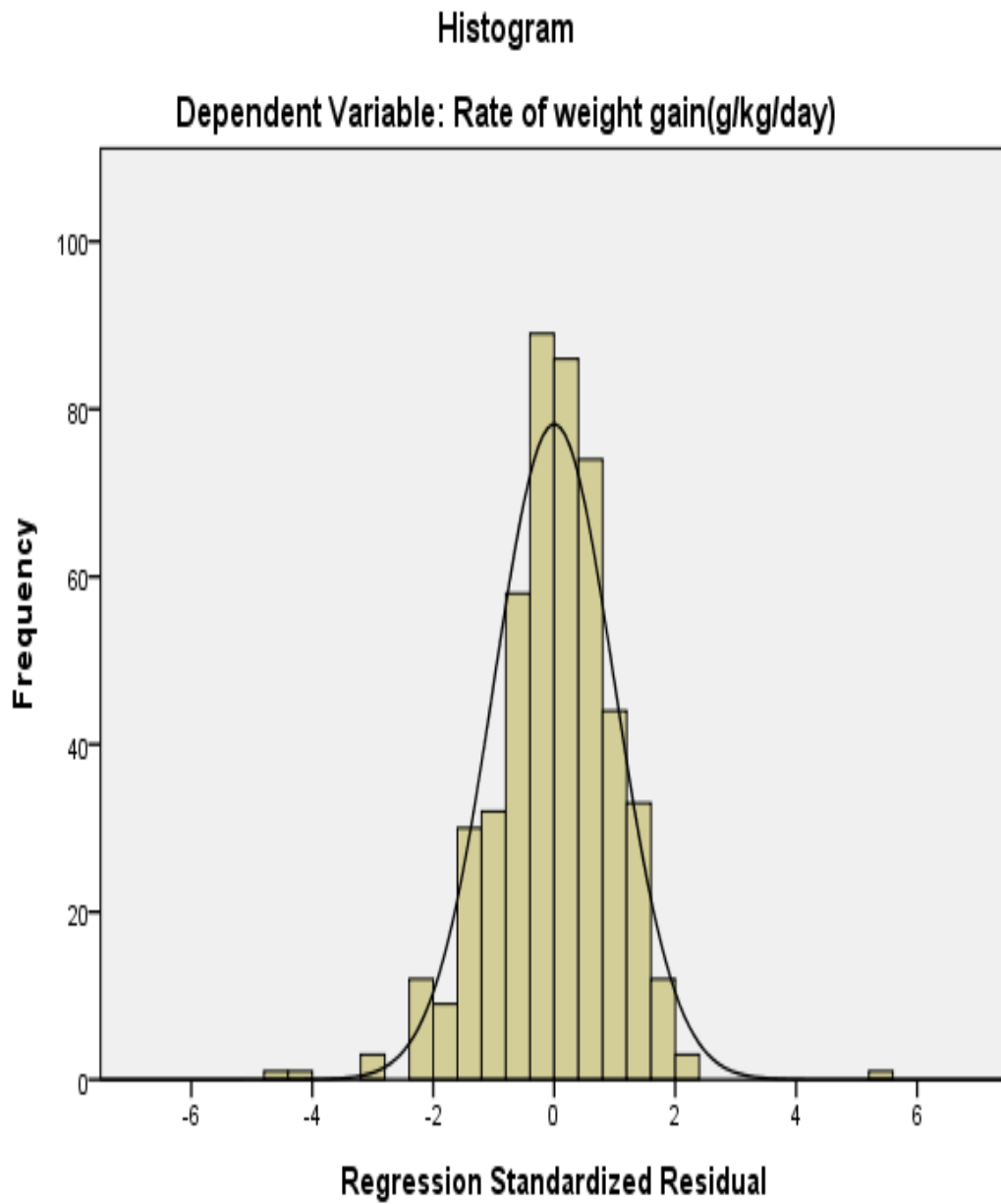
In Figure 4.3, the residual followed the diagonal line closely, thereby satisfying assumption 3 for multi linear regression.

Figure 4.3: Normal distribution P-P plot of regression standardised residual of dependent variable

Normal P-P Plot of Regression Standardized Residual

Dependent Variable: Rate of weight gain (g/kg/day)
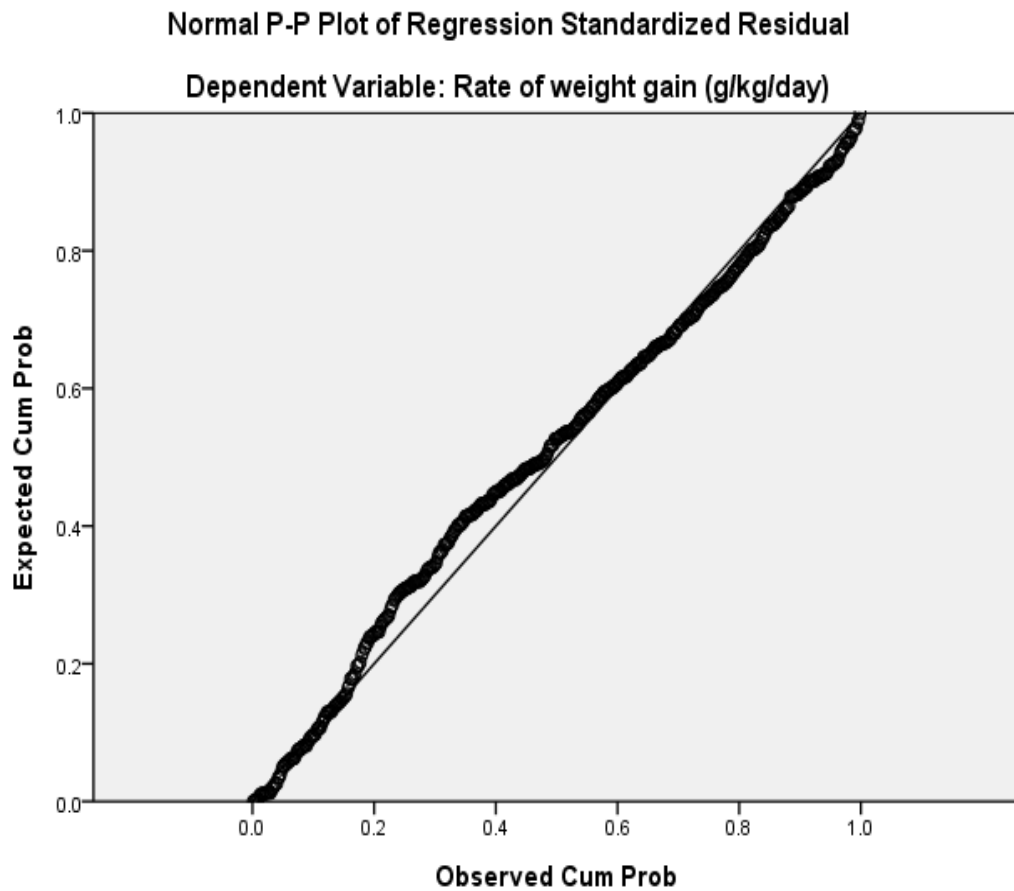
In Figure 4.4, the variance of the residual does not change with the predicted value (Assumption 4). The scatter plot also shows no pattern in the residual values versus predicted values (from left to right). This also satisfies assumption 1 (that variables have no linear relationships).

Figure 4.4: Scatter plot of dependent variables
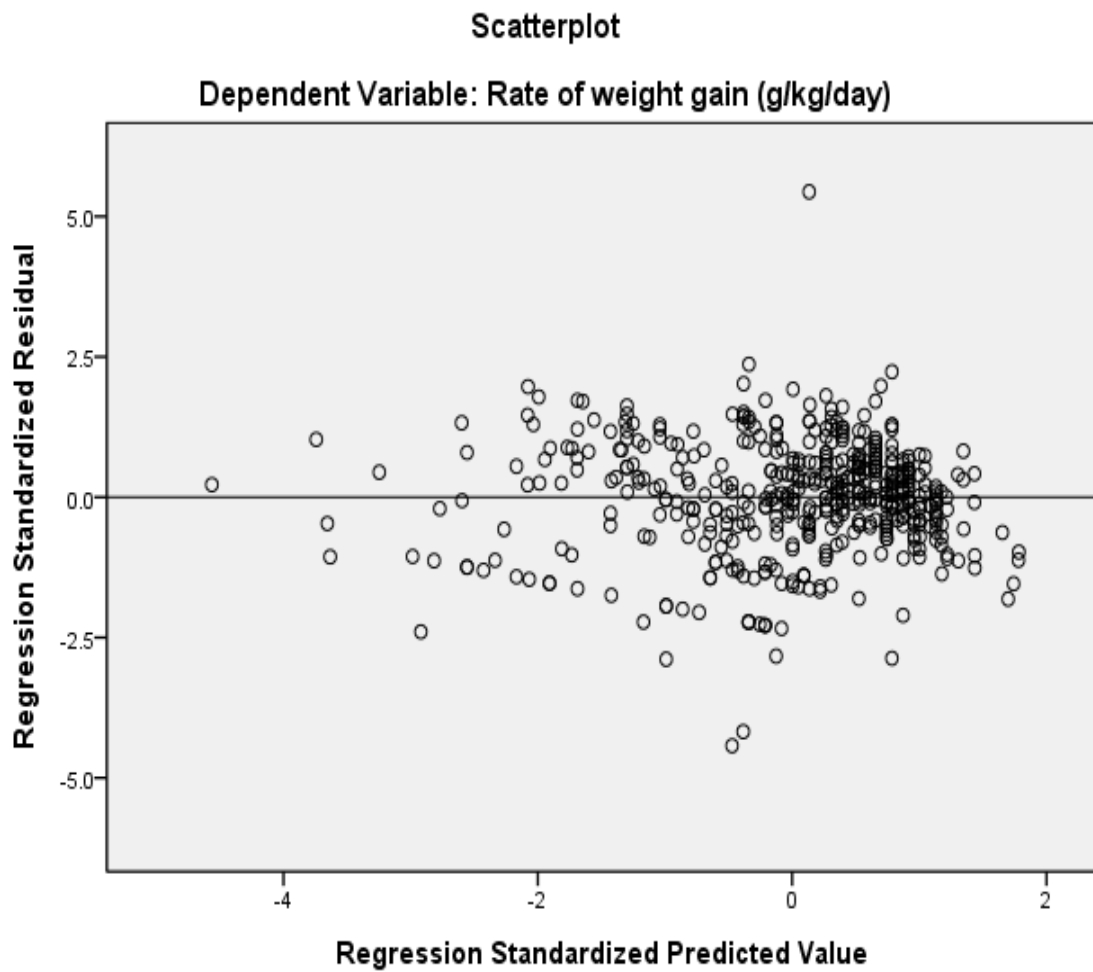
The results of the test are presented in Table 4.29. Malaria diagnosed at baseline, low MUAC and length of stay in the programme were significantly associated with poor rate of weight gain ($p<0.001$). The results suggest that for every unit increase in MUAC, weight gain increased by 0.7g/kg/day (95%CI: 0.46 - 1.099, $p<0.001$), and for every one week extra stay in the programme, weight gain was likely to increase by 0.1g/kg/day (95% CI: 0.08- 0.18, $p<0.001$).

Table 4.29: [Step-wise Linear regression] adjusted for predictors of weight gain for children who completed community-based therapeutic care programmes in Upper East region (n=488)

Variables	Beta	95% CI	P
Malaria	-1.25	(-1.58 - 0.92)	<0.001
Admission MUAC	0.78	(0.46 - 1.00)	<0.001
Length of stay	0.13	(0.08 - 0.18)	<0.001

Note: a) data presented in B (Beta) confidence interval at 95% and p (probability values).

4.5 DISCUSSION

The quantitative study presented findings of community-based treatment of children aged 6-59 months with RUTF. The study was designed to evaluate whether outcomes achieved from the treatment have met international acceptable standards. The results indicate that the recovery rate achieved was higher, with a significant lower mortality rate compared to the Sphere standard. However, default rate was significantly higher compared to the standard. Rate of weight gain was also lower compared to the standards, but was within what other studies have previously reported. In section 4.6.1 the key findings of the programme are discussed.

4.5.1 Programme primary outcomes

The overall mortality rate reported in the programme (1.6%) is well within the international Sphere of < 10% stipulated minimum standard (Sphere, 2011). The result is similar to mortality rates reported previously in CMAM delivery in emergency (Chapter 2), as well as recent operational reports that are based on CMAM pilot programme implementation in non-emergency contexts in Nepal, Kenya, Pakistan (UNICEF, 2012). The finding thus, adds to the existing evidence to draw the conclusion that the management of SAM using a community-based

approach can significantly avert a large proportion of child mortality caused by SAM.

However, there is a possibility that the mortality rate reported in Ghana CMAM delivery could be underestimated, as the majority of the children who defaulted with a lower (MUAC <11.5cm) were not traceable during the post-discharge assessment phase (migrated). Caregivers of these children might have attempted to use traditional methods of addressing the problem, and could end up exposing the children to increased risk of mortality.

During the treatment, the majority of the children recovered (72%) although the recovery rate compared to the Sphere stipulated standard of > 75% is slightly lower. However, compared to recent similar reports based on the evaluation of CMAM delivery within a routine health service context in northern Ethiopia (Gebremedhin et al, 2013), the Ghana CMAM programme achieved higher recovery rate. The recovery rate reported in programme implemented in Ethiopia (Gebremedhin et al., 2013) was below the Sphere indicator (61.8%). Reports published by UNICEF following operational evaluation of CMAM delivery non-emergency context in Kenya, Nepal and Pakistan demonstrated higher than the Sphere indicator of recovery rate (UNICEF 2012). The rates reported in Ghana and Ethiopia are also slightly lower than rates reported in previous emergency programme (see e.g. Defourny et al., 2009; Linneman et al., 2007; Amthor et al., 2009; Chaiken et al, .2006; Collins and Saddler 2002; Cilberto et al., 2006).

Gebremedhin and colleagues (2013) argued that lower recovery rate in non-emergency implementation may be justified in the sense that emergency CMAM delivery is usually co-ordinated by NGOs with adequate resources and capacity to

follow children under treatment regularly to ensure adequate intake of the therapeutic diet provided. According to them, regular monitoring may be able to control for the potential sharing of the therapeutic diet with other siblings at home, which some studies suggest is a likely predictor of poor recovery of children treated at home. Although Gebremedhin et al. (2013) failed to explore contextual factors that might have impacted on the programme and outcome reported in Ethiopia, my experience working with governments public health institutions in sub-Saharan Africa suggest that in non-emergency contexts where programmes are coordinated by government health departments, there may be less capacity to undertake regular home visits. Sharing was likely to occur, resulting in an inadequate nutrient intake than the recommended daily intake to achieve optimum recovery (Briend et al., 1999).

Nearly twice the Sphere recommended indicator for default was found (28%). Theoretically, higher default could be a signal of non-acceptability of the programme (e.g. perceived quality of the services provided, and perceived accessibility, e.g. distance to treatment centres (Sadler 2008). Was this the case for CMAM programme delivered in Ghana? These indicators could not be investigated because such variables were not collected by health workers. Therefore, there is the need for further studies using in-depth qualitative methods to establish whether these links exist. Carers were more likely to stop attending the programme if they perceived that their children were not gaining enough weight based on their expectations or vice versa, which also need further investigation.

Comparatively, the defaulter rate is similar with what has been published previously by Gebremedhin et al (2013) following the evaluation of CMAM delivery in northern Ethiopia in non-emergency routine health services, as well as clinical trials

programme conducted by Gaboulaud et al (2005) in Malawi. The default rates reported in these programme are 4 times higher those reported in emergency situations, although a few emergency CMAM programmes have also reported higher than acceptable default rates, e.g. Save The Children UK (2001 & 2002) coordinated programmes in Northern Sudan. As discussed before, the differences in default rates observed could be due to differences in resource availability to effectively coordinate programme delivery in a non-emergency context. For instance, in Ethiopia and Malawi, where emergency CMAM programmes have reported significant lower defaulter rates, children were visited daily in their homes by community-based nutrition workers until discharged (Kerac et al., 2009; Manary et al., 2007; Collins and Sadler 2002; Amthor et al., 2009). Furthermore, because there is likely to be scarcity of food for children in emergency situations, caregivers may be compelled to stay in a programme until their children are discharged, since that may be the only source of food for the children in such circumstances. In non-emergency contexts, where there may be different food options besides the therapeutic foods provided, caregivers are likely to be reluctant to follow the programme protocol until children are discharged, especially when they begin to see gradual improvement of the child's condition after a few weeks of receiving the treatment (Defourny et al., 2006).

4.5.2 Secondary outcomes

CMAM delivery in a non-emergency context allows children to stay in the programme until 16 weeks, unless early recovery is achieved. This time period is longer than the original Sphere length of stay indicator of 30-40 days (Sphere, 2011). This long period assigned to treatment in non-emergency situations may be because the frequency of attendance of CMAM sessions is likely to be lower in a non-emergency context compared to an emergency situation where there is often scarcity

of food for children. However, the average length of stay reported for children attending CMAM programmes in non-emergency context to recovery is between 40-50 days, which is shorter than the 16 weeks recommended (UNICEF, 12; Gebremedhin et al, 2013). In Ethiopia, the length of stay of children attending CMAM services to recover was 6.24 weeks - about 45 days (Gebremedhin et al., 2013). This rate is similar to the length of stay of the children to recovery reported in the Ghana programme (6.0 weeks or around 42 days). These results are comparable to length of stay of children treated with CMAM in emergency situations in Ethiopia, Malawi, Sudan and Niger (Sadler 2008; Cilberto et al., 2006; Defourny et al., 2009; Defourny et al., 2009; Collins and Saddler 2002; Taylor 2010). The average length of stay became shorter (5.6 weeks) within the Sphere stipulated standards when all children (dropouts inclusive) were included in the analysis. Drop out of the programme in Ghana was within the first 2.5 weeks of enrolment. This might have impacted on the overall length of stay of children in the analysis.

The rate of daily weight gain was likely to be higher if the children stayed in the programme. The overall daily weight achieved in the programme was 4.7g/kg/day. However, for those who achieved recovery at six weeks, the average rate of daily weight gain was about 1g/kg/day higher. However, this rate is slightly lower than the Sphere standard of >8g/kg/day (Sphere 2004 & 2011) but higher compared to the rate of weight gain reported elsewhere in Nepal (4.8g/kg/day), Kenya (5.6g/kg/day) and Pakistan (4.6g/kg/day) (UNICEF, 2012). In Ethiopia daily average weight gain reported was slightly higher (6.3g/kg/day) compared to what was found in Ghana, Nepal, Pakistan, and Kenya, as well as all the emergency programmes. The results agree with the conclusion that CMAM programmes may be effective in achieving nutritional recovery and reducing mortality, however their effectiveness in promoting

weight gain to acceptable levels remains questionable. However, Collins has argued that the rate of weight gain meeting the Sphere standard becomes less important in community-based management where children are recovering within their own home environment, with less risk of nosocomial infections (Collins 2005).

4.5.3 Post discharge outcome

The degree of relapse rate will be high if children who recover from SAM do not continue to receive adequate nutrients required for them to maintain their body weight after they are discharged from nutritional therapy programmes. Low relapse rates (<10%) have been reported in previous studies that followed children up to 3 months post-discharge. In Kenya, a 6.1% relapse rate was reported (UNICEF 2012), 9% and 3% have also been reported in Ethiopia and Malawi respectively (Collins 2005). The rates measured in Kenya and Ethiopia are higher than what is being reported in Ghana (3.4%), although the relapse rate in Ghana is also slightly higher than what was reported in Nepal's operational evaluation of CMAM programmes (1.2%)(UNICEF, 2012; Gebremedhin et al., 2013),. In Nepal the follow-up period was not specified for us to know whether longer or short duration of follow up was carried out. Relapse rate is likely to be higher when children are followed for a longer period than when the follow-up is < 6 months (Manary et al., 2007). The lower relapse rate reported in this study however could be because most children were likely to be referred back to the programme monthly during the routine growth monitoring sessions. Health workers did not keep records of this for analysis in order to determine the actually relapse rate over the 12 months period. The rate reported in this study is likely to be children who had relapsed a few weeks or months but could not re-join the programme before the assessment was carried out. This may not be a true reflection of the proportion of children who relapsed after

discharge over the 12 months. On the other hand, this lower relapse rate reported could also be an indication that the educational component of the CMAM programme has been effective in promoting good nutritional practices at home. The caregivers might have implemented the nutritional messages on infant and young children feeding practices delivered by health workers during the programme and the monthly growth monitoring sessions.

4.5.4 Determinants of programme primary and secondary outcomes

The retrospective analysis of the programme data to identify the determinants of outcomes of the CMAM delivery in Ghana was limited to only socio-demographic, clinical and anthropometric variables which were the only data collected by health workers. Contextual factors such as social and geographical barriers to service utilisation were not investigated. Results of the data analyses show that mortality was associated with illness such as malaria, fever and diarrhoea diagnosed at baseline. Children who were diagnosed with the listed co-morbidities were less likely to survive, compared to those who were admitted without any illness or other illnesses other than malaria, fever and diarrhoea ($p<0.001$). The daily rate of weight gain and recovery rate were also likely to be slower among children enrolled with co-morbidity compared to those enrolled without co-morbidity. This was expected because children with SAM and diagnosed with co-morbidity are likely to experience poor appetite to eat the therapeutic diet provided, which could lead to poor nutrient intake or poor absorption of essential nutrients (Macallan 2005). Poor nutrient intake will subsequently affect weight gain and recovery, which then puts children at increased risk of mortality (Golden, 2000).

Besides co-morbidity, the study demonstrates that children who stayed in the programme < 3 weeks were less likely to recover. As stated before, the average time taken to default in the programme was 2.5 weeks. When caregivers are encouraged to stay longer than this period, recovery rate increased to and could exceed the Sphere stipulated rate. This was reflected in the higher recovery rate (98%) showed in the analysis excluding children who defaulted. This result is consistent with past studies that investigated co-morbidities as predictors of recovery, weight gain and mortality (Gebremedhin et al., 2013; Sadler 2008; Sadler and Collins 2002). Gebremedhin et al (2013) reported higher default rate of children who were withdrawn early in the programme with lower weight and MUAC, and associated this with poor programme results. In their study, up to 14% of children attending CMAM programmes withdrew from the programme and never returned. Earlier clinical trials to test efficacy of RUTF also associated lower recovery achieved with higher default (Gaboulaud et al., 2005). Results published by UNICEF show that default rates in Pakistan and Nepal were lower than 10%, which probably explained the higher recovery rate (>80%) reported (UNICEF, 2012).

Children were more likely to stay longer than 6 weeks if they were diagnosed with malaria, diarrhoea and fever, although fever and vomiting were no longer present after 2 weeks upon enrolment. The reason for this has been discussed before, as poor appetite, leading to slow intake of adequate nutrients. Socio-demographic variables such as 'mother alive' predicted length of stay in the programme. The findings suggest that children whose mothers were not alive were more likely to stay longer in the programme than children whose mothers were alive. The possible explanation to this observation is that children would receive better care from their own mothers when they are sick than they would normally receive from other foster caregivers.

Therefore if the mothers believed in the therapeutic diet provided to treat their children, they were more likely to persuade or encourage their children to eat the RUTF compared with the other caregivers. A mother would also adhere to the prescribed treatment given to the child more than a foster caregiver because it is the wish of every mother to see their child recover from SAM to relieve them of care burden, and they fact they also love their children. Therefore nutrient intake was likely to be higher, through adequate dietary intake, among the children whose mothers were alive, and hence will result in rapid nutritional recovery and shorter length of stay in the programme.

Finally, the results of the study suggested that children admitted with smaller MUAC were more likely to stay longer than if they were enrolled with a larger MUAC. This result compares well with recent reports published by Dale et al (2013), Goossen et al. (2013) and Gebremedhin et al (2013). In clinical practice, smaller MUAC <11cm indicates severe body wasting, which makes children vulnerable to increased risk of co-morbidity. Such children would require a longer time period to achieve recovery because of poor appetite to eat well within a shorter time period, compared with children who are less severely malnourished and are receiving similar treatment (Goossen et al. 2013).

4.6 Conclusion and further research

The quantitative results demonstrate that community-based management of children can also achieved positive outcomes in non-emergency contexts, where CMAM services are integrated within routine health care services. Mortality rate reported in the programme was compatible to the international Sphere standards and others earlier studies, whilst recovery rate achieved shows a modest success compared to

the Sphere standards. However, default rate reported was significantly higher compared to the Sphere standards. Further analysis of the quantitative data to find associations between outcomes achieved and the predictor variables show that co-morbidities and baseline nutritional status were significantly associated with recovery and mortality but were not associated with default. It may be that, the implementation process or the context in which the programme was implemented might have influenced the dropping out of the children. Therefore there is the need for further research using more in-depth qualitative methods to explore what contextual factors that might have influenced children to default from the programme.

Furthermore, the results also suggest that completion in the programme was high, and that children who completed were more likely to achieve the highest rate of recovery above the Sphere the Sphere minimum standards, compared to those who were non regular attendants. However, there were insufficient variables in the quantitative data to establish the facilitators of attendance and completion of the programme. Therefore further in-depth qualitative research is needed to investigate what factors contributed to this.

 The next chapter is the qualitative component that was designed as a follow-up to investigate the gaps identified, so as to have a holistic picture of what contextual factors influenced the programme outcomes in Ghana.

CHAPTER FIVE: EVALUATION OF WHY AND HOW THE CMAM PROGRAMME WORK

5.0 Introduction

This aspect of the study adopted a qualitative approach to understand why and how the CMAM programme implemented in Ghana has worked. The key question addressed was: "what factors influences the CMAM programme to work in Ghana". This evaluation was necessary because the quantitative analysis of routinely collected data was insufficient to be able to understand how contextual factors might have played a part in influencing what has worked. The evaluation also provides an opportunity to undertake a realist analysis of the programme theory to determine what has worked and how. Qualitative study is best suited in this type of investigation because of its flexibility to use a semi-structure interviews, focus groups or observation methods to collect in-depth data (Richie and Lewis, 2003). In section 5.1, the qualitative methods that were utilised to collect and analyse data to address the questions are described.

5.1 Qualitative data collection methods

Multiple qualitative data collection techniques were used to collect data for from programme stakeholders and within the context. These were documentary review, semi-structured interviews, focus groups and observations. The four methods are widely considered appropriate for generating in-depth qualitative data from research participants (Holloway, 2005; Richie and Lewis, 2003). Gill and colleagues argue that combining semi-structured interviews, focus groups with observation of participants' actions, behaviours and context can help to generate in-depth data

(Morgan 1996; Gill et al., 2008). In this study, combining these multiple methods worked well to generate useful information to understand how and why the programme outcomes were achieved.

5.1.1 Semi-structured interviews

The two approaches to interviewing in qualitative study to collect in-depth data from research participants are semi-structured and unstructured interviews (Silverman, 2004; Bryman, 2008; Richie and Lewis, 2007; Mason, 2002). Unstructured interviews approach lacks structure to govern or direct discussion towards addressing specific issues (Manson, 2002; Burgess, 1994). According to Gill et al (2008) unstructured interviews are most appropriate when nothing is entirely known about the subject being addressed, but not when interviews are based on specific research questions. As a result the approach was not suitable for use in this study as data collection focused on caregivers' motivations to attend or not attend the programme, as well their views and perceptions about the programme process and the condition treated. The approach was also used to interview community health volunteers to explore their experiences in taking part in the programme delivery at the community level and what in their opinion contributed to the programme success or failure.

The semi-structured interviewing approach was considered more relevant because it allowed the researcher to use an interview guide to plan and direct the interviews (Manson, 2002). This approach also allowed the researcher to keep the participants more focused on the key issues during the discussion, so that they did not deviate to other issues that were irrelevant to addressing the research issues (Silverman, 2006). Furthermore, adopting a semi-structured interview approach accorded both

researcher and participants the opportunity to enter into an interactional exchange of dialogue to generate in-depth views and opinions (Mason, 2002).

5.1.2 Focus groups

Morgan (1996) recommends the use of focus group interviews, which the author described as fastest means of generating large amount of data within a short time period. The approach is particularly useful when financial resources are limited or there is less amount of time available to the researcher to reach data saturation with interviewing individuals. Unlike the individual interviews where participants were interviewed in turns, focus group allows groups of 8-12 people to be interviewed at one time (Kitzinger, 1995; Kitzinger in Mays and Pope, 2006).

Using focus group in this study was useful in stimulating debate among the discussants on the issues explored. Different issues were explored in three separate focus groups sessions. One focus group was held with health workers to explore their experiences regarding the programme implementation, as well as understand implementation constraints and facilitators. The other two focus groups were held with gender specific community members (men and women groups) to explore similar issues of awareness about malnutrition and the programme The information generated from the two group discussions was used to evaluate whether the sensitisation process influenced their awareness and participation in the services delivered.

Furthermore, throughout the field work, conversations were also held alongside direct observations of proceedings within the context with programme managers as well as other stakeholders (implementation partners) to gain a broader understanding

of what issues needed to be addressed to improve the programme effectiveness and sustainability within the local context.

5.1.3 Sampling of participants

The selection of participants for both the individual and focus groups interviews was made using maximum variation purposeful sampling strategy. This strategy is used when researchers want to understand how an intervention is seen and understood among different people involved directly or indirectly in its implementation (Marshall, 1996). The aim is to maximise the different responses from the different stakeholders who are engaged in the programme in order to understand their own perspective about the delivery and outcomes. Therefore the researcher selects only small number of participants that maximize the diversity relevant to the research question. This diversity usually includes people with good knowledge and in-depth understanding of the programme, in order to be able to provide rich information required to address a research question (Bryman, 2008; Bryman, 2008; Patton, 2002). They could therefore be selected based on their experience of participation in an event, personal characteristics or on the basis of their behaviour, attitudes and beliefs about the issues (Draper and Swift 2010). In the current study, participants were selected on the basis of their knowledge and experience of taking part directly or indirectly in the programme.

Individual interview participants (caregivers and key informants - programme staff) were sampled from 9 communities selected randomly from the 3 pilot districts. Focus group participants (men and women) were sampled from communities where health workers, as well as review of monitoring reports identified as places with high dropouts of children receiving treatment. Caregivers were subdivided into two

groups, and a sample drawn from each sub-group using a quota sampling technique. These two groups consisted of caregivers who regularly attended the programme, and those who did not attend regularly or had withdrawn their children from the programme.

5.1.3.1 "Appropriate" sample recruited for interviews and focus groups

Unlike quantitative sampling techniques where clear statistical formulas exist that can be used to determine what sample size is needed to carry out a particular quantitative study, qualitative sampling methods have no such criteria for estimating sample size. Whereas some researchers are of the view that, for semi-structured interviews one or more people can be selected (Bowling and Ebrahim, 2009) others maintained that participants' selection depends on the research aim, the time frame of the study and the resources available (Mays and Pope, 2006). Morgan (1996) emphases on data saturation, indicating that information richness should remain the underlying factor underpinning the researcher's decision of the number of participants needed.

For focus groups sample, Morgan (1992) argues that smaller group sizes give each participant more time to exhaust their views and/or experiences on the topics under discussion. The author argues that large focus groups work better with neutral topics, whilst smaller numbers are better for familiar topics. According to Bowling and Ebrahim (2009), average focus group size should range between 6 and 8 members, as with more than 8 participants it can be difficult to manage the group and ensure that all group members have the opportunity to participate.

In order to maximise individual responses and to reflect on the views of each stakeholder group represented in this study, an overall sample of 40 participants was

recruited for the study (Figure 5.1). Drawing on my community development work experience in Ghana, it is obvious that women in rural households are more likely to remain silent when they are mixed with men to talk, even if they are knowledgeable about the subject. Therefore the two separate sex focus groups interviews (men and women) were held deliberately for the grandparents, in order to allow women to have greater opportunity to freely express themselves in their group without intimidation from or domination by the men during the discussion. Morgan (1996) supports this decision and has argued that discussion may flow more smoothly in homogenous focus groups than in mixed focus groups with regards to sex. Table 5.1 summarises the sample recruited as well as participants' background.

Table 5.1: Distribution of study participants

Data collection steps	Date	Study participants	Sample	Purpose
Semi-structured interviews	(April – April 2011)	Caregivers[8]	16	• To gain an insight into caregivers experience and views about the programme • To identify programme delivery challenges/constraints
Interaction with programme managers	(May – August, 2011)	Programme coordinators	3	• Explore if any changes made to original programme delivery plan
Interaction with programme partners	March –July, 2011	UNICEF	2	• Gain an understanding of their influence on the programme implementation
Focus groups (1)	July, 2011	Community health workers	7	• Explore views about barriers and facilitators of service delivery
Focus groups (2)	August 2011	Grandparents[9]	12	• Explore knowledge/ awareness, perceptions about malnutrition and the CMAM programme.
Participant observation	March –August 2011	all stakeholders	15 communities	• Understand the implementation context, take part in programme delivery to understand the delivery, context, attitudes and behaviour of beneficiaries and service providers to confirm information gathered from the interviews
Document review	March –July, 2011	N/A	20	• Understand programme protocol, policy, and implementation plans

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[8] caregivers interviewed were only women. In the Ghanaian contest, women are the caretakers of children with little support from men
[9] Grandparents interviewed included both men and women.

5.1.4 The data collection process – interviewing of participants

Question guides (see appendix VI and VII) were developed and used to direct the interviews. The guides created a certain amount of order in the way the topics were approached during each interview and focus group discussion, although this order was not strictly followed during the interviewing and focus groups because of the flexible advantage of semi-structured and focus groups interviews (Richie and Lewis, 2003). The individual interview guide covered issues related to the individual views about programme and delivery process, as well as barriers to utilisation. The focus groups interview guides addressed the issues related to community understanding about malnutrition in children, the programme implemented to address the problem and community members influence on utilisation.

The use of the focus group encouraged debate among the participants, and they were able to challenge each other's point of view on issues raised, which would have been impossible if individual interviews were used (Kitzinger, 1995). The method also helped to stimulate deeper thinking among the participants around the subject, through the exchanges of idea during the discussion (Bassett, 2004).

Closed generic questions were asked at the start to create a relaxing atmosphere for interviewees and to build their confidence and interest to participate. These were followed by open-ended questions. The questioning allowed some flexibility for participants to freely articulate their views on issues discussed (Gill et al., 2008). Each interview was conducted at a quiet location, free from distraction, and the location was determined by the interviewee. Allowing the interviewees to choose a location where they preferred to be interviewed made them feel more relaxed and safe (Bowling and Ebrahim, 2009; Bassett, 2004). The researcher ensured that

leading and sensitive questions that would put interviewees off from responding to the questions were not asked, especially with the beneficiaries (Holloway, 2005). Thus, very simple easy to understand language was used throughout the interviewing process.

All interviews and focus groups were conducted face-to-face by the researcher in English with English speakers and in local languages (*Kussal and Frafra*) with native speakers. Interviews conducted in local language were translated into English by a trained translator.

5.1.5 Data capture

All the interviews, except the key informant interviews were tape recorded using an audio-recording device. According to Mays and Pope (2001) recording of interviews has advantage over writing notes, although the authors also acknowledge that in some circumstances it is better to write notes than to rely on recording alone. They also noted that with only the audio recording the researcher may lose the information if something went wrong during the recording or when the tape develops technical fault in the process. In addition to the tape recordings, the researcher kept a diary and wrote notes, at every key event, on actions and inactions of people during meetings, training sessions, home visits.

5.1.6 Participant observation

During the time of data collection implementation of the programme was still ongoing. Therefore the researcher also had the opportunity to take part in the process to observe daily activities to understand how the programme was delivered. Being part of the programme and observing the implementation process was also useful to gain more insight into individuals' actions, behaviours and attitudes towards the

programme that might have impacted on the outcomes (Draper and Swift, 2010). Furthermore, the issues observed complemented previous insights the researcher had about the programme during the initial design whilst working with UNICEF in 2007.

I also had the opportunity to participate in the programme review and planning processes, to observe how decisions were made and the impact of these on programme implementation and outcomes. At the implementation site I observed how daily programme activities were carried out and assisted health staff to carry out some of those activities such as screening of children to identify SAM. On reflection, this was useful for understanding how the quantitative data were collected and the reliability of the data.

Furthermore, I observed how health staff delivered health and nutrition behaviour change education messages to carers and parents to encourage them to participate. Through this I was able to assess the strengths and weaknesses of the messages and the delivery approach. The overall observation process left me with an understanding of why beneficiaries or community members were participating or not participating in the services. A checklist was developed (with questions) and used to guide observations (see appendix VII).

5.1.7 Document review

A documentary review was undertaken of programme records, including field and training reports, the programme implementation protocol and published materials. Because of my earlier role at UNICEF and links with the Ghana Health Services, on arrival in the field, it was much easier for me to be integrated into the programme implementation team and to take part in the implementation process. This allowed me access to relevant reports, interactions with the programme staff, as well as

gained easy access to field sites to interview the participants. Documents were selected based on their relevance to provide information regarding the implementation process, such as monitoring and training reports, programme review reports and presentation. Overall, 20 such documents were reviewed.

Table 5.2 summaries the type and quantity of documents reviewed.

Type of documents	Number
Programme protocol/implementation guidelines	1
Programme implementation plan	1
Feasibility study report	1
Report on training of regional coordinators	1
Report on training o community health workers (Officers)	3
Report of training of community health volunteers	3
Regional level review of progress report	1
District level review of progress reports	3
Progress presentation slides	4
Community visits and sensitisation reports	1
Monitoring reports	1
Total reviewed	**20**

5.1.8 Positionality, reflexivity and validity of the qualitative data

Positionality and reflexivity are two crucial concepts that need to be understood in order to understand the subjectivity of researchers. Barton and Louise (2002) "refer to Positionality as a term use to describe how people are defined, not in terms of fixed identities, but by their locations within shifting networks of relationship, which

can be analysed and changed." They also refer to it as the "knower's specific position in any context as defined by race, class, and other social significant dimension" (p.2). Reflexivity on the other hand is the process of looking both inward and outward with regards to the positionality of the researcher and the research process (Shaw and Gould, 2001). Therefore, the positionality and reflexivity of a researcher need to be recognised, in the first instance, as an important factor that could potentially influence the trustworthiness of qualitative research findings.   In the Ghanaian context where patriarchy and segregation by gender are the norms, gender is particular important and need to be considered in the research data collection process, since cultural and social norms elicit certain expectation from researchers and participants in terms of their gender (Vilkko et al., 2003).

Returning to Ghana to conduct fieldwork posed several dilemmas for me. What constitute the field versus home is a problematic distinction (Sultana, 2007), as going back to Ghana to conduct the fieldwork was by no means returning home. Family ties made me feel very familiar with the setting and a few faces were also known to me and vice-versa. Initially, I was unconscious about my engendered researcher's position, especially with female participants. Riesman (1994) indicate that being a man and planning an interview involving males may encourage them to be more open as they may assume shared assumptions and experiences. However, the opposite may happen for interview involving the opposite sex (a man interviewing women). This is derived mainly from cultural defined gender roles for women and men (Seikal, 1998). Oakley (1981) wrote that, being the same gender allows both the interviewer and the interviewee to share their common experience. Finch (1984) agrees that sharing the same gender reduces the social distance between the interviewer and the interviewee, as well as it facilitates free conversation and might

contribute to validity and reliability of qualitative findings. But Cotterill (1992) discovered in her study that sharing the same gender does not always leads to freely expression or open responses between the interviewer and interviewee (particular with women).

In the current research, the service of a female interviewer was employed to ensure gender balance. She assisted in translating responses from local language to English and vice-versa. The female interviewer was carefully chosen so as not to introduce response bias. For instance, it was deliberate decision not to use a nurse, as the presence of a nurse could influence the way participants (benefiting from the services of nurses) would response to the interviews questions. Therefore, a non-health female interviewer was chosen to assist the researcher to interview female participants.

Besides my gender, I was also worried that my previous knowledge and experience of the context and some key participants (e.g. project staff) could bias the study findings. However, reading from Strauss and Cobin (1990) who argues that being directly involves in the phenomenon under investigation, or having prior experience of the subject being investigated is an asset rather than a problem, I was relieved of my fears. I was also fully aware of my class and educational privilege. As such I was simultaneously an insider, outsider, both and neither (Gilbert, 1994). Mays (1993) argue that being an insider is not something that can be achieved as it is something you either are or not. Others have argued that having knowledge and understanding the research participants helps facilitate intimacy and closeness with participants (Long and Johnson, 2000). Arguably, familiarity offsets disadvantage of single interviews as rapport can developed quickly, which is conducive to detail and

meaningful discussion. Lincoln and Guba (1985) suggest that prior experience of the research context can help make sense of the data in the early stages of the analysis.

5.1.9 Dealing with Gatekeepers

Before the fieldwork, several discussions were held between the researcher and the key gate keepers of the CMAM programme to gain their support to carry out the study. Meetings were held with GHS Director of Nutrition, Mrs Wilhelmina Okwabi, the National Coordinator of the CMAM programme, Mr Michael Neequaye, the Regional Director of Health Services of the Upper East region, Dr Awoornor Williams and the Regional Nutrition Officer, Benjamin Aggrey. The support of UNICEF, the financial stakeholders of the programme was also solicited for their permission to carry out the study. All these 'gatekeepers' were very supportive and contributed to the research process. Their inputs were incorporated into the initial research protocol before seeking ethical approval to conduct the research with the Ghana Health Service. The field work was conducted between March and September, 2011.

5.1.10 Local supervision of the field work process

Dr Seth Adu-Afarwuah, who is based in the Food Science and Nutrition Department of the University of Ghana, supervised the field work process in Ghana. We reviewed the data collection process before and after the field. He was also the local contact person in case of an emergency. In addition, the researcher reported the process regularly by email to his UK supervisors.

5.2 Ethical issues addressed in the qualitative data collection

5.2.1 Informed consent

Prior to starting the field work to collect data, I was aware of the ethical implications for interviewing participants regarding their views on a programme that they are either participating or benefiting from. According to Bassett (2004), this may leave participants in a vulnerable position after the interviews. Informed consent was sought to address this issue, asking potential participants to agree to participate in the research, by either confirming their agreement verbally or signing a written consent form (Mason 2002). In the Ghanaian context, community members are more comfortable giving verbal consent than written, but people with higher education are likely to opt for either of the two (GHS, 2003). Therefore both approaches were adopted in this research, so as to allow participants to choose which type of consent they were comfortable with.

5.2.2 Issues of distress and harm

The research was graded low risk by the Research Ethics Committee of the University of Sheffield and the GHS-ERC for study involving human subjects. Therefore participants were assured that they were unlikely to be harmed or become distressed if they participated in the research. However, issues related to physical and psychological distress to participants were considered and duly addressed prior to data collection. For instance, participants were assured before agreeing to participate that their participation was voluntary, and that if any participants felt uncomfortable or distressed at any point before or during the research process they could opt out without assigning reasons. They were also assured that in the unlikely event that any participant felt distressed after participating, special provisions would be made to put them in contact with counsellors within the GHS.

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5.2.3 Data privacy and confidentiality

Participants were assured that information gathered would remain anonymous and confidential to the research team only, and would not be passed on to any other persons. They were assured before, during and after the interview that their responses would be kept, safe and confidential in compliance with data protection laws. They were further assured that the question guides and information sheets used for the research would all be kept safe, so as to prevent other people from having access. Furthermore it was explained that no participant's identification would be stored alongside their responses, but instead would be stored in a separate locked cabinet. Participants were assured that electronic copies generated from the data would be protected by password and that voices of participants would be transcribed and safely stored in a password protected filed on a password protected computer. On completion of the thesis, all documents enabling the future identification of participants in this study will be destroyed, and no names will be mentioned in any publications resulting from this research.

5.2.4 Recording of voices, observational data and photographs

Permission to audio-record interviews, take photographs and make notes during field observations was first sought from family heads and participants themselves. They were assured before and after the recording that the recordings are only meant to allow the researcher to obtain the best understanding of what they said during the interview, and that the audio recording would be typed up and used for analysis. Participants were informed that their name, if mentioned in the audio-recording, would be replaced by code during the analysis of the interview record and that all information in the interview transcript would be anonymised. They were also told that following completion of thesis all audio recordings would be destroyed.

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5.2.5 Safety issues

The safety of me as the researcher and those who assisted me in the field was paramount. From my own experience living and working in rural communities in Northern Ghana, I thought a safety issue could arise if community members felt they were not being respected by the research team. This could happen if the researcher had limited or no knowledge of the cultural beliefs and practices of the people of the study area. Having grown up in the area, I felt that I had good understanding of the customs and traditions of the people, minimising personal safety issues in this respect. However, in compliance with research ethics these issues were prioritised and addressed. For instance, traditional protocols[10] such as the proper way to enter into the community were acknowledged and procedure followed.

5.3 Data analysis

Preliminary data analysis began from the field, i.e., during data collection the researcher listened to the audio recordings of each interviews, to understand the issues discussed. This initial process guided further and more focused data collection (Luff and Lacey, 2009). This process also helped in the refinement of the questioning and approach to subsequent interviews (Pope, 2000). Pope acknowledges that this sequential approach to data analysis is useful because it prompts the researcher on what to look out for, outside the interviews.

A more detailed analysis of the data was carried out after the quantitative data analyses were completed. The framework analytical approach, based on the programme logic model, was considered appropriate at this stage to analyse the data.

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[10] Traditional protocol for community entry requires the researcher to first visit the chief palace to discuss their research. To be able to see the chief, the research team would have to identify one of the chief's elders to leads them to the chief house. *Colanut* is requiring when visiting a chief house (personal experience).

The framework approach was developed by qualitative researchers in the UK, as a suitable method for managing and analysing qualitative policy type research data (Richie and Spencer, 1994). The method is similar to thematic analysis where the analytical process takes the form of an 'iterative inductive' process (Richie and Spencer, 1994). However, unlike thematic analysis, the framework method provides systematic and flexible stages of the analysis, allowing readers to have a clear understanding of how the results have developed from the data, stage by stage (Luff and Lacey 2009). The approach is particularly useful when the research questions are clearly defined, with a pre-defined study participant selected on purpose (Luff and Lacey, 2009). Furthermore a framework approach is most suited where there are *a priori* issues that need to be explicitly addressed from a reductive, rather than deductive process (Pope, Ziebland and Mays, 2006; Hope et al., 2000). This is applicable in this research where the issues investigated were based on how the implementation process of the programme influenced the programme outcome, as well as implementation constraints.

The analysis process

Individual interviews and focus groups were first transcribed verbatim before analysing the data manually. Nvivo software, a qualitative data analysis tool was only used to organised and manage the data for analysis. The five stages of framework analysis described by Richie and Lewis (2003) were followed in analysing the data. The stages are familiarisation, identification of a thematic framework, indexing or assigning codes, charting (rearranging the data according to themes), and mapping and interpretation of the data. Details of how these steps were applied are described below:

Stage 1: Familiarisation

The interview transcripts and observations notes were printed and read. The transcripts were crossed checked for errors and to gain a better picture of the data pattern by listening to the tape recordings a number of times. During this process, the researcher systematically summarised each paragraph in the margins of each transcript, whilst noting details of the keys issues on a separate sheet of paper using the participants own words. This exercise was useful because it helped the researcher to develop an overview of the data.

Stage 2: Identification of a thematic framework

The *a priori* issues outlined in the evaluation framework (figure 3.2), the issues identified in quantitative data, as well as the key concepts that emerged from the interview transcripts and field notes were used to guide the development of a thematic framework. The initials ideas generated during the familiarisation stage were coded by looking at data patterns (Pope et al., 2006). Similarities and differences observed in these patterns were grouped together accordingly to create categories, which were subsequently used to develop themes that were relevant to understand how the programme was implemented and how outcomes were achieved.

Stage 3: Indexing of the data

The transcripts were indexed using codes from the thematic framework. This process was useful for identifying specific pieces of the data which corresponded to the different themes. Complex relationships or contradictions which emerged from the transcripts were also identified at this stage. Text which was not relevant to the research questions was left out at this stage of the coding process. New codes on the other hand were developed if any portions of the transcript, which were found to be

relevant to the research question, did not fit in the framework. These codes were integrated into the framework and used in coding the rest of the interview transcripts. When coding was completed the framework was re-examined to remove unassigned codes and to combine duplicate codes. The modified framework was used at this stage to recode the transcripts one more time. This exercise was useful to make sure that the final codes were appropriately and consistently applied to all the transcripts.

Stage 4: Charting

After indexing was completed, the next important stage of framework process was to make sense of the data, in order to find explanations of factors that influenced the programme outcomes, such as reasons for dropouts. Charting involves re-arranging the data in appropriate parts of the thematic framework (Pope, Ziebland and Mays, 2006). During this process, the data were taken from their original context and placed at appropriate sections of the various themes (Richie and Spencer, 1994). Rather than create charts the data were sorted according to the thematic framework, using the cut and paste function (in word possessor) to move relevant data to match with appropriate themes (Hewitt et al., 2013).

Stage 5: Data mapping and interpretation

Finally, the key features of the data were brought together for interpretation. According to Richie and Spencer (1994), this is the stage where the researcher decides whether they want to define concepts, map the range and nature of phenomena, create typologies, find associations with the data or provide explanations and develop strategies. Using the theme and the key data placed under each themes, the researcher constantly compared and contrasted the views of participants with the aim to develop an explanatory model to understand how the CMAM programme

outcomes were achieved. Therefore, the researcher focused on identifying differences/similarities in the patterns of reasons given by participants.

To add meaning to the interpretation of the data and for users to understand the conclusions drawn from the findings, I picked up some direct quotes from participants own words, and presented them in the findings sections where necessary. Quotes were edited to make them brief and easy to understand. Thus, they included only highlights of the main points I wanted to make to support the interpretation.

5.4 RESULTS

This section presents the results of the evaluation of why and how the CMAM programme has worked in Ghana to address severe acute malnutrition in children. The results presented here, are used for us to understand contextual factors that potentially influenced the programme delivery and outcomes. In section 5.4.1, the programme process (implementation of theory of change) is described to offer an understanding of how the implementation process might have influenced the results. Section 5.4.2 discusses the contextual factors (facilitators and barriers) that influenced the programme delivery and outcomes.

5.4.1 Programme implementation: what influenced impact?

In figure 1.3 (chapter 1), the programme's logic model outlined the programme activities that were expected to be carried out and the outcomes that were expected to be achieved. The theory of change actions are summarised as follows:

- when capacities of health workers are strengthened on the CMAM approach, better services would be delivered at the community level to achieve positive results,

- raising the awareness of community members through sensitisation about malnutrition as a condition that can be treated with RUTF, has the potential to increase uptake and attendance of the CMAM service,

- Community members will enrol their children to attend the programme, if screening services were conducted within local communities' setting. Also, awareness about the programme and malnutrition will further influence high uptake

- Children and their caregivers will continue to use the service until discharge if regular home visits and counselling services are conducted.

The activities that were planned, based on the above theoretical assumptions, are assessed and described below to understand what was achieved.

Programme theory of change 1: Knowledge of health workers and volunteers

Before the introduction of CMAM in Ghana, competency of health staff was based on the traditional case management of SAM in hospitals and nutrition rehabilitation centres. According to the interviews conducted with the programme managers, CMAM was not part of the curriculum of training health workers (nurses, doctors or allied health professionals). Hence, health workers had limited knowledge on the management of children with SAM using a CMAM approach. The aim was to train health workers and volunteers to enhance their knowledge and technical competence on nutritional management of SAM using a community-based approach.

The assessment results show that, the training was conducted with selected health workers and community-based volunteers, between 2008 and 2010. First, the National Coordinator of the programme attended international training programmes

organised on CMAM in Malawi and the USA in 2008. Second, Regional Nutrition Officers, referred in this document as "programme managers", were trained as trainer of trainers (TOTs) in a workshop organised by the National CMAM Coordinator with support from UNICEF and USAID. This training was held in Agona-Swedru in the Central region of Ghana. The programme managers then organised training at the districts and community levels to train Community Health Officers/ workers (CHOs) and the Community Health Volunteers (CHVs) who were drawn from the local communities to support the programme delivery. The CHOs received five days of training, covering key theories, concepts and practical demonstration on the steps involved in CMAM (outlined in Box 5.1), as well as counselling techniques using a behaviour change approach. The CHVs on the other hand received one day training on community mobilisation and case-finding techniques, as well as practical demonstration on how to use MUAC criteria to identify SAM.

Box 5.1: Key steps in community-based treatment of children with SAM (CMAM protocol, 2010)
1. Screening children for SAM
2. Admission criteria
3. Medical assessment and decision making for treatment
4. Referral to inpatient care
5. Medical treatment in outpatient care
6. Dietary treatment in outpatient care
7. Counselling, health, nutrition and hygiene education
8. Individual monitoring during follow-on visits at health facility
9. Follow-up home visits for children requiring special attention
10. Discharge criteria

Data from training reports showed that a total of 123 and 750 health and volunteers workers respectively from the Bolgatanga, Bawku West and Kassena-Nankana districts were trained between 2009 and 2010 to deliver the CMAM services.

Table: 5. 3. Health workers and volunteers trained between 2009 and 2010

Upper East Region	Total number of health Centres piloting CMAM	Category of staff trained	
		Health works	**Volunteers**
Bolgatanga	22	41	250
Bawku West	23	44	250
Kassena-Nankana	11	38	250
Regional total	56	123	750

From the focus group discussions held, health workers expressed satisfaction on the training content and delivery approach, and indicated that the process has re-oriented their initial thinking about management of malnutrition, as well as increased their level of understanding of the management of children with SAM using the community-based model. They added that, the approach adopted by the trainers (theory and practical demonstration) made it easier to understand the key concepts of the CMAM approach. Some of the health workers' comments regarding the training are presented below:

> *The CMAM approach is a very new concept to us. During the training we learnt so many things, especially the key steps to follow to provide treatment and care to a severely malnourished child. It was very useful and gave us an insight into the approach (CHO # 1).*

> *The training was useful, and the skill we acquired has enabled us to be able to counsel mothers on malnutrition and how to prevent it (CHO # 3)*

The volunteers also described the training as satisfactory and useful, adding that the training met their expectations, as well as increased their confidence to take part in the delivery process. They indicated that, they were able to use the MUAC tape to identify children with SAM, and also to apply the knowledge gained from the

training to engage and counsel parents of malnourished children to motivate them to enrol their children. Views expressed by three volunteers interviewed are as follows:

Because of the training we had, I am confident using the MUAC tap to screen the children for SAM (CHV, Male)

I'm able to take part in the education of people to understand the programme because of the knowledge I acquired. I can now screen children using the MUAC tape to enrol in the programme (CHV, Female).

I'm applying the theory I learnt from the training to mobilise my people to attend the programme. I go from house-to-house at least twice a month to talk to couples about the services provided, using persuasive language to encourage the mothers in particular (CHV, Female)

Conclusion: The perspectives of the health workers and volunteers suggest that the training was a success, and with the increased knowledge and confidence, they were able to develop key strategies to deliver the service to treat and care for children at community level.

Programme theory of change 2: Awareness of community members

The health workers reported that after the training, the communities selected to pilot the programme were mobilised to sensitise the community members to understand and take part in the programme. Evidence suggests that, high uptake of community interventions will depend largely on the degree of community members' awareness of a programme/intervention, besides the availability and accessibility (Guerrerro et al., 2013; Collins 2005). Increased awareness may also lead to acceptability of the programme by the community members. The sensitisation carried out involved dialoguing with community members about the problem being addressed

(malnutrition) and the availability of the services to address the problem using various strategies.

According to the health workers, community sensitisation included meetings and durbars held with men and women groups at each community level. The intention to conduct separate rather than mixed group meetings was to give women and men equal opportunity to contribute to the discussion on malnutrition or express their concerns or fears about the treatment using ready-to-use therapeutic foods. The health workers explained that, during the meetings, community members were informed about the available screening and treatment services that will be provided. The programme target population and eligibility criteria were also discussed. Other strategies adopted to increase awareness of the programme and the conditions treated were house-to-house campaign conducted by the volunteers. The health workers opined that the involvement of the community members and volunteers in the sensitisation, promoted high interests among them to participate in the programme.

> *The volunteers mobilised the local community members and took part in the sensitisation process as well, which has motivated the interest of the community members to take part (CHO, #2).*

The community volunteers were literate members of the communities who were selected by their leaders in collaboration with the health workers to represent them in the programme. Being literate means that, they could read and understand many issues about the programme in order to be able to convince other community members to take part. They were further trained to enhance their knowledge on the programme. This might have inspired community trust and subsequently increased their interest to take part in the programme activities. Previous studies conducted in Ghana to examine the contributions of health volunteers in child health interventions

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have demonstrated positive benefits, in terms of increased participation and effectiveness of such interventions to promote child survival (Pence et al., 2007). Furthermore, anecdotal evidence reported by health workers suggests that volunteers' involvement in community-based malaria intervention has promoted uptake of the service.

Community members' awareness and knowledge the causes of malnutrition and the programme were examined. Awareness among community members were universal, suggesting that they knew of the causes of malnutrition and availability of the treatment. According them, the sensitisation created their awareness of availability of RUTF to treat children with SAM. Majority of the community members were more enlightened about the importance of taking part in the programme and said.

> *I think the information they gave us about malnutrition was well delivered and accepted among the community members. We are now aware of what is causing our children to suffer this condition. It is important that people take part in it because it will help their children (Community Leader, 52 years)*

Health workers were of the view that the sensitisation has changed majority of the community members' perception about malnutrition. According to them, malnutrition has long been perceived by the elder members of the communities as a spiritual problem or linked to superstition. As a result, parents of malnourished children were believed to be the 'disobedient' members of the community. One health worker narrated her experience:

> *'Traditionally when a woman with a little baby is widowed, she is forbidden to take the baby out to the public before 40 days after her husband's death. She is also not supposed to engage in any sexual act until after the 40 days is*

over. Therefore women with malnourished children were perceived to be

disobedient to the gods and are punished (CHO #6).

During the discussion with the community members, they disclosed that such beliefs were now diminishing as a result of education and the increased awareness of what is causing malnutrition.

Such beliefs were held strongly during the days of our grandparents. These

days because of education people no longer think that way. If the belief is still

practiced then maybe among a few ethnic groups (Community elder, 48)

These view confirmed the health workers assertion that community members' negative perceptions were being change towards the causes of malnutrition.

Interviews with female child caregivers, aside the focus group held with the wider community members found that, they had better knowledge and understanding of the causes of malnutrition compared to the rest of the community members. However, this knowledge was not likely to be translated into practices at home to prevent the condition. Majority of them cited economic constraints as barriers to practising good child care and feeding practices for children to prevent malnutrition.

I know that when children eat good food more frequently they will not be thin,

but because I cannot afford to buy some of these foods I only give my child

what's available (Mother, 2 children).

She likes "tom-brown", but I don't have enough money to be buying it

always. The one I bought at the clinic is finished and her father won't give

any money to buy more (Mother, 3 children).

Almost all the caregivers interviewed were petty traders with very limited source of income. They indicated that, they would like to be able to give their children more nutritive meals because they know that it is needed for the children to grow well, yet their economic conditions was a barrier.

Conclusion: The sensitisations were successful according to the views expressed by health workers and volunteers. The evaluation results show that community members demonstrated increased awareness of the programme and the conditions treated as a result of the sensitisation. This was perceived as a potential factor promoting service utilisation.

Programme theory of change 3: Uptake of community screening services

Screening is an important component of the community based approach. It is conducted to identify children with SAM early to prevent development of severe complications (CMAM protocol). Under the traditional case management of SAM in hospitals, children were screened by a clinician at the health facility using the weight-for-height measurement and z-score calculation technique (WHO, 2013). Parents were required to travel to the health facility before their children could be screened. This process often resulted in community members refusing to present their children early for screening and treatment (Manary et al., 2006). With the CMAM approach, this problem is being addressed by allowing children to be screened within their own communities using a MUAC tape[11]. The assumption is that, if screening took place within children's own communities, parents will be willing to participate. This will increase coverage of screening and identifying children who

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[11] A colour-coded tape is used. It has three colours, red, green and yellow. If the reading of the measurements falls in red, the child is diagnosed with SAM (CMAM protocol., 2010)

need treatment early to avoid development of complications. The criteria for screening children to enrol in the CMAM programme (CMAM protocol, 2010) are outlined as follows:

- All children under age five years should be routinely screened for SAM

- The MUAC tape should be used by a trained health worker or volunteer to measure the mid upper arm circumference of the child

- A clinical check should also be conducted on the child to identify bilateral pitting oedema

- Children under age five years with visible wasting are not measured using MUAC but referred to the health facility where they are further evaluated.

- After the screen, children must be checked to identify medical problems or confirm presence or absence of oedema[12].

During the focus group and interviews, the health workers and the volunteers were asked about the screening process in order to gain a better idea of how and where it was conducted, as well as their views about the community members' participation. The outcome of this showed that, screening was conducted both at the community and facility levels. The trained volunteers screened children at the community level, whilst health workers carried out the screening mainly at the facility level. There was demonstrated evidence that both health workers and volunteers had understood the screening process. One volunteer described the process as follows:

We use the MUAC tape to measure the mid-upper left arm circumference of a

child who is above six month to determine whether they qualify to be on the

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[12] This is performed by pressing the thumbs for three seconds on the top side of both feet. If the indentation remains after removing the thumbs, the child is diagnosed with bilateral oedema (CMAM protocol., 2010)

programme or not. First, we use the tape to measure the length of the upper

arm to identify a midpoint of the arm. Then we wrap the tape around the arm

at the midpoint and read the value. If the midpoint falls within the red zone

we refer the child to the centre for validation. If we suspect that a child may

have oedema we do not measure, but we refer them to be evaluated by a

nurse (CHV, Male).

The volunteers reported that at each community, parents were asked to report at a particular location (agreed by every member) with their children to be screened. Parents were given the option to choose whether they wanted their children to be screened at the community/home or at the facility levels. According to the volunteers, screening was conducted twice every month at the community level, followed by a mop-up house-to-house follow-up screening which they conducted once a month.

Health workers on the other hand indicated that screening was carried out at the health facility setting usually during child welfare clinics and antenatal education sessions, but indicated that participation was not that encouraging.

There was no record available to compare coverage or uptake of the screening service, as well as measure what proportion of the children who had SAM enrolled in the treatment programme or refused to be enrolled. However, the volunteers insisted that enrolment was always high during each screening session at the community level. Such records were needed in order to understand the effectiveness of the community screening strategy to promote enrolment. Elsewhere in East Africa, Guerrerro et al. (2013) reported that 6.7% of children identified with SAM at the community level failed to enrol in treatment programme after they were identified during similar screening programmes.

When volunteers were asked why there were no such records, one of them said the following:

The form we use in capturing the data did not make room for that. May be you could talk to the managers to see if the form can be reviewed to include that section. We cannot do that unless they give us permission to do so. All what we have been asked to do is what we are doing (CHV-Female).

The volunteers indicated that all the children they identified with SAM were referred to the health facilities for validation and enrolment, but did not keep records of how many were referred and how many eventually got enrolled. At the health facilities, only information of children who enrolled was available.

The views of the community members were also sought in order to confirm what the service providers had said. The views expressed suggest that they were satisfied with the process and were more likely to take part. According to them conducting the screening at the community level was very convenient for people to attend, as oppose to if the screening had taking place exclusively at the health facility.

It is very convenient for many people to go to the assembly point to screen their children than if they were to walk all the way to the health centre (Mother, 2 children).

It is a good thing that they came here to screen the children because you will get to know whether you need to go to the health centre or not. Sometimes you can go there only for them to tell you your child is not qualified to be enrolled (Mother, 3 children).

Most women are busy during this period so if the screening is within a short walking distance, I belief everyone with a child will attend (Man, 46)

Conclusion: From the results presented, both service providers and users of the screening service perceived that the screening conducted at the community level had increased enrolment of children as opposed to the facility level screening. However this was not supported with data.

Programme theory 4: Counselling and home visits reduces barriers

In addition to the community sensitisation, counselling and home visits were planned to re-enforce the messages provided about malnutrition and the treatment. The home visits were further planned to motivate caregivers to attend the programme, as well as supervise the treatment at home to ensure compliance with the treatment guidelines. The guidelines recommend that counselling should be conducted at three contact points: at point of enrolment, during home visits, and at weekly review sessions conducted at the health facilities. According to the protocol, the health workers were expected to lead the counselling process at the health facility level, with the health volunteers providing supplementary counselling in between at the communities. According to the protocol, the recommendations for counselling include the following:

- Provide counselling on the treatment process including administration of RUTF and routine medication at home.
- At weekly sessions, provide individual counselling to caregivers on the progress of the children
- Emphasise on early signs of treatment, non-response and deterioration of nutritional status that requires immediate return to the health facility

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- Provide counselling on breastfeeding, complementary feeding, nutritional care for sick children, basic hygiene, health seeking behaviour and any other relevant topic as appropriate

- Provide, if there are more than one caregivers at one session, group health and nutrition education during the waiting time at the outpatient session

The specific key counselling messages recommended are outlined in box 5.2 below.

Box 5.2.
- RUTF is a food and medicine for every thin child only. It should not be shared.
- Sick children often do not like to eat. Give small, regular meals of RUTF and encourage the child to eat often (if possible eight meals per day). Your child should have at least ___2_____ packets per day
- RUTF is the only food sick/thin children need to recover during time in outpatient (however, breastfeeding should continue)
- For young children, continue to breastfeed regularly
- Always offer the child plenty of clean water to drink or breast milk while he/she is eating RUTF
- Wash the child's hands and face with soap before feeding if possible
- Keep food clean and covered
- Sick children get cold quickly. Always keep the child covered and warm
- When children get diarrhoea, never stop feeding. Continue to feed and (if applicable) breast milk.

The data generated from focus group discussions to evaluate this process show that although the health workers followed the protocol to provide the counselling, caregivers received counselling only at point of registration. After that, counselling was not prioritised and less frequently conducted by health workers. For instance, the health workers' response at the focus group discussions showed that during the weekly review sessions, counselling was less frequent and in some centres never

provided. According to them, workload and inadequate staff did not permit the frequency of counselling recommended to be carried out at the health facility. Inadequate staff and workload also impacted on the frequency of home visits conducted by the health workers to support the treatment at home. From the discussions, the only time home visits were prioritised was when caregivers failed to show up at the follow sessions for more than three consecutive times. Workload and staff as barriers to effective service delivery are discussed further under section 5.4.2.2.

However, majority of the caregivers interviewed expressed satisfaction at the level of support they received from the community volunteers. They indicated that the community volunteers regularly visited them to find out how their children were progressing with the treatment. According to them, that was enough motivation to stay on the programme.

> *Even when you're worried about your child's survival they will still encourage you really to motivate you to continue to give the treatment. They were very supportive and I thank them for that (Mother, 1 child).*

Conclusion: From the views expressed by the health workers, counselling was only partially achieved, but potentially promoted regular attendance in the programme. The sensitisation activities carried out before implementation, as well as follow up by volunteers might have influenced caregiver decisions to attend rather than the counselling conducted by health workers.

The next section presents a discussion of the factors that influenced the service process, delivery described above.

5.4.2 Contextual factors influencing impact

Contexts are defined as the circumstances within which the programme was implemented, and include organisations, socio-economic, cultural and policy/political conditions, but also the stakeholders involved (WHO, 2011). The contextual factors contributing to the CMAM programme delivery process, which has led to success and failure are categorised into organisational level factors, and socioeconomic barriers affecting attendance. The organisational level factors are further divided into the factors that facilitated the implementation of the programme activities (described earlier) and those factors that hindered the delivery process.

5.4.2.1 Organisational level factors: facilitators of success

The key factors that enabled the implementation of the programme plan of actions were identified as follows: involvement of civil society organisations, coordinated leadership and policy/strategic documents that enabled the integration of activities into existing health services. These are discussed in details below.

Involvement of civil society organisations

The contribution of some partner organisations in the planning and implementation of the CMAM process has enabled the successful delivery of the approach in Ghana. This study discovered that key civil society partners such as UNICEF, USAID, WHO and the World Food Programme (WFP) have played a significant role in the planning and implementation processes to pilot the CMAM in Ghana. Analysis of documents and interviews conducted indicate that the support provided by UNICEF and USAID through the FANTA-360 project and the WHO in the programme implementation range from technical to financial. The organisations provided technical support to develop the programme implementation guidelines and teaching

materials, as well as facilitated the training of health workers. Financial support was provided towards the procurement of supplies and logistics and some capacity strengthening of health staff, as documents reviewed shows that government budget could not support these. A review of the Ghana Health Service plan of work shows that the nutrition unit was allocated only 3.3% of the government overall health budget in 2010/2011. This amount covered both preventive as well as curative services aimed at improving the nutritional wellbeing of women and children in Ghana. In comparison with the amount allocated for other health activities, the figure was far lower than the amount allocated for malaria (12.2%) and HIV/AIDS interventions (4.5%). There was no separate budget for nutrition or CMAM activities at the operation level, neither was there a plan in place by government to absorb CMAM costs in the near future.

The Government therefore, relied on the civil society partners to raise funds to support the pilot implementation of the programme. Interviews with nutrition programme managers revealed that, UNICEF and USAID provided most of the logistics and supplies, as well as funding for the capacity building of programme staff.

> *UNICEF procured all logistics such as plumpy'nut, weighing scales and MUAC tapes. Even the teaching aids we used were donated by UNICEF and the USAID-FANTA360 project (Programme Coordinator, GHS)*

A report available at UNICEF indicated that, between 2010 and 2011, the organisation procured about 435,000 sachets of RUTF for distribution to caregivers to treat their children suffering from SAM in Ghana. Also at the time of this study

the WFP was rolling out strategies to provide supplementary feeding for children identified with moderate malnutrition. According to one of the programme managers:

> *The support provided by UNICEF and others, particularly the procurement of the plumpy'nut was the turning point for CMAM delivery in Ghana. I wonder how we would have managed to buy the plumpy'nut and the other supplies without the support of UNICEF. If these institutions withdraw their support [...], I just hope they don't* (*Programme managers, GHS)*

A cost effectiveness study carried out by Abdul-Malik et al (personal communication) has estimated that, on average, it cost about US$80 to treat one child with SAM in Ghana (including the cost of shipping and transportation of RUTF). With this high cost, the funds allocated by government to the Ghana Health Services towards nutrition interventions were barely sufficient for CMAM to be implemented without external support.

As the CMAM activities expand it would become more challenging for the government to meet the programme cost should these organisations withdraw. Interviews with UNICEF staff indicated that the organisation would continue to work closely with USAID and WHO to develop a consistent plan to leverage resources to support the scaling-up of SAM. However, a report from the USAID-FANTA project360 revealed that its funding to support health programmes was running out and the organisation was planning to end its activities in the country. The managers of the programme were therefore concerned that this would impact negatively on the scaling-up plan, as well as the future sustainability of the CMAM programme in

Ghana as UNICEF alone might not be able to take the full responsibility of mobilising the funds.

Coordinated leadership

The leadership structure put in place to coordinate the activities of CMAM within the Ghana Health Service was also perceived to contributing to success of the CMAM delivery in the Upper East region. Although health services delivery in the country is decentralised, which is a requirement for CMAM implementation (ENN, 2004), that is, each region is responsible for planning and coordination of the delivery of health services within its geographical coverage, this study found that the planning and implementation of CMAM was coordinated right from the national level through to the community operational level. At the national level, the Ghana Health Service has put in place a SAM Technical Committee to plan and coordinate resources mobilisation from development partners for the programme implementation. The committee, which is made up of representatives from the nutrition unit, the health policy, planning and monitoring and evaluation unit, as well as the partner organisations also provided technical leadership to the regional programme management team to implement the programme at the community level.

At the regional level, a similar coordination team exists, comprising of nutrition technical officers, clinical staff (nurses and doctors) as well as members of the district assembly. The regional team collaborates with the existing health management team at district and community level to monitor progress of the programme implementation. They also conduct quarterly and half yearly meetings to review progress, identify challenges and deliberate on local solutions to address some of the challenges. At each sub-district level there is a focal person who acts as a

liaison between CHOs and volunteers implementing the programme and the regional team. This existing management structure was viewed a facilitator for effective planning and implementation of the programme in the pilot districts.

Integration into policy and existing health services

The implementation of the programme was also made possible because of available protocols, policies and strategic documents that supported or enabled the treatment of SAM to be integrated into existing programmes. Although at the time of the study Ghana had no nutrition policy to support the implementation of CMAM, there was a national health policy which emphasised ensuring access to quality and affordable nutrition services to all, especially the integration of nutrition treatment programmes into the national health system. Furthermore, the Ghana Health Service had approved interim guidelines on community based management of children with SAM in 2009. The guidance paved the way for the development of the CMAM protocol, and provided job aids for health workers spelling out how CMAM should be integrated into the existing annual health plan of work (POW). These documents were being used as a guide in the implementation of the programme, e.g. for identification, diagnosis and treatment of the children with SAM. The guidelines cover approaches to organising community outreach programmes, identification of children and provision of community-based care.

Furthermore, the existence of child nutrition improvement programmes, such as the National Infant and Young Child feeding programme and the Integrated Management of Childhood Illnesses (IMCI) programme also provided an opportunity for mainstreaming of CMAM. These programmes already have an excellent coverage of children < 5 years for community-based treatment of childhood illness. The IMCI, for instance, is one strategy that was introduced by the government prior to CMAM

in 2005 to improve child survival. The aim is to improve the management of diseases causing mortality in children, such as malaria and diarrhoeal diseases. The prevention and management of malnutrition in children is targeted by the programme because of the increasing burden of the condition on child mortality in the country.

The only identified by this study hat since the introduction of CMAM, this strategy has not been reviewed to reflect the shift from hospital treatment of childhood illness to community-based treatment, in line with the current CMAM guidelines.

5.4.2.2 Organisational level factors: barriers to success

There were a number of organisational or health system factors that hindered the CMAM programme delivery in Ghana to achieve outcomes. These factors were repeatedly emphasised during the focus group interviews with health workers, and transportation constraints, inadequate staffing and lack of motivational incentives for community health volunteers.

Transportation constraints

Vehicles, including cars, motorbikes and bicycles are major resources and very important tools for health care delivery in rural areas in Ghana. Health workers use these transport facilities to enable them to travel regularly (to and from the health facility) to reach community members in remote locations in their communities. In the case of CMAM delivery, transport was needed to be able to travel to all communities to sensitise community members, undertake case-finding, as well as conduct follow-up home visits.

From the reports reviewed, UNICEF and the Ghana Health Services had provided motorbikes to facilitate health delivery on ongoing primary health services in rural communities in the Upper East region before the commencement of CMAM.

However, the health workers indicated that the vehicles that were provided were not enough to address the chronic transport challenges facing health system. According to the health workers, the motorbikes donated broke down more frequently because of the poor condition of the roads but added that the majority of the bikes were of inferior quality. During the field work, I observed that, the transport facilities that were available at the sub district and community levels for CHOs to used were broken down Chinese '*Nanfang*' motorbikes of inferior quality, which the Ghana Health Service donated, and functional Japanese Yamaha motorbikes donated by UNICEF. The health workers indicated that only the motorbikes donated by UNICEF were of a better quality, however there were hardly enough of them. There were also concerns about inadequate supply of fuel for the bikes to carry out regular community visits to educate community members and to trace defaulters.

> *Sometimes our In-charge uses her money to buy fuel for the motorbike before we could go to the field. When you send requisition for fuel to use the motor bike to run errands and do work, it will take ages before it can be approved (CHO # 4).*

At the district level, nutrition officers also expressed similar views regarding transport. According to them, CMAM activities at the community level need to be prioritised and monitored regularly. However, because of transport challenges the only monitoring undertaken was the general one carried out by the district health management team, which happens only on a quarterly basis. The only time additional monitoring visits were undertaken was when UNICEF provided funds to support the monitoring.

Inadequate staffing and workload

In addition to the transportation problems, the shortage of vital health workers such as nurses and midwives in Ghana was discussed as a major constraint to the CMAM delivery. The current health system reform is arranged such that the delivery of primary health services is coordinated at both the sub-district level and at convenient community locations. This reforms was facilitated by the CHPS initiative (described earlier in chapter one), which is aimed at a complete transformation of the dynamics of rural health care service delivery from community health care providers who passively wait for patients, into outreach health workers or CHOs who actively provide services at the communities and home levels (Awoornor-Williams, 2013). According to the documents reviewed, CHOs who previously stayed at the sub-districts to assists nurses and midwives to coordinate the delivery of primary health care have now been moved to a community location to coordinate the CHPS compounds (Nyonator et al., 2005). The original concept of CHPS only allows the CHOs to identify risk factor of health, conduct health education and promote maternal and child health at the community and home level, whilst referring patients with complications to the health centres level where there are nurses, midwives and/or medical assistants. As a result, a maximum of 2 outreach health workers were at post per a CHPS compound to serve a cluster of local communities.

During the focus group discussions, the CHOs reported that the CHPS compounds were now being treated as a clinic because the community members continuously come there to seek medical treatment.

> *When you refer them to go to the health centre they don't want to go because they say it's far, and that the CHPS compounds are nearer to them. So we are compelled to run it like a clinic for them (CHO, #6).*

The CHOs also complaint that because of the shortage of midwives to supervise deliveries of new babies at home, they are now expected to perform this role, which was previously carried out by trained traditional birth attendants. According to them, these multiple tasks activities were affecting the frequency of community visits to carry out health education and to promote health and nutrition at the community level.

> *There is so much work to be done at the CHPS centres that it is now becoming difficult for us to combine with routine outreach education activities. We are only two CHOs at each CHPS centre but the work is more than two people's work (CHO #2).*

They admitted that follow-up home visits, as well as counselling of caregivers enrolled in the CMAM programme were less frequent, but attributed this to the excessive workload at the CHPS centres and the few staff at the community level to deal with the pressure of work. They indicated that counselling is a time consuming activity that cannot be combined with other activities.

> *You cannot do any effective counselling at the centre especially when other patients need your attention. It is so time consuming (CHO # 5)*

Although the CHPS concept was not designed to be delivering clinical care to community members, the CHOs suggested that the policy should be reviewed in order to allow clinical nurses to be posted to the CHPS centres to share their workload so that they can focus on their community duties.

> *We were not trained to do the work we are doing now, but because there are no clinicians here, we have no option but to manage what we can. The Ghana*

Health Service needs to take a second look at this because it is becoming more and more difficult for us to cope with the pressure of work (CHO # 4).

I want to be in the communities more than seeing patients at the CHPS compound, because that is not what I was trained to do (CHO # 3)

Incentive for volunteers (CHVs)

The WHO (2000) defines incentives as the "factors and /or conditions within a health professional's work environment that enables and encourages them to stay in their jobs". According to (Luoma, 2006) incentives is the most reliable means of improving motivation, and can be provided either in the form of financial or non-financial incentives with an intention to attract, retain and motivate employees to improve their work performance. The CMAM volunteers make up for the shortfall of health workers available to deliver the services at the community level. CHOs reported that, because the community volunteers are respected members of their communities, people are likely to listen to them and will participate in the services. They revealed that the outputs of the volunteers were initially high at the beginning of the programme implementation, probably because of their high expectations of being rewarded. However, later in the implementation process their enthusiasm wore out, because according to them, there are no incentives to motivate them.

At the beginning the volunteers were very active and supportive, but now when you call them they start dodging you. One of them told me that they are not paid to work, so they can come whenever they want (CHO #1)

Although the word volunteering is not associated with payment for services, the CHOs were of the view that a small incentive package to motivate volunteers will re-activate the interest of non-active CHVs to contribute to improve the quality of the CMAM services.

They really take the pressure off us, and I don't think some small allowances for them for transport when they come for meetings is too much for the region to support (CHO # 2).

During the interview with the volunteers, it became clear that some of them were less active in their participation because they felt that their services were probably not being recognised by the programme providers. According to them their source of motivation to participate in the programme was rather from the community members. They indicated that they command a lot of respect from the community members because of the work they do to help people, together with the satisfaction that came with saving a child's life.

5.4.2.3 Socioeconomic and cultural factors contributing to poor uptake/dropout of services

The main socio-economic and cultural barriers to uptake of the programme in the Upper East region were identified as: distance to treatment centres, busy schedule of caregivers and unsupportive husbands, scheduled days inconvenient for caregivers and alternative treatment options (availability of traditional medicine). The factors are described in further detail below.

Distance to treatment site

The key barrier to caregivers' utilisation of the CMAM service was distance to the treatment centres. The study found variations in caregivers' opinions about the distance travelled to access treatment. Whilst caregivers who were living closer (within 1-2 hr round trip) to treatment centres indicated that the distance encouraged regular attendance, those who lived far (5 hrs round trip) said the distance was too far for them to attend regularly. They mentioned problems with transportation to these

centres and the cost involved. Whilst some of them walked regardless of distance, the majority could not bear the long walking distance, and eventually dropped out.

> *The place is very far, and there is no means of transport. The transport comes only on market days, and even with that the cost of going and coming (GHC 2) is expensive (Mother of 2 children).*

Perceptions on distance as a barrier to participation varied according to the season of the year. According to the caregivers whose children completed the programme, although it took determination to stay and complete the programme, it was more difficult attending the programme during the wet season or very hot periods compared to when the weather was less hot and dry.

> *The place is far and with this hot sun. I was unable to go there weekly, so I decided to stop (Mother with 1 child).*

Busy schedule of caregivers and unsupportive husbands

Apart from distance, participants stated that they dropped out of the programme because of their domestic workload. According to the CHVs, multiple time-consuming tasks, such as fetching water and firewood, cooking and taking care of the households made walking to treatment centres too unlikely for most caregivers to attend regularly. They indicated that, there is simply no room to fit into trips to these centres when their days are swamped with chores to begin with. Most caregivers would rather walk the 4-5 hours distances in search of firewood instead of walking to these centres. These views were confirmed by two of the caregivers who said:

> *I do everything at home by myself, my husband is travelled away to Kumasi, and there is no one to take care of our other two kids at home. The first day, I*

carried all of them with me to the centre, when we came back I could see how

tired they were. So I decided not to do that again (Mother, 3 children)

After attending a few times I stopped because I usually have to go to the

forest to look for firewood in the morning, come back and then go to fetch

water. This was too much for me as a single mother (Mother of 2 children).

These mothers, however, pointed that if they had help from their husband with the childcare they could manage to take their children weekly to access the treatment. For most of the women, their husbands did not object to the treatment, they were simply not supporting them to attend.

He just doesn't care about anything. I think he is afraid that his colleagues

will tease him that he is doing a woman's job at home, so he has left

everything for me. If I had his support I would be willing to continue my

participation in the programme. I see how my colleagues' children look now,

after they have been there (Mother of 3 children)

Dropouts' mothers who returned to the programme said, that their husbands had offered bicycle ride to the centre after the nurses had persuaded them to help.

RUTF distribution days not convenient

Another cited reason for non-utilisation or dropping out of the programme was the treatment centres' fixed schedules to provide treatment services. The study gathered that, each of the treatment centres had fixed days when caregivers can visit the centres every week to review progress of their children health and nutritional status and receive counselling. According to the caregivers, the days coincided with the community market days, which made it impossible for the majority of them to attend.

They explained that they would prefer health workers to solicit their opinion before fixing the days.

> *They were aware that market days are busy days for women in this community, yet they want us to come. We earn our livelihood through buying and selling at the markets (Mother of 2)*

When some of the health centre managers were interviewed regarding the issue, they responded that most of the centres did that on purpose. According to one of them, the intention for scheduling the review to coincide with market days was to increase coverage, by relieving caregivers some burden to attend the treatment service. They indicated that although the plan did not work for the majority of the caregivers' because of their individual geographical locations, it was more convenient for some mothers to combine.

> *We thought that they could easily come to the CMAM sessions and then proceed to the market when they are done, "killing two birds with one stone" (Health Centre Manager, GHS)*

According to one of the programme coordinators, the monitoring team identified this problem and advised the sub-districts to review their schedule in order to make it flexible for the caregivers to be able to choose days that were favourable to them. However this did not address the problem as caregivers who were interviewed (mostly the defaulters) said they were not aware of this flexibility.

Alternative choice for traditional medicines

The WHO (2002), described traditional medicine as "diverse health practices, approaches, knowledge and beliefs, incorporating plants, animals and/or mineral based medicine, spiritual therapy, manual techniques and exercises applied singularly or in combination to maintain well-being, as well as to, diagnose, treat or prevent

illnesses". The study identified that, the option to use traditional medicine (TM) to treat childhood illness was one of the reasons for non-attendance and/or drop outs in the programme. According to the CHOs, it is a common practice among the local community members to use traditional medicine as first option for treatment of all kinds of illnesses. Community members will only go to the hospital if the condition they were treating does not improve. According to the CHOs, this health seeking behaviour was partly a reason for non-utilisation of the treatment service or caregivers dropping out of the treatment.

During the interviews with the caregivers, the majority confirmed that they consulted a Traditional Health Practitioner (THP) to find a cure of their child's condition before later enrolling in the CMAM programme.

> *Grandma took us to the traditional medicine man and he gave us some herbs to use. We boiled the herbs and bathed him with it, but he also said we should give him some to drink for 5 days. His condition did not improve much and the volunteers came to the house to talk to us about the programme. He looks healthy and is growing well now (Mother of 1 child).*

The caregivers indicated that, this decision to seek traditional remedy first was partly influenced by their child's grandparents and partly because of their previous experience of using traditional medicine to treat other illnesses.

> *His grandfather was the one who gave me the herbs to boil it and bath him. They said that not all illness can be treated by the doctors. Sometimes the traditional medicine too is good (Mother of 1 child).*

According to the health workers, the children whose parents sought traditional treatment before enrolling on the programme were usually seen with deteriorating nutritional status and poor health conditions. They indicated that this behaviour

exposes children to be at greater risk of non-recovery and mortality, compared to their counterparts who were enrolled with better health conditions. From the results of the interviews, the caregivers who dropped out of the programme were more likely to favour traditional medicine to the CMAM treatment.

5.5 Summary

The results presented above identified various factors that potentially influenced the CMAM programme in Ghana. The assessment of the programme activities implemented indicates a positive influenced on outcomes. The results show that training was conducted to train health workers and volunteers, which potentially influenced their understanding and capacity to deliver the programme at the community level. The health workers carried out sensitisation activities after the training to promote malnutrition and the programme among community members, which may have contributed to increased their interest, acceptability and participation. The factors that facilitated the programme delivery were identified as: involvement of civil society organisations, coordinated leadership, and the integration of the service into existing policy and programmes. The factors that acted as constrained were identified as: Inadequate transportation, staff and lack on incentives for health workers. The study also found that, nonattendance and/or dropouts from the programme was affected by distance to treatment centre, busy schedule of caregivers, treatment days schedule not suitable to caregivers, lack of husband support and the option to use traditional medicine.

CHAPTER SIX: SYNTHESIS OF THE FINDINGS

6.0 Introduction

This chapter presents a synthesis of the realist evaluation findings, in order for us to understand what has worked, how and why for the CMAM programme. The methodological issues of the evaluation are also discussed followed by some recommendations for policy and practice.

6.1 Summary of findings

Given the purpose of the research, the use of realist evaluation method to uncover what works, how and why of the complex community-based management programme was a good fit. To recap, the study evaluated a community-based management programme designed to treat children suffering from SAM in Ghana, with the aim to measure whether the programme is achieving the intended outcomes, as well as how outcomes are achieved. This evaluation approach was particularly useful because it allowed the researcher to combine methods (qualitative and quantitative research methods), which is appropriate in complex programme evaluation (Lean et al., 2008). Quantitative methods were utilised to analyse treatment outcome data, collected by programme staff, to assess whether children achieved nutritional status that meets international acceptable (Sphere) standards. Qualitative methods were used to examine how different services delivery aspects and contextual factors might have influenced the programme to achieve success or failure (Rycroft-Malone et al., 2010).

In recent years, interest have been growing in the study of context within implementation research (Dopson et al., 2002; Rycroft-Malone et al., 2009; Rycroft-

Malone et al 2008; McCormack et al., 2002; Scott et al., 2008, Lean et al., 2008). Therefore methodological approaches that pay attention to the study of context are timely (Rycroft-Malone et al., 2010). Within realist evaluation, the primary preposition is that the effect of mechanism is contingent upon the context under which the programme was implemented. As shown in figure 6.1 the programme was implemented through various steps, categorised in two pathways: outreach service delivered at the community level (Pathway - 1), and health centre level service (Pathway - 2), where children were assessed and treated with ready-to-use therapeutic foods to improve nutritional status. The evaluation therefore sought to find out how the different implementation contexts interacted with key mechanisms of actions to influence the programme delivery and the outcomes achieved.

Figure 6.1: Sequence of programme implementation
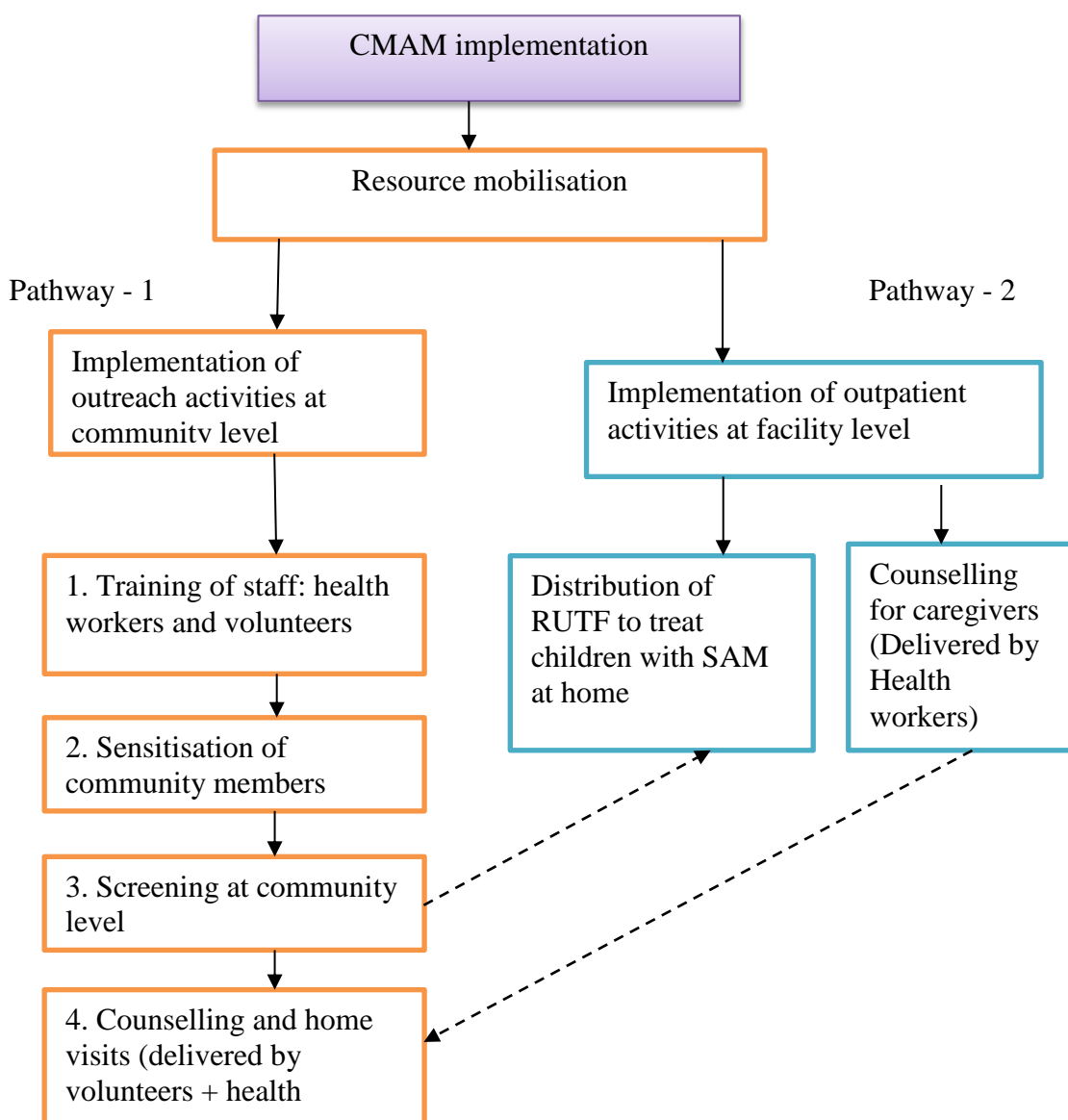
As described in chapter 4, the results of the quantitative analysis showed that the programme achieved the following clinical outcomes: recovery (72%), mortality (1.6%) and default rate (28%). Comparing these outcomes with the Sphere standards for therapeutic programmes to be effective, the mean recovery rate was close to the Sphere standard (>75% recovery). Statistically, the confidence interval of the recovery rate lie within the minimum acceptable range (95% CI: 68.0% - 76.0%). Mortality rate was lower than the acceptable minimum rate (< 10% mortality).

However, the rate of default reported was near doubled, and significantly higher compared to the Sphere rate (<15 % default.)

These results could not be well explained by the quantitative analysis because of insufficient data. However, the qualitative results suggest that effective collaboration with partners such as UN health agencies and other civil society organisations has facilitated the delivery of the programme at the community level to achieve the results. Ensuring service integration within existing health services, as well coordinated leadership have also led to the success of the programme. Higher default rate was influenced by a combination of health systems, organisation and socio-economic and cultural factors. E.g. the study found that regular monitoring of the programme (treatment of children) at community level, as well as counselling of caregivers were constraint by transportation difficulties, inadequate health staff and poor incentives for overburden health staff. Geographic access (distance to treatment centres), workload of caregivers, lack of support from their husbands and the belief in traditional cure for SAM were also identified as issues that need to be addressed to minimised higher dropouts.

6.1.1 The programme initial theory of change – findings of what worked?

The results of the evaluation demonstrated that the initial theoretical assumptions of how the programme was expected to work have been positively proven, except the assumption that, the provision of counselling to caregivers will lead to low dropout rates of children receiving treatment. In this section, I have provided a summary of the findings of the evaluation for us to understand which theory was a success or failure. In summary, the processes or actions that were planned to be implemented, and expected to lead to change were: building collaboration with partners to deliver

the service, training of service provider, screening services to identify severely malnourished children, follow-up visit to monitoring treatment at home, as well as counselling of caregivers about the programme and malnutrition.

The results of the evaluation of these process revealed that the collaboration between community members (beneficiaries of the programme) and health workers (service providers) has work to achieved positive results. This is reflected in the outcome of the collaboration action between volunteers and health workers that allowed community members to be mobilised and sensitised on malnutrition and the programme. The sensitisation potentially led to increased awareness of malnutrition and the programme. Increased awareness resulted in acceptability of the treatment, active participation and utilisation of service. These latest findings are similar to previous operational evaluation outcomes reported in Pakistan, Ethiopia and Nepal (Puett et al., 2013).

The study also found that when training was conducted for health workers and programme volunteers, knowledge and understanding of the programme protocol were enhanced. This potentially led to increase in their confidence and commitment for better service delivery. For example, the results from the interviews suggest that health workers and volunteers increasingly understood the CMAM programme approach and delivery strategy. Community health volunteers attested that their confidence was boosted after participating in the training, and this led to their participation in the service delivery.

Furthermore, the evaluation found that when screening was conducted at the community level by health workers and volunteers to identify severely malnourished children, parents were more willingly to use the service. This particular finding

suggests that community-based screening can results in increased enrolment of children compared with clinic or clinic-based screening approach. According to recent publication (Collins and Briend, 2010) parents were unwilling to use centre-based screening services because of geographic accessibility and lack of awareness about the service. Beneficiaries of the community-based screening indicated that bringing the screening services to their doorsteps motivated everyone to enrol their children into the programme.

On the other hand, the evaluation results demonstrated that counselling did not lead to low dropout as initially postulated. This was probably because follow up visit was not regularly carried out as originally planned. As outlined in the initial theoretical model (Table 1.4), the original plan was to undertake regular home follow-up visit to monitor treatment at home, during which caregivers will be counselled on malnutrition and the need to comply with the treatment schedule. However, the evaluation outcome show that this was not delivered as expected. In the next section (6.1.3) the factors that contributed to infrequent home visits and counselling are discussed. On the wider level, the factors and barriers that facilitated the programme delivery to achieve these results are discussed in 6.1.2. Table 6.1 present the refined programme theory, summarising which theory of change was achieved and which was not.

Table 6.1 Refined programme theory

Initial theory of change	Expected change/outcome	Final outcome
Training health workers and community members can contribute to enhanced their knowledge about malnutrition and the CMAM protocol	Increased knowledge will increase confidence, commitment and improve quality of the service	✓✓
Mobilisation and sensitisation of community members about malnutrition and the programme can contribute to increased awareness about malnutrition causes, treatment and prevention, as well as the CMAM programme to treat the condition	Increased awareness will lead to participation and utilisation of services	✓✓
Conducting screening at the community level can contribute to early identification of cases for prompt treatment	Early identification and prompt treatment will increase compliance to treatment and results in rapid nutrition recovery.	✓✓
Distribution of RUTFs to carers to treat children at home will increased acceptance and intake	Increased intake will improve nutritional status and subsequently reduce risks of death.	✓✓
Frequent monitoring of children receiving treatment at home, as well as providing counselling to caregivers contribute to address barriers to utilisation	Reduced barriers to utilisation will results in less than 15% dropouts' rates	✓✘
Collaboration with local community members to deliver service will increase their interest in the programme	Increase interest will led to participation	✓✓

Notes: ✓✓ = activity delivered as plan and outcome achieved. ✓✘ = Activity delivered but outcome not achieved.

6.1.2 Summary discussion of why and how the programme worked or failed (barriers and facilitators of impact)

Apart from the programme related factors that influenced the programme implementation outcomes (discussed above), several other contextual factors were identified as facilitators and barriers to programme success and failure. For instance, the involvement of civil society organisations, coordinated leaderships within the Ghana Health Service, and the integration of services into routine health care system were cited by health workers as positive drivers for the programme success. Civil society organisation including the USAID and UNICEF were cited as two key organisations that were actively involved in the programme delivery process. The discussion held with programme coordinators revealed that the two organisations provided the largest proportion of funding to support the programme implementation, including the procurement of logistics that enabled children to receive treatment. They also offered technical support to strengthen the capacity of health workers to deliver quality health service, as well as in planning and monitoring of programme activities implementation.

On the other hand, structural inadequacy hindered the effective implementation of the programme in Ghana. As a result of the chronic problem of inadequate human resource to provide health care in rural communities, coupled with the lack of transportation and incentives to motivate health workers and volunteers, counselling and home visits were not adequately carried out. The health workers emphasised that the health facilities were understaffed and the available ones were overworked. This affected frequent home visits and counselling, which indirectly may have contributed

to the high dropout rate reported in the programmes. These findings are not peculiar to Ghana alone as many low income countries also are faced with the same problems of structural problems including staff inadequacy due to high turnover, and frequent migration (Mirkuzie et al., 2010; Nigatu 2010).

6.1.3 Socio-cultural, economic factors influencing non-utilisation of service and/or dropouts

Failure to use the service was further complicated by socio-cultural and economic factors. Key among these barriers cited was distance to treatment centres to access the treatment. Despite the CHPS concept that was introduced to extend access and affordable health care to rural areas in Ghana, geographical access health care remains a major barrier to health service utilisation by rural community members. For most of the caregivers, using the service regularly means that they have to travel a significant distance from their communities to the therapeutic centres. The problem of distance was directly linked to cost, as majority could not afford the high cost of travel to access service. Even if the caregivers who knew about the benefits of using the service were willing to attend, their inability to overcome the transportation barrier constituted another challenge.

Another key barrier was a lack of husband or family support with home chores to enable mothers use the service. Studies have emphasised the importance of family support to women accessing health interventions to achieve effectiveness (Adedemije et al., 2012). Adedemije and colleagues' reported that where mother-in-laws and some husbands played a supportive role to women accessing health care for a child, participating was higher compared to those with no such support. This was the situation in the study context where women who were likely to received support from their spouses were more likely to use the service regularly compared to those who

never enjoyed such support. The study also found evidence suggesting that traditional medicine was a common barrier to utilisation of the service in Ghana. The belief in traditional medicine as a cure to malnutrition corresponds with the belief held by some community members linking malnutrition to spirituality.

6.2 Methodological Issues

This section discusses the key methodological issues of the study. First, the strengths and the weaknesses of the mixed methods design are discussed, followed by a discussion of the key strengths and limitations of the individual quantitative and qualitative methods.

6.2.1 The realist mixed methods: strengths and limitations

The mixed method study, from a realist perspective, was designed to provide a complete picture of what works and how, when CMAM programme are implemented in non-emergency context in Ghana. The combining the two qualitative and quantitative research methods is the main study strength. The decision to use this approach was based on the fact that both qualitative and quantitative approaches have their strengths and weaknesses, and a combination of both methods in a single study would allow the strength of one to compensate for the weakness of the other (see details in section 3.3.2). The inclusion of a quantitative component enabled the evaluation of therapeutic outcomes using statistical techniques (address the question what worked?). The qualitative study on the other hand explored the context and the mechanisms of actions that might have influenced the programmes outcomes (explore how and why the programme worked or fail). A single qualitative or quantitative design would not have been able to address these different research

questions. Therefore, the two methods complemented each other to produce a comprehensive understanding of what outcomes were achieved and how these were achieved.

The main challenges faced for using this approach in a single study however, is that it requires longer time to collect and analyse both qualitative and quantitative data and to write-up the report, compared to using a single qualitative or quantitative approach. Another challenge is that, the research process required the researcher to have experience and skills in conducting mixed methods research. Prior to starting the PhD study, I only had some background experience in conducting quantitative research and not qualitative or mixed methods. Therefore, I had to take additional courses on conducting qualitative research in order to enhance my knowledge and skills. I also attended various seminars on how to conduct mixed methods research, which together enabled me to combine the two approaches to complete this study.

6.2.2 Limitations and strengths of the quantitative phase

The quantitative results must be interpreted in light of the following study limitations. First, the Ghana Health Service (the implementers of the CMAM programme) has not set out criteria to evaluate the effectiveness of the CMAM implementation in the local context. The criteria outlined in the programme implementation protocol are based on indicators that were developed for measuring effectiveness of nutrition therapeutic programmes in emergency situations (based on the Sphere standards). Since the prevailing environment in which the current CMAM intervention was implemented (non-emergency) is not the same as that of emergency contexts, the use of such standards to compare the programme outcomes may not be appropriate.

Second, there is reason to believe that other family members might have been sharing the RUTF prescribed for a child, which most likely would influence recovery rate and rate of weight gain. In the Ghanaian traditional homes sharing food with other family members is a common practice. Home supervision of caregivers, as they administer treatment was too little to be able to ascertain if any of sharing occurred at all. Therefore, it was very likely that this might have occurred but was not accounted in the analysis.

Finally, 37 children were excluded in the final data analysis as a result of incomplete baseline and discharge measurements. This exclusion might have biased the overall results. Also, unequal and small sample sizes were used in some of the subgroup comparative statistical analysis. Therefore, the results of such comparison must be cautiously interpreted.

On the other hand the important strengths of the study were related to the programme design, the overall sample size (n = 488) used and the data quality. The CMAM programme was designed as a follow-up observational cohort intervention which recruited children at baseline and followed them through to discharge, default or death. This design is best suited for measuring therapeutic programme outcomes over time. The design allowed eligible children to be recruited at baseline and followed throughout the treatment phase till they achieve nutritional recovery, dropout or died. This made it possible for health workers to collect data during the treatment and follow-up phases.

Finally, the data were likely to be of good quality. As described earlier, all health workers who collected the data were trained on the process before starting the

programme. In addition, the data collection was supervised by nutrition technical officers who are experienced in carrying out anthropometry nutritional status assessment of children under age five years. Although the researcher did not have the opportunity to supervise the data collection process, at the time of the field work there was an opportunity to take part in ongoing activities to confirm what was happening with regards to the data collection. I established that the anthropometry data were collected using standards criteria. Weight was measured using the Salter scale and was performed by two people, one focused on hanging the child properly without clothes on, whilst the other would read the scale without announcing the results to the other. The two then swapped positions to repeat the process, after which they compared readings. Where there were discrepancies in the figures ($> \pm$ 0.1), the processes were repeated until error is corrected. These are good practices in anthropometry data collection to increase reliability of anthropometry study findings, as well as the generalibility of it (Marshall, 2008).

6.2.3 Strengths and limitations of the qualitative phase

The qualitative component of the study is limited by the relatively small sample size which may not be representative of the views of the people who benefited from the programme or the health workers who delivered the services. However, this could be ignored as the purpose of the qualitative study was not to generate views that are representative of the general population.

The key strength of the qualitative study was related to the flexibility of qualitative design, which allowed the researcher to use a topic guide to direct discussions with research participants. Because of the flexible nature of qualitative interviews, the study participants were allowed to express their views more freely e.g. views on the

programme implementation process and what influenced their decisions to participate or not. The semi-structured interviewing technique adopted afforded the researcher the opportunity to use open-ended questions to probe more deeply into the issues discussed, as well as other issues that emerged (Bowling, 2008; Silverman, 2006). For instance, deep probing was necessary to understand contextual factors that influenced participation in the programme, rather than restricting the questions to only the individual actions and behaviours towards the programme.

The participants were also able to ask questions during the interviews. This process led to the gathering of 'rich' and 'thick' data (Richie and Lewis, 2005). Finally, the qualitative study allowed the researcher direct participation and observations of the programme implementation processes to further gain insight into the key issues that influenced the programme outcomes. The researcher was also able to validate the information during the individual interviews, as well as in the focus groups.

6.4 Recommendations

This section draws on the study findings and provides key recommendation for policy, practice and research. How the research findings contribute to current knowledge, as well as issues for further research are also outlined and followed by a general conclusion.

6.4.1 Implications of findings for policy and practice

Although cost-effectiveness of the CMAM programme could not be evaluated in this study, other studies have shown that the approach is potentially a cost effective alternative to hospital-based treatment of SAM (Bhutta et al., 2008). Furthermore, the outcomes documented in this, as well as other previous studies have

demonstrated that the approach can achieve better outcomes compared to hospital approach. For instance, overall average mortality of all CMAM implementations both in emergency and non-emergency situations, have been < 5%, compared to most hospital treatment programmes, which on average have recorded >15% mortality rate in sub-Saharan Africa (Collins et al., 2005; Briend et al., 2001). The current programme recorded mortality rate of < 2%, and a recovery rate of 72%.

The findings however show that the impact of CMAM implementation in Ghana and in non-emergency contexts can be diluted by higher defaults. The default rate reported (28%) was significantly higher than the Sphere standards (<15%). The qualitative study identified organisational challenges (weak health system) such as lack of funding, resulting in lack of transportation to carry out monitoring, inadequate staff to implement and carry out effective supervision of the treatment at home and lack of incentives to motivate service providers as issues that have constrained the programme effective implementation in Ghana. Furthermore, the findings suggests that socio-economic and cultural barriers including distance to sites, lack of support from husbands and deeply rooted cultural beliefs might have influenced beneficiaries to drop out of the programme. All these findings have important implication on policy and practice. Therefore, the following are recommended:

6.4.1.1 Recommendations for policy and practice

The study provides evidence to suggest that the CMAM approach has been successful in the Upper East region despite higher dropout rates. A scaling –up of the strategy would benefit the majority of the children suffering from SAM in all parts of the country. The study found that, attempt was made to integrate CMAM activities

into existing health and nutrition programmes. However, this was constrained by the lack of nutrition policy to facilitate the process. Therefore, the development of a nutrition policy to help reposition and facilitate CMAM integration and large scale implementation of the approach to benefit many more malnourished children is needed. The existence of such a policy will help in facilitating nutrition advocacy towards increasing government funding for all nutrition and related services. Furthermore, as it is not clear how long UNICEF will continue to support this noble programme in Ghana, especially in the procurement of supplies and logistics, government should take ownership of the programme and explore how funding could be made available to future CMAM activities. In the short term, the government should consider increasing the current 3.3% budget allocation for nutrition activities to take care of CMAM activities. Government could explore the feasibility of setting up or supporting local industries to produce RUTF locally, as done in other countries such as Ethiopia, Malawi and Niger. Also, the issue of inadequate staffing and incentives for health workers (including community volunteers) who work in rural areas needs to be seriously examined and addressed. One way to do this is to use part of the national education trust fund (Getfund) to support candidates who have the interest to study rural healthcare as a profession, so as to increase their strengths at the rural clinics.

6.4.1.2 Recommendation for programme implementers to address default

The key issue that emerged from this research that needs to be addressed, at the level of the programme providers, to improve effectiveness is the problem of high default rate of children receiving therapeutic care. The evaluation identified geographical accessibility due to distance to treatment sites, workload of women providing care to

malnourished children, lack of husbands support for their wives to use service, RUTF distribution days not convenient to all carers, and the beliefs in traditional remedy for malnutrition as main reasons for non-utilisation and dropouts from programme. Therefore, these issues need to be prioritised and seriously addressed by the programme providers. For example, scheduling distribution of RUTF and reviews of children progress in the programme days, with inputs from all caregivers will be one better way to address the problem of non-attendance/dropout. Second, the health workers could consider holding the reviews and distribution days at a convenient multiple community locations, and creating awareness among community members about availability of this service in their communities.

Furthermore, as the current counselling service targets only women and ignoring the men, the providers of the service should review the programme delivery approach to include men as target for counselling sessions. This will help address the problem of lack of support by husbands. As this has worked in previous programmes to promote breastfeeding practices, the formation of men-to-men nutrition support groups would be useful. Finally, families of children who recovered from severe malnutrition after short stay in the programme could be identified and used as change agents during community sensitisation and education fora to give their testimonies about the programme. This may further convince people who want to dropout or those who are reluctant to use the service to change their minds from doing so.

6.4.2 Further Research

This study used a mixed method approach to evaluate what was achieved and how, following the implementation of the community-based model in non-emergency context. Because the quantitative study relied on routine data, and the qualitative

phase only collected snapshot cross sectional process data through interviews with service providers and users, compliance of the treatment at home by caregivers could not be investigated. Therefore further ethnographic research and direct observations to investigate compliance of therapeutic care at home for a longer duration is needed. Furthermore, the current study only examined three Sphere outcomes: recovery, mortality and default and how these outcomes were achieved. Coverage of the programme was not studied because of lack of data at the time. This is an important indicator useful in understanding therapeutic programme effectiveness, and therefore need to be studied in order for us to have a full understanding of the impact of the programme implementation in the Upper East region.

Also, the need to model the cost effectiveness of a community based model to treat children with SAM is important to understand the cost-benefit of adopting such a model in non-emergency, developmental context. Current data on cost-effectiveness of community-based SAM treatment programmes are only based on the implementation of the model in emergency context, which may have different programming cost implications from non-emergency context. Therefore a cost-effectiveness study will be useful to generate evidence that can be used to inform policy decisions. Finally, this study has identified the need for studies to explore the seasonality of malnutrition in the Upper East region, as there is no such data available to inform intervention programme planning to tackle the causes of malnutrition more seriously. An understanding of when malnutrition in children is at its peak will also help the service providers to make plans to accommodate the large numbers of children who may require treatment during the peak seasons.

6.5 Conclusion

The mixed methods study provides evidence to suggest that CMAM can produce acceptable outcomes when implemented in non-emergency situations in local communities in Ghana. The mortality rate reported was significant lower than the stipulated Sphere minimum standards for therapeutic programme effectiveness. Recovery rate reported was only marginally achieved, as the upper limits of the confident intervals met the Sphere standards. The study however, reported significantly high default rates, which was associated with poor supervision and counselling of caregivers administering the treatment at home, and socio-economic and cultural barriers such as, distance to treatment centres, heavy workload of caregivers, opportunity to use alternative traditional medicine and lack of husband support. To improve effectiveness and ensure sustainability of CMAM programmes in non-emergency context such as Ghana, these factors need to be addressed.

The findings from this study add to emerging international literature on factors that influenced the full impact of community therapeutic programme to address SAM, both in emergency and non-emergency situations. The systematic review indicate that majority of the previous studies only explored what outcomes were achieved in CMAM programmes by evaluating the effectiveness of the therapeutic diet used to treat the children. Therefore, evidence was lacking on how the programme process and contextual factors influenced success or failure. The current findings, contribute to addressing this research gaps. The findings are particularly useful to enlighten programme managers on what needs to be addressed in order to improve programme effectiveness, as well as scale-up CMAM programmes in developmental, non-emergency situations to address SAM among children under age five years.

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8.0 APENDIXES

Appendix 1: details of results extracted from published studies to demonstrate effectiveness of Community-Based programmes to treat severe acute malnutrition

Table 1:

Author; Yr of pub.	Country; year of study	Study design	Pop / sample	Intervention/comparison, enrolment criteria	Outcome measures	Results	Limitation	Quality appraisal score
Ciliberto, 2006	Implemented between 2003 & 2004 in 8 communities in Malawi	Prospective cohort *Eligibility*: presence of oedema, good appetite and no complication	12-60 months (n= 219)	Daily dose of RUTF providing [733kj/kg/d of energy and 5.3g protein/kg/d + recommended daily micronutrient intake]. Follow-up up to 8 weeks or early recovery or death	Recovery (resolution of oedema after 4 weeks and attainment of WFH> -2 z scores), failure to gain weight, clinical relapsed and death rates were measured	Recovery was 83%, deaths was 5%, RWG was 2.8±3.2g/kg/day, dropouts was 4% Relapse: 8.2% Mean (±SD) weight gain 2.8±3.2g/kg/d	Study was not a controlled trial, as a result direct comparison with other standard treatment could not be made	medium
Defourny 2009	Implemented in 2007 in 52 communities in Niger	Prospective cohort *Eligibility:* presence of oedema or MUAC measure of <110mm or WFH<70%, with good appetite	6-36months (n=62922)	Daily dose of RUTF providing 1000kcal/d of energy for children <8 kg and 1500kcal/d of energy for children >8kg. Sample in treatment (n=3362); and no treatment group (n=2949) for 8 weeks or early recovery or death.	Recovery (resolution of oedema and attainment of MUAC >115mmoor WFH>70%, deaths, and defaults or failing to show up for 2 consecutive sessions) rate and the rate weight gain	Recovery (MUAC>115mm) was 92.3% in RUTF and 90 % No RUTFs–P<0.003. Death was 1.8% in RUTF vs. 2.2 in no RUTF. Default rate was lower in RUTF 4.7% vs. No RUTF (6%) –P<0.0236; RWG was (5.1±4.6 (RUTF); 5.5±4.7) g/kg/d. P<0.005	Study was not randomised	medium

WFH = Weight-for-Height ratio, NCHS =National Commission for Health Services, RWG=Rate of Weight Gain, RUTF=Ready to use therapeutic food.

Table 2:

Author; Yr of pub.	Country; year of study	Study design	Pop / sample	intervention/comparison, enrolment criteria	outcome measures	Results	Limitation	Quality appraisal score
Linneman, 2007	Implemented between 2005 &2006 in 12 community therapeutic centres in Malawi.	Prospective cohort *Eligibility:* Severe (WH< 70%) or oedema with good appetite. Moderate (WH< 70-85%) with good appetite.	6-60 months (n=2937)	Daily dose of RUTF providing [733kj/kg/d] energy (n=2131, severely malnourished) and (n=806, moderately malnourished) for 8 week's or early recovery or death.	Outcomes of severely was compared with moderately malnourished (control). Recovery (attainment of WH> 0 based on admission height) rate, Clinical relapsed or occurrence of oedema or systematic infection requiring inpatient admission and default (absence from program for 2 consecutive weeks) as well as rate of weight gain measured.	Recovered in severely malnourished was 89% vs. Moderately malnourished was 85%. Died rate in severely malnourished 1% vs. Moderately malnourished 2% – $p<0.01$. RWG was (3.5±4.1 (Severe) vs.4.6±4.1 moderate) g/kg/day. Default rate in severe was 7% vs. 8% in moderately malnourished.	Study was not randomised and no comparative intervention group to compare outcomes. Due to ethics and limited resources Admission criteria were not the same with both groups.	medium
Amthor, 2009	Implemented between March and July 2006 in Malawi, delivered by community health aid.	Prospective cohort *Eligibility:* presence of oedema and or measure of WH <70% NCHS.	6-60 months (n= 826)	Daily dose of RUTF providing 733kj/kg/d of energy and 5.3g /kg/d of protein for 8 weeks or early recovery or death.	Recovery (attainment of WH >100%), dropouts (fail to turn-up after 2 weeks follow-up) and death rates, as well as rate of weight and MUAC gain were measured .	Recovered rate was 93.7%, only 1.8% remained malnourished. Default rate were 3.6% death rate was 0.9%. Mean (±SD) rate of weight was 2.7±3.7g/kg/d. The Fraction of children with severe malnutrition before and after were significant less ($p<0.001$) MUAC gain was 0.2 ± 0.3mmd/d.	Study was not randomised. RUTF manufactured to meet local context. Population served were relatively stable. Unforeseen challenges may present if implementation is to take place in conflict situation. Results may not be replicable to other setting.	medium

Table 3:

First Author/ yr	Country & year of study	Study design	Pop/ sample	Intervention/ comparison, enrolment criteria	Outcome measures	Results	Limitation	Quality appraisal
Chaiken 2006	Implemented 2002 & 2003 in 16 community therapeutic centres in Ethiopia	Prospective cohort *Eligibility:* measure was WHM<70% NCHS or presence oedema	< 59 months (n= 5799)	Daily dose of 200kcal/kg/d of body weight of RUTF. Monitored weekly till 8 weeks or discharge if early recovery or death. In addition CSBs was provided to minimise sharing and as supplement to RUTF at home.	Recovery rate (attainment of adequate defined as WHz ?), default rate (failure to attend session for 2 consecutive) and deaths rates were measured	87% recovery reported. 2.3% defaulter and less than 1% deaths recorded. Under five mortality and severe malnutrition before was 1.47/10,000 and 1.0% and after intervention improved to 0.45/10,000 and 0.6% (95%CI 0.2-0.9)	Study was not randomised or no control group to compare findings with.	low
Collins 2002	Implemented between 2000 & 2001 in 10 community therapeutic centres in Ethiopia	Retrospective cohort (analysis or programme outcome data) *Eligibility:* WHM<70% NCHS or presence of oedema	6-120 months (n= 170)	Daily dose of RUTFs, providing 733kjkg/d per body weight. Followed-up until recovery or death or defaulted. At home, Famix + RUTF given in addition of Vitamin A (100, 000IU for children <12 months and 200,00o if older, plus 5mg folic acid for nightly	Recovery, died and default rates, as well as rate of weight gain measured. Length of stay was also measured	85% recovered, 4% died and defaults rate was 5%. Median length of stay was 42 days (IQR; 28-56), days to death was 7-26 days and days to default (7-28). Median rate of weight gain was 3.2g/kg/d (1.9-5.6)	First no randomisation to enable comparison. Second, follow-up weights and height were measured by different workers, and therefore increasing chance of measurement errors. Also children were weight only once and not at the same time, thereby reducing internal validity. Results thus not generalisable	medium

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Table 4:

First Author/ yr	Country & year of study	Study design	Pop/ sample	Intervention/ comparison, enrolment criteria	Outcome measures	Results	Limitation	Quality appraisal score
Sandige 2004	Implemented in 2002 in Malawi	nRCT *Eligibility:* presence of oedema or measure of WHz> -2	12-60months (n=260) (include HIV positive and negative)	Systematic allocation to receive either imported RUTF (n=135) and locally produced RUTFs (n=125). Followed up till 16 weeks or early recovery or death. Imported RUTF provided 733kj/kg/d of energy. Local RUTF provided 2090kj//d. Additional 6 months post-intervention follow-up carried out	Recovery (attainment of WHz > -0.5), relapsed and deaths (or fail to achieve recovery) rates and the rate of weight gain measured	78% recovery was achieved 75% Imported vs. 80% local. Difference in recovery rates were 5% (95% CI -5-15%). RWG was [5.2±4.6 local vs. 4.8±4.0 imported] g/kg/d. Difference: 0.4g/kg/d (95% CI -0.6; 1.4). Dropped-out rates were 5 %, while 11% died, relapsed or did not reach target recovery. After 6 months post-intervention 91% maintained WH growth	Children were systematically assigned, rather than randomisation, and participants and staff were not blinded – potential for bias	medium
Ndekha 2004	Implemented in January in 2001 in Malawi	nRCT *eligibility:* having a WH<70% NCHS or oedema	12-60 months (n=93) Comprised only HIV positive children	Systematic allocation to receive RUTF (n=20), RUTF supplement (n=28) or CSB (n=45). Followed-up for 8 weeks or early recovery or deaths: children previously hospitalised to infections, duration not stated. RUTF and maize flour provided 733kj/kg/d energy while supplement gave a fixed 2090kj/d of energy during home therapy.	Recovery rate (attainment of WH>100%), relapsed, mortality rates as well as rate of weight gain were measured. Time to survive was also assess	Overall recovery rate was 56% (75% for RUTFs vs. 46% supplement vs. 53% CSB). Relapsed was 0% in RUTF vs. 11% in supplements vs. 22 in CSB. 15% died in RUTFs vs. 14% supplement vs. 9% CSB. Mean (±SD) RWG were 3.2±2.8 [3.1±2.9; RUTF vs. 2.4±2.6 RUTF supplement and CSB] g/kg/day. Mean survival days was 42.	Severity of malnutrition at start of treatment was different, thus, the results cannot be concluded. RUTF groups were more wasted than the other 2 groups. Also sample sizes were small - does not allow any meaningful comparison	medium

Table 5:

First Author/ yr	Country & year of study	Study design	Pop/ sample	Intervention/ comparison, enrolment criteria	Outcome measures	Results	Limitation	Quality appraisal
Oakley 2010	Implemented between 2008 and 2009 in 15 community therapeutic centres in Malawi	RCT *Eligibility:* measure of WHz <-3 NCHS or oedema and good appetite. Children with severe clinical condition excluded	6-59months (n=1874)	Random allocation to receive one of 2 locally produced RUTFs. One containing 25% milk (n=945) and the other with 10% (n=929) and followed for 8 weeks or early recovery or death. Both diet provided 733kj/kg/d energy given per body weight	Recovery (attainment of WHz <-2 with dissolution of oedema) assessed. The rate of weight and height gain were also measured	Recovery were 85% (25% milk) Vs 81% (10% milk) – p<0.18. Rate of weight gain [2.4±2.8 (25%) vs. 1.94±2.7] g/kg/day - p<0.001 Height gain were 0.23±0.29 (25% milk) vs. 0.19±0.25 (10% milk) - p<0.001 and MUAC gain 0.17±0.26 (25% milk) and 0.13±0.25(10% milk) - p<0.001	Study was based on children suffering from Kwashiorkor. Results may not be generalisable for severely wasted (marasmus) population where HIV is likely. The study based rural based and results may not be applicable in urban setting. Children lost to follow-up, though low were very likely to bias the study.	high
Nackers 2010	Implemented in 2 community therapeutic centres in Niger; between 2007 and 2008	RCT *Eligibility*: measured of WHz = 70% but <80 or MUAC ≥ 110cm	6-59 months (n=451)	Randomised to RUTF (n=215) or corn/soy blend (CSB) pre-mix (N=236).Followed-up for 8 weeks follow-up or early recovery. RUTF (plumpy'nut) provided 1000kj/d energy, CSB provided 1750 g/day energy	Recovery (attainment of WH ≥ 85%), deaths, default, transfers to ITFCs rates and the rate of weight gain measured. measured also were length of stay	Recovery rate were 79.1% (RUTF) vs. 64.4% (CSB). No data on mortality, default rates reported. More transfer from CSB to ITFC observed (19.1%) vs. RUTF (9.3%); – p<0.003Mean rate of weight gain were 1.08g/kg/d, higher in RUTF (95%CI 0.46-1.70). Length of stay was shorter in RUTF (4 weeks) vs. 6 weeks for CSB	The study was rather selective of only children with weight <8kg – chances for selection bias of only younger children leaving out older children suffering from same problem	high

Table 6:

Author/ Yr of pub.	Country; year of study	Study design	Pop / sample	Intervention/ comparison, enrolment criteria	Outcome measures	Results	Limitation	Quality appraisal score
Matilsky, 2009	Implemented between 2007 and 2008 in 12 community therapeutic centres in Malawi.	RCT *Eligibility*: included having a WHz<-2 but ≥ - 3.	6-60 months n=1362	Randomly assigned to one of three diets: RUTFs (n=465), soy/peanut fortified (n=450) and CSB (n=447) and follow for 8 weeks or early recovery or death.	Recovery (attainment of WHz > - 2), the rate of weight gain, as well as death rates were measured.	Recovery was 79% RUTF vs. 80% Soy fortified vs. 72% CSB)]; rate of weight gain were 2.6 (RUTF) vs. 2.4(soy fortified) vs. 2.0 (CSB)] g/kg/day. Deaths rates were 0.6% (RUTF) vs. 0.5% (soy-fortified) vs. 1.1 % (CSB).	Study conducted with rural children where corn is staple diet. Results may not be replicable in urban setting and in other contexts. No provision for assessment of compliance with consumption of foods. Sharing may have taken place at home with other siblings.	high
Kerac , 2009	Implemented between 2006 and 2007 in hospital nutrition rehabilitation unit in Malawi	Double-blind RCT *Eligibility:* either WH<70% NCSH, nutritional oedema or both, MUAC<11cm or both	5-168 months n=795 (included HIV positive and negative children)	Assigned to RUTF, plus symbiotic2000 forte (intervention, n=399) or standard RUTF with no symbiotic2000 (control, n=396). Followed-up for 5 weeks or early recovery or death. Children initially received F100 treatment at inpatient (specific duration not mentioned). RUTF provided 200kj/kg/d and 300g of RUTF/day for 7kg child.	Recovery (attainment of WH > 80% or more), defaults and death rates as well as the rate of weight gain were measured.	Recovery rate were 53.9% in RUTF symbiotic group vs. 51.3% RUTF with no symbiotic. 38.8% recorded in HIV positive group vs. 71.4% in the no HIV RUTF consumption groups. Death rates were 27.1% in RUTF vs. 30% (Not differentiated for HIV). Defaults rate were 6.8 in RUTF plus symbiotic vs. 9% in control. Not differentiation for HIV. Mean RWG was 4.18(±4) in RUTF symbiotic vs. 4.14 (±4.1).	Uncertainty regarding sharing, as this was not accounted for. Likelihood of faeco-oral probiotics cross-contamination, which could results in dilution of true groups' difference.	high

Table 7:

First Author/yr	Country & year of study	Study design	Pop/ sample	Intervention/ comparison, enrolment criteria	Outcome measures	Results	Limitation	Quality appraisal score
Manary 2004	Malawi in 2001	nRCT *Eligibility:*	12 -60 months (n= 282)	Systematic allocation to receive RUTF (n=69), RUTF supplement (n=96), and soy/maize flour (n=117) for 16 weeks or until recovery or death. RUTF provided 730kj/kg/d RUTF or, while other supplements provided 2100kj/d of energy	Recovery (attainment of WHz >0). Rate of weight gain, Statural growth, as well as growth in MUAC	95% of children receiving RUTF achieved recovery vs. 78% of supplement group (RUTF supplement or corn-soy flour meal). RR 1.2, (95% CI 1.1 to 1.3). average weight gain was 5.2g/kg/d in RUTF group versus 3.1g//kg/day in other 2 groups	Systematic allocation rather than randomisation could yield bias. Also because intake was not measured at home it is uncertain why RUTF was superior to the other approaches. There may have been a difference in the pattern of sharing and usage of food provided between 3 groups.	medium
Patel et 2005	Implemented between Dec2002-May 2003 in 7community Centres.	nRCT *Eligibility*: at risk of severe malnutrition (weight-for-height >80%, but <85%), without oedema.	10-60 months n= 372	Systematic allocation to receive either RUTF (n=331) or micronutrient-fortified corn/soy-blend (n=41) for up to eight weeks, or early recovery or death. Energy intake data available	Recovery (attainment weight-for-height >90% and being free of oedema. Clinical relapse and death rates, as well as rate of weight gain were also measured.	RUTF were more likely to recover: 58% vs. 22%; difference 36%; 95% CI 20- 52 p<0.001, and had greater rates of weight gain 3.1 g/kg.d vs. 1.4 g/kg.d; difference 1.7; 95% CI 0.8-2.6, p<0.001 than corn/soy-blend.	Not randomly assigned due to local beliefs and limited resources – but no evidence of bias from this. Large disparity in numbers between groups. Results may not be replicated in large scale programmes.	medium

RCT =Randomised controlled Trials, *nRCT* = Quasi-experimental or non-Randomised Control Trials

Table 8:

First Author/ yr	Country & year of study	Study design	Pop/ sample	Intervention/ comparison, enrolment criteria	Outcome measures	Results	Limitation	Quality appraisal score
Akram, 2010	Implemented in rural Karachi communities, Pakistan (year not stated)	Prospective cohort *Eligibility*: having a WHz<-3	<59 months (n=24)	Received locally RUTF plus Vitamin A and iron supplement. RUTF provided 100kj/kg/d energy initially but later increased to 120kj/kg/d. Locally made diets were also introduced after one week to increase intake to 150kj/kg/d. Duration was until recovery	Recovery (achieving WH >-1SD) rate	45.8% achieved recovery after 3 months. 41.6% took 4 months to achieve recovery while 2 children recovered after 5 months.	Very small sample size used	low
Patel ., 2010	Implemented between 2006 & 2008 in 1 centre in Delhi, North India	Prospective cohort *Eligibility:* having a WH > 70% , in addition to if mother/caretaker was not fully employed Family residing within 5 km of centre	6-59 months (n=34)	Medically ill children (n=19) initially received medical stabilisation plus started diet (F100), followed by home-based therapy (nutrient dense local diet) when children became stabilised. Non-medical complicated children receive direct home-based therapy (nutrient dense local diet). Local diet provided 150kj/kg/d energy and 2-3g/kg/d protein at start, then increase to 150-220kcal/kg/d energy and 4-5g/kg/d protein. Followed for till 16 weeks or early recovery or death	Recovery (attainment of WH more than 80%. The rate of weight gain and energy intake were also measured	Mean (±SD) hospitalisation before home-based therapy was 5.4 (±2.2) days. Two children died and 3 defaulted during initial hospitalisation. Overall 29 followed the home-based therapy (26 completed) and 3 defaulted. Mean (±SD) energy intake was 100 (±5) before and 243 (±13kcal/kg/d after 16 weeks (p<0.001). Protein intake increased 1.1 ± 0.3) to 4.8 (±0.3) g/kg/d (p<0.001). Average weight gain for community-based therapy was 3.2 (± 1.5)g/kg/day. Recovery was 45%. No deaths	The small sample size used in this study may have probable influenced study power. Hence results cannot be concluded. No comparison was made; hence we cannot tell if the outcome was attributable to the local diet they received.	medium

Table 9:

First Author/year	Country; year of study	Study design	Pop/ sample	Intervention/ comparison, and enrolment criteria	Outcome measures	Results	Limitation	Quality appraisal score
Ciliberto 2005	implemented between December 2002 and June 2003 in seven centres Malawi	nRCT *Eligibility:* was WHz <-3 or mild oedema	10-60 months (n=1178)	Systematic allocation to receive standard F-100 therapy (n=186), and F-100 (centre level) for 3 weeks then RUTF at home (n=992) for 8 weeks or early recovery or death.	Recovery (attainment of WHz> -2 + free of oedema), clinical relapsed (occurrence of oedema or systematic infections requiring admission or died were measured	Recovery after 8 weeks: 49% standard vs. 72% standard + home (95% CI 21 (10, 32), relapsed: 16.7% standard vs. 8.7% standard + home; 95%CI 8 (4, 12), RWG for 4 weeks follow-up: [2.0±6. Vs 93.5±3.7] g/kg/day (standard vs. standard +home); 95% CI 0.7 (-0.4, 1.8), Deaths: 5.4% standard Vs 3.0% (standard+ home)	No random assignment due to local beliefs and resources constraints. Results may not be replicated in large scale programmes	medium
Diop 2003	Implemented in 1 therapeutic feeding centre in Senegal (March-Sept 2003)	RCT *eligibility*<- 3z scores or oedema	6–36 months N=70 (60 in analysis)	Randomly allocated to receive 3 meals containing either F100 (n = 35) or RTUF (n = 35) in addition to local diet. Follow-up until recovery or deaths or end of programme at 3 weeks.	Energy intake and rate of weight gain were measured	Mean (± SD) daily energy intake in the RTUF group was 808 ± 280 (95% CI: 703.8, 912.9) kJ · kg body wt · d, and F100 group was 573 ± 201 (95% CI: 497.9, 648.7) kJ · kg body wt· d (p< 0.001). Average weight gains in the RTUF and F100 groups were 15.6 (95% CI: 13.4, 17.8) and 10.1 (95% CI: 8.7, 11.4) g · kg body wt d, respectively (p< 0.001). Difference in weight gain was greater in the most wasted children (p< 0.05).	Study was not blinded and foods appeared different. More children left the centre before reaching the target weight in the F100 group than in the RTUF group; may have led to an underestimation of the difference. Energy intake was greater from RTUF than from F100. Does not take into account possible differences in breast-milk intake between the 2 groups.	high

Table 10

First Author/ yr	Country & year of study	Study design	Pop/ sample	Intervention / comparison, enrolment criteria	Outcome measures	Results	Limitation	Quality appraisal score
Gaboulaud, 2005	Implemented at various inpatient and community therapeutic sites between 2002 & 2003 in Niger	nRCT *Eligibility:* measure of WHz<-3 or bilateral oedema	6-59 months (n=2209)	Systematic allocation to three treatment approaches: Group A: only ITFC therapy with F100 (n=794), Group B: started with ITFC and completed at home or F100 + RUTF (n=1,061) Group C: received exclusive home-based therapy or RUTF only (n=2,209). Duration not stated	Rate of weight gain, length of stay in program and exit outcomes (cure, death, default and transferred) rates were measured	Mean weight gain was 20.2 (ITFC), 10.1(ITFC + home), 9.8 (exclusive home)] g/kg/d. Mean length of stay was 14.7, 35.3 and 29.0 (days) respectively for Group A; B and C. Default rates were 26.5 %(ITFC), 15.7 %(ITFC+ home), 5.6 (home). Mean cure or recovery rate was 75% [55% (ITFC), 84% (ITFC + home), and 92% (home exclusive). Mean death rates were 6.5% [17.5% (ITFC), 10% (ITFC +home) & 1.7% (home exclusive)	Different nutrition status was recorded at baseline, which does not allow comparison of results among the three groups. Sharing was likely to take place at home therapy compared to TFCs where health staff manages the treatment, which was not accounted for.	medium
Saddler, 2008	Implemented between 2003 & 2004 in one ITF centre in Malawi	Prospective cohort *Eligibility:* WH<70% or <-3 zscore NCHS or presence of pitting oedema	6-59 months (n=1237) Comprise HIV posit and neg.	Initial inpatient stabilisation to treat medical complication, plus starter F100 therapy (duration not known). After stabilisation received 170 kj/kg/d RUTF (n=?) and family ration of 2kg blended maize-soy flour (n=?) providing 700 kj/kg/d at outpatient (home)	Recovery (defined as reaching >85%), Case fatality and default rates were measured	Overall recovery was 58.1% (95%CI 55.1 -61.0). Recovery rate difference in HIV+ (34.4%) Vs. no HIV 68.5%] Case fatality 25.7% (95%CI 23.1-28.3), difference in HIV [49.5% HIV+ vs. 15.1% HIV-] and default rate (16.2 (95%CI 14.0-18.4), diff in HIV groups {16.1 HIV+ vs. 16.4]		medium

Appendix II: Copy of Ethics Approval Letter (University of Sheffield (ScHARR)

The University Of Sheffield.

Cheryl Oliver
Ethics Committee Administrator

Regent Court
30 Regent Street
Sheffield S1 4DA
Telephone: +44 (0) 114 2220871
Fax: +44 (0) 114 272 4095 (non confidential)
Email: c.a.oliver@sheffield.ac.uk

Our ref: /CAO

17 January 2011

Robert Akparibo
ScHARR

Dear Robert

The impact of community based treatment of severe acute malnutrition in children under age 5 years in Ghana

Thank you for submitting the above research project for approval by the ScHARR Research Ethics Committee which is dependent upon you obtaining the necessary research ethics approval in the country in which you are researching and permission to use the secondary data.

On behalf of the University Chair of Ethics who reviewed your project, I am pleased to inform you that on 17 January 2011 the project was approved on ethics grounds, on the basis that you will adhere to the documents that you submitted for ethics review.

If during the course of the project you need to deviate significantly from the documents you submitted for review, please inform me since written approval will be required. Please also inform me should you decide to terminate the project prematurely.

Yours sincerely

Cheryl Oliver
Ethics Committee Administrator

Cc: Lindsay Blank

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GHANA HEALTH SERVICE ETHICAL REVIEW COMMITTEE

*In case of reply the
number and date of this
Letter should be quoted.*

Research & Development Division
Ghana Health Service
P. O. Box MB 190
Accra

My Ref. :GHS-ERC: 3
Your Ref. No.

*Tel: +233-0302-681109
Fax + 233-0302-685424
Email: Hannah.Frimpong@ghsmail.org*

July 21 , **2011**

ROBERT AKPARIBO, Principal Investigator

ETHICAL CLEARANCE - ID NO: GHS-ERC: 10/1/11

The Ghana Health Service Ethics Review Committee has reviewed and given approval for the implementation of your Study Protocol titled:

"Effectiveness of community based treatment of severe acute malnutrition in children under-five years in Ghana"

This approval requires that you submit periodic review of the protocol to the Committee and a final full review to the Ethical Review Committee (ERC) on completion of the study. The ERC may observe or cause to be observed procedures and records of the study during and after implementation.

Please note that any modification of the project must be submitted to the ERC for review and approval before its implementation.

You are also required to report all serious adverse events related to this study to the ERC within seven days verbally and fourteen days in writing.

You are requested to submit a final report on the study to assure the ERC that the project was implemented as per approved protocol. You are also to inform the ERC and your mother organization before any publication of the research findings.

Please always quote the protocol identification number in all future correspondence in relation to this protocol

SIGNED...
PROFESSOR FRED BINKA
(GHS-ERC CHAIRMAN)

Cc: The Director, Research & Development Division, Ghana Health Service, Accra

Appendix IV: Participants Consent form

Title of Research*:* Effectiveness of Community Based management of SAM Malnutrition in Children under age Five Years in Ghana   Investigator: ROBERT AKPARIBO Please initial in the box I confirm that I have read or had read to me the information on what this research is about and what it intends to achieve, that I understand the purpose of the research, that I have had the opportunity to ask questions about it and that any question I have asked has been satisfactorily answered. ☐ I understand also that my participation is voluntary and that I am free to withdraw at any time without giving any reason. If I have any problems or queries or need further information I can contact: the chief investigator (Robert Akparibo) or Dr Caroline Dryden (lead supervisor of the researcher). See contacts in information sheet ☐ I understand that my responses will be anonymised before analysis. I give permission for the researcher to have access to my anonymised responses ☐ I therefore agree to take part in the research project. ☐ I agree to the tape recording of my interview ☐ _____ _____ _____ Name of Participant   Date   Signature _____ _____ _____ Name of person taking consent   Date   Signature *To be signed and dated in presence of the participant*

Appendix V: A: Participants Information sheet (Individual Interviews)

Research Project Title*: Effectiveness of Community Based Management of SAM Malnutrition in Children under age Five Years in Ghana

Invitation

We are inviting you to take part in the above research project. Before you decide whether or not to participate in the research, it is important for you to understand why the research is being carried out and what it will involve, why you are being selected to take part and the specific role you will be playing in the research process. I will be explaining this shortly to you in either English language or a local language of your choice in the next 10-15 minutes. I will also give you information about the advantages and disadvantages of your participation in the research. This will help you to reflect on your participation. Other issues that you need to know including what will happen to the information you will provide at any time during the research process will also be explain to you. Ask me if there is anything that is not clear to you or if you would like more information about the project before you make up your mind to take part. I will give you more time to decide whether or not you wish to take part. Thank you for your time. **Now about the research**

Purpose of the research

You recall that in 2010 the Ghana Health Services came to this community to begin the treatment of your children suffering from severe malnutrition with some food mix put in sachets, called "plumpy'nut". It is a malnutrition intervention programme that aims to promote the children fast recovery from severe malnutrition and subsequently prevent them from dying from the "disease". The purpose of our

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research, for that matter our coming here today is to see how effective the programme is in helping the children to grow and develop following their participation in the programme.

We think that as direct carer of your child your views and perceptions about the programme to provide treatment to your child are of great importance for to understand the programme effectiveness/impact on [name of child] health. We will therefore like to interview you and a few other mothers whose children also completed the programme to find out your thoughts about the programme ability to treat the children with malnutrition in this community. You also can recall that the programme also provided some mothers with basic health and child nutrition education so that they will adopt good child care practices to ensure that the children who completed the programme do not become malnourished again when they are no long receiving dietary treatment provided by the programme. We will also want to explore whether this has been useful or not to you and the child.

In summary the issues I will discuss with you include, child malnutrition, prevention and management of child malnutrition, infant and young child feeding practise, yours views/opinion about the dietary treatment and other issues that may come up during our discussion.

Why you are being selected to take part
Because you and your child were part of the programme, your experiences and views will be valuable to us in working out ways to improve the programme in future

Your role if you agree to take part

Your role in this research if you make up your mind to take part will be to take part in a 30-45 minutes face-to-face interview/discussion with me on the issues I told you earlier. There would be no wrong or write answers. I intend to ask very flexible questions so feel free and relax to respond in your opinion what you feel is right. You are free to ask as many questions as possible during our interaction on the issues. Similarly I will also ask you further questions apart from the ones I will initially ask you if I do not hear you well or need to be clear on something that you have said, I hope you won't mine. You may stop the interview at any time and you would not be asked to participate again.

With your approval, the discussion will be tape recorded to allow me to obtain the best understanding of what you have said after the interview is completed. The recorded information will later be typed up and the information will be analysed and used to consider how to improve the programme. The interviews will be conducted within your home or at a place and time convenient for you.

Is it compulsory that you must take part?

NO. Your participation in the interviews is entirely voluntary. It is up to you to decide whether or not you wish to be interviewed on this occasion. If you understand the research process and have decided to take part that will be great and I will appreciate but you are not obliged to take part.

Is there anything you must do before taking part?

No, you do not need to do anything special. All you need to do before I interview you is to:

1. either say "yes I agree to participate" verbal

2. Or I will give you a consent form which you will need to sign as evidence of your acceptance. It is up to you whichever way you wish to give your consent

There is no risks involve in signing the consent form. You can still withdraw from taking part in the interviews even after signing or agreeing to participate at any time; before the interview or while it is in progress without it affecting you or your child/family in any way. You do not have to give reasons for your withdrawal.

What are the possible disadvantages and risks of taking part?

There are no disadvantages and or any risk to your personal life or the lives of your child or any of your family members when you agree to take part in the research interview. The process is entirely voluntary and no individual is under any obligation to participate if they don't want to. However your participation will be highly appreciated because of the experience we think you have to share. If at any stage you feel you are uncomfortable you can withdraw without given reason, or you may want to discuss your fears with me at any time before, during and after the interview. I will leave my contact details with the community health nurse residence in this community and the district director of this district for your easy access.

What are the possible benefits of taking part?

There are no immediate personal benefits in taking part in the research. However, the information you will provide may be used in future by the Ghana Health Service (GHS) who are responsible for the welfare of children in this community to improve the programme and to develop other child health programme to benefit more children in this community and in the country as a whole.

Will my taking part in this research be kept confidential?

Yes, all the information that I will collect from you and others during the course of the research will be kept strictly confidential. You will not be identified in any reports or publications. Your name will be replaced by a code during analysis of the interview records, and all information in interview transcripts will be anonymised.

What will happen to the results of the research project?

In the first instance, the results of the research will be used to write a report, which will be submitted to the School of Health and Related Research (ScHARR) of the University of Sheffield (UK) to be examined for a Doctor of Philosophy degree. However, the most interesting part of the results will also be shared around the world through publication in academic journals and conferences as a contribution to the growing scientific knowledge regarding evidence of community treatment to address acute malnutrition. No individual name will be identified in any form in any of the publications.

Who has ethically reviewed the project?

This research has been reviewed and approved by the University of Sheffield Research Ethics Committee, as well as the Ghana Ethics Review Committee. In addition, I have asked permission from the programme implementers, your community leaders and the head of this family and they have approved of the research.

What if I have complaints regarding this research?

If you wish to raise a complaint or a concern about any aspect of this research or this particular interview process you are allowed to do so. You should in the first instance contact the community health nurse resident in this community who is well aware about this research and will be happy to address your concerns. If the nurse is unable

to help handle your concerns he/she will contact me directly or the Director of Health Service in this District and your concerns will be addressed.

If you want to know more about this research project or if you need clarification or have some suggestions you are encouraged to do so.

APPENDIX VI: INDIVIDUAL SEMI-STRUCTURED INTERVIEWS

Community Based Volunteers Interview Guide

Socio-demographic details

- Date of interview…………………………………………….
- Date of birth …………………………………………………..
- Marital status …………………………………………………
- Sex (gender) …………………………………………………
- Level of educational …………………………………….
- Occupation ……………………………………………..

Guiding questions

1. How are you involved with the CMAM programme?
2. What motivated your participation in the programme?
3. What kind of training did you receive before getting involved, and can you describe this training?
4. What are your views about the training you received?
5. Can you share your experience about the programme, including your involvement in the service delivery?
6. What challenges have you faced in dealing with community members?

7. How will you describe your working relationship with the health workers?

8. What do you think could be done better to improve the programme delivery and success?

9. What is your general views/opinion about the programme and the delivery process?

10. What are your views regarding the use of plumpy'nut to treat the children with SAM?

Caregivers Interview Guide

Socio-demographic details

- Name of district …………………………………………
- Name of community………………………………………
- Date of interview……………………………………………….
- Date of birth …………………………………………………..
- Marital status ……………………………………………………
- Number of children…………………………………………
- Level of educational ……………………………………………
- Occupation ……………………………………………………….

Guiding questions

1. Tell me what you know about your child(ren) condition, that made you to send him/her for treatment?

2. Have you heard about malnutrition "disease", and how do you call this disease in this community? – *prop to find out whether participants are able to relate child illness to malnutrition.*

3. Can you tell about the CMAM programme that provided treatment to your child? How did you know about the programme?

4. What are your views/perceptions about the programme?

5. What/who influence your decision to participate in the programme?

6. What/who influence your decision to withdraw your child from the programme?

7. What treatment did you give to the child after withdrawing from the programme and why? Find out more about whether this is the traditional way to manage malnutrition

8. How easy or difficult was it for you to access the treatment for your child?

9. Would you recommend your friend or family member whose child have this condition to attend the programme and why?

APPENDIX VII: FOCUS GROUP INTERVIEWS

Information sheet (focus group participants)
Research Project Title: Effectiveness of Community Based Management of SAM Malnutrition in Children under age Five Years in Ghana

Invitation

We are inviting you to take part in the above research project. Before you decide whether or not to participate in the research, it is important for you to understand why the research is being carried out and what it will involve, why you are being selected to take part and the specific role you will be playing in the research process. I will be explaining this shortly to you in either English language or a local language of your choice in the next 10-15 minutes. I will also give you information about the advantages and disadvantages of your participation in the research. This will help you to reflect on your participation. Other issues that you need to know including

what will happen to the information you will provide at any time during the research process will also be explain to you. Ask me if there is anything that is not clear to you or if you would like more information about the project before you make up your mind to take part. I will give you more time to decide whether or not you wish to take part. Thank you for your time.

Purpose of the research

The purpose of our research, for that matter our coming here today is to see how effective the CMAM programme is helping children to survive death from SAM malnutrition.

We think that your perspective as a service provider/or a grandmother/father (where appropriate) caring for se4vere malnourished children) would be useful to determine the overall success of the treatment and education programme. The information you will collectively provide following the discussion will also help us identify factors that need to be address in order to sustain the programme in this community. We will therefore like you to come and join other CHOs/ or community members (where appropriate) in a focus group discussion to debate on issues including your views about access to the treatment, the cultural acceptability of dietary supplements being use, community participation and what you think about the programme sustainability. We will also be interested to know from you as representatives of this community in the discussion what are the community perceptions and beliefs about the programme in general. We will be happy also to find out what are some of the challenges you face as a community in taking part in such a treatment process.

Why you are being selected to take part

You are being asked to take part in the group discussion because we think you may have very interesting information as a beneficiary to share about the programme in the group, which will also be valuable to us in working out ways to improve the programme in future

Your role if you agree to take part

Your role in this research if you make up your mind to take part will be to take part in a 45-50 minutes focus group discussion with your colleagues in the group regarding the issues I told you earlier. There would be no wrong or write answers. I will be a facilitator of the discussion and my colleague here will assist me in taking notes. We will have very minimal interference during the discussion. You have decided to put men and women in separate groups to allow for free expression, as we are aware that culturally the women may not be comfortable to speak in the presence of men or their husbands. Everybody in the discussion group including you is free to express your views without fear of intimidation. You are also free to ask questions or challenge member in the group objectively if you think in your opinion they are not saying what you think is write about the issues being discussed. . My colleague and I will also from time to time ask any member of the group to know more from the group about the issue being discussed

With your individual and group or approval, the discussion will be tape recorded to allow me to obtain the best understanding of what the responses regarding the issues were since we may not be able to capture all what was said after the discussion. The recorded information will later be typed up and the information will be analysed and used to consider how to improve the programme. The discussion will be conducted

within a suitable place within this community where there will be no be public interference. We will agree on a place and time convenient to everybody.

Is it compulsory that you must take part?

NO. Your participation in the group discussion is entirely voluntary. It is up to you to decide whether or not you wish to take part. If you understand the research purpose and process and have decided to take part that will be great and I will appreciate it, because your inputs are useful to us in this research, but you are not obliged to take part.

Is there anything you must do before taking part?

No, you do not need to do anything special. All you need to do before I interview you is to

1. either say "yes I agree to participate" verbal

2. Or I will give you a consent form which you will need to sign as evidence of your acceptance. It is up to you whichever way you wish to give your consent

There is no risks involve in signing the consent form. You can still withdraw from taking part in the group discussion even after signing or agreeing to participate at any time; before or during the discussion without it affecting you or your child/family in any way. You do not have to give reasons for your withdrawal.

What are the possible disadvantages and risks of taking part?

There are no disadvantages and or any risk to your personal life or the lives of any member of your family when you agree to take part in the research (discussion). As I said before the process is entirely voluntary and no individual is under any obligation to participate if they don't want to. However your participation will be highly appreciated because of the experience we think you have to share. If at any stage you feel you are uncomfortable you can withdraw without given reason, or you may want

to discuss your fears with me at any time before, during and after the session. I will leave my contact details with the community health nurse residence in this community and the district director of this district for your easy access.

What are the possible benefits of taking part?

There are no immediate personal benefits in taking part in the research/discussion. However, the rich information you and the rest of the group members will provide may be used in future by the Ghana Health Service (GHS) who are responsible for the welfare of children in this community to improve the programme and to develop other child health programme to benefit more children in this community and in the country as a whole.

Will my taking part in this research be kept confidential?

Yes, all the information that I will collect from you and others during the course of the research will be kept strictly confidential. You will not be identified in any reports or publications. Your name will be replaced by a code during analysis of the discussion responses. All information contained in a transcript that I will produce out of the analysis of the responses will be anonymised.

What will happen to the results of the research project?

In the first instance, the results of the research will be used to write a report, which will be submitted to the School of Health and Related Research (ScHARR) of the University of Sheffield (UK) to be examined for a Doctor of Philosophy degree. However, the most interesting part of the results will also be shared around the world through publication in academic journals and conferences as a contribution to the growing scientific knowledge regarding evidence of community treatment to address acute malnutrition. No individual name will be identified in any form in any of the publications.

Who has ethically reviewed the project?

This research has been reviewed and approved by the University of Sheffield Research Ethics Committee, as well as the Ghana Ethics Review Committee. In addition, I have asked permission from the project implementers, your community leaders and the head of this family and they have approved of the research.

What if I have complaints regarding this research?

If you wish to raise a complaint or a concern about any aspect of this research or this particular group discussion process you are allowed to do so. You should in the first instance contact the community health nurse resident in this community who is well aware about this research and will be happy to address your concerns. If the nurse is unable to help handle your concerns he/she will contact me directly or the Director of Health Service in this District and your concerns will be addressed.

If you want to know more about this research project or if you need clarification or have some suggestions you are encouraged to do so.

Focus Group Guide – Community Members

1. Can you tell me what you know malnutrition?

2. How can malnutrition be prevented or treated?

3. How did you know about malnutrition?

4. Can you share your views about what causes this condition (malnutrition)? Explore causes, preventions and local strategies to address and/or manage malnutrition.

5. How do people in this community perceive about malnourished children?

6. Do you know the CMAM programme that uses plumpy'nut (peanut paste-like butter) to treat children suffering from malnutrition?

7. How did you become aware of the programme?

8. What are your views/perceptions about the programme?

9. How did you become aware about malnutrition?

10. What information have you received from health workers regarding malnutrition and the CMAM programme? How useful was this information to you?

11. Would you recommend family members who are suffering from malnutrition to use the service?

Focus Group Guide – Health Workers

1. What are your views and experiences about the CMAM programme that you have been involved in?

2. What training did you receive and how relevant was it to you in relation to the skills you required to take part in the programme?

3. What difficulties/constraints/challenges do you face as service providers delivering this programme in local community context?

4. Are there any issues you have identified that need to be addressed to improve this programme?

5. What are your perceptions about how local community members feel about the programme?

6. What strategies did you adopt to engage community members (beneficiaries) to participate in the programme? What informed your decision to choose these strategies?

7. What has been your key motivation for committing your time to deliver this programme?

Key Observation/Key Informant Questions

- How were meetings organised and held?
- Who took part in those meetings?
- How decisions were take regarding programme delivery?
- Were the different stakeholder groups involved in decisions making?
- What major issues aroused and how were these addressed?
- How did all this impact on the programme delivery?
- Who was involved in delivering the programme at the community level?
- Were they trained and what kind of training?
- How training was conducted, who delivered training and who participated?
- Did trainers have the skills to train?
- How were daily activities carried out at health centres and community levels?
- How were RUTF distribution sessions organised?
- Who conducted the distribution and where?
- How was anthropometry of children taken?
- Did staff have the skills to do anthropometry?
- Was monitoring conducted regularly per the programme protocol?
- How was counselling conducted and where?
- How was severe malnutrition cases identified?
- Did screening for severe malnutrition take place at the community level?

Appendix VIII: Sample of 'the framework analysis': Thematic charts on barriers to utilisation

ID	Barriers to programme success: Socioeconomic and cultural factors as barriers to utilisation			
	Distance to treatment site	Busy schedule of caregivers and unsupportive husbands	RUTF distribution days not convenient	Alternative choice for traditional medicines
CG -6	"The place is very far, and there is no means of transport. The transport comes only on market days, and even with that the cost of going and coming (GHC 2) is expensive" (Mother of 2 children*).*	"After attending a few times I stopped because I usually have to go to the forest to look for firewood in the morning, come back and then go to fetch water. This was too much for me as a single mother" (Mother of 2 children).	"They were aware that market days are busy days for women in this community, yet they want us to come. We earn our livelihood through buying and selling at the markets" (Mother of 2)	
CG-4	"The place is far and with this hot sun. I was unable to go there weekly, so I decided to stop" (Mother with 1 child).	"He just doesn't care about anything. I think he is afraid that his colleagues will tease him that he is doing a woman's job at home, so he has left everything for me. If I had his support I would be willing to continue my participation in the programme. I see how my colleagues' children look now, after they have been there" (Mother of 1 children)		

CG-3	"I do everything at home by myself, my husband is travelled away to Kumasi, and there is no one to take care of our other two kids at home. The first day, I carried all of them with me to the centre, when we came back I could see how tired they were. So I decided not to do that again" (Mother, 3 children)	Grandma took us to the traditional medicine man and he gave us some herbs to use. We boiled the herbs and bathed him with it, but he also said we should give him some to drink for 5 days. His condition did not improve much and the volunteers came to the house to talk to us about the programme. He looks healthy and is growing well now (Mother of 3 child).
CG-2		His grandfather was the one who gave me the herbs to boil it and bath him. They said that not all illness can be treated by the doctors. Sometimes the traditional medicine too is good (Mother of 4 children).

CG=caregiver