Contributing factors for undernutrition in children admitted to Nutrition Rehabilitation Units (NRUs) in Malawi

A follow-up descriptive case study from Mangochi District, Malawi

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Abstract

Background: Child undernutrition is a major health problem and an important risk factor for child mortality as more than 50% of deaths among children under five are either a direct or indirect attributable to undernutrition. Nutrition Rehabilitation Units (NRU`s) have been established where severely undernourished children come in for therapeutic feeding and their caregivers are offered education on child feeding. Few follow-up studies have been done to investigate their long-term prospects after discharge. It is well recognised that caring practices are important factors in order to maintain good health and nutrition in the children, however adequate caring practices require time, knowledge, economic resources and motivation. Possible obstacles of the caregiver's possibility to maintain the nutritional status of the child is important to identify in order to contribute to the understanding of ways to implement supportive measures both in prevention of undernutrition and to maintain the child's health status after rehabilitation.

Objective: The aim was to explore how various caring practices can contribute to severe undernutrition in the children admitted to the NRU. Further, to examine possible obstacles for the caregiver to provide adequate care to the child before admittance and after discharge.

Design: A descriptive case study was conducted using a structured questionnaire and taking of anthropometric measurements on admission to the NRU and one month after discharge. In addition, qualitative interviews were conducted with both caregivers of the children and staff at the NRU.

Setting: A total number of 70 patients and their caregivers admitted to three NRUs in Mangochi District in Malawi were included.

Results: Lack of resources of different kinds seemed to be a limiting factor for the caregivers to provide adequate care to the children. These resources were related to support, time, knowledge, a healthy environment and access to medical assistance. After discharge, the nutritional status improved for 67 % of the children who were followed up after discharge. The failure of improvement for the remaining seemed to be both due to lack of resources in the household and problems related to compliance to the follow-up system.

Conclusion: Severe undernutrition may be determined to a large extent by the caregivers resources available to give adequate care to their child. Education on child health and nutrition must be improved in the community through community based services in order to

prevent illness and undernutrition in children. Incorporating treatment of undernourished children and supplementary feeding programs into such community based services might increase the success rates.

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Abbreviations

AAH	Action against Hunger
AIDS	Aquired Immunodeficiency Syndrome
ARI	Acute respiratory infections
CDC	Centre for Disease Control and Prevention
CHAM	Christian Health Association of Malawi
DH	District Hospital
FAO	Food and agriculture organisation of the United Nations
Ha	Hectares
H/C	Health Centre
HIV	Human Immunodeficiency Virus
HSA	Health surveillance assistant
NCHS	National Centre for Health Statictics
NGO	Non Governmental Organisation
NRU	Nutrition Rehabilitation Unit
MDHS	Malawi Demographic and Health Survey
MSF	Medicins sans frontiers
MTCT	Mother-to child transmission
MUAC	Mid upper arm Circumference
ORT	Oral rehydration theraphy
RUTF	Ready-to use therapeutic food
SPSS	Statistical Package for Social Sciences
STI	Sexually transmitted infections
TALC	Teaching Aid at Low Cost
TFC	Therapeutic feeding Centres
TFR	Total fertility rate
TB	Tuberculosis
UNICEF	United Nations Childrens Fund
USAID	United States Agency for International Development
WFP	World Food Programme
WHO	World Health Organisation
WHZ	Weight-for height z-score

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1. Introduction

Worldwide, undernutrition has been directly or indirectly responsible for 60 % of the 10.9 million deaths annually among children under five. Undernourished children who survive commonly suffer long-term consequences of impaired physical growth and cognitive development (1). Life long impacts include poor educational attainment, reduced productivity and impaired intellectual and social development. This further diminishes livelihood options in adulthood, reducing human capital which is a fundamental asset in society (1;2). Main causes of childhood diseases and/or deaths such as measles, malaria, respiratory infections, diarrhoeal diseases and perinatal conditions are attributable to undernutrition (2;3). This is due to a vicious cycle between undernutrition and infection, as undernutrition compromises the immune system and increases vulnerability to disease. On the other hand, infections cause appetite loss, malabsorption of important nutrients and altered metabolism (2;4).

The causes of undernutrition are complex and multifaceted as many factors may lead to a failure of preconditions for good nutrition. Even if child undernutrition is most prevalent in poor countries, the link between poverty and undernutrition has been debated. The degree of relationship has been questioned at community level as other factors than poverty by itself has been associated with child undernutrition. Such may include insecure or inadequate food supply, inappropriate feeding and/or child care practices, poor health status, intra-household use of resources or poor socioeconomic conditions (5).

Learning more about main challenges in global health, especially in poor settings with limited resources, the student researcher took interest in the complexity of child undernutrition early during this Masters course. Reading about and discussing some of the main global health challenges, a special interest arose in understanding how good nutrition is linked to and plays an important role in a wide range of other challenges both in the fields of health, education, empowerment of women and several other important development issues. Especially, the interest was related to women's roles and participation and what kind of factors influences women's possibilities to secure adequate nutrition in their children.

The decision of recruiting participants from Nutrition Rehabilitation Units (NRUs) was made through discussion with my supervisors in Norway, Dr. Liv Elin Torheim and Prof. Gerd Holmboe-Ottesen. Malawi was chosen as the country of investigation as the Section of International Health has collaborators at the College of Medicine in Malawi who could assist as local supervisors. Dr. Ken Maleta assisted as a local supervisor and suggested the NRU at Mangochi District Hospital (DH) to be a suitable place to conduct the study. In collaboration with Dr. Ken Maleta and Christian Health Association of Malawi (CHAM) representative Desiree Mhango, the additional NRUs at St.Martin Hospital and Nkope Health Centre (H/C) were also included as study locations. These are the three NRUs serving the population in Mangochi District.

2. Country profile of Malawi

2.1 Background information

2.1.1 History and politics

Before the colonists came to Malawi, the area was called the Marawi Empire which is the origin of the name Malawi. Malawi was under British rule from 1891 until 1964 under the name of Nyasaland Protectorate. In 1964, the country gained its independence, and gained republic status in 1966. The prime minister at the time, Hastings Kamuzu Banda was elected president in 1971 and instituted an authoritarian one-party rule until 1994 when Malawi held its first multiparty elections after pressure by its inhabitants (6). Today the country is a multiparty democracy. It is divided into three regions: the Northern, Central and Southern regions, which are further divided into 27 districts. These are subdivided into Traditional Authorities, composed of villages, which are presided over by village headmen (7).

Mangochi District, in which this study took place, is one of the twelve districts in the Southern region and is located at the Southern tip of Lake Malawi in the Southern region of the country. The districts total land area is 6,273 square kilometres and it comprises 6.7 % of the whole country.

2.1.2 Geography

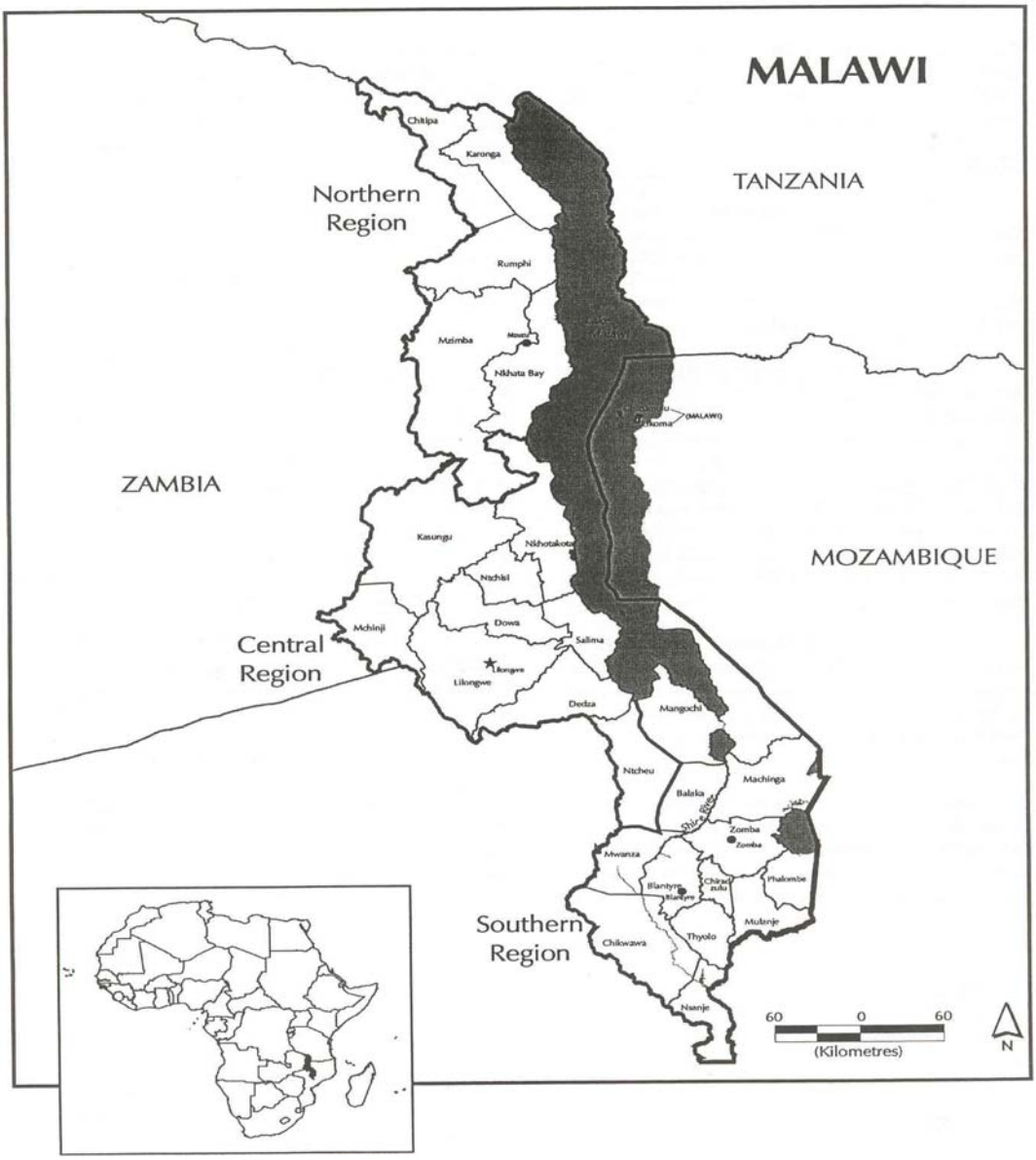
Malawi is a landlocked country south of the equator in sub-Saharan Africa, bordering Tanzania to the north and northeast, Mozambique to the east, south and southwest and Zambia to the west and northwest. It has a total area of 118,484 square kilometres, of which 94,276 kilometres is land area. The remaining is mostly composed of Lake Malawi, which is 475 kilometres long and runs down Malawi's boundary with Mozambique. The Shire River drains the water from this lake into the Zambesi River in Mozambique (7).

Malawi has a tropical climate and rainfall and temperature vary depending on the proximity to the Lake. The Lake shore has hot and humid weather all year round with mean annual temperature of 24 ^{o}C and has the least rainfall compared to the inland areas which have higher

altitude. Malawi's climate varies in three main seasons: a dry cool season from May to July; a dry hot season from August to November; a warm rainy season from November to April (7).

Mangochi District is characterized by a warm tropical climate with mean annual temperatures ranging from 18-32°C. It experiences a dry season from May to October and a rainy season from November to April. Most of the rains fall during the months of January and February.

Figure 1: Map of Malawi



2.1.3 Economy and livelihood

Malawi is one of the poorest countries in the world and is ranked by the World Bank as number 201 out of 208 countries (8). Malawi has a predominantly agricultural economy with

about 90 % of the population living in rural areas (7;9). Agriculture accounted for nearly 36 % of GDP and 80 % of export revenues in 2005 (9). The major export commodities are tobacco, tea and sugar. The Malawian currency, Kwacha, is unstable and depends heavily on tobacco and petroleum prices and maize crops. The economy currently depends on inflows of economical assistance from international organisations and individual donor nations (9).

Forty percent of the total land is suitable for agriculture and most of the arable land is under traditional or customary tenure system where cultivation rights rather than ownership is granted by the village headman (10).

In Mangochi District, the majority of land is considered vacant, and this compromise unutilized arable/buildable land, steep slopes, swamps, floodplains and dambos. Forest reserves occupy 22.5 % of the total land area, agricultural estates occupy an estimated 7 % of all the land, while 11.2 % is under scattered and nucleated settlement gardens (11).

According to the 1998 census, 66 % of the Malawian population aged 10 or more years was economically active. Of the economically active population, an estimated 76 % of the populations were subsistence farmers and 13 % were employees (12). Poverty is widespread and it affects people's everyday lives widely, including the health and food situation.

In Mangochi District, most of the population is concentrated along the lakeshore where fishing is the major economic activity. Other major economic activities are in the areas of smallholder and estate agriculture, livestock rearing and tourism. Tobacco is the major cash crop, while maize is the major food crop grown by subsistence farmers. Paid employment is limited and petty trading is the source of livelihood for many.

2.1.4 Population and demographic characteristics

The country has experienced a rapid population growth rate. The 1998 Population and Housing Census enumerated a population of about 9.9 million (12), representing an increase of 24 % since 1987 (7). Malawi's land mass is small, resulting in a high population density of

about 105 persons per square kilometre (increased from 85 persons per square kilometre in 1987) and an increasing pressure on agricultural land (7). For Mangochi District, population density in 1998 was 95.6 persons per square kilometer. The population of the district was 599,953- representing an annual growth rate of 1.7 %.

Preliminary findings of the Malawi Demographic and Health Survey 2004 (MDHS) indicate that total fertility rates (TFR) are on the decrease, as this has decreased from 6.3 in 2000 to 6.0 in 2004 (13). According to the MDHS 2004, this decline is due to lower fertility rates among older women and indicates the beginning of a transition involving a decision among women to reduce their family sizes.

Malawi's population is largely constituted by young people, as the median age of the population was 18 years according to the 1998 population census. It also revealed that about 17 % of the population constituted of under-five year old children (12). According to the census, the literacy rate was 58 %, having increased from 42 % in the last decennial survey (12). Female and rural literacy rates were in general lower in both surveys. Poverty, poor educational standards, malnutrition and long distances have been explained as the reasons for high failure and drop-out rates in school (7;14). Maternal education was also linked to poor nutritional status of children by this survey (7).

2.1.5 The people

The people of Malawi are of Bantu origin and the ethnic groups include Chewa, Nyanja, Yao, Tumbuka, Lomwe, Sena, Tonga, Ngoni and Ngonde. In Mangochi District, the dominant tribe is Yao followed by Chewa. The Chewa people are predominantly Christian, while the Yao people are mainly Muslim. Traces of animism which is the belief in ancestral spirits is evident, especially in times of stress such as droughts and floods (11). The district is predominantly matrilineal, which means that the husband leaves his village to live with his wife and cultivation rights are inherited by the wife.

2.2 The health situation in Malawi

2.2.1 Health indicators and burden of disease

Life expectancy dropped from 43 years in 1996 to 39 years in 2000, partly due to the HIV/AIDS epidemic (14). In 2003, an estimated 14 % of the adult population (15-49 years) were living with HIV (15). The HIV/AIDS burden is growing, with an overall prevalence of 19.8 % for antenatal attendees in 2003. The prevalence at Mangochi DH was 14.5 % according to the same sentinel. Mother-to child transmission (MTCT) is high with an estimated a prevalence of 26.9 % of infants being born to HIV-infected mothers (16).

Maternal mortality rates increased in the 1990's, from 620 (in 1992) to 1,120 (in 2000) per 100,000 live births (7). Child mortality is also high compared to other countries. Under-five mortality rate is one of the highest in the world with an estimated an estimated 133 per 1,000 live births (13). A recent decline has been observed from 189 per 1,000 live births in 2000 (7). Urban mortality rates are generally lower than in the rural areas.

In Mangochi District, major causes of child mortality are malaria, anaemia, diarrhoea and respiratory infections. Limited accessibility to potable water has resulted in the high prevalence of water borne diseases and malaria continues to be the most prevalent ailment (11).

2.2.2 Health system in Malawi

The health care services are provided by three main agencies. The Ministry of Health and Population provides about 60 %, the Christian Health Association of Malawi (CHAM) provides about 37% and the remaining 3 % is provided by the Ministry of Local Government, private practitioners, the army and the police (17).

CHAM is the major government collaborator in health delivery and comprises of independent church-related and private voluntary agencies. CHAM is subsidized by the Government through annual grants for human resource expenses. CHAMs services require user fees for

most of its services except for growth monitoring, immunizations and community based preventive services that include treatment for specific communicable diseases such as tuberculosis (TB) and sexually transmitted infections (STIs).

Health services are being provided at three levels. At primary level, services are delivered through health centres, health posts and outreach clinics. This is largely the first point of contact for health care services at community level. At secondary level, health care services mainly function as a backup to the primary health care services by providing additional services, such as surgical facilities. This level of health care is largely provided by district hospitals and most of CHAM hospitals. Most districts in the country have a district hospital which is owned by the government. At tertiary level, the services are similar to those at secondary level except for specialist surgical and medical interventions. Despite this organization in the health care delivery, health facilities are still inaccessible to many people. In 2000, there were about a total of 510 primary health care facilities, each serving an average of 16 000 people (17).

Mangochi District has 3 hospitals, namely Mangochi DH (run by the Ministry of Health and Population), St. Martin Hospital (run by the Anglican Church) and Sister Martha Hospital (run by the Catholic Church), as well as 29 health centres, 2 health posts and 134 outreach clinics (11).

2.3 The food and nutrition situation in Malawi

2.3.1 Food in Malawi

Maize is the main agricultural crop in Malawi and it covers approximately 76 % of smallholder farmland. Other food crops include rice, sorghum and millet. Legumes, beans, pigeon pea and groundnuts are traditionally grown by smallholders. Cassava, irish potato and sweet potato are more locally based crops (10). According to a report by the Food and Agriculture Organisation (FAO), approximately 4 % of households had cattle, 15 % had goat and 55 % had poultry in 2000 (10). Fish is commonly consumed in the lakeshore areas and provides between 60- 70 % of animal protein consumption (14). The staple diet in Malawi is

nsima- a thick maize porridge made from either refined maize flour or whole grain maize flour. *Nsima* is traditionally eaten with vegetables and/or fish or meat.

In Mangochi District over 90 % of the population are farmers, cultivating 42 % of the total arable land in the district. As in the rest of the country, the main food crop is maize which accounts for almost 80 % of the cultivation area. Other food crops grown in the district are rice, sweet potatoes, cassava, ground nuts, beans, pigeon peas, cow peas, soy beans and vegetables. Locally grown fruits include mangoes, pawpaws, bananas, guavas, lemons, avocado pears and custard apples (14). Fruits are characterized by seasonality and most are given away very cheaply after harvest due to excess supply. The majority of the crops are grown in the rainy season, and farmers are vulnerable to droughts. The district was greatly affected during the droughts in 1997/98. Main livestock kept by farmers are cattle, goats, sheep, poultry, ducks, doves, pigs and rabbits. Fish is also a main source of animal protein for people living along Lake Malawi, Lake Malombe, Shire River and other rivers. The main fish types are *chambo*, a number of small fish called *usipa* and *catfish* which is dried or smoked. The people benefit directly through fishing and trading of these.

2.3.2 Food insecurity

Malawi is increasingly food insecure and has in recent years become dependent on food donations to fulfil its national food need. Some of the main reasons are chronic poverty, increased pressure on land, decreased soil fertility, unfortunate climatic conditions, unfavourable agricultural policies, bad governance and lack of political will (18;19). In addition, the HIV/AIDS epidemic has resulted in loss of productivity and coping mechanisms for farmers and is contributing to food insecurity in the country (19).

Malawi faced serious food crisis in 1991/92 and in 2002 (18). At the time of writing in June 2006, the people of Malawi are facing another food crisis.

2.3.3 Prevalence of undernutrition

Undernutrition is one of the most important health problems facing children in Malawi today and little improvement is evident when looking at nutrition data over recent years. The 2000 Malawi Demographic and Health Survey (MDHS) found the prevalence of stunting to be 49 %, with 29 % of these being severely stunted. The 2004 MDHS found that 48 % of the children were stunted, of these 22 % were severely stunted (7;13).

The 2000 MDHS found that 6 % of the children of the children were wasted, 1 % of these were severely wasted. Again, the prevalence was similar to the 2004 MDHS data which found that 5 % of the children were wasted, with 1 % of these severely wasted (7;13).

Regarding underweight, which reflects both stunting, wasting or both, 25 % of the children were underweight according to the 2000 MDHS. The 2004 MDHS found 22 % of the children to be underweight, of these 7 % were severely underweight (7;13).

3. Causes of child undernutrition and care for the severely undernourished

3.1 Undernutrition and the study setting

3.1.1 Definition of undernutrition

The term malnutrition is used in the literature to describe both undernutrition and overnutrition. Since undernutrition is the focus of this study, this term will be used throughout this thesis. Undernutrition is most commonly reflected by three anthropometrical indices; height-for-age, weight-for-age and weight-for-height. Stunting (low height-for-age) reflects linear growth and indicates chronic or long-term effects of inadequate nutrition and/or health. Wasting (low weight-for-height) usually reflects a recent and severe process of weight loss due to sudden food deprivation or disease, but can also be a result of chronic disease or dietary deficit. Underweight (low weight-for-age) reflects body mass relative to age and is influenced both by height and weight of a child (3).

3.1.2 Brief description of NRUs and its patients

As a response to high child mortality due to undernutrition, NRUs have been established where severely undernourished children come in for therapeutic feeding and their caregivers are offered education on child feeding (20;21). The caregivers take part of every aspect of the food preparation and feeding, which is an important part of the learning experience, as well providing an emotional effect on the caregiver of the child's recovery in response to the diet she has prepared. The NRUs are part of an important strategy in order to save children's lives, but the concept has been and is controversial, as the case fatality rates of children admitted to NRUs are high. In Malawi it is estimated that the case fatality rate is between 20-30 % (22;23).

NRUs- which is also called Terapeutic Feeding Centres (TFCs), has been set up in many countries in the world, either as a short-term intervention in emergency situations or as a long-term intervention in places where prevalence of severe undernutrition is high. International and/or humanitarian organisations are responsible for coordinating, providing resources and

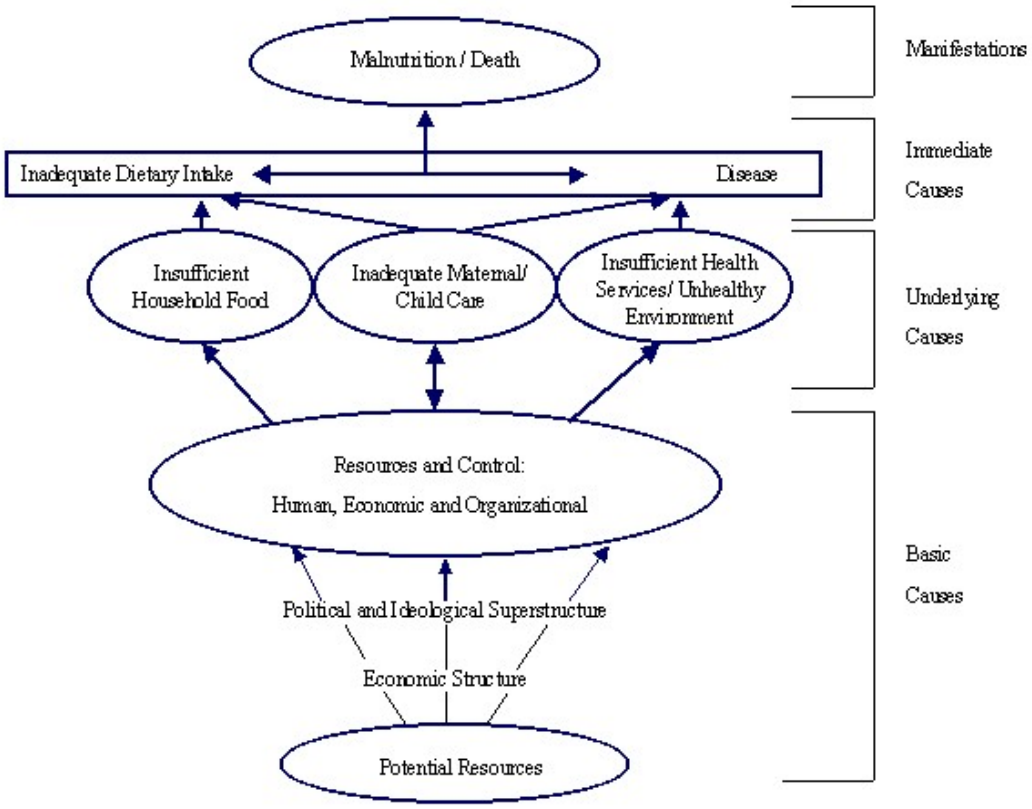
monitoring the NRUs. Examples are United Nations Children's Fund (UNICEF), Medicins Sans Frontiers (MSF), Action against Hunger (AAH), World Food Programme (WFP) and others. Due to the high prevalence of undernutrition in Malawi, NRUs have been established in all districts.

Children admitted to NRUs most often present themselves with two clinical forms of severe undernutrition, namely: *kwashiorkor* or *marasmus.* Kwashiorkor usually affects children aged 1-4 years old and is often related to the weaning period. Its main sign is oedema, usually starting in the feet and legs and spreading to hands and face as illness progresses. Other common signs are loss of pigmentation of the hair, skin lesions and hypo-pigmentation. Marasmus is recognised by severe wasting as most fat and muscles have been expended to provide energy. It usually results from prolonged starvation or recurring infections with limited food intake. Marasmic kwashiorkor is a mixed form of these conditions, where the child presents with oedema but no other signs of kwashiorkor (24).

3.2 Causes of undernutrition (malnutrition)

The conceptual framework of the causes of undernutrition was developed by UNICEF in 1990 as a tool to identify and assess the causes of child undernutrition on different levels of society (25).

Figure 2: Conceptual framework of causes of undernutrition (malnutrition) (UNICEF 1990)



It shows that the causes embrace many different sectors, such as food availability and access to food, factors related to adequate health and caring practices and also that these causes influence each other on the different levels (4;26). This framework have been used as a tool for planning this research, however the term *caring practices* is used in a wider term and hence overlapping several of the immediate and underlying causes used in this framework.

Child undernutrition is a problem that can result from many causes and experience has shown that even if a family lives in a healthful and safe environment with adequate food in a household, a child can still become undernourished. On the other hand, in poor countries like Malawi, many children do not live in such an environment, but can still grow up to be healthy

because the mother or caregiver are able to give adequate care to the child. This shows that caring practices are important factors in order to maintain good health and nutrition in the children. Care refers to the practices of caregivers on a daily basis that translate food, health care and water and sanitation into satisfying growth and development of children. It has been defined as " the provision in the household and community of time, attention and support to meet the physical, mental and social needs of the growing child and other households members" (27). It is a wide term which includes practices related to feeding and food preparation, hygiene practices, care during illness and healthcare seeking behaviours and providing psychosocial support (27). For the scope of this project caring practices includes feeding practices, care for children during illness/healthcare seeking behaviour and hygiene behaviours.

3.3 Child nutrition and feeding practices

An extensive knowledge on infant and child feeding practices has been developed and what is adequate and inadequate caring practices have been listed in numerous recommendations and guidelines. The importance of giving colostrums to the child, adequate breastfeeding of the child and to introduce complementary feeding in an adequate, safe, timely and properly fed manner have been recognised. There is evidence that exclusive breastfeeding in early life both strengthens the immune system and that breast milk meets all the nutritional needs of the child up to 6 months of age (28). These recommendations include exclusive breastfeeding until the child is 6 months old, and complementary feeding should then be introduced gradually from four-six to 12 months while breastfeeding is continued (28-31). On demand, frequent breastfeeding should continue until the child is 2 years or beyond while receiving adequate and safe complementary foods (31). The complementary foods have to be rich in energy, proteins and micronutrients (25).

However, the reasons for why such recommendations are not followed are many. According to Kamau-Thuita et al 2002, the amount of time and type of care given to the child are determined by the caregiver's knowledge about childcare, on caregiver's educational level and occupation, number of children less than five in the household, and the child's age and

birth order. The children who were found to be undernourished in this study had been devoted less time for breastfeeding, food preparation and feeding (32). Adherence to the infant feeding recommendations has been associated with maternal education and number of children in the family (29). Mothers perception has also been identified as reasons for introducing complementary foods early, and expressed by such statements as "baby always crying", "not enough breast milk" and "baby is hungry"(33).

3.3.1 Feeding practices in Malawi

In Malawi, studies have found that inappropriate weaning practices are common. Hotz et al (2001) found that breastfeeding initiation was 100 %, however about half of the mothers had given non-nutritive liquids (mostly water) to their infants before 4 months of age (33). Breastfeeding was reported by the MDHS 2000 to be nearly universal and early initiation of breastfeeding to be common in the country. However, according to the MDHS 2000 63 % of the children under 4 months are being exclusively breastfed and the median duration of exclusive breastfeeding was 2.0 months (7).

Traditional weaning foods are different types of cereal- based foods like porridge. The most common weaning food is a thin maize porridge- *light phala* and early introduction with this is common. One study showed that as many as 30 % of the babies was given such porridges during their first month of life (29). Another study found that half of the infants were given non-nutritive liquids (mostly water) before 4 months, and after 4 months all received complementary foods, mostly *light phala* (33).

Other studies have also found that inappropriate weaning practices have been related to stunting, with the incidence peaking at about six months of life (29;34-36). Underweight and wasting incidence also tend to peak between 6 and 18 month of life (34). This indicates that the complementary feeding practices at the time of weaning may be inadequate. These practices also increase the risk of mother-to child transmission (MTCT) of HIV if the mother is HIV-infected as studies have shown that exclusive breastfeeding the first six months reduces the risk of MTCT (37). HIV infection is also linked to a decrease in dietary intake

because of reduced food intake when being HIV infected, malabsorption of the nutrients in the GI-tract and increased nutritional requirements when ill.

One study showed that micronutrient undernutrition is a serious problem in Malawi, as vitamin A deficiency was prevalent in almost 60 % of children between 6 and 36 months and anaemia was prevalent in 80 % of the children (38).

As mentioned, the food security situation has been and is difficult (18). A study looking at causes of undernutrition will therefore need to include the access to food in the household. Periods of food insecurity may be evident by the fact that there are seasonal patterns of undernutrition, as especially the prevalence of kwashiorkor peaks during the rainy season (December to March) (22). However no literature is found related to household food security for cases admitted to NRUs in Malawi.

3.4 Illness and health care seeking behaviour

Children admitted to NRUs often have a history of infectious diseases, leading to severe undernutrition. According to Brewster et al (1997), kwashiorkor (including marasmic kwashiorkor) was responsible for 75 % of all admissions to seven NRUs in the southern region in Malawi (22). Wasting was present in 52.1 % of the cases after resolution of oedema (22). The same study also found that severe undernutrition was commonly associated with bacterial and viral infections.

HIV infection has become an important additional factor to severe undernutrition in children as paediatric HIV is a growing problem in Malawi due to high mother to child transmission rates. Brewster et al (1997) estimated the HIV prevalence to be 21.7 % of the kwashiorkor cases included in their study (22). Kessler et al 2000 found that 34.4 % of the children over 1 year of age admitted to one NRU in Malawi were HIV seropositive. The latter study also found that HIV infections were significantly associated more frequent with marasmus than with kwashiorkor, and the case fatality rates were significantly higher among HIV positive than among HIV negative children (23).

Brewster et al 1997 found that diarrhoea was present in 54 % of the children admitted to the admitted to the seven NRUs included in their study, of these 48.9 % had a history of persistent diarrhoea (22). The disease picture also seems so be seasonal among these children, as the same study found both diarrhoea and wasting to be worse in the wet season (January-June). One survey showed that there is a strong association between dysentery and kwashiorkor in Malawi, and a smaller association between kwashiorkor and non-bloody diarrhoea (36). This suggests that the prevention and treatment of diarrhoea is an important part of preventing undernutrition among these children. Chronic diarrhoea is also a common manifestation of HIV infection and this may explain the high prevalence of diarrhoea. A population-based cohort study also found that multiple illness episodes during infancy was linked to a twofold risk for development of both stunting, moderate wasting and severe underweight (34;35). Severe underweight was further linked to residence far away from the health facility, while moderate wasting was linked to maternal HIV infection (34).

The rainy season is also called the "hungry season" since it is the pre-harvest period. This is also a time of more infections, such as diarrhoea, malaria and pneumonia (35;36). Undernutrition and infections often goes hand in hand- since undernutrition may lead to higher rates of infectious diseases and infectious diseases with multiple illness episodes have a negative impact on nutritional status (30).

When caring for the children that become severely undernourished and often with other infections present, health care seeking behaviour is an important caring behaviour. As mentioned before, the case fatality in the NRU is high; something that can imply that medical assistance is sought too late in the disease process. In Malawi, 80 % of the households are situated within 8 km of a health centre, but poor quality of services, staff shortages, drug shortages and use of traditional healers have been suggested as reasons for the low level of utilisation of the curative health care services (22). Traditional healers are a common source of assistance in Malawi. Vahteera et al 2000 found that infant morbidity is higher in families who use traditional healers more commonly than families who seek modern health care services (29). Of the acute illness episodes with diarrhoea, malaria or acute respiratory

infections (ARI), 37 % were managed at home without seeking medical assistance, while in 55 % of the cases a medical professional was consulted. Traditional healers were consulted in 16 % of the cases (39). This may be linked to the higher incidence of severe underweight among children living far away from the health facility, as shown by a cohort study in the same area (34).

3.5 Hygiene practices

Type of sanitation and source of water supply is important preventive measures in the maintenance of children's health. The presence or absence of a toilet (ventilated or simple pit latrines) has been associated with undernutrition in young children, as well as lack of access to clean water (40). Source of drinking water has also been associated with high infant morbidity (39), because poor water quality has been linked to diarrhoea and is a risk factor for undernutrition in children and adverse effects on child health (30). However, one study from Peru by Checkley et al (2004) showed that better water source alone did not lead to better health benefits. Adequate storage of water and sewage disposal was found to be just as important. The study showed that the children exposed to the worst conditions in all these three factors had 54 % more diarrhoeal episodes than those with the best conditions (41). Inadequate access to water also affect nutrition indirectly, as it may increase the workload of women through fetching the water and thereby decrease available time for child care (25).

According to the MDHS 2000, about 65 % of the households in Malawi have access to clean water (as piped water, protected wells or boreholes). About 79 % of the households have pit latrines and 19 % no toilet facility at all (7).

In addition, domestic hygiene behaviour, such as hand-washing has been shown to be important in the prevention of diseases caused by pathogens entering the food and water and thereby the gastrointestinal tract leading to diarrhoea. The importance of boiling the water has also been recognised as an important way of decreasing the number of pathogens before giving it to the child.

As mentioned is diarrhoea a common illness associated with undernutrition in children. The prevention of diarrhoea through adequate hygiene and sanitation is therefore an important caring behaviour. Purifying drinking water, good hand-washing practices and wearing of shoes are examples of preventive actions. It has also been suggested that limited resources, beliefs and the children's behaviours were considered to be some of the barriers for good prevention practices at home (42).

3.6 Care and obstacles for adequate caring practices

As mentioned earlier does care refer to the practices of caregivers that translate food, health care and water and sanitation into satisfying growth and development of children.
It requires resources such as education, time, motivation, economic resources and so autonomy, heavy workload, no or few alternate caregivers, lack of education and knowledge and undernutrition or disease in the caregiver. These may affect both feeding-related and health-related behaviours and may consequently lead to undernutrition and death. Several studies were found suggesting a strong link between having such resources available and providing adequate childcare.

Vahteera et al.2001 found in Malawi that the caregivers educational level was related to better adherence to recommended feeding practices and to improved preventive and curative health care seeking behaviours (29). The MDHS 2000, found that the proportion of female household members who have never been to school was 27 %, compared to 10 % of the males. This number increased with age (7). The median number of years of schooling completed was 3.1 for women and 5.1 for men. Caring behaviours may also be culture specific and are influenced by knowledge, beliefs and perceptions.

Women often have the dual burden of child care and trying to maintain food security. Several studies have found that the absence of father has been related to higher levels of stunting and underweight in children (23;39;40). Heavy workloads can reduce their ability of taking care of their children. Evidence shows that children who became undernourished was often devoted less time for feeding, which again was determined by the caregiver's knowledge

about childcare, with caregiver's education level and occupation, number of children less than five in the household, child's age and birth order (31). These factors may also influence healthcare seeking behaviour, both in recognising symptoms at an early stage and in terms of seeking medical assistance early in the disease process.

The high prevalence of HIV in Malawi can put an additional strain on the caregiver's ability to care for the children, and Maleta et al. 2000 found that maternal HIV infection is one of the risk factors identified for child undernutrition (34). This can be due to MTCT and anorexia in the child as a result of the HIV infection and associated secondary infections. It can also be due to the fact that a sick mother may not be able to cope with the workload, something leading to lack of care for the child, especially if there are no other carers present. The accelerating HIV/AIDS epidemic have also left many children orphaned, or in lack of care and support from their parents. Lack of money and food in combination with the increasing number of orphans and reduced number of healthy adults poses enormous challenges in caring for these children (43). In Malawi, an estimated 1 million children under 17 years of age are orphaned, half of these orphaned by AIDS (44).

Undernutrition in children may also be linked to the health status of the caregiver in several ways. Firstly, frequent illness episodes may have a negative impact on her capability to take care of the children. Secondly, undernutrition during pregnancy has a negative effect on the birthweight of the baby and is shown to be a risk factor for inadequate catch-up growth leading to stunting (3). In Malawian children, Espo et al 2002 identified both low maternal height and low birth weight as risk factors for severe stunting (35).

In many societies, gender roles may also influence workload and time availability for childcare as women's work are often distinguished from men's work. The majority of caregivers are women and these are often engaged in other time-requiring activities related to domestic and non-domestic production activities (27). Literature suggests that women in general spend more time in such production activities (27). In African countries, it is common that women carry out agricultural and domestic work, while men control land and homestead (45). This was found to be true in one area of Mangochi district, as women were the ones

taking care of the fields, providing food, bringing up the children and taking care of the household (46). Only a few studies have found significant linkages between work and nutritional status of the children (27).

3.7 Prognosis and long-term prospects for children after discharge from NRUs

Few studies have been done on children admitted to NRUs, and most of these have looked at disease prevalence and case management of undernutrition. Regarding case-fatality rates and long-term prospects and factors influencing these, some studies were found.

One study performed in seven NRUs in Malawi found that the overall case fatality was 24 % (22). Another study performed in one NRU found that the overall in-mortality was 28 % (22;23). Case fatality rate is here meant as percentage of children diagnosed as severely undernourished and who die of that specific illness in the facility. These studies suggested that some of the reasons for this were lack of human resources, nutritional supplies and supervision in the NRU, as well as late presentation of severe disease. 75 % of the admissions were due to kwashiorkor (including marasmic-kwashiorkor). The majority of the children admitted also presented with infections (majority with HIV or persistent diarrhoea) in addition to undernutrition (22;23). One of these studies also suggests that children are often discharged from the NRU too early - as soon as they are considered to have recovered from acute illness (23).

Few follow-up studies have been done to investigate the long-term prospects of these children, and these indicate that the long-term prognoses for these children are poor. One study from Kenya found that mortality was 36 % and 28 % were found to be underweight 1.5 year after discharge (21). In Guinea Bissau it was found that there was a 25 % reduction in mortality among the children who had been rehabilitated in an NRU compared to the group who had not been rehabilitated (47). Results from a study in Nepal were more positive, finding the mortality rate to be 10.9 % one year after discharge (20).

Even if the NRUs are important to save the lives of children that have become so severely

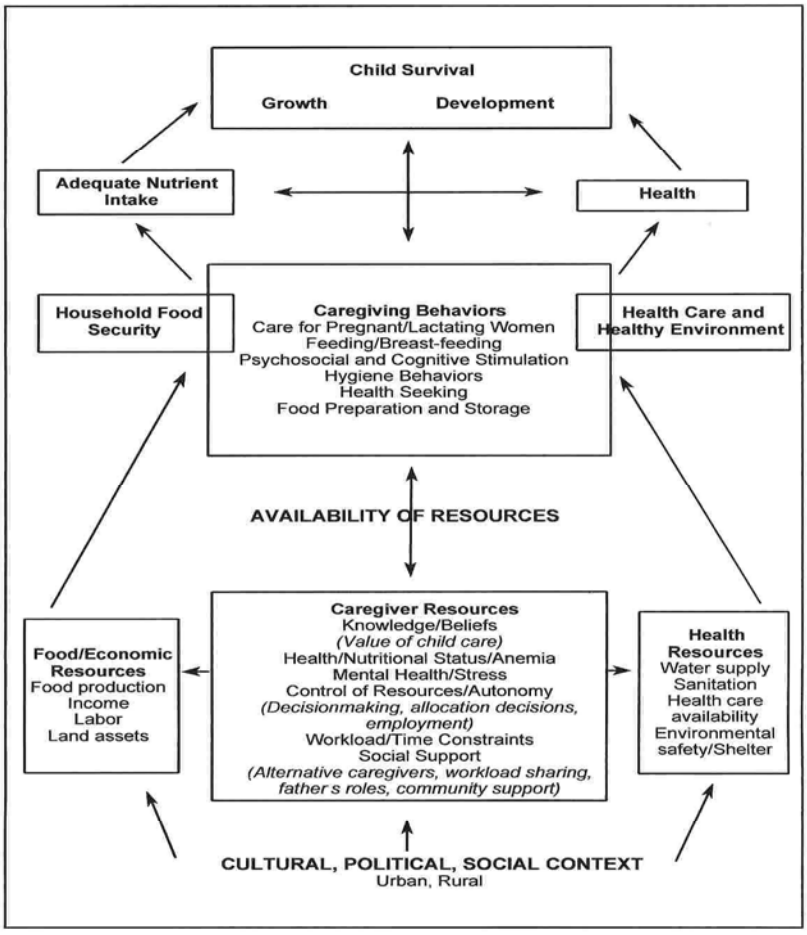
undernourished, it has been suggested that these types of programmes only focuses on the poor and already undernourished and fails to address the wider social and economic causes of undernutrition (21;40). Interventions aiming at long-term prevention of chronic undernutrition have been suggested to be more likely to improve child health than those targeting acute undernutrition in Malawi, due to the high incidence of stunting (35).

4. Theoretical framework and research questions

4.1 The extended model of care

An extended UNICEF model of child care has been developed as a tool for assessing the ability and capacity for the caregiver to provide necessary care for their children (27).

Figure 3: The extended model of care



This model indicates that different types of resources need to be available for the caregiver in order to provide the child with the necessary care to secure adequate nutrition and health for optimal growth. In addition, possible factors which may serve as obstacles for caregiving is included.

4.2 Rationale

Few studies have been done on the causes of undernutrition in the children admitted to the NRUs in Malawi. The same refer to studies that have looked at causes related to caring practices, even if it is well known that these aspects are important for children's positive development and growth. To our knowledge, few follow-up studies have been done in order to assess the prospects of these children after discharge. The aim of this study was therefore to identify and describe possible causes of undernutrition related to caring practices, and obstacles to adequate levels of care to the child after discharge from the NRU that the caregiver may experience. The identification of such obstacles can hopefully contribute to the understanding of ways to implement supportive measures.

4.3 Objectives

Main objective:

To describe various caring practices that may have contributed to severe undernutrition in children admitted to the NRU. Further, to examine possible obstacles for the caregiver to provide adequate care to the child before admittance and after discharge.

Sub- objectives:

1) To identify possible socio-economic factors that may lead to inadequate caring practices.
Could factors related to the household situation, socioeconomic status or illness of the caregiver serve as obstacles to give adequate care to the child?

2) To compare feeding practices before the child was admitted to the NRU with such practices

after the child is discharged from the NRU.
Did the caregiver notice any changes in food consumption after onset of illness compared to before?
Have there been any changes in feeding practices after discharge from the NRU compared to before admittance?
Is the supplementary feeding program after discharge successful or are there problems related with this program?

3) To compare presence of illness and response to illness one month prior to admittance with one month after discharge.
Was illness of the child identified by the caregiver before admittance to the NRU and how was this responded to?
Has the child been ill during the month after discharge and has this been responded to in a different way than before admittance?

4) To compare caregiver's practices related to household hygiene prior to admittance to the NRU with one month after discharge.
Is the caregiver aware of risk related to hand washing and food preparation? Have these practices changed after the stay at the NRU?

5) To assess whether caregivers practices and related obstacles differ between children that maintain or gain weight and those that lose weight one month after discharge.
What happens to the children one month after discharge, which of the children loses weight and who maintains their nutritional status related to the care they receive?

6) To explore the caregivers and homecraft workers subjective understanding of the contributing causes of their children's poor health.
What does the caregiver understand as being the main causes of the deterioration of the child's health status? Does the caregiver perceive certain factors as obstacles in caring for the child, such as time available, illness, lack of food available and so on?
What are the homecraft workers perceptions of causes of undernutrition in the children?

5. Methodology

5.1 Research design

The method chosen for this study was a follow-up descriptive case study. A descriptive study describes the characteristics of one or a limited number of cases. The cases in this study were the pairs of children/caregivers which are admitted to the NRU. Descriptive studies include both case studies and cross-sectional surveys, depending of the scale of the study (48). Since this study involved a limited part of the population (severely undernourished children admitted to the NRU for therapeutic feeding and their caregivers) it was classified a case study. A descriptive case study was thought to be the most appropriate as it describes or reveals characteristics associated with a particular situation. The follow-up component was added to examine the situation of these children after discharge. A triangulation of qualitative and quantitative methods was used in order to gain a broader understanding of the situation.

5.2 Preparation for the field study

5.2.1 The development of research tools for quantitative data

A structured questionnaire, including both closed and open ended questions was developed in collaboration with the supervisors in Norway. This questionnaire was designed to include both the initial interview on admission to the NRU and the follow-up interview one month after discharge. This was used as a tool for interviewing the participants. It was developed on the basis of the research questions in order to collect the information needed for best being able to answer these. It also included a food frequency list with common weaning foods/child food and frequencies. The caregivers were asked what kind of foods or fluids the child had normally eaten. For each item they mentioned, they were asked approximately how many times per week the child had eaten this food item (see Appendix 2).

The questionnaire was written in English and was translated into the local languages of Chichewa and Yao by the research assistant. To check for translator errors, it was back translated orally to English by a different person. The questionnaire contained several parts, including socioeconomic data for background information, household food situation, feeding

practices and food frequencies, history of illness of the child, health care seeking behaviour and hygiene practices. Some of the questions used in the initial interview were repeated one month after discharge in order to compare the answers before and after admittance to the NRU. These questions related to feeding practices, time allocation, healthcare seeking behaviours (if the child has been sick) and hygiene practices (see Appendix 2).

5.2.2 Piloting of the questionnaire

The draft questionnaire was reviewed by a local researcher. Questionnaires used in previous studies were reviewed in order to adjust the draft questionnaire into local standards. Minor adjustments were made during this process, such as the inclusion of local food items, local education system, possible types of housing and so on. It was piloted on 6 participants, 5 at Mangochi DH and 1 at St. Martin Hospital in order to check for accuracy. The follow-up interview was piloted on 3 participants- all which had been included in the piloting of the initial interview.

5.2.3 The development of research tools for qualitative data

Two sets of interview guides were developed in order to collect the qualitative data, one for interviewing the caregivers and one for the homecraft workers (see Appendix 3). Homecraft workers is the term used for the staff at the NRUs in Malawi.

The guide for the caregivers consisted of questions which could give more insight into the caregiver's perceptions regarding the causes of deterioration of the child's health and possible obstacles for adequate care for their child. This information would serve both to gain a deeper understanding of their home situation, and also for the researcher to better understand the quantitative data collected. The interview guide consisted of issues concerning the caregiver's perceptions of the causes of illness and undernutrition in the child, the food situation in the household and available time allocation by the caregiver for caring practices.

The interview guide used for interviewing the homecraft workers consisted of issues around

their perceptions and experiences of what causes undernutrition in the children. It was developed in order to explore their understanding of causes of undernutrition in these children, as they had been working with the undernourished children and their caregivers for some time and was therefore an important source of information.

5.2.4 Research tools for anthropometric measurements

On admittance and discharge from the NRU the children's weight, height/length were measured. One month after discharge the children's weight were re-measured in order to determine if their situation had improved during their stay at the NRU and finally to identify weight loss or maintenance of weight after discharge. The anthropometric measurements were performed by the researcher, with the assistance of the research assistant.

A Salter spring scale with the capacity of 25 Kg was used with a set of baby hanging trousers. The weight was calibrated using a 2-litre plastic bottle (weight 2 Kg) before every measurement was taken. If the child had open sores or pitting oedema, the mothers *chitenje* (a light wrap around cloth) was used in order to prevent cross-infection. The weight was then calibrated using the *chitenje* (as opposed to the baby hanging trousers). Weight was measured in light indoor clothing to the nearest 0.1 kg. Height was measured on admittance to the NRU, using a stadiometer. Length was measured in children under 85 cm and height was measured in children above 85 cm and measurements were taken to closest millimetre.

The presence of bilateral oedema was assessed on admission to the NRU and on the follow-up visit. This was done by symmetrical finger pressure on the top of the children's feet for three seconds.

The children's age was determined by asking the caregivers of date of birth and how old the children were in months. The *Road to Health Card* was also consulted in order to verify the age stated by the caregiver. Birth weight was planned to be incorporated as a variable, however it was found that most of the mothers had given birth at home and therefore did not know the birth weight.

To prepare for the anthropometric assessments, the researcher reviewed selected literature on measuring anthropometric measurements (49) and spent a day in an antenatal clinic in Oslo in order to receive some practical training in collecting these types of data.

5.3 Sampling

5.3.1 Quantitative data collection

The initial aim was to include about 80-100 pairs of children/caregivers in the study, however this depended on the number of children and their caregivers admitted to the NRU in the time period of the study (beginning of August till end of November). As a result, 70 pairs were included in the initial interview on admittance and 30 pairs were followed-up. Of these, 3 children had deceased and these were all children who had absconded from the NRU before discharge and no follow-up interview was conducted. The other lost follow-ups were due to death of the child during the stay in the NRU (N= 12), but also to time limitation of the study (N= 25) as the follow- up interview was conducted 30-32 days after discharge. In this case, the children were discharged later than 30 days before or were still at the NRU at the end of the research period.

The participants were recruited through purposive sampling as they were selected as participants based on one common characteristic which was that they were all admitted to one of the three NRUs due to severe malnutrition. The inclusion criteria's were:

1) The caregiver was the primary caregiver of the child admitted. For the purpose of this study, primary caregiver was defined as the person caring fulltime for this child during the last three months.

2) The child was admitted not more than four days prior to the participation of the initial quantitative interview.

3) The caregiver gave informed written consent to participate in the study.

4) The child admitted was between 0-59 months of age.

(5) This admission was the first time the child was admitted to the NRU. This last inclusion criterion was discarded as several of the participants represented readmissions to the NRU and would therefore further limit the number of participants to the study.

5.3.2 Qualitative data collection

The aim was to conduct qualitative interviews with every 7th caregiver participating in the quantitative study. However, as one of the chose participants refused to be interviewed and some of the children died and there was a time limitation, the participants were chosen as being every 7th judged to be the most suitable given these other constraints. A total of seven interviews were conducted with caregivers. The three homecraft workers interviewed were chosen by length of employment and location. The ones who had been employed the longest time in each of the three NRUs and who consented were interviewed.

5.3.3 Procedures for establishing contact with the informants

As mentioned previously, it was decided to conduct the study at the NRU at Mangochi DH in agreement with Dr. Ken Maleta and CHAM. The researcher was introduced to the District Health Officer as well as to the homecraft workers at this hospital. On the basis of the hospital reports from previous years, it was noticed that sampling from this NRU alone would not be sufficient to reach the aimed sample size of 80-100 pairs of children/caregivers given the time available for field research. The study setting was therefore expanded to include the two other NRU`s in Mangochi District, namely at St. Martins Hospital and Nkope H/C (see Section 2.4). With the help of the local supervisor, the researcher was granted permission from CHAM, as well as from the Medical Assistant in Charge of the two institutions. As the humanitarian organisation AAH is supporting the NRUs at Mangochi DH and St. Martin Hospital, information was given and permission granted from the NRU coordinator for AAH in Malawi. All key persons in this process were informed about the content of the study and given a copy of the research protocol to read for further information.

5.3.4 Selection and training of the research assistant

A research assistant was employed as an interpreter. As a female assistant was most appropriate for this study, she was introduced to the researcher through the local supervisor and the Centre for Reproductive Health, College of Medicine at the University of Malawi,

whom she had been working with during previous research projects. The research assistant had previous experience from working with both Malawian and foreign researchers, both as interpreter and in the process of data collection.

The research assistant translated the questionnaires into the local languages Chichewa and Yao and was trained thoroughly. The purposes of the study and the importance of language used for the informants to understand the questions asked were discussed during this process. The correct methods of conducting anthropometric measurement were also reviewed with the research assistant.

During all the interviews for the quantitative part, the researcher was present for answering any questions or in case clarifications were needed as these were conducted in the local language. For the qualitative part, the research assistants were translating the conversations between the researcher and the informants.

5.3.5 Information to the participants

The participants were given information about the purpose and the use of the information gathered, and the right to withdraw from the study at any time during the interviews. The participants were also being ensured that the information gathered would be treated confidentially and would not be traceable back to them. This information was written in an informed consent form (see Appendix 1), and was provided in a simple language by the research assistant who read from this and described the purpose and arrangement of the study in the appropriate local language. When this was clear to the participant and she agreed to participate, both verbally and written consent was obtained. Most of the participants were illiterate and in this case the written consent was obtained by a thumb print.

5.3.6 Ethical considerations

This research project was performed in accordance to the Helsinki declaration on ethical principles for medical research involving human subjects of 1964 (50). Ethical clearance was

sought and approved from the Regional Ethical Committee in Norway and the Medical Research Ethical Committee in Malawi prior to the commencement of the study.

The Regional Ethical Committee in Norway approved the research project on the prerequisite that the researcher kept a logbook noting the participants who did and did not give consent. This was due to the high levels of illiteracy and therefore difficulties with reading and signing the consent form. The Medical Research Ethical Committee in Malawi required the participants who could not provide a written signature to sign by thumb printing.

5.4 Practical experiences in the field

5.4.1 Logistical matters in the field

The College of Medicine at the University of Malawi has its Centre for Reproductive Health located in the Mangochi Boma. All work related to training of the research assistant, developing questionnaires, transcribing the questionnaires and discussions were done there. The staff at this centre was helpful and kindly assisted the student researcher with matters related to the research. Computers and offices was also made available for the students researcher, in which the researcher and research assistant had a meeting every morning (Monday to Friday) to plan the day and further progress.

The researcher was fortunate to stay with a Malawian friend in a house at the St. Paul's Catholic Seminary about 5 km outside Mangochi Boma. As the Mangochi District Hospital is located in the Boma, it was easy to travel to and from the hospital. A Toyota Hilux was rented in order to travel to the Nkope Health Centre, St. Martin Hospital and to the villages for follow-up visits. Every morning during weekdays the researcher visited the NRU at Mangochi DH to check for new admittances and/or discharges, and interviews were conducted at an appropriate time regarding feeding times, the settling in of the patients to the NRU and so on. In order to save unnecessary travelling time, a nurse at St. Martin was helpful by sending the researcher a cell phone message (SMS) to inform about new admissions or discharges. As there were neither available mobile phones nor any coverage at Nkope Health Centre, the homecraft worker at Nkope H/C used a local radio network system developed for the local

health centres/hospitals to send information regarding new admissions and discharges to Mangochi DH. This system worked out quite well, although the rains often broke down the electrical system and then extra visits needed to be paid.

Some of the villages visited for follow-up were very remote and difficult to reach. On advice from the local supervisor, the researcher escorted the study participants home on discharge in order to be able to locate them for follow-up. Some places were impossible to get to by car, so they had to be reached by walking. When the rains started in September, it happened on some occasions that the car got stuck in the mud; however helpful villagers were always at rescue. All in all, a follow-up study performed at the facilities covering a great catchments area by only one researcher ended up requiring much travel time over long distances and many adventures along the way.

5.4.2 Setting for the interviews

At all the NRUs the interviewing were performed on the ground outdoors as the inside were often crowded and sometimes privacy was difficult to obtain. The researcher, assistant and participant sat on the ground, usually under a three for shadow from the blazing sun. At Mangochi DH, the NRU shared its outdoor area with the psychiatric ward whose patients often showed great curiosity for the white visitor and some disturbances were therefore difficult to avoid. Also, some breaks had to be taken when passers by came to see what was going on or due to matters with the child, such as crying, restlessness and so on. The anthropometric measurements were performed inside the NRUs.

The participants in the follow-up were given a note with the date for the visit. The majority were readily waiting when we arrived to their villages. Some had forgotten about the visit or were at this time of the year cultivating their fields sometimes far away. We then had to come back the next day or seek assistance from relatives in order to locate them. The interviews were performed in the gardens or at the front of the house, and sometimes inside the houses when the curiosity of the other villagers, especially the children took overhand and privacy were impossible to maintain outside the house. The anthropometric measurements were

performed using branches of threes or the beams of the ceiling in the houses for hanging the weight scale. During busy days, the latest interviews were performed after dark and a torch or the lights of the car had to be used in order to read the anthropometric measurements and/ or to read the questionnaire.

The qualitative interviews were performed inside rooms at the NRUs as using a dictaphone required a more silent environment.

5.4.3 Data handling in the field

The qualitative interviews were transcribed while still in Malawi with assistance from the research assistant. They were all written down in the local language, then translated into English and checked for translation errors by another person before it was typed into the researcher's computer. Clustering of themes and further analyses were done after arrival to Norway.

Due to regular problems with electricity and lack of time available, the quantitative data were not entered during the field stay but carried home and entered after arrival to Norway.

5.5 Data analysis

5.5.1 Program and food tables used for analysis

Data was entered into the program Statistical package for Social Sciences 12.0 (SPSS) for analysis. Anthropometrical measurements were entered in ANTHRO Version 1.02 to obtain the required deviations (z-scores), which were based on the 1978 NCHS/CDC/WHO growth reference. The z-scores calculated by ANTHRO were then transferred to SPSS as own variables.

The food items were clustered into main the food groups: breastmilk, staples, protein-rich foods, vitamin and mineral-rich foods, energy-rich foods and others. Variable were created on the basis of how often items from each of these food groups was consumed by the child.

5.5.2 Description of variables

Dependent variables:

- Initiation of breastfeeding
- Initiation of complementary foods
- Nutritional status
- Perceptions of food/fluid intake
- Perceptions of causes of child undernutrition
- treatment/length of stay
- Perceptions related to household hygiene
- Healthcare seeking behaviour
- Feeding practices before and after stay in the NRU
- Time available for child care

Independent variables:

- Age of child/caregiver
- Sex of child
- Caregivers relationship to child
- Ethnic background
- Education obtained
- Literacy of caregiver
- Caregiver's/ husbands profession
- Marital status
- Type of house roofing
- Type of sanitation
- Bathroom present in house
- Total children of the caregiver
- Number of deceased children
- Number of adults in the household
- Religion
- Number of siblings of the child
- Household food security
- Source of drinking/domestic water
- Presence and type of illness in child
- Experience of illness in caregiver
- Presence of bilateral oedema

5.5.3 Data processing and statistical analysis

Quantitative data:

After the data was entered, every 5th questionnaire was randomly tested to check correctness and frequency checks were run for missing values for most variables. For the anthropometric data, median was used as the data was not normally distributed. Weight-for-height was used as a main nutritional indicator as this best reflects acute undernutrition or wasting and was found most appropriate for these children.

The food items were clustered into main food groups and each food item was registered as answering "yes" if the caregiver reported the child to have consumed this item four or more times per week. If the child had eaten this food item less than four times per week, it was not included in the data as it then was thought to not be a common food item in the child diet.

Descriptive statistics (frequencies and descriptives) and cross-tabulations were used to analyse the data. Bivariate analyses were intended to be used in order to compare variables before and after stay in the NRU and to check for correlation between nutritional status after discharge and different possible factors influencing nutritional status after discharge. Due to the low number of participants included in the follow-up part of the study, this was not possible to complete.

Qualitative data:

A total of 10 qualitative interviews was collected. In addition some observations were made in the field. The interviews were reviewed and the data were conceptualized into main themes. These themes were related to caregiver's and homecraft workers perceptions on issues related to health and undernutrition. For both caregivers and home craft workers the themes were: lack of resources, common medical problems in children, feeding practices, perceptions relating to ways of preventing illness and undernutrition in children, traditional beliefs on undernutrition and perceptions of related to the stay and treatment at the NRU. For homecraft workers, additional themes were their experiences with paediatric HIV and its implication for undernourished children and their impression of the follow-up system. This data was then further clustered into two main headings, namely lack of resources and traditional versus modern health care. The qualitative data was then used to interpret and deepen the understanding of the quantitative data as will be shown in the discussion chapter.

5.6 Background information of the NRUs

5.6.1 NRUs in Malawi and places of recruitment

There are 92 NRUs in the country, and three of these are found in Mangochi District. As mentioned, these NRUs in Mangochi were chosen as places to recruit participants for this study. These were located at Mangochi DH, St. Martin Hospital and Nkope H/C (see Figure 2).

Figure 4: Map of Mangochi District

Mangochi DH is located on the main street of Mangochi Boma, which is the main town of the district. It is a government hospital and is the main referral hospital for Mangochi District. St.Martin Anglican Community hospital is located on the lakeshore about 16 km north-west of Mangochi Boma. It was founded by Oxfam in 1970. Nkope H/C is an Anglican health centre which is located on the lakeshore about 30 km northwest of Mangochi Boma. St.Martin

Hospital and Nkope H/C are both operated by Christian Health Association of Malawi (CHAM).

These NRUs were supported by different organisations, and therefore the resources available for treatment were different. At Mangochi DH and St. Martin Hospital AAH was responsible for the supervision, teaching and supervision of the home craft workers on issues related to treatment of severely undernourished children. Staff from AAH was visiting once per week to inspect stocks and supervise the home craft workers in their treatment and management. The therapeutic milk F75 and F100 (see 5.1.3) was provided by AAH, while the rest of the food including Likuni Phala (see 5.1.3) was provided by WFP. Medications for use at the NRU and items for distribution on discharge were provided by UNICEF and WFP.

The NRU at Nkope H/C was not under AAH supervision and severe cases were therefore transferred to Mangochi DH. Milk, oil and other foodstuffs were provided from the WFP and United States Agency for International Development (USAID) and the treatment regime was different from the other two NRUs.

5.6.2 Treatment regimes at the three NRUs

Table 1: Treatment regimes at the NRUs

	Mangochi DH	***St.Martin Hospital***	***Nkope H/C***
Admission criteria			
	-presence of oedema -Mid-Upper Arm Circumference less than the norm. - Weight-for Height less than 30 % of the standard weight-for height.	-presence of oedema -Mid-Upper Arm Circumference less than the norm. - Weight-for Height less than 30 % of the standard weight-for height.	The admission criteria is a MUAC under 11.5.
Description of the phases of treatment			
Phase 1	F75 milk 8 times per day according to their body weight. Resomal if needed.	F75 milk 8 times per day according to their body weight. Resomal if needed.	Therapeutic skimmed milk according to body weight 5 times daily between 07 and 16 hrs. The caregivers are provided with milk for four feeds during the night. Additional foods are given if the caregivers have this available.
Transition	F100 milk 8 times per day according to their body weight.	F100 milk 8 times per day according to their body weight.	-
Phase 2	F100 5 times per day and Likuni Phala twice per day also according to their body weight. If the children have diarrhoea in Phase 2 they go back to the treatment in Phase 1.	F100 5 times per day and Likuni Phala twice per day also according to their body weight. If the children have diarrhoea in Phase 2 they go back to the treatment in Phase 1.	Therapeutic skimmed milk according to body weight two times per day and Likuni Phala three times per day. Milk is prepared for three feeds during the night.
Additional systematic treatment			
Multivitamin syrup	-	-	On admission and daily
Vitamin A (according to age)	On day 1,2 and 14	On day 1,2 and 14	-
Folic Acid (5mg singe dose)	On day of admission	On day of admission	On day of admission
Iron	Added in milk daily in Phase 2	Added in milk daily in Phase 2	-
Systematic antibiotics (according to body weight or age)	Amoxicillin, gentamycin and chloramphenicol the whole Phase 1 plus 4 days. Albendazole on admission if <1 year	Amoxicillin, gentamycin and chloramphenicol the whole Phase 1 plus 4 days. Albendazole on admission if <1 year	Albendazole on admission
Average length of treatment (according to homecraft workers)			
Phase 1	4 days	4 days	Only if oedema- on average 7 days.
Transition	4 days	4 days	-
Phase 2	10 days	10 days	If no oedema on admission, the child goes straight to Phase 2

5.6.3 Description of phases of treatment and products used in treatment

As shown in Table 1 the treatment regimes are divided in three phases based on the physiology and the severity of undernutrition.

Phase 1: This first phase of treatment is mainly to identify and treat infections, treat or prevent hypoglycaemia and hypothermia, treat dehydration or septic shock when necessary and to initiate re-feeding (F75). The children usually stay in this phase for the first 3-4 days and the criteria to progress to Transition phase are return of appetite and loss of oedema (51).
Transition phase: This phase uses the same type of treatment as in Phase 2 (F100), however the number and timing of feeds and volume of the diet are different (see table 1). This is to ensure that the children makes progress and tolerates the new diet without complications. If any complications arise the child is moved back to Phase 1. Odematous patients stays in this phase until the oedema is gone (51).
Phase 2: This phase is to promote rapid catch-up growth and to restore normal weight as fast as possible. If any deterioration, they are moved back to Transition phase or Phase 1 (51).

Now follows a short description of the products used in the treatment at these NRUs (see Table 1).
F75 therapeutic milk: is specialised milk used in the first phase of the treatment of severe malnutrition. Ingredients are: sucrose, skimmed milk, maltodextrin, vegetable fat, minerals, partially demineralized whey and vitamins. This milk is rich in glucose and has fewer lipids, proteins and sodium than the F100 milk. It is also low in iron.
F100 therapeutic milk is designed for the treatment of severe malnutrition after the acute phase. Ingredients are skimmed milk powder, vegetable fat, lactoserum, dextrine-maltose, sugar, mineral and vitamine complex.
ReSoMal is one type of oral rehydration salt used in severe cases of dehydration. If they have diarrhoea the children receive ReSoMal in Phase 1 and transition Phase.
Skimmed milk made from powder: the homecraft worker makes a mixture of 75 mls of water (boiled from the Lake Malawi), 75 grams of milk powder, 1200 mls refined vegetable oil (vitamin A fortified), 3/4 of a teaspoon potassium and 75 grams of sugar.

Likuni Phala is a micro-nutrient fortified maize and soybean flour blend, and the caregivers received this as a part of the supplementary feeding program they are enrolled in after discharge. Vegetable oil was also provided to be added to the Likuni Phala as an energy supplement.

The criterias for discharge were that the target weight was reached and the children were taking food properly. The children should be discharged 10 days after entering Phase 2 (oedema is gone), and should never stay any longer due to the risk of nocosomial infections at the NRU. This is especially true in the high season from November-March. This is when the numbers of children admitted are high and the NRU gets crowded. Unfortunately, problems related to discharge were observed both at Mangochi DH and Nkope H/C. This was primarily due to medical officers being responsible for discharge, while at St.Martin Hospital the homecraft workers had been given this responsibility. Often the pairs of children/caregivers ended staying at the NRU for some additional days in order for the Medical officer to visit the NRU and discharge the children. It is also worth mentioning that the physical area of the NRU at Mangochi DH and St.Martin was shared other types of patients. Mangochi DH shared its NRU ward with paediatric TB patients and St.Martin Hospital shared it with paediatric patients. This may increase the risk of infection from communicable spread of pathogens. At Nkope H/C the NRU was located in its own building.

5.6.4 Health and nutrition education to the caregivers

The caregivers were involved as much as possible in feeding and other activities during their stay in the NRU. They also received sessions with nutrition and health education in order to acquire the experience and knowledge needed to take care of the children after arrival home.

The homecraft workers provided education sessions to the caregivers. The topics included food hygiene, food and nutrition, general child care, HIV/AIDS and so on. Education on food groups and food preparation using local ingredients was given orally before it was practiced using the kitchen outside. The caregivers were also encouraged to grow a diversity of nutritious crops. Information posters of children with marasmus and kwashiorkor hung on the

walls inside the NRUs. Some of the education consisted of songs and dances. The fathers of the children were encouraged to come for visits and join the health education sessions. The caregivers were also informed of the availability of HIV voluntary testing and counselling, which was available at Mangochi DH and St.Martin Hospital.

5.6.6 Follow up-visits and supplementary feeding program

The children were enrolled in a supplementary feeding program after discharge. At Mangochi DH and Nkope H/C, medical assistants were responsible for discharge, while at St.Martin Hospital the home craft workers did the discharge. The caregivers received Likuni Phala premixed with vegetable oil on discharge and was invited back to follow-up every forthnight for 6 weeks at Nkope H/C and for 14 weeks at Mangochi DH and St. Martin Hospital. On follow-up visits, anthropometric measurements were taken and additional rations of Likuni Phala was handed as supplementary foods.

6. Results

6.1 Background information of the children

6.1.1 General description of the children's situation and treatment

A total number of 70 pairs of children/caregivers were included in the study. The majority of the children (69 %) were admitted to Mangochi DH, while the remaining was admitted to St. Martin Hospital or Nkope H/C (Table 2). The children were all under five years of age, with the mean age of 24.9 months. The youngest child was 2 months of age, while the oldest child was 58 months of age. The majority of the children were between 13-36 months old and a slightly greater proportion was females (Table 2).

On admittance, the median height-for-age z-score for all the children in the sample was -3.7, the median weight-for-age z-score was - 3.7, and the median weight-for-height z-score was - 2.0. Being admitted to the NRU, high levels of severe undernutrition was expected, however great variations in z-scores were found (Table 2). As many as 54 % of the children presented with bilateral oedema which is related to the severe form of undernutrition, *kwashiorkor*. Of these, the median weight-for-height z-score were - 1.7 on admission, compared to the median weight-for-height z-score of - 2.2 for the children with no oedema on admission.

The treatment regimes of the children varied widely as various forms of undernutrition were presented. However, the children who were followed up stayed and received treatment for a median of 22 days at the NRUs. The median number of days of receiving phase 1 treatment was 3, transition phase treatment was 3 days and for receiving phase 2 treatment was 16 days. As Nkope H/C operated with a different treatment regime, the number of days in the different stages of treatment differed compared to the other NRUs (Table 2). Due to lack of resources to provide an adequate treatment regime at Nkope Health Centre, severe cases or cases which did not improve after some days were referred to the NRU at Mangochi DH. It should also be mentioned that some of the children at Mangochi DH stayed at the NRU for longer than their treatment required due to lack of medical officers available to discharge the children on the planned day of discharge. These children would then receive milk according to Phase 2 treatment also on the additional days of their prolonged stay. In one case in Nkope H/C, one

pair of child/caregiver was held back from discharge in order to prevent a fellow caregiver to abscond with the child from the NRU.

Of the 70 pairs of children/caregivers included in the initial interview, 27 were followed-up one month after discharge (Table 2).

Table 2: Description of the sample during the course of treatment

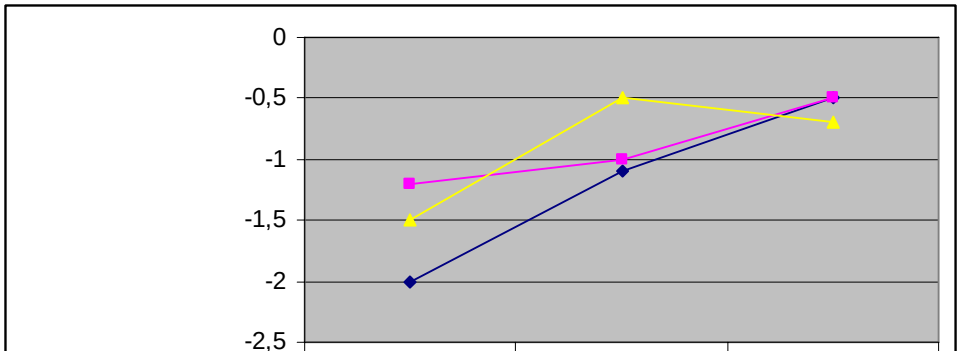
	Mangochi DH ***% (n)***	***St.Martin Hospital*** ***% (n)***	***Nkope H/C*** ***% (n)***	***Total*** ***% (n)***
	68.6 (48)	18.6 (13)	12.9 (9)	100 (70)
Age on admission				
0-12 months	16.7 (8)	0 (0)	44.4 (4)	17.1 (12)
13- 36 months	66.7 (32)	61.5 (8)	44.4 (4)	62.9 (44)
37-59 months	16.7 (8)	38.5 (5)	11.1 (1)	20.0 (14)
Sex				
Males	54.2 (26)	30.8 (4)	22.2 (2)	45.7 (32)
Females	45.8 (22)	69.2 (9)	77.8 (7)	54.3 (38)
Nutritional status on admission[a]				
Height-for age z-score	- 4.0 (- 4.9- -2.8)	- 3.8 (- 4.8- -3.1)	- 2.6 (- 2.9- -2.0)	- 3.7 (- 4.9- - 2.7)
Weight-for age z-score	- 4.0 (- 5.1- -2.5)	- 3.7 (- 4.3- -2.3)	- 3.0 (- 3.4- -2.4)	- 3.7 (- 4.7- -2.6)
Weight-for height z-score	- 2.0 (- 2.7- -1.3)	- 2.0 (- 2.6- -0.5)	- 1.7 (- 2.0- -1.3)	- 2.0 (- 2.6- -1.3)
Bilateral oedema on admission	63.2 (24)	23.7 (9)	13.1 (5)	54.3 (38)
Treatment[b]	***No of days (median)***	***No of days (median)***	***No of days (median)***	***No of days (median)***
Total days of treatment	22	22	27	22 (8-37)
Phase 1	3	4	10	3 (0-14)
Transition phase	4.5	3	0	3 (0-14)
Phase 2	15	14.5	17	16 (0-37)
Endpoint	***% (n)***	***% (n)***	***% (n)***	***% (n)***
Discharged and followed up	37.5 (18)	30.8 (4)	55.6 (5)	38.6 (27)
Absconded and deceased	4.2 (2)	7.7 (1)	0 (0)	4.3 (3)
Absconded and failed to trace	2.1 (1)	0 (0)	0 (0)	1.4 (1)
Deceased in NRU	10.4 (5)	38.5 (5)	0 (0)	14.3 (10)
Unknown[c]	45.8 (22)	23.1 (3)	44.4 (4)	41.4 (29)

[a] Z-scores by median and (25-75 percentiles).
[b] Only admittances which were followed- up (n=27). (Min-max) numbers of days for the last column.
[c] Not yet discharged or not followed up due to time limitation.

6.1.2 Changes in nutritional status during treatment and after discharge

The results of the anthropometric measurements of the children completing the follow-up part of the study are shown in Figure 3. The measurements were taken on admittance to the NRU (whz1), the day of discharge (whz2) and on the day of follow-up (whz3). A steady increase in median whz-scores for the children admitted to Mangochi DH and St. Martin hospital was demonstrated, while for the children admitted to Nkope H/C the median whz-scores decreased slightly after discharge.

Figure 5: Changes in weight- for-height z-scores over time



	whz1	whz2	whz3
Mangochi DH (n=18)	-2	-1,1	-0,5
St.Martin Hospital (n=4)	-1,2	-1	-0,5
Nkope H/C (n=5)	-1,5	-0,5	-0,7

6.2 General information of the caregivers and household situation

6.2.1 Information related to the caregiver

Table 3 shows information related to the caregiver which may influence their caring practices.

Table 3: Characteristics of caregivers

Factors	***N***	***%***
Relationship to child		
Biological mother	62	88.6
Grandmother	6	8.6
Other	2	2.8
Age		
≤ 20	7	10.1
21 – 25	14	20.0
26 – 30	17	24.2
31 – 35	12	17.2
36- 40	8	11.4
≥ 41	12	17.1
Education completed		
Primary school (year 1-4)	12	17.1
Primary school (year 5-8)	13	18.6
Junior secondary	1	1.4
No school attendance	44	62.9
Ethnicity		
Yao	53	75.7
Chewa	7	10.0
Other	10	14.3
Religion		
Islam	56	80.0
Christian	14	20.0
Pregnant		
Yes	13	18.6
No	56	80.0
Don't know	1	1.4
Number of live births		
≤ 2	25	35.7
3-5	28	40.0
≥ 6	17	24.3
Number of deceased children		
None	43	61.4
One	13	18.6
≥ 2	14	20.0
Marital status		
Married (monogamous)	37	52.9
Married (polygamous)	14	20.0
Divorced/ separated	15	21.4
Widowed	3	4.3
Never married	1	1.4
Illness in caregiver[a]		
Yes	31	44.3
No	39	55.7

Cont Table 3:

Factors	***N***	***%***
Frequency of illness[a+b]		
All the time	6	19.4
4-5 times	14	45.2
2-3 times	10	32.3
One time	1	3.2
Alternate caregiver during illness[b]		
Grandparent	10	32.3
The main caregiver	8	25.8
Siblings	6	19.4
Father of the child	5	16.1
Other	2	6.4
Information received on child health and nutrition		
Yes	17	24.3
No	53	75.7
Place where such information was obtained[c]		
Local health centre	11	64.7
Under-five clinic	3	17.6
Mobile clinic	2	11.8
Hospital	1	5.9
Alternate caregivers[d]		
Siblings	14	20.9
Grandparent	33	49.3
Father of the child	8	11.9
Other relatives/neighbours	17	25.4
Activities when child was left with alternate caregivers[d]		
Working in the field	39	58.2
Taking care of other family/children	58	86.6
Other	7	10.4
Perception of the child being fed more often if more time available[d]		
Yes	43	64.2
No	24	35.8

[a]Illness experienced by the caregiver in the last four weeks.
[b]Among those who reported having experienced illness (n=31).
[c] Among those who reported having received information (n=17).
[d] (n=67). The caregivers answered several options for these questions.

All the primary caregivers of the children admitted were females. Of the 70 caregivers in total, 89 % were the child's biological mothers, while the remaining were either grandmothers

or other relatives (Table 3). The reasons for mother not being primary caregiver was death of the mother (63 %, n=5), the mother caring for other children (25 %, n=2) or current pregnancy in mother (13 %, n= 1).

The median number of children the caregiver had given birth to was 3. The minimum number of live births was 1 and the maximum number of live births was 11. About 2/3 of the women reported to have given birth to more than three children. The majority had not experienced a death of a child, while 39 % (n=27) had experienced the death of one or more children (Table 3).

As the Yao are the main ethnic group in this area, the majority belonged to this ethnic group, while the second largest ethnic belonging in the sample were Chewa. The remaining belonged to either Lomwe, Nyanja,Ngoni or Shona. Most of the caregivers were Muslims, while the remaining belonged to different Christian groups (Table 3). The pairs of children/caregivers resided in 59 different villages located in different rural areas of Mangochi District.

The caregivers' age were spread over different age groups, although the majority of the caregivers were in the age groups 21-35 years (Table 3). The mean ages of the caregivers were 31.5 years. Some of the caregivers were under 20 years of age, the youngest being 17 years old. The maximum age of the caregivers was 55 years, as some of the caregivers were grandmothers of the child admitted.

The majority were married, of these some were in a polygamous marriage. Of the women being in a polygamous marriage, all reported their husband to have one wife in addition to the respondent. In such cases, the husband's time and resources were shared among the two wives. The remaining caregivers were either divorces/separated widowed or never married (Table 3).

Most caregivers reported that they were not currently pregnant, although a few reported current or unknown pregnancy (Table 3).

More than 60 % of the caregivers had never attended school. Of those who had attended school, the majority had completed primary school (Table 3).

A little more than half reported having experienced no illness in the last four weeks. Of the ones having experienced illness, the majority reported to have been sick three or more times in this period. In most cases, the child's grandparent or the caregiver herself had been taking care of the child during illness; however some had received assistance from the father of the child or from siblings of the child (Table 3).

Most of the caregivers had never received any information on child health and nutrition. The majority who had received such information had received it at the local health centre or at the under-five clinic (Table 3).

Most of the caregivers reported to have duties during the day in which they left their child with alternative caregivers for some hours of the day (81 %). However, such duties were for the majority related to working in the field or taking care of other children/family, however other duties reported were related to household chores or income generating activities like cooking, fetching water, doing petty trading, fetching firework and so on. For most of the caregivers, close relatives acted as alternate caregivers. The majority of the caregivers also believed that their child would be fed more often if they had more time available with their child (see Table 3).

6.2.2 Information related to the children

Table 4 shows factors related to number of children and number of siblings.

Table 4: Factors related to the children:

Factors	***N***	***%***
Number of siblings		
Younger siblings		
None	60	85.7
1	10	14.3
Older siblings		
None	17	24.3
1-2	34	48.5
3-5	14	22.9
=>6	3	4.3
Twin sibling[a]	5	7.1

[a] Twin sibling who was not malnourished treated as older sibling for statistical purposes.

The majority of the children had older siblings; most of these had one or two older siblings while 24 % of the children did not have any older siblings. Some of the children (14 %, n=10) had one younger sibling, while 18 % (n=13) of the children were the only child of the mother.

6.2.3 Information related to the household situation

Table 5 shows factors related to the household situation which may influence caring practices.

Table 5: Factors related to the household situation:

Factors:	***N***	***%***
Number of adults (over 18) in the household		
≤ 2 persons	57	81.4
3-4 persons	11	15.7
≥ 5 persons	2	2.9
Type of housing		
Grass thatched roof	66	94.3
Iron sheets/tiles roof	4	5.7
Ownership of house		
Yes	63	90.0
No	7	10.0
Bathing facilities in house		
Yes	58	82.9
No	12	17.1
Toilet facilities in house		
Traditional pit latrine	54	77.1
Other toilet facilities	2	2.8
None	14	20.0
Safe drinking water		
Yes	43	61.4
No	27	38.5
Safe water for domestic use		
Yes	23	32.9
No	47	67.1
Distance to drinking water point		
> 10 min	11	15.7
≤ 10 min	57	81.4
Don't know	2	2.9
Source(s) of livelihood for caregiver		
Small scale farming	64	91.4
Commercial farming	6	8.6
Petty trading	18	25.7
No income	5	7.1
Source(s) of livelihood for husband		
Small scale farming	35	50.0
Commercial farming	4	5.7
Small scale fishing	6	8.6
Paid labouring	10	14.3
Petty trading	16	22.9
No income	1	1.4
Not applicable	19	27.1

Cont Table 5:

Factors:	***N***	***%***
Size of cultivated land		
0,25-0,5 Ha	16	22.9
> 0,5-1 Ha	38	54.3
> 1 Ha	14	20.0
No cultivated land	2	2.9
More than one source of food for household		
Yes	49	70.0
No	21	30.0
Main source(s) of food for household		
Harvest from private garden	67	95.7
Purchasing from shop/marked	50	71.4
Other	2	2.8
Number of months experiencing food insecurity in a year		
No food shortage	8	11.4
2-3 months	19	27.1
4-6 months	19	27.1
≥ 7 months	20	28.6
No garden/ don't know	4	5.8
Experience of lack of food in the four weeks prior to admittance		
Yes	13	18.6
No	57	81.4
Experience of lack of food for the child in the four weeks prior to admittance		
Yes	10	14.3
No	60	85.7

The majority of the households consisted of ≤ 2 adults over 18 years of age (Table 5). Of all the caregivers, 16 % (n=11) lived alone as single parents in their household.

The most common type of housing was grass-roofed houses (Table 5). Grass can be easily obtained from wild growing bushes, while iron sheets need to be bought off the counter and is therefore not affordable for many households. The majority reported to own the house they lived in, while the remaining reported to rent or borrow a house or live in their parents house. The majority also reported to have bathing facilities present at their house, while the remaining had no such facilities. In regards to toilet facilities, the majority reported to have a traditional pit latrine, while the remaining reported to have no latrine or other types of toilet facilities available (Table 5). Of those having a toilet facility, 14 % (n=8) shared this with other households.

The majority of the households had access to safe drinking water (Table 5). This was obtained through a borehole well or piped water supply. These were mostly situated in the middle of the village in order to serve its population. Most households had a walking distance to this water source of 10 or less than 10 minutes. Regarding water for domestic use, few of the households had access to safe water (Table 5). The unsafe water sources for both drinking water and water for domestic use were unprotected wells, the Shire River or Lake Malawi.

Most of the caregivers relied heavily on small scale farming as their main source of livelihood (Table 5). This indicates high reliance on own crop production. Some also had an additional source of livelihood, mostly petty trading such as selling firewood, selling vegetables/donuts or brewing beer. The majority of the spouses also depended on small scale farming; however a greater range of sources of livelihood were found among these (Table 5). Other common sources were petty trading or paid labouring, such as tailoring, driver or carpentry.

Most households had their own land which they cultivated. Some had a garden outside their house, but the majority possessed agricultural land outside the villages which they cultivated. The majority reported this garden or land to be between 0,5 – 1 Hectares (Ha), while the remaining possessed smaller or greater land for own cultivation (Table 5). Two of the caregivers reported to have no cultivated land. The majority of the households had more than one source of food in times when own harvest was short or finished. The main source of food for the household was mostly caregiver's harvest from their own cultivated land, while many had the additional opportunity to purchase their food from the shop/marked at times when the crops were finished (Table 5). The caregivers who did not possess cultivated land reported to obtain food from the shop/marked or through assistance from relatives. Only one caregiver reported to having received food aid as an additional source of food.

In addition, food insecurity was experienced at times by many of the caregivers, as only a small number reported to experience no food shortage in a normal year. The months between the household started to face food shortages until the month of the next harvest varied from the minimum of 2 months and up to the maximum of 8 months (Table 5). Food shortages

were typically experienced in the period from October to February (61 %), and maize was harvested by the majority in April (69 %). Some of the households reported lack of food and/or lack of food to give to the child in the four weeks prior to admittance (Table 5).

6.3 Infant feeding practices from birth

Table 6 presents information regarding known infant feeding history of the children in the sample. Information on this is lacking from some of the caregivers as they were not biological mothers whereas some reported to not remember.

Table 6: Infant feeding practices

Factors	***N***	***%***
Time of initiating breastfeeding		
Immediately after birth	16	22.9
After ½ hours	27	38.6
After some hours	8	11.4
After ½ day	8	11.4
Don't know	11	15.7
Colostrum given		
Yes	49	70.0
No	10	14.3
Don't know	11	15.7
Currently breastfeeding		
Yes	28	40.0
No	42	60.0
Duration of breastfeeding[a]		
0-6 months	2	4.8
7-12 months	2	4.8
13-18 months	7	16.7
19-24 months	8	19.0
> 24 months	11	26.2
Don't know	12	28.6
Reasons given for stopping breastfeeding[b]		
It was time to stop	14	46.7
Pregnant caregiver	6	20.0
The baby refused	5	16.7
Other	5	16.7
Time of supplementary fluids introduced		
1-2 months	14	20.0
3-4 months	13	18.6
5-6 months	33	47.1
7-8 months	3	4.3
Don't know	7	10.0
Type(s) of supplementary fluids introduced		
Plain water	61	87.1
Tea	16	22.8
Cordial *(sobo)*	12	17.1
Powdered milk	7	10.0
Fresh animal milk	5	7.1
Fruit juice	5	7.1
Other	7	10.0

Cont Table 6:

Factors	*N*	*%*
Time of supplementary foods introduced		
1-2 months	6	8.6
3-4 months	10	14.3
5-6 months	29	41.4
7-8 months	14	20.0
9-10 months	2	2.9
11-12 months	3	4.3
Don't know	6	8.6
Type(s) of supplementary foods introduced		
Maize porridge (*mgaiwa)*	63	90.0
-with sugar added	29	45.3
-with groundnut flour added	12	18.8
- with salt added	30	49.9
- with other added	2	3.2
Other porridge	3	4.8
Fruits	9	14.1
Green leaves	4	6.3
Other foodstuffs	4	6.3

[a] Of those who had stopped breastfeeding (n=42).
[b] Of those whose duration of breastfeeding was known (n=30).

The majority of the children were breastfed within some hours after birth, while some initiated breastfeeding after ½ hour after birth (Table 6). Those who were not biological mothers of the child were uncertain of the breastfeeding history of the child. Colostrum was given to most of the children; however some of the children with known breastfeeding history had not been given this important substance. In these cases, the colostrums had then been released before breastfeeding was initiated. For 6 % (n= 4) of the children, other substances were given before breastfeeding was initiated and in these cases sugar solution (n=1) or traditional medicine (n=3) were given.

At the time of admission to the NRU, the majority of the children had stopped breastfeeding and none of the children were exclusively breastfed. Of the children who were not breastfed at the time of admission (and the infant feeding history was known), the mean age of ceasing was 22.1 months. The minimum age for ceasing breastfeeding was 4 months and the maximum age was 36 months, however the majority continued breastfeeding after 12 months of age (Table 6). The main reasons for ceasing breastfeeding were that the caregiver felt it

was time to stop, pregnancy in caregiver or the baby refused (Table 6). Other causes mentioned were related to illness in mother or child, such as advised to stop breastfeeding, sores in the child's mouth, sore nipples or diarrhoea in the child which was thought to be caused by the breast milk.

The mean age of introduction of supplementary fluids was 4.5 months, with the minimum age of 1 week and the maximum of 7 months. The majority introduced supplementary fluids before the recommended age of 6 months (Table 6). The main types of first supplementary fluids introduced was for the majority plain water, tea, cordial (*sobo)*, powdered milk, fresh animal milk, or fruit juice. Other types of fluids then given were soft drinks or a water solution with sugar and a colouring substance added (*fizzes)*.

The mean age of introduction of supplementary foods was 5.9 months, with the minimum age of 1 month and the maximum age of 12 months. The majority introduced supplementary foods within the range of 5-6 months of age. The majority of the children were given maize porridge (*mgaiwa)* as the first supplementary foods in addition to breastmilk, of whom many added salt and sugar (Table 6).

6.4 Changes in food intake

6.4.1 Reasons given for changes in food and fluid intake before and after illness

The caregivers were asked if they had noticed any changes in amount of food and fluid intake after the child became sick compared to before and their perceptions for reasons for these changes. Table 7 shows what the caregivers reported related to such changes.

Table 7: Changes in food/fluid intake before and after onset of illness[2]

	N	*%*
Changes in amounts of food intake		
Eaten less	65	92.2
Eaten more	2	2.9
The same amount	3	4.3
Reasons given for decreased food intake[a]		
Refusal due to illness/pain	47	67.1
Loss of appetite/refusal of food	17	24.3
Vomiting	4	5.7
Lack of food	4	5.7
Oral sores	3	4.3
Weakness in the child	1	1.4
Reasons given for increased food intake[a]		
More appetite during illness	2	2.9
Don't know	2	2.9
Changes in amounts of fluid intake		
Drunk less	49	71.0
Drunk more	18	26.1
The same amount	2	2.9
Reasons given for decreased fluid intake[b]		
Refusal due to illness/pain	34	49.3
Vomiting	6	8.7
Refusal/loss of appetite	3	4.3
Oral sores	3	4.3
Other	5	7.2
Reasons given for increased fluid intake[b]		
The child likes fluids	10	14.5
Needs more due to diarrhoea	3	4.3
Other	5	7.2

[a] Among those who reported changes in amounts of food intake.
[b] Among those who reported changes in amounts of fluid intake.

The far majority of the caregivers reported that their child had eaten less after their onset of illness compared to before, while the remaining reported no change in food intake or that the child had eaten more food than before (Table 7). The majority of the caregivers expressed that they perceived the illness or pain experienced by the child to be the main cause of decrease in food intake. Several of the caregivers stated the reason being loss of appetite/refusal of food but did not directly express this in relation to illness or pain (Table 7). The majority of the caregivers had also noticed a decrease in fluid intake after onset of illness in the child;

however a greater variety of reasons for changes in fluid intake were stated than that of changes in food intake (Table 7). Other reasons stated for a decrease in fluid intake were: to stop the child from having diarrhoea, lack of fluids, mother was scared to give more fluids as the child was young, due to cough and because the child had become smaller the child drunk less. Other reasons for increase in fluid intake were: to add fluids lost during diarrhoea, due to fever, to let the child gain weight or due to illness.

6.4.2 Comparison of food intake before and after stay at the NRU

Table 8 shows a comparison of the percentages (numbers) of children who had eaten the different food groups approximately more than four times per week before the child was admitted to the NRU and in the four weeks after discharge. These numbers includes the 27 children who were included in the follow-up part of the study. The table shows an increase in intake of most of the food groups after discharge from the NRU.

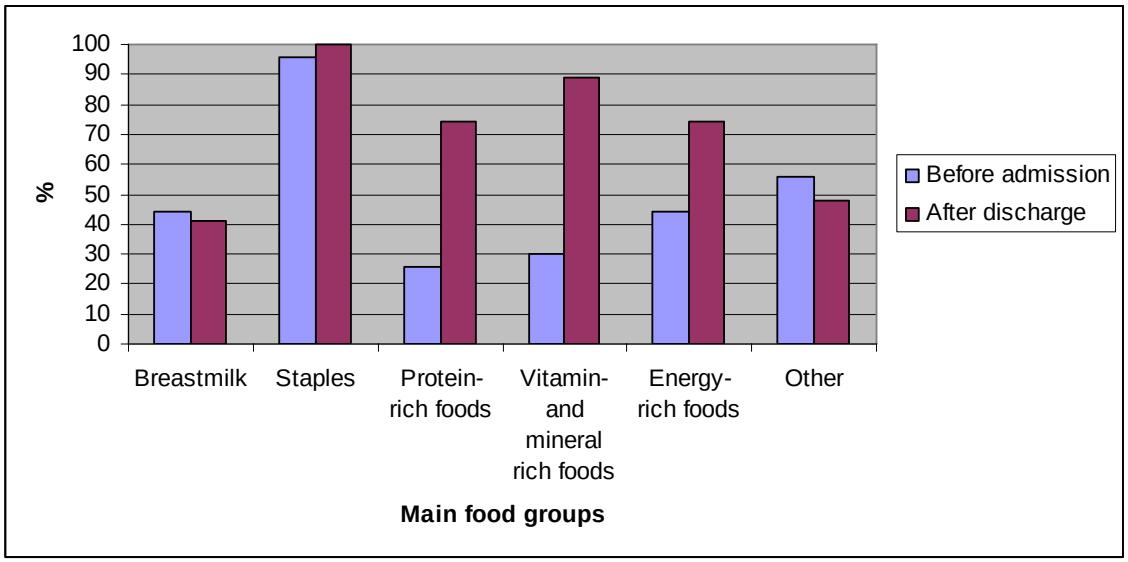
Table 8: Comparison of intake of different food items (more than four times per week) before and after stay at the NRU (n=27)

Food group	*Type of food items*	*Before stay at the NRU % (n)*	*After stay at the NRU % (n)*
Breastmilk	Breastmilk	44 (12)	41 (11)
Staples	*Nsima*	52 (14)	93 (25)
	Maize porridge (*mgaiwa)*	82 (22)	37 (10)
	Likuni Phala	4 (1)	96 (26)
	Other	4 (1)	0 (0)
Protein rich foods	Fish	11 (3)	52 (14)
	Beans	3 (2)	30 (8)
	Chicken	0 (0)	4 (1)
	Peas	0 (0)	0 (0)
	Animal milk	0 (0)	0 (0)
	Powdered milk	15 (4)	22 (6)
	Groundnut flour/animal milk added to porridge	19 (5)	70 (22)
	Goatmeat/eggs	7 (2)	15 (4)
Vitamin and mineral rich foods	Green leaves	26 (7)	56 (15)
	Banana	4 (1)	30 (8)
	Mango, paw-paw, pumpkin or avocado pear	0 (0)	41 (11)
Energy rich foods	Oil[1]	7 (2)	48 (13)
	Sugar[1]	14 (10)	22 (6)
Other	Cordial	30 (8)	7 (2)
	Tea	14 (10)	44 (12)
	Snacks	7 (2)	11 (3)
	Other fluids	11 (3)	15 (4)

[1] Added to porridge as supplements

In Figure 4, the different types of foodstuffs have been clustered into the main food groups in order to see if there was any increase in dietary diversity after their stay in the NRU compared to before. Each child was regarded to have consumed one item from the food group if the caregivers reported them to having consumed one type of food item belonging to a specific food group more than four times per week (before and after their stay) in this analysis. It should be noted that the children's ages have not been adjusted. This may influence the results as they would have grown approximately two months older after discharge from the NRU as food intake may have increased or the children's diets may have been changed relative to their ages.

Figure 6: Foods consumed (by % of children) more than four times per week in the four weeks before admission and four weeks after discharge from the NRU (n=27) by.



Breast milk was consumed by a total of 44 % (N=12) before admittance to the NRU and one mother had stopped breastfeeding her child after discharge. The reason for this was a new pregnancy.

Consumption of staples consisted commonly of maize porridge (*mgaiwa)* and *nsima* (maize pudding) before admittance to the NRU. The frequency of consumption of staple food increased after discharge and this was mainly because of introduction of *likuni phala* into the children's daily diets. This was because the caregivers received *likuni phala* as food support on discharge and when returning to the NRU for follow-ups. The frequency consumption of *nsima* also increased, while maize porridge (*mgaiwa)* decreased. Sweet potatoes were introduced in the diet for one of the children after discharge.

The protein rich foods consumed before admittance consisted of powdered milk which was either infant formula or a powdered milk called Cowbells. Both could be bought in the marked. Other protein-rich foods were animal milk or groundnut flour added to porridge, fish or beans. After discharge consumption of this food group increased due to an increase in both powdered milk, fish, beans and chicken. Groundnut flour was still being added to of the

children porridge, while milk was not anymore added as a supplement.

Vitamin and mineral rich foods was relatively low before admittance, consisting mainly of green leaves and banana. After discharge, consumption of green leaves, banana increased, as well as other types of fruits/vegetables.

Frequency of oil added to porridge as an energy supplement increased highly after discharge, while sugar intake decreased. This was mainly due to the caregivers receiving oil at the NRU to mix into the *likuni phala* as an energy supplement to the children.

Other foodstuffs/fluids the children commonly consumed before admittance were biscuits or donuts and tea, cordial *(sobo)* or other fluids. After discharge consumption of tea had slightly increased, cordial decreased, while biscuits or donuts and other fluids had slightly increased (see Table 7). In conclusion had the children increased their consumption in all of the main food groups after discharge from thee NRU.

6.4.3 Supplementary feeding after discharge

Table 9: Supplementary feeding after discharge (n=27)

Factors	***N***	***%***
Reception of supplementary food after discharge		
Yes	17	63.0
No	10	37.0
Frequency of supplementary feeding the day before follow-up[a]		
Three times	6	35.3
Twice	8	47.1
Once	2	11.8
Other	1	5.9
Sharing of likuni phala with other children[a]		
Yes	15	88.2
No	2	11.8

[a] Of those having received *likuni phala* (n=17).

In the last two weeks before follow-up, only 63.0% of the 27 caregivers had received *likuni phala* from the NRU during follow-up visits (Table 9). The remaining had not returned to the NRU for follow-up visits for various reasons. Reasons given for not attending these visits were lack of transport and lack of money for such transport and long distances between the

home village and the NRU.

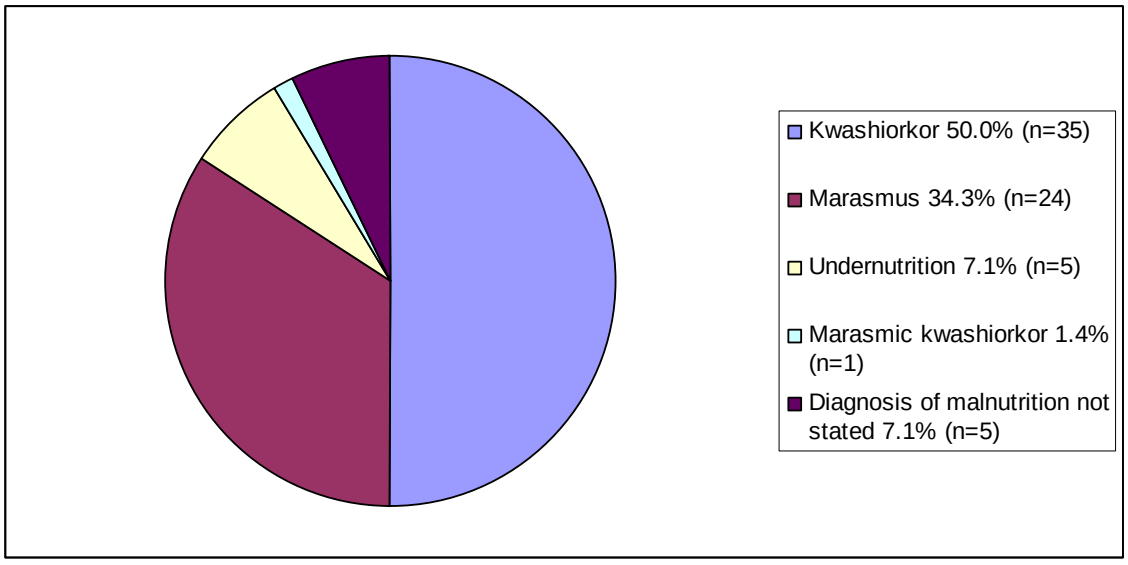
Of the caregivers having received supplementary food, few reported their children to have consumed this kind of food three times as recommended (Table 9). One of the children had refused eating such food when being offered. The majority also reported to have shared this food with other children.

6.5 Comparison of disease pattern and health care seeking behaviour after discharge compared to before admittance

6.5.1 Types of illnesses in the children on admission

The majority of the caregivers carried with them a *Road-to-Health card*, which is a card provided at birth where the children's anthropometric development, history of illness and immunisation history are documented. In general, these cards showed that many of the children had a long history of illness, such as frequent malaria, pneumonia and other common diseases. A history of undernutrition was also apparent for some, as 14 % (n=10) of the children were readmissions to the NRU. Of these, two of the children had two previous admittances.

Figure 7: Types of undernutrition on admission (n=70) by % (n).



On admittance, a medical chart review was performed and the medical problems stated were collected. This review showed that the children were presented with one or more medical problems in addition to different types of undernutrition. The caregivers were also asked about what their child was suffering from. Figure 7 shows types of undernutrition diagnosed by the healthcare workers, however as shown in the figure this was not always stated in the charts (nor fully comprehensive to findings of the researcher who found that 54 % presented with bilateral oedema).

When questioning the caregivers about what kind of illness their child was suffering from, only 30 % stated undernutrition as the problem.

Table 10: Health care personnel and caregivers observations of types of medical problems in the children admitted (n=70) in % (n) [1].

Medical diagnosis/symptoms	***Health care personnel's observations***	***Caregiver´s observations***
Diagnosis		
Malaria	18.6 (13)	8.6 (6)
Pneumonia	4.3 (3)	2.9 (2)
Symptoms		
Anemia	10.0 (7)	1.4 (1)
Diarrhoea+vomiting	12.9 (9)	11.4 (8)
Diarrhoea	30.0 (21)	44.3 (31)
Vomiting	8.6 (6)	7.1 (5)
Fever	42.9 (30)	61.4 (43)
Oral sores	22.9 (16)	8.6 (6)
Cough	28.6 (20)	42.9 (30)
Immunosuppression	2.9 (2)	0.0 (0)
Other	7.1 (5)	11.4 (8)

[1] The majority of the children suffered from multiple symptoms or had several diagnoses.

As mentioned, most of the children were presented with co-diagnosis/symptoms of or in addition to undernutrition. Table 10 shows the different diagnoses and related symptoms collected from the medical chart review and the caregivers opinion of what their children was suffering from. In many cases, symptoms were listed as the medical problem and not a disease and it may therefore be a lack of accuracy of data of the proper medical conditions of these children.

6.5.2. Health care seeking behaviour before admission

Table 11 shows caregivers health care seeking behaviour before admission to the NRU.

Table 11: Health care seeking before admission to the NRU

Factors	*N*	*%*
Presence of health facility in the home area		
Yes	37	52.9
No	33	47.1
Distance from home to health facility		
≤ 5 km	32	45.7
> 5 km	35	50.0
No data	3	4.3
Type of health care service sough at first consultation		
Health centre/hospital	52	74.3
Traditional healer	13	18.6
Other	5	7.1
Time spent between notification of illness to h/care first consultation		
≤ 4 days	38	54.3
≥ 5 days	31	44.3
Don't know	1	1.4
Type of health care service sought for second consultation		
Health centre/hospital	64	91.4
Traditional healer	5	7.1
Mobile clinic	1	1.4
Medical treatment given before admission		
Yes	70	100.0
No	0	0.0
From where treatment was obtained		
Health centre/hospital	59	84.3
Traditional healer	16	22.9
Market/shop	7	10.0
Other	3	4.3
Type of treatment given to the child		
Antibiotics	39	55.7
Analgesics	41	58.6
Oral rehydration therapy (ORT)	27	38.6
Antimalarials	13	18.6
Traditional medicines	14	20.0
Iron supplements	7	10.0
Other	7	10.0

Most of the caregivers reported to have a health facility present in the home area, however half of the caregivers were estimated to live more than 5 km from a health facility. All of the caregivers reported to have consulted medical services twice before admission to the NRU. For the first consultation, the majority had sought a health centre or a hospital, while about 1/5 reported to have consulted the traditional healer. The remaining consultations were at the

mobile clinic, neighbour, the father of the child or the health surveillance assistant (HSA). Time spent between illnesses was noticed till medical assistance was sought were ≤ 4 days for more than half of the caregivers, while one caregiver was unsure (Table 11).

A higher number had consulted the health care centre/hospital for the second consultation, while the remaining had consulted either the traditional healer or the mobile clinic.

All the children had been given medications before admittance to the NRU, majority of which was provided by a health centre/hospital. Some had also received medication from the traditional healer, while others had bought medications off the counter at the marked/shop, which is easily available in Malawi. Other places where the caregivers had obtained medications were their garden/bush, HSA or mobile clinic. The main types of treatments given to the child were; antibiotics, analgesics, oral rehydration theraphy (ORT), antimalarials, traditional medicines and iron supplements. Other types of treatment mentioned by the caregivers were vitamin supplements, IV fluids, blood infusion or unspecified topical cream. Some of the children were transferred from the paediatric ward to the NRU or were admitted to both wards in order to receive both necessary medical treatment and therapeutic feeding.

6.5.3 Health care seeking behaviour after discharge

Table 12 shows caregivers healthcare seeking behaviour after discharge.

Table 12: Health care seeking after discharge from the NRU (n=27)

Factors	*N*	*%*
Illness in child after discharge		
Yes	10	37.0
No	17	63.0
Type of health care service sough at first consultation[a]		
Health centre/hospital	7	70.0
Traditional healer	3	30.0
Type of health care service sough at second consultation[a]		
Health centre/hospital	9	90.0
Traditional healer	1	10.0
Medical treatment given after discharge		
Yes	10	37.0
Not applicable	17	63.0
From where treatment was obtained		
Health centre/hospital	8	80.0
Traditional healer	3	30.0
Market/shop	1	10.0

[a] Of the caregivers who had experienced illness in their child after discharge (n=10).

On follow-up, most children had not experienced illness according to the caregiver, however about one third had experienced some kind of medical problems (Table 12). Types of medical problems reported by the caregivers were diarrhoea, cough, oral thrush, skin rash, pneumonia, fever, vomiting and malnutrition. All of the caregivers had sought medical assistance for the child, either at the health care centre/hospital or from the traditional healer. Again, all of the caregivers reported to have sought a second consultation, in this case only one had consulted the traditional healer and the remaining nine had consulted the health care centre/hospital. All the children having experienced illness had received medication, either from the health care centre/hospital, traditional healer or shop/market (Table 12).

A comparison of illness and the caregiver's response to that was intended; however this was not completed due to the low numbers having experienced illness after discharge. A brief description of the situation was therefore found most appropriate.

6.6 Knowledge regarding household hygiene practices

As mentioned, during the stay at the NRU the caregivers also received education about food hygiene and household hygiene practices. The caregivers were asked the same open-ended questions related to household hygiene practices and risk factors related to water borne diseases in the initial and the follow-up interview. Table 13 shows a comparison of knowledge of selected household health practices for the 27 caregivers of the children who completed the follow-up.

Table 13: Knowledge of household health practices on admission and follow-up (n=27)

Factors	*On initial interview n(%)*	*On follow-up interview n(%)*
Caregivers handwashing practices		
Before going to bed	1 (3.7)	1 (3.7)
Before preparing food	10 (37.0)	21 (77.8)
Before eating	24 (88.9)	25 (92.6)
After eating	21 (77.8)	26 (96.3)
Before feeding the child	10 (37.0)	8 (29.6)
After being to the toilet	17 (63.0)	17 (63.0)
Before going to the toilet	5 (18.5)	1 (3.7)
After helping the child to the toilet	12 (44.4)	13 (48.1)
Washing of childrens hands		
After the child has eaten	9 (33.3)	26 (96.3)
Before child eats	23 (85.2)	27 (100.0)
After the child has been to the toilet	15 (55.6)	16 (59.3)
Before child goes to bed	2 (7.4)	1 (3.7)
When they are dirty	19 (70.4)	21 (77.8)
When child wakes up in the morning	7 (25.9)	6 (22.2)
Preparation of fruits and vegetables		
Rinsed with water	19 (70.4)	22 (81.5)
Boiled	0 (0.0)	3 (11.1)
Thoroughly cooked	3 (11.1)	5 (18.5)
Relation between water and disease		
Yes	24 (88.9)	26 (96.3)
No	2 (7.4)	1 (3.7)
Don't know	1 (3.7)	0 (0.0)
Type(s) of illnesses related to water		
Diarrhoea	18 (66.7)	20 (74.1)
Dysentery	1 (3.7)	2 (7.4)
Cholera	12 (44.4)	12 (44.4)
Nausea/vomiting	3 (11.1)	3 (11.1)
Fever	2 (7.4)	3 (11.1)
Bilharzia	3 (11.1)	1 (3.7)
Malaria	2 (7.4)	2 (7.4)
Undernutrition	0 (0.0)	1 (3.7)
Preparation of drinking water		
Boiling	9 (33.3)	13 (48.1)
Nothing special	15 (55.6)	6 (22.2)
To be covered with lid	0 (0.0)	6 (22.2)
Wash cup to be used	0 (0.0)	2 (7.4)
Add chemicals	1 (3.7)	0 (0.0)
Don't know	2 (7.4)	0 (0.0)

The caregiver's knowledge related to these hygiene practices had not changed after staying at the NRU; however their knowledge related to hand washing practices of both caregivers and children related to food preparation and eating had increased (Table 13).

6.8 The informants subjective understanding of causes of undernutrition in the children

The main themes which were raised during the qualitative interviews with homecraft workers and caregivers have been clustered into three main contexts; 1) lack of resources as a limiting factor in giving adequate care to the children, 2) modern versus traditional perceptions of medicine and health care and 3) experiences of children's recovery after discharge.

6.8.1 Lack of resources as a limiting factor

When asked about perceptions of main causes of undernutrition in children, both groups of informants mentioned resources of different kinds as limiting factors in giving adequate care to the children. Resources are in this context used in a wide meaning of the term and include both physical resources like food and money and non-physical resources like knowledge, time and support.

Poverty and lack of food

Poverty and lack of food was mentioned by most as a common contributor to the problem by both groups of informants. Many Malawians do experience seasonal food shortages, as expressed by one caregiver: …."*in times of hunger there is no food to eat. They [the children] eat vegetables only, and then the child becomes oedemous [kutupa]." "In my village mostly they depend on cultivating land and the harvest. So if the harvest is not good that year they get only little harvest and that is when they [the children] get the problem of undernutrition [kutupikana]."* In a resource poor setting, having an additional source of livelihood is important in times when own harvest fails. As described in the quantitative results, harvest from own garden was the main source of food for most of the caregivers, however the majority also had the opportunity of purchasing food in the shop/marked. Apart from

assistance from husbands, the sources of which the caregivers obtained means of purchasing food were different types of petty trading or casual labours - *ganyu*. Such activities was the making and selling of donuts made from bananas - *zitumbuwa*, traditional beer, woven mats or fetching and selling firewood were activities many of the caregivers engaged in order to have an additional income. The children were often left at home with other family members while the caregivers were doing labour or went to work in the gardens.

When asked about possible solutions, the caregivers had several suggestions for how undernutrition could be prevented. Being primarily dependent on harvest from own garden one caregiver said: "*We need to work hard in the garden so that we can be able to harvest more food in order for the children to have food to eat so that we prevent them from undernutrition [kutupikana].*" During times of poor harvest, the importance of having alternate sources of livelihood was mentioned by another caregiver: *"…….maybe if there could have been chances of doing casual labours and working so that you could have means to buy special food [for the child]."* One caregiver addressed a lack of assistance from the government and the NGOs in times of hunger. She thought these could help: "*By distributing foods in order for the children to have something to eat. Especially the government and non-governmental organisations should distribute different kinds of food in my village."*

Family size was also believed to influence the availability of food to give to the children, as a higher number of children also require more resources to share among these. One caregiver explained that:… *"some families have a small family with less children and some have big families with many children, and to those who have many children their children are more affected with undernutrition [kupewelera zakudya thupi] because there is not enough to feed all the children."*

Another repeated problem was that the size of the agricultural land was too small, not being able to produce enough crops for the needs of the family. In combination with lack of family planning this created a scarcity of resources for many households. The homecraft worker at St.Martin Hospital also described how there was a lack of suitable land for cultivation in the area, leading to vulnerability in the food situation for many: "*Their gardens are somewhere at*

Makomba, which is about 4-5 km away and it is very difficult for them to have a big garden. They wake up very early in the morning, sometimes 3 or 4 they go there and just cultivate a small land before they come back. The other thing is that in this area there is not a proper place for them to cultivate, because of the hill on one side and the lake on the other side, so the land area is very small."

Lack of support

Lack of support of different kinds was mentioned as limiting the resources available for child care. Being a single mother in a female headed household with lack of support from the father of the child was raised by several caregivers. One caregiver explained that"… *for those who are single it is difficult because they find food for themselves while others who have a husband it is the husband who finds food for the family. Sometimes in other families the man can be there but cannot be able to find food and sometimes it is the woman who finds ways of finding food for the family."*

Three of the caregivers participating in these interviews were single after being divorced or widowed. They all raised the issue of lacking support as the main reason for their child having become undernourished. These experienced a high workload and had difficulties to manage their responsibilities on their own. This in turn led to their children suffering as they were not able to provide sufficient food. One of them was divorced from her husband some time back. He remarried and was not supporting the child and the caregiver expressed that ……."*I am failing to get enough so that the child's body should be well because I do everything myself."* Another explained that*: "I experience lack of food in my home, sometimes I need to look around to search for food and it happens that I get food very late. This means my children stay a whole day or two without food."….. especially after I divorced with my husband things are not good at all. "*A strong wish of support was stated by some of these. One said: "*Some get married with business men while others marry poor men so when getting married with poor men they say it is better just to marry no matter if he is poor. I just need to find someone who can look after me properly."* A widowed caregiver said: "*My husband passed away last year and since that time I was failing to feed the child properly and [the child] now started oedema [kutupa]…." "..I lack help or support…. if I could get married again maybe the man*

will help me in caring for the child and there would be a difference."

Another issue raised was polygamy which is common in Mangochi. This was mentioned by two of the home craft workers who viewed it as having a negative influence on the children's nutritional status. The home craft workers believed being in a polygamous marriage would limit the resources available for the children. In Mangochi, it is common that the women being in a polygamous marriage do not live together, but the husband lives partly in his wives houses. The caregivers being married polygamously lived with their husband two weeks per month, and then he would live the remaining weeks with the other wife. This left the woman alone with a high workload in periods when the husband was not present. The caregivers reported their husbands to have only one wife in addition to them, although it was common to have more than two wives. As explained by one home craft worker: *"Their husbands don't only have one wife; they have two, three, four wives. So the woman goes alone to cultivate…. Although they have a big land, the woman can't manage because she is alone. The husband is going here and there [between his wives]. And little money he can share between four women. That is common here."*

The fact that the women had the main responsibilities in the homes was also reflected when asked about their thought about their stay in the NRU. Even though the caregivers in general expressed a positive attitude towards their stay in the NRU, there were two main worries which were shared among the caregivers. One worry was related to their other young children who were left at home. Some of the caregivers had small children who were still breastfeeding and these were brought along to the NRU. However, most of the caregivers had young children who were left with other family members at home while she was staying in the NRU with her sick child. One caregiver said*"… those I left my children with are not caring for the children well. They are not giving enough care for my children and here at the NRU mostly I am worried about that."* Another caregiver said: *"….I am worrying about my child I left at home. The child just stopped breastfeeding last month."*

The other worry shared by the caregivers was that this period was the time for cultivating the agricultural lands, as the rainy season (November - March) was approaching. As the women

were mostly responsible for cultivating maize and some other crops, several worried that they did not have anyone who could assist them with this important task while they were staying in the NRU. One caregiver stated: *"There is nobody who is helping in my garden; everybody is busy with his or her own garden."* Others expressed a feeling of punishment or a fear from God because of the difficult situation they found themselves in: *"What I worry very much about here at the NRU is that this time it is the rainy season and people are busy cultivating the gardens and cultivating different crops. But me, I am here at the hospital with the child and sometimes I wonder what God [mulungu] really thinks of me. My home is far away and I am here at the hospital with the child."*

Lack of time

As mentioned, the women often experience a high workload as it is traditionally the women who are responsible for the main household duties such as work in the agricultural lands, cultivating the land and harvesting the crops, as well as child care. One caregiver described how a high workload on the women often restricts healthy feeding practices: *"Early in the morning they wake up and go for cultivation in their garden without first preparing porridge for their children. In the garden they spend the whole day busy cultivating and forget that they are supposed to cook for their children at noon. They come home late and that means the children stayed the whole day without eating any food"*.

One of the home craft workers confirmed this problem of high workload for the women with lack of involvement from the husbands. She explained that: "*They don't have time to feed their children, because these children they have to be fed five times per day. They have too much work to do in their home, early in the morning they go out for gardening not feeding their child. They feed their child in the evening sometimes, in the afternoon with all day no feed. So they end up undernourished". ….And the other thing is that most of the women here, their husbands they are not fond of gardening, they are found out on the lake fishing somba so it is only the women who are doing the garden, cultivating the land. So the woman she is busy with children so they can't cultivate a big garden because of too much work"*.

Lack of knowledge

In addition to lack of economic resources, support and time, poor feeding practices were brought up by both groups of informants. This may also be linked to their stay in the NRU at the time of the interview and the child feeding information they receive. However, one home craft worker explained that: *"Sometimes it is because of lack of knowledge; they don't know how to prepare food for their kids. They don't know how they can mix or change the diet because there are so many ways to prepare porridge [mgaiwa]. But sometimes other mothers do know because they go to the antenatal clinic and receive health education on how they can prepare porridge to their children, but they are just too lazy to do it. Sometimes it is because of poverty, they can't afford to buy groundnuts or milk to add to the porridge or anything".*

The perception of mothers being lazy and not preparing balanced food for their children was also brought up by both some of the caregivers.

When asked about prevention of undernutrition, the home craft workers suggested several important factors. Education was raised as an important factor and HSA were believed to be an important source for giving health, nutrition and agricultural education in the villages. Even if food aid from the government or the NGO`s were suggested in times of hunger, the issue of dependence was raised:"…. *in past times we had supplementary feeding in the villages, they were receiving Likuni phala and soybeans. They can't depend on those things, because if they phase out then they have problems. We have to teach them how to make it themselves".* The responsibility of the males and the importance of involving the husbands and fathers in prevention of undernutrition were also stressed: "… *I mean whenever the civil education is being given to the mothers the husbands should be there too, because they are the people who can find the food for their family. And I think the other thing is they should not have so many wives because they cannot manage to feed them all".* The men were encouraged by the home craft workers to join the education sessions at the NRU, however during the researchers work in the NRU no men was observed in doing so.

Lack of a healthy environment

Illness in the children was also a repeated theme by both groups of informants as major cause of undernutrition, especially vomiting, diarrhoea, and malaria. Interestingly, oedema was mentioned as a separate illness by several caregivers, but was not clearly described as a sign of undernutrition. However, several caregivers clearly described a relation between undernutrition and illness. One explained that "*If the child is getting sick very often the child is likely to become undernourished [kupelewera zakudya thupi] and sometimes if the child is dehydrated [kuthamadzi thupi] it also become undernourished [kupelewera zakudya thupi].* "

Poor hygiene practices were repeatedly mentioned by both groups of informants as a cause of poor health in children. One homecraft worker explained that *"Some caregivers don't cook the food of their children thoroughly, they feed their children uncovered food, they don't wash their hands when preparing food for their children, even sometimes if the homes are not swept and things like utensils are just used without cleaning them all. This can lead to diarrhoea [kutsegula mmimba] and vomiting [kusanza]."* During the rainy season, cholera is common in the villages and the government has made big efforts in health education campaigns in order to prevent this. Dysentery and intestinal worms were also mentioned by several as common health problems in the children. The problem of unsafe water leading to illness and undernutrition were raised. One caregiver explained that: "*Diarrhoea [kutsegula mmimba] and dysentry [mmimba mwakamwazi] is common in my vllage. I think it is the water because we draw water along the river [….] the water is not safe […] along the river there is sand and we make wells in that sand [kufukula chitsime muchenga]. The government and some NGOs should drill boreholes in my village like in other villages in some areas so that we can drink well protected water."*

The homecraft workers who had been working at the NRU had seen a change in the disease pattern. Measles used to be a common cause; however this is not the case anymore due to vaccination campaigns. HIV/AIDS was now believed to be an important determinant of undernutrition in the children. One homecraft worker stated that: "….. *HIV is one of the causes of undernutrition in Malawi".* In recent years, treatment failures have also been linked to the increasing number of HIV/AIDS. *" If the mother has HIV/AIDS definitely the child*

born from this mother will have HIV/AIDS. So the child become sick definitely will have undernutrition [kutupikana] and the medical assistant sends the child here to the NRU, we start to feed the child but long at last we see that the child is not changing no matter how we are feeding him or her."

6.8.2 Traditional versus modern beliefs of undernutrition

During the conversations, traditional beliefs and the use of traditional medicine were brought up as opposed to modern health care. This was reflected by both groups of informants in connection with traditional beliefs of causes of undernutrition and to decisions regarding healthcare seeking behaviour. Traditional medicine here refers to medical techniques and beliefs which have been traditionally developed and used in Malawi before the era of modern medicine developed in the western part of the world. Traditional medicine is still widely used parallel to modern medicine and a distinction between these two medical systems became evident during the conversations with both groups of informants.

Traditional beliefs on undernutrition

Through informal conversations with the homecraft workers, traditional beliefs related to causes of undernutrition which they had learnt about from conversations with the caregivers were as follows:

1) If the mother is pregnant and is breastfeeding at the same time, then the breastfed child can become undernourished [*sepho*].
2) Young children under five should not eat eggs because eggs can lead to oedemous tummies [*kutupa mmimba*].
3) If the father or the mother of a young child has sexual relations outside of marriage their child can become undernourished. Breaking the traditional rules of not having sexual relations outside of the marriage, may also cause undernutrition in the children of their extended families [*waadypha*] if the child is touched or carried by the person who broke this rule [*wamutupha/wamusepha*].
4) If a mother has an abortion or gives birth to a stillborn baby, the mother and the father need to have a sexual intercourse [*milanza*] within the first weeks after the abortion/birth.

If this is not performed, and either of the two touches or carries either their own child or a child of the extended families, this child can become undernourished. If sexual intercourse is not possible, the elders can prepare the traditional medicine [*mankhwala achikuda*] and make everybody in the family drink it together and this will prevent undernutrition in the children. This medicine should be taken 7 days after the abortion or stillbirth, then the couple must have sex after 40 days and the sex will remove what is inside his/her body which causes undernutrition in the children s/he touches [*nthaka*].

5) If the woman has delivered, the couple has to wait for 6 months to have sex. If they wait more than 6 months the child will suffer from undernutrition [*sepho*], [*amusiya*].

Witchcraft is also common in Malawi, and some of the caregivers were asked whether they believed this could be a cause of undernutrition. This link was not clearly expressed by any of the caregivers. One caregiver stated that*" I can`t predict that undernutrition [kutupikana] is coming from witchcraft [ufiti]. What I believe is that all diseases [matenda] that are found in children are coming from God [mulungu]."* One caregiver explained how the child suddenly started crying one night early in the disease process and how the child refused breast milk after this. When questioning one of the homecraft workers about beliefs related to witchcraft and undernutrition, she answered: "*Yes, they do tell me that my child was all right but the other day at night she or he has started crying and that means it is witchcraft."*

Factors influencing choices in the health care seeking process

The homecraft workers had experienced such explanations to be more common in previous years prior to the establishment of therapeutic and supplementary feeding programs than in recent times. However, they still experienced the children being admitted to the NRU at a late stage in the disease process due to the use of traditional medicine prior to seeking assistance from modern health care services: …."*some of the caregivers believe in traditional medicines. Around the neck and waist of the children they put traditional necklaces with medicines. So with their belief of the traditional medicine the child can have severe kwashiorkor [kutupikana] or marasmus [kunyetchera] on admission and these children take longer here to be cured "… "It is their culture at their homes - their great grandparent told them that the child will be cured with traditional medicines and not in the hospital."*

Many of the children involved in the study wore such traditional medicines around their waists or necks and these were used as prevention of different medical problems and for the child to grow strong and healthy. When the caregivers were asked about their beliefs of traditional medicine and its use of treatment of undernutrition, several of these caregivers expressed disbelief of the use of traditional medicine for this use. As one stated; " *Some of my elders related to me [agogo] told me that the child has diarrhoea [kutsegula mmimba] because of the problem of head [liwombo]- that is the head is not getting strong because I did not put a traditional medicine necklace and that's why she has diarrhoea [kutsegula mmimba]…." when I go back home I will tell them that you are not doing anything with your traditional medicine, go to the hospital you will receive health care and your child will be cured. I have been going to the traditional healer but my child was not cured up to when I came here [the NRU] and I see that my child is improving better than with traditional medicine. It [traditional medicine] is not helpful to undernutrition."*

A problem of not seeking medical assistance early enough in the disease process, leading to undernutrition was raised by one of the homecraft workers; *"…… if the children are sick and the caregivers do not care for the children to look for health care, the children easily become undernourished. Also the caregivers sometimes [makolo] take long time without seeking health care for the children if they get sick."*
Lack of availability to modern health facilities due to lack of transport and long distances were also raised as a problem when the children become sick. As traditional healers are present in most villages, the issue of availability influences their choice of health service as described by one home craft worker: "*The villages is far away from health facilities so the easiest way is to go to traditional healers because they are found within the village than walking long distance to the health centre or hospital."* These statements may suggest a need of increased availability of modern heath care services in remote areas.

Lack of trust in modern health care services was also reflected by one caregiver who stated that "…..*for some caregivers [makolo] it is possible to prevent undernutrition in my village because once their children fall sick they seek health care, but some caregivers they fear to go*

to the hospital with their children especially if they are referred from health centres to district hospitals like here in Mangochi they refuse to go."

6.8.3 The homecraft worker's experiences of the children's recovery after discharge

After discharged, the caregivers/children were enrolled in a supplementary feeding program in which they return to the hospital every fortnight for follow-ups and receiving foodstuffs for the child. However, when asking the homecraft workers about their experiences related to the follow-up system, all had experienced that the child's nutritional status failed to improve after discharge. One of the homecraft workers expressed it like: "…… *most of them- their weight is just static, some of them drop down in weight, but most of the time their weight is just static."* Several causes for this were stated for this problem, many being linked to lack of resources earlier described. Improper feeding practices and lack of food were mentioned as a main problem for not being able to feed the child as taught at the NRU. A common problem experienced was related to the reception and misuse of Likuni Phala as this was often being shared by other children: *"… when they come here [for follow-up] we give them 5 kg Likuni Phala for that one child. The family is a big family with seven children, do you think she can just prepare a small amount for only one child? Never. So it means that those 5 kg she cooks for only 2-3 days and then it is finished. That is a big problem..... She can't cook only small porridge for one, when the whole family is hungry and everyone is crying."*

Some of the caregivers also failed to come for follow-up. Interestingly, the homecraft workers seemed to perceive this as being due to laziness in the caregivers. As stated by one: " *….they say that nowadays we are busy in the gardens, cultivating and so on. They are just lazy because it is every fortnight. They can come this Monday and another Monday, they do not cultivate all these days… They are just lazy."* Some of the caregivers lived far away from the NRU, however problems with transport were not perceived as being limiting for follow-up visits by one of the homecraft workers. She stated that: *"…..…..some who stays far away they fail to come, but no matter if they stay far away [from the NRU], if they wanted their children to get well they will try to come"*.

Some of the caregivers abscond with their children and if it is possible, the homecraft workers do encourage the absconders to come for follow-ups: "…….. *we tell them that even though they go [left the NRU] according to their own wish they should be coming with the child for a check-up. Some of them they do come."*

Four of the caregivers/children included in this study absconded, of whom three children were followed-up, but had deceased after arrival home from the NRU. Upon these follow-ups, a condolence was made but no further interviewing was completed due to ethical reasons. However, through informal conversations between the assistant and the caregivers in the NRU and on follow-up, some reasons for absconding was stated. A lack of seeing the child improving as these were severe cases seemed to result in distrust in the treatment at the NRU and a wish of trying to consult the traditional healer in the village. In one case, there was a long distance between the NRU and their home village and a fear of failing to find transport in case the death of the child was mentioned as a worry, as it is not allowed to bring a dead body on the bus or the *matola.* Another caregiver was suffering illness and developed shingles during the stay in the NRU. The child's grandmother assisted her and her child home, probably due to the illness. Upon follow-up both the caregiver and the child had deceased.

6.9 Factors explaining weight change after discharge

Of the 27 children included in the follow-up, 33 % had either experienced weightloss or maintained a stable weight according to the whz-scores measured on the day of discharge and on the day of follow-up. Of these, the majority (67 %) were boys. Statistical tests were intended in order to check for significance between various factors which may have influenced the childrens nutritional status after discharge. Due to the high number of attrition, this was not possible. Some of the results from a cross tabulation are presented in Table 14, 15 and 16 in order to describe possible trends. In this part, some selected variables were chosen which had been highlighted as possible factors during the qualitative interviews with the caregivers and homecraft workers.

Table 14: Lack of resources

Factors	Gaining weight % (n=18)	Losing/static weight % (n=9)
School attendance of caregiver		
Yes (n=12)	67 (8)	33 (4)
No (n=15)	67 (10)	33 (5)
Marital status		
Married (monogamy) (n=13)	69 (9)	31 (4)
Married (polygamy) (n=6)	67 (4)	33 (2)
Divorced/separated (n=8)	63 (5)	38 (3)
Size of cultivated land		
≤ 0.5 Hectares (n=10)	70 (7)	30 (3)
> 0.5 Hectares (n=17)	65 (11)	35 (6)
Additional source of livelihood		
Yes (n=8)	88 (7)	13 (1)
No (n=19)	58 (11)	42 (8)
Experience of difficulties in obtaining foods in the household		
Yes (n=10)	60 (6)	40 (4)
No (n=17)	71 (12)	29 (5)
Number of younger siblings		
0 (n=23)	78 (18)	22 (5)
1 (n=4)	0 (0)	100 (4)
Safe source of drinking water		
Yes (n=17)	59 (10)	41 (7)
No (n=10)	80 (8)	20 (2)
Information received on health and nutrition		
Yes (n=6)	67 (4)	33 (2)
No (n=21)	67 (14)	33 (7)
Time spent with child during the day		
24 hours (n=3)	100 (3)	0 (0)
18-23 hours (n=20)	75 (15)	25 (5)
≤ 17 hours (n=4)	0 (0)	100 (4)
Perception of the child being fed more often if more time was available		
Yes (n=19)	74 (14)	26 (5)
No (n=8)	50 (4)	50 (4)

Table 15: Illness and health care seeking behaviour after discharge

Factors	Gaining weight % (n=18)	Losing/static weight % (n=9)
Illness in child after discharge		
Yes (n=9)	67 (6)	33 (3)
No (n=18)	67 (12)	33 (6)
Illness in caregiver after discharge		
Yes (n=4)	75 (3)	25 (1)
No (n=23)	65 (15)	35 (8)
Health facility present in the home area		
Yes (n=10)	80 (8)	20 (2)
No (n=17)	59 (10)	41 (7)
Distance to health facility[a]		
≤ 5 km (n=9)	89 (8)	11 (1)
> 5km (n=17)	59 (10)	41 (7)

Table 16: Compliance to follow-up system after discharge

Factors	Gaining weight % (n=18)	Losing/static weight % (n=9)
Reception of Likuni Phala		
Yes (n=17)	71 (12)	29 (5)
No (n=10)	60 (6)	40 (4)
Sharing of this food with other children[b]		
Yes (n=15)	67 (10)	33 (5)
No (n= 2)	100 (2)	0 (0)
Frequency of feeding on the day before follow-up		
1-2 times (n=4)	50 (2)	50 (2)
3-4 times (n=21)	76 (16)	24 (5)
Child refused food (n=1)	0 (0)	100 (1)
Food preparation of the childs food separately		
Yes (n=17)	71 (12)	29 (5)
No (n=4)	50 (2)	50 (2)
Varies (n=6)	67 (4)	33 (2)

[a] (n=26)
[b] Of those having received *Likuni Phala* after discharge

These cross tabulations may suggest that some factors were related to lack of progress in the children's recovery after discharge. Related to lack of resources, some factors seemed to have an influence. Not having an additional source of livelihood, having experienced difficulties in obtaining foods in the household, having a younger sibling, having a safe source of drinking water and a having a perception of the child being fed more often if more time was available may seem to have an unfavourable effect on the children recovery. In addition, it seemed that less time spent with the child reported by the caregivers the more likely they were to have experienced weightloss/ static weight (Table 14).

Regarding illness and health care seeking behaviour, not having a health facility present in the home area and distance > 5 km to health facility may have had a negative effect (Table 15).

Regarding the follow-up system after discharge, not having received *Likuni phala*, low frequency of feeding on the day before follow-up and not preparing the child's food separately may have had a negative effect (Table 16). Another factor worth mentioning is the different treatment regimes, as the children at Nkope H/C did not receive treatment as recommended. Of the children followed-up, the children not gaining weight were 39 % at Mangochi DH (n=18), 25 % at St.Martin Hospital (n=4) and 20% (n=5) at Nkope H/C.

7. Discussion

7.1 Overview of the main findings

Some factors known to be risk factors of child undernutrition were found common among the caregivers. These were related to having a high number of children, lack of education or household food insecurity. Interestingly, the majority reported to have additional sources of food and that lack of food had not been a problem during the last month prior to admittance of their child. However, most of the caregivers reported a decrease in both food and fluid intake after onset of illness. The reasons stated were related to loss of appetite and symptoms related to the child's illness.

Most of the children presented with several co-diagnosis and/or symptoms and seemed to have experienced illness for some time as all had sought medical assistance twice or more before admission to the NRU. The majority of these consultations had been at a health centre/hospital.

It seemed to be an increase in dietary diversity after the stay in the NRU, as the consumption of items from most of the main food groups had increased. However, the supplementary feeding program proved to have its shortcomings as several of the caregivers had failed to receive the supplementary food. The majority of the caregivers who had received supplementary foods after discharge reported to having shared this with other children in the household. The homecraft workers also reported this to be a common problem. Their experiences were that many of the children's nutritional status failed to improve after discharge, both due to lack of resources in the household and problems related to compliance to the follow-up system.

Lack of resources of different kinds were believed to be a limiting factor for giving adequate care to the children, both by the caregivers themselves and the homecraft workers. These resources were food, support, time, knowledge and a healthy environment. Lack of availability to modern health care services and the use of traditional medicine as treatment was raised as a problem by both the caregivers and the homecraft workers.

Out of the children who were followed up after discharge, 67 % had increased in weight one month after discharge while the remaining had either lost weight or their weight had remained static. Nearly half of the children had experienced some sort of illness after discharge and about 1/3 presented with bilateral oedema on the day of follow-up.

7.2 Methodological considerations of the study

Small sample size

A sample size of 80-100 participants was intended for this study. This was not possible due to a higher rate of attrition than was expected and made several of the analysis which was planned for to be impossible to complete. As mentioned, chi-square tests were intended in order to check if some factors were significant for the nutritional status after discharge. Due to the low number of follow-ups in the sample, the assumption of a lowest expected frequency in the 2 by 2 table was violated. A general presentation of the numbers was therefore presented to describe possible trends.

Caregivers recall

The caregivers were asked about frequency of consumption of different food items before and after they noticed onset of illness of the child. During analysis it became clear that this data could not be trusted as a recall over several months would be difficult for the caregivers to remember. The food data from before onset of illness was therefore not used in the analysis. The food data from the month before the child was admitted to the hospital and the month after discharge was used. Caregivers recall may be a limitation of the study, as food consumption was asked on a very general basis.

Age of the children and the caregivers was crosschecked to secure accuracy. The children's ages was crosschecked with the *Road to Health cards*, which the far majority of the caregivers possessed. The caregiver's age was crosschecked by asking in two different ways to check for accuracy. They were both asked for the year they were born, as well as how old they were in years. In some cases they were unsure about their age, and the research assistant

used major events in order to state the age as accurate as possible.

Language and the use of an interpreter

As the researcher did not speak the local language, a research assistant was used during the interviews and conversations. For the quantitative interviews, measures were taken to decrease the possibility of translations problems, such as back translation of the questionnaire and piloting. For the qualitative data collection, information and meanings of expression might have been lost or misunderstood as there is no standardised questionnaire used but rather an unstructured conversation. The interviews were recorded, transcribed and checked by a third person to check for translation errors in order to minimise this problem. However, informal conversations with both caregivers and home craft workers could not be checked for such errors and the researcher could therefore not be certain how the assistant asked the questions or how answers were responded to.

The research assistant used for this study had experience from several previous research projects, and was recommended by The Centre for Reproductive Health for whom she had been working for previously.

The researcher's presence during the interviews

During all interviews, the researcher was present in case the assistant had questions or any clarification was needed. This could be both a strength and limitation of the study. The strength would be that questions were clarified immediately and the questionnaires could be reviewed for errors while the caregiver was present in case some answers needed further clarification. The limitation could be that the informants could feel pressured to answer "the right answer" or what she thought the researcher wanted to hear.

Validation methods used

The limitation of the use structured questionnaires is that people may give answers that are not corresponding with their actual behaviour due to several factors. Participant observation would minimise this problem, but this was not possible due to the setting of the study, which did not reflect the natural home setting. The follow-up visits made it possible to validate some

of the data collected in the first interviews such as type of housing, distance to health care facility, source of water and so on. Regarding this kind of data, it seemed that information given was correct. History of illness, age of the child and number of children was validated by crosschecking with the *Road to Health Card*. In two cases it became clear that the caregivers did not mention the right number of deceased children, which may be due to several factors such as shame, grief and so on. For ethical reasons, the caregivers were not confronted with this but the information from the *Road to Health card* was used.

Medical chart review

The researcher performed anthropometrical measurements and checked for bilateral oedema, but was not able to perform further clinical examinations. The co-diagnosis and symptoms were therefore collected from the medical charts of the children. Diagnosis was often made on a symptomatic basis, and the symptoms were listed in the charts without a fulfilling diagnosis. Information related to the medical problems of the children may therefore be incomplete.

Lack of control group

This study only included severely malnourished children and was not compared to a matched control group. The findings could therefore not be compared with a healthy population, to identify possible casual factors for undernutrition.

7.3 Discussion of the findings

In the discussion of the findings, the qualitative results from objective 6 have been merged with the quantitative results in order to highlight some of the main findings.

7.3.1 Possible socio-economic factors which may lead to inadequate caring practices

Several factors have been linked to a risk of undernutrition by several studies as this may negatively affect caring behaviours and resources available in several ways. Such risk factors include lack of education and knowledge of the caregiver, occupation, few alternate

caregivers, heavy workload, illness in caregiver, food insecurity and more (27).
Some known risk factors showed to be present among the caregivers and in their household situation.

Factors related to the caregiver

The majority of the women had not attended school (63 %) and not received information on child health and nutrition (76 %). This is a lower rate of school attendance (primary school) than the net attendance ratios found among rural females by the MDHS 2000, which was 78 % (7). One study from Malawi did not find any association between maternal literacy and undernutrition (34), however increased maternal education has been associated with better adherence to infant feeding recommendations (29). Maternal education has been associated both with quality of feeding, health care seeking behaviour, and breastfeeding practices (27). A study from Kenya showed that maternal education increased time spent in caregiving activities such as food preparation, breastfeeding, bathing and playing (32). Low school attendance of the caregiver may therefore be one factor leading to undernutrition in these children.

The HIV/AIDS epidemic has left many children in Malawi orphaned and few alternate caregivers have been associated with undernutrition. Only 11 % of these children had other than their biological mother as their primary caregiver, of these 63 % were orphaned. In this respect it did not seem that lack of care was a result of orphan status. One study from Malawi did not associate orphanhood with stunting nor wasting (52).

Illness in caregiver, especially maternal HIV infection has been associated with moderate wasting (34). As the caregivers' HIV status was unknown it was difficult to predict an association, however as many as 44 % of the caregivers reported to have experienced illness during the last four weeks. This was also highlighted as a common and accelerating problem during the interviews with home craft workers. The relatively high levels of illness experienced by the caregivers may both reflect the HIV/AIDS epidemic and negatively affect caregiver capacity. The linkage between illness in caregiver and children nutritional status has rarely been studied (27), so no information was found on this matter.

As mentioned earlier, polygamy is common in Mangochi district and this was raised as contributing to undernutrition by the homecraft workers because it negatively affects resources available for each of the children. Only 20 % of the caregivers were in polygamous marriages and 27 % were divorced, widowed or never married. Being in a female headed household was raised as a problem for some of the women as they experience a lack of support from a husband. In this area, women in polygamous marriages live in separate houses and the husband lives part time with the different wives. They may therefore not experience the same support from each other as in societies where the wives live together and form a collaborating alliance (45). One study from Jamaica showed that few of the mothers of undernourished children were married or lived with the child's father compared to the control group of adequately nourished group (53;53).

Factors related to the children

The majority of these children (86 %) were the youngest child of the mother and the majority had older siblings (76 %). High number of children has been associated as a risk factor of undernutrition as it increases workload for the caregiver and limits time available for each child (IFPRI 1996). The bearing of many children was also raised by both caregivers and homecraft workers as being a risk factor for undernutrition in children. Some of the children (10 %) had younger siblings, and pregnancy in the mother may have influenced the length of breastfeeding in these cases.

Factors related to the household situation

The majority of the households (81 %) consisted of ≤2 adults over 18, which may lead to a high dependency ratio in households with many children and a lack of support in cases where only one caregiver were present. This was stressed by some caregivers during the qualitative interviews. The caregivers often experienced lack of time to both attend to child care and to take care of the household chores, such as cultivating the agricultural lands. However, in carrying out household chores, like going to the maize milling centre, cultivating agricultural land, fetching firewood or water many of the caregivers would leave their children behind

with alternative caregivers. In addition, 64 % of the caregivers reported that they thought their children would be fed more often if they had more time available with the child. This suggests that several responsibilities negatively influenced time available for child care.

Poverty was raised by both caregivers and home craft workers as a contributing factor of undernutrition. The type of housing most common, namely grass-thatched roof (94 %) suggests that the far majority of the caregivers were from poorer households as iron-roofed houses were more costly than grass-thatched houses.

Unsafe drinking water has been associated with child morbidity and undernutrition by several studies as it is a source of enteric pathogens (28;34;39;41;54). Little over half of the households (61 %) had access to safe drinking water and water for domestic use was unsafe for 67 % of the households. This might have had a negative effect on these children's health.

One study in the same district showed that socio economic factors like poor building material of the house, unsafe drinking water, small cultivated land area, food insecurity, large number of children in the household and a high number of dead siblings served as predictors of infant morbidity (39).

Food insecurity is a serious threat to a healthy life and this often translates into problems of undernutrition. It is very dependent on size of land, education, available means of production and a person's income purchasing power. Lack of food was raised by both groups of informants during the qualitative interviews, and most caregivers reported to having experienced food insecurity for at least 2 months of the year (83 %). Interestingly, the majority of the caregivers reported to have a relatively big size of cultivated land (74 %) and more than one source of food for the household (70 %). Additionally, few of the caregivers had experienced lack of food (19 %) or lack of food to give to the child in the last four weeks (14 %). This suggests that during this period food insecurity by itself may not have been a main cause of undernutrition in most of these children. It should be mentioned that food shortages in Mangochi are seasonal and commonly experienced during the rains (December-March) as it is the pre-harvest period. As the interviewing was carried out from August to

November, the majority of these household might still have had food left from the previous harvest. This seasonality of food shortages was also experienced by the homecraft workers as admission rates at the NRU increased during this period. Also, even if the majority of the caregivers did not perceive themselves to lack food they can still lack food consisting of the nutrients a child requires for optimal growth.

7.3.2 Changes in feeding practices before and after stay at the NRU

The far majority reported that their child had decreased consumption of both foods and fluids after the child became sick compared to before due to refusal of foods/fluids as a result of the illness, symptoms of illness and/or pain. This was supported by a child care study from Malawi who found that 41 % of the children drank less and 68 % ate less during illness compared to before (55).

Food consumption and dietary diversity increased after their stay at the NRU compared to before. This may both be due to increased appetite in the children as their health improved and to increased awareness of the importance of different food groups as a result of nutrition education at the NRU. The home craft workers expressed a problem of lack of knowledge among the caregivers related to child nutrition resulting in poor feeding practices both before and after stay at the NRU. Regarding the increase in consumption of vitamin and mineral rich foods, it should be mentioned that some fruits and vegetables are seasonal and the period of study were season for fruits like bananas, mangoes and paw-paws. This may also have contributed to the higher consumption of these kinds of food as availability increased. One follow-up study was found comparing food consumption before and after stay at the NRU. This study from Ghana found that NRU education was unsuccessful in changing home-feeding behaviour and did not address the use of street foods for child feeding (56). The observations from this study partially support these results. Even though basic ingredients like maize flour may be available, nutritious additives like groundnuts and/soy flour or oil were encouraged to be added but may not be available for many caregivers. The caregivers were educated on growing their own nutritious foodstuffs. However, successful changing of home-feeding behaviour also depends on other resources available than knowledge such as

accessibility to the recommended foods.

Both homecraft workers and key informants at AAH and UNICEF had experience with problems related to foods received through the supplementary feeding program after discharge. This study confirmed problems being common in two ways. Firstly, the *likuni phala* rations received in order to feed the patient after discharge was in 88 % of the cases being shared with other children. Only 35 % of the children had been fed with this food three times per day the day before follow-up, which is the recommended frequency. Secondly, only 37 % of the caregivers had returned to the NRU for follow-up and received the supplementary foods due to long distances and lack of means of transport. Again, no previous studies were found related to the successfulness of supplementary feeding programs. It should be mentioned that pilot studies are currently being done related to home-based therapy using ready-to-use therapeutic food (RUTF) in the area. Previous pilot studies have shown that this is associated with better outcomes for undernourished children than standard therapy at nutrition rehabilitation units in Malawi (57-59). In addition, this would be a better option for the caregivers, their responsibilities in their homes and their other children.

7.3.3 Presence of illness and health care seeking behaviour before and after stay at the NRU

This study shows that the majority of the children presented with co-diagnosis and symptoms in addition to undernutrition. Without knowing the exact medical history or performing a clinical examination it is difficult to say whether these diagnoses or symptoms were a result or a complication of undernutrition. Interestingly, in many cases the observations made by the health care personal and the caregivers differed. The reasons for this may be different understandings or knowledge of illness. Common symptoms which were listed in the medical charts are complications of undernutrition, such as diarrhoea, vomiting, fever, oral sores and so on as undernourished patients often present with infections (30). Paediatric HIV is known to be associated with underweight and is common among patients at NRUs in Malawi (22;34;35). Two of the children in the study were diagnosed with immunosuppression, however it is likely that some of the participants were unknown cases of paediatric HIV.

Several studies have found associations between infections and undernutrition in children admitted to NRUs. Studies have shown that paediatric HIV, dysentery, diarrhoea and other infections have been associated with severe undernutrition in Malawi (22;23;36).

Data is missing on the time spent between illness were noticed in the child and the admission to the NRU. All caregivers reported to have sought consultation twice before admission and having given medical treatment to the child. This suggests that illness was identified by the caregiver and that the children had been sick for a period of time before admission without obtaining the appropriate medical attention. At first consultation, health centre/hospital was sought by 74.3% and 18.6% sought traditional healers for assistance. For second consultation, the vast majority consulted health centre/hospital and only 7.1% sought assistance from the traditional healer. This suggests that some caregivers saw their child not responding to traditional medicine and sought modern health facilities instead. Late presentation of severe illness was also raised as a problem experienced by the homecraft workers during the interviews. One follow-up study from Kenya concluded that a majority of the children admitted to the NRU were too severely undernourished and therefore lacked proper medical care at the NRU (21).

This study found that 50 % of the caregivers/children resided more than 5 km from a health facility and long distances to health care services may lead to reduced health care seeking activities. Multiple illness episodes and residence more than 5 km from a health facility has been shown to predict severe underweight by one study in Mangochi District (34). Both homecraft workers and caregivers raised the use of traditional medicine for treating undernutrition in the interviews. Even though traditional medicine is commonly believed to be useful for many cases, both caregivers and homecraft workers expressed disbelief of its use in treatment of undernutrition. Long distances to health facilities, lack of trust in modern health services and pressure from the elders were explained to be reasons why traditional healers were consulted. Maleta et al 2003 found that health care seeking behaviour was strongly associated with infant morbidity as traditional healers were significantly more commonly used by families whose infants died (34).

Over 1/3 of the caregivers reported that their child had experienced illness after discharge and two consultations had been made during the month after discharge from the NRU. Again, some had been using traditional healers on their first consultation, but the majority consulted health centre/hospital for the second consultation. These findings suggest that health care seeking activity is high, however the high number of children experiencing illness after discharge may be a result of problems related to the supplementary feeding program (as discussed earlier), a lack of availability to modern health facilities due to long distances, cultural beliefs and/or distrust in the modern health system. Another explanation may be that there has been little improvement in the conditions for good health and nutrition in their children's homes, which makes their vulnerability to illness and undernutrition continuing after rehabilitation. Even though knowledge among the caregivers may improve, the living conditions have most probably not changed after discharge. Paediatric HIV/AIDS may be a cause for lack of improvement in some of the childrens health status.

7.3.4 Caregivers knowledge of household health practices before and after stay at the NRU

This study found that the caregivers the majority of the caregivers were aware of the relation between water and illness, however their knowledge related to healthy food preparation practices and hand washing behaviour was limited. Their level of knowledge only increased slightly after their stay at the NRU. This suggests that some of these children may be particularly vulnerable to infectious diseases due to unhealthy hygiene practices, which may have contributed to deterioration of their health.

7.3.5 Possible factors in caregivers caring practices influencing the children's nutritional status after discharge

In this study, 27 of the children was followed after discharge. Of these 67 % had a favourable improvement gaining weight after discharge, while 33 % lost weight or their weight remained static. Poor recovery rates have also been shown by previous studies which have shown that only 25 % of the children who are treated and discharged from the NRU go on to recover at home. The remaining continues to be undernourished at home (45 %), relapse (20 %) or die

(10 %) (57). Reasons for this have been suggested to be limiting factors in the follow- up studies. However, as discussed earlier several factors have been linked to undernutrition in the children and these may as well influence a deterioration of children after discharge if there has not been an improvement of these factors. Lack of time available with the children have been discussed before and could seem to have a negative effect for the weight gain of these children. Interestingly, there were several factors which have been associated with undernutrition did not seem to have a negative effect in this study, such as low school attendance of the caregiver, size of cultivated land, having received information on health and nutrition or illness in the child. According to these trends, safe source of drinking water seemed to have a negative effect on several of the children. The only feasible explanation for this is that the selection is too small due to the low sample size. Nor did reception of supplementary food seem to have as great an influence as expected. Better recovery rates with other types of therapeutic foods than standard therapy treatment at the NRUs have been recognised by several studies and may explain this (57;59;60). Interestingly, it was the children at Nkope H/C who had the highest percentage of children gaining weight after discharge. This may also be due to the fact that severe cases are often transferred to Mangochi DH. However, these results can only describe possible trends due to the low sample size.

7.4 Conclusion

The results from this study indicate that several risk factors were present which may have contributed to undernutrition in the children admitted to NRUs in Malawi. Poverty is a complex and multifaceted issue which affects people in many ways, as shown by this study. Lack of different types of resources available for adequate child care was evident, even though different faces of poverty became evident from the different caregivers. It also seemed that women are disproportionately affected by a cross pressure situation as they both have the main responsibilities for household chores as well as taking care of the children.

It also seemed that food insecurity in itself were not a main limitation for the majority of the households, however this finding is based on the caregivers own experiences and may not reflect availability of nutritious foods for the child as recommended by nutritionists. According to the caregivers reporting, it seemed that illness resulting in loss of appetite was

the main reason for a decreased food intake leading to undernutrition in combination with lack of appropriate and timely medical attention. However, as undernutrition is faced by many children in Malawi it is likely that several of these children were undernourished prior to the illness episode leading to admission at the NRU.

The supplementary feeding program did not seem to fully benefit the children it was targeted to. There were two reasons for this; lack of access to the NRU for follow-up visits and sharing of supplementary food with other children. In a resource poor setting, it is comprehensible that this happens as the caregivers would wish to give nutritious foodstuff for all their children. The majority of the children had experienced an improvement of their nutritional status after discharge.

7.5 Recommendations

This study has implications on two levels. Firstly it shows the importance of disease prevention in the community, as well as the importance of availability to timely and appropriate health care services. Education on child health and nutrition must be improved in the community through available services such as mobile clinics or under-five clinics. Long distances to health care services may be reduced with improvement of outreach clinics. By incorporating follow-up services and supplementary feeding programs into such outreach services might increase the success rates of the supplementary feeding programs.

In young children, medical attention must be given early in the disease process in order to prevent them from becoming severely undernourished. The medical services may need to respond earlier during illness in children so that they can be treated at an early stage. As traditional healers serves as an important and influential branch of the health system in Malawi, they may be involved to a greater extent in the prevention of disease and undernutrition in children. The elders in society are often highly respected in Malawi and may be incorporated as an entry point for community based health and nutrition promotion.
Also, alternate treatment with RUTF of severely undernourished children may seem to be of greater success than standard treatment at the NRU as shown by several pilot studies in the

area. This may also be a better option for the caregivers as the children can receive treatment in their home villages. Negative attitudes seemed to be common by the homecraft workers as perceptions of the being lazy and ignorant became evident trough the conversations. Such attitudes should be improved as it does create a distance between health care personnel and the caregivers, and may negatively affect the collaboration and motivation of the caregivers.

Secondly, in order to maintain good health and nutrition in the children after discharge improvements at the household level may be needed so that caregivers have the possibilities to provide adequate care for their children. One such improvement may be increased involvement of males in child care practices and involvement of the elders in the promotion of higher involvement in household responsibilities.

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Appendices:

Appendix 1: Informed consent form

Dear prospective participant:

My name is Jeanette Stålcrantz and I am a student researcher from The University of Oslo in Norway. I am visiting this Nutrition Rehabilitation Unit (NRU) in order to interview the mothers/caregivers of the children admitted here due to malnutrition.

The reason for this is that many children in Malawi suffer from malnutrition and it is important to prevent this. Therefore it is important to understand which factors are causing malnutrition in these children. Your answers can help the health workers and programme planners to better understand what can be done in order to prevent malnutrition in this area of Malawi. Your answers will also be used to write a research paper as a part of my university degree.

If you agree to participate in this research, I will ask you questions about your family background, the situation in your household, feeding practices, health care seeking behaviour and hygiene practices. I will also measure the weight/height of the child on the day you leave from the NRU. One month after you come home from the NRU I will if possible arrange another meeting with you and your child. I will then weight your child once more and ask you some more questions.

Your participation is voluntary and you do not have to answer if you don't want to. You can withdraw from the research at any time if you wish to, without this having any negative effects on you. Your or your child's name will not be used in any way after the interviewing are finished, and during the research period it is only used to identify you and your child for follow-up meeting after one month. The information you give me will be treated with confidence and nobody will be able to link this information to you and your child.

Consent form for child/ caregiver no: ____

I have received information, both in writing and verbally and am willing to participate in the study.

Name:

Signature: Thumbprint:

X _____

Appendix 2: Questionnaire

"Contributing factors for undernutrition in children admitted to Nutrition Rehabilitation Units (NRUs) in Malawi"- Malawi Research Project 2004.

Name of the NRU:_____ Date of first interview (dd/mm/yy): _____
Date of admission (dd/mm/yy):_____
No of previous admittances:_____

Identification:

Child/caregiver no:____ Name of the caregiver_____
How old are you?_____ When were you born_____? Age of caregiver_____ (years)

Name of the child _____Sex of the child____ 1=Male 2=Female
How old is the child?_____When were the child born_____? Age of the child_____ (months)

Where does the caregiver/child live:_____ Village ID-number □□□□
□ Village [1]□ Urban [2]□ Semi-urban [3]□ Rural[4] (to be specified)

Anthropometry and health status on admission:

Birth weight: _____ Weight:_____ MUAC :_____ Height:_____
Oedema present: □ Yes □ No
Medical diagnosis of the child on admission:_____

Section A: Household composition:

First I will ask you some questions about you and your household.

No.	Questions	Coding categories
1.	What is your relationship to this child (NAME)?	□ Mother- go to 4. 1 □ Grandmother 2 □ Sibling 3 □ Aunt 4 □ Other, please specify 5 _____
	Ask respondents who are not biological mothers:	
2.	What has happened to the mother of the child (NAME)?	□ Deceased 1 □ Other, please specify 2 _____
3.	How many children (under 15) live with you that you did not give birth to?	_____
	Ask all:	
4.	How many children have you given birth to?	_____
5.	How many of these children are still alive?	_____
6.	How many older siblings does the child (NAME) have?	_____
7.	How many younger siblings does the child (NAME) have?	_____
8.	Are you currently pregnant?	□ Yes 1 □ No 2 □ Don't know 99
9.	Are there any children (under 15) living in your household that you did not give birth to?	□ Yes- specify how many? 1 _____ □ No 2

10.	How many female adults (above 18) live in your household (in addition to you)?	_____
11.	How many male adults (above 18) live in your household ?	_____

Section B: Socio-economic background:

Now some questions about your socio-economic background:

12.	What is the main material for the floor (Main House)?	□ Natural floor of earth/sand □ Natural floor of dung □ Finished floor of ceramic tiles □ Finished floor of cement □ Other, specify _____	1 2 3 4 5
13.	What is the main material of for the roof (Main house) ?	□ Grass thatch □ Iron sheets □ Iron & Tiles □ Other, specify _____	1 2 3 4
14.	What is the material for the wall (Main house) ?	□ Burnt bricks □ Unburnt bricks □ Concrete □ Mud and wattle □ Reeds/straw □ Wood/planks □ Other, specify _____	1 2 3 4 5 6 7
15.	Does the household have a bathroom?	□ Yes □ No - go to 17	1 2
16.	What is the building material of the main bathroom?	□ Grass □ Tin □ Reed □ Palm leaves □ Other, specify _____	1 2 3 4 5
17.	Is this your own house/property?	□ Yes □ No, I/we rent it. □ My parents house □ Other, please specify _____	1 2 3 4
18.	Have you gone to school ?	□ Yes □ No – go to 20	1 2
19.	What is your highest level of education obtained?	□ Primary school (year 1-4) □ Primary school (year 5-8) □ Junior secondary □ Senior secondary □ Post secondary □ Adult school □ None	1 2 3 4 5 6 7

20.	What is your religion?	□ Protestant	1
		□ CCAP	2
		□ Anglican	3
		□ Seventh day advent/baptist	4
		□ Catholic	5
		□ Other christian	6
		□ Muslim	7
		□ No religion	8
		□ Natural religion	9
		□ Other, specify _____	10
21.	What is your ethnic background?	□ Chewa	1
		□ Nyanja	2
		□ Tumbuka	3
		□ Yao	4
		□ Lomwe	5
		□ Sena	6
		□ Tonga	7
		□ Ngoni	8
		□ Ngonde	9
		□ Other, specify _____	10
22.	What is your current marital status?	□ Married (monogamy)–go to 24	1
		□ Married (pologamy)	2
		□ Never married- go to 26	3
		□ Divorce/separated- go to 26	4
		□ Cohabiting –go to 26	5
		□ Widowed – go to 26	6
23.	How many other wives than you do your husband have? _____		
24.	If married, how many days per week/month do you live with your spouse?	□ The whole week	1
		□ Only 4-6 days per week	2
		□ Only 1-3 days per week	3
		□ Only on the weekends	4
		□ Only on weekdays	5
		□ Only two weeks per month	6
		□ Every second month	7
		□ Less than every second month	8
		□ Other, specify _____	9
25.	If married, what are the main sources of income of your spouse?	□ Small scale farming	1
		□ Commercial farming	2
		□ Small scale fishing	3
		□ Commercial fishing	4
		□ Paid labouring	5
		□ Petty trading	6
		□ Assistance from relations	7
		□ Unemployed	8
		□ No income	9
		□ Others, please specify _____	10

26.	In your household, do you have the following items. Please state yes/no		
		Yes	No
	Wooden chairs ……	1	2
	Upholstered chairs …….	1	2
	Oxcart……	1	2
	Radio ……..	1	2
	Bicycle ……...	1	2
	Boat…….	1	2
	Motorbike ……...	1	2
	Car……	1	2
	No of livestock:		
	Cattle_____	1	2
	Chickens____	1	2
	Goats_____	1	2
	Others, specify _____	1	2
27.	What is the size of your cultivated land? (1 Ha =100x100, 0.5 Ha=100x50)	□ No cultivated land □ Less than 0.25 Hectares (Ha) □ Between 0.25 and 0.5 Ha □ Between 0.5 and 1 Ha □ More than 1 Ha	1 2 3 4 5
28.	What are your main sources of income?	□ Small scale farming □ Commercial farming □ Small scale fishing □ Commercial fishing □ Paid labouring □ Petty trading □ Assistance from relations □ Unemployed □ No income □ Others, please specify _____	1 2 3 4 5 6 7 8 9 10

Section C Food security:

29.	What are your main sources of food in the household?	□ Harvest from private garden □ Crops from shared field □ Purchasing from shop □ Battering of food for work □ Food for work projects □ Food aid □ Other, specify _____	1 2 3 4 5 6 7
30.	During the last month, how often did you experience lack of food?	□ Most days of the month □ Three weeks of the month □ Two weeks of the month □ One week of the month □ A few days of the month □ Never □ Don't know	1 2 3 4 5 6 99

31.	During the last month, how often did it happen that the Child was hungry because of lack of food?	□ Most days of the month □ Three weeks of the month □ Two weeks of the month □ One week of the month □ A few days of the month □ Never □ Don't know	1 2 3 4 5 6 99
32.	Which month of the year do you harvest maize?	_____	
33.	Which month does your harvest get finished?	_____	
34.	Which month does your household start facing food shortages?	_____	

Section D Sanitary conditions:

35.	What is the main source of drinking water for members of your household?	□ Piped water supply □ Borehole well □ Natural open water (river or lake) □ Protected shallow well/spring □ Unprotected shallow well/spring □ Other, specify _____	1 2 3 4 5 6
36.	Do you share this source of drinking water with other households?	□ Yes □ No	
37.	If the main source of drinking water is outside the household area, how long does it take you to walk to the source (approx. in minutes)? _____		
38.	What is your main source of water you use for other use than drinking ?	□ Piped water supply □ Borehole well □ Natural open water (river or lake) □ Protected shallow well/spring □ Unprotected shallow well/spring □ Other, specify _____	1 2 3 4 5 6
39.	What type of toilet facility do you have in your household?	□ Waterborne flushing latrine □ Traditional pit latrine □ Traditional pit latrine with san-plat □ Ventilated improved pit latrine □ No latrine □ Other, specify _____	1 2 3 4 5 6
40.	Do you share your latrine with other households?	□ Yes □ No	1 2

Section E Illness in the family:

41.	Is or have you been sick in any way during the last four weeks?	□ Yes □ No- go to 45 □ Don't know	1 2 99

42.	If yes, what kind of sickness have you experienced?	□ Malaria	1
		□ Diarrhoea	2
		□ Vomiting	3
		□ Malaise	4
		□ Fever	5
		□ Cough	6
		□ Pneumonia	7
		□ Bilharzia	8
		□ Other, specify _____	9
43.	If yes, who has been taking care of the child (NAME) while you were sick?	□ Siblings-age_____	1
		□ Aunt/relative	2
		□ Neighbour	3
		□ Grandparent	4
		□ Great grandparent	5
		□ Respondant/self	6
		□ House maid	7
		□ Other, please specify _____	8
44.	In general, how many times have you been sick during the last month?	□ All the time	1
		□ Five times	2
		□ Four times	3
		□ Three times	4
		□ Two times	5
		□ One time	6
		□ Have not been sick	7
		□ Don't know	99
		□ Other, specify _____	8
45.	Is or have your spouse been sick in any way during the last four weeks?	□ Yes	1
		□ No – go to 47	2
		□ Don't know	99
46.	In general, how many times has you husband been sick during the last month?	□ All the time	1
		□ Five times	2
		□ Four times	3
		□ Three times	4
		□ Two times	5
		□ One time	6
		□ Have not been sick	7
		□ Don't know	99
		□ Other, specify _____	8

Section F Illness in the child:

Now I will ask you some questions about the child's health in the last four weeks.

47.	What has the child (NAME) been suffering from in the last four weeks? .	□ Malaria □ Diarrhoea –ask 48 and 55. □ Malnutrition □ Cough □ Pneumonia □ Measles □ Vomiting □ Malaise □ Fever □ Other, specify	1 2 3 4 5 6 7 8 9 10

Section G Care for the child during diarrhoea:

Only ask if the child has been suffering from diarrhoea?

48.	Do you think the child (NAME) should receive less, more or the same amount of fluids when s/he has diarrhoea compared to when s/he does not have diarrhoea?	□ Less fluids □ The same amount □ More fluids □ No fluids □ Don't know –go to 50	1 2 3 4 99
49.	Why should the child (NAME) receive less, more, the same amount? _____ _____ _____		
50.	What type of fluids do you think is good for the child (NAME) when s/he has diarrhoea?	□ Water □ Rice water □ ORS/ORT- go to 52 □ Tea □ Rice water □ Juice □ Milk □ Other, please specify _____ □ Don't know	1 2 3 4 5 6 7 99
51.	Have you ever heard about Oral Rehydration Therapy? (ORT or ORS)	□ Yes □ No □ Don't know	1 2 99
52.	Was there anything given to treat the diarrhoea?	□ Yes □ No –go to 54 □ Don't know	1 2 99
53.	What was given to treat the diarrhoea?	□ ORS/ORT □ Pill or syrup □ Injection □ IV Intravenous □ Home remedies/herbal medicines □ Other, specify _____	1 2 3 4 5 6

54.	Do you think the child (NAME) should receive, less, more or the same amount of food when s/he has diarrhoea compared to when s/he does not have diarrhoea?	□ Less food □ The same amount □ More food □ No food at all □ Don't know –go to 56	1 2 3 4 99
55.	Why should the child (NAME) receive less, more, the same amount? _____ _____ _____		

Section H Health care seeking behaviour:

56.	Is there a health facility close to where you live?	□ Yes. If yes, how Long does it take you to walk there _____min □ No □ Don't know Estimated distance in km_____	1 2 99
57.	When you noticed that the child (NAME) was sick, Who were initially sought for medical assistance?	□ Health centre/hospital □ Mobile clinic □ Health surveillance assistant □ Community health worker □ Traditional healer □ Village chief □ Neighbour □ Other, please specify _____	1 2 3 4 5 6 7 8
58.	When you first noticed that the child (NAME) was sick, how many days did it take before this assistance was sought ?	□ 1 day □ 2 days □ 3-4 days □ 5-7 days □ More than one week □ Don't know	1 2 3 4 5 99
59.	Who, if any, did you go to after this first consultation?	□ Health facility/hospital □ Mobile clinic □ Health surveillance assistant □ Community health worker □ Traditional healer □ Village chief □ Neighbour □ Other, please specify _____	1 2 3 4 5 6 7 8
60.	Did the child (NAME) receive any medications before it came to this NRU?	□ Yes □ No- go to 63	1 2

61.	Where did you get this medication from?	□ Shop/marked □ Garden/bush □ Health facility/hospital □ Mobile clinic □ Health surveillance assistant □ Community health worker □ Traditional healer □ Village chief □ Neighbour □ Other, please specify _____	1 2 3 4 5 6 7 8 9 10
62.	What kind of medications was this?	□ Traditional medicines □ Antibiotics □ Antimalarials □ ORT □ Analgesics □Other, specify _____	1 2 3 4 5 6
63.	Via whom did the child (NAME) come to the NRU?	□ Health post/centre/hospital □ Mobile clinic □ Health surveillance assistant □ Community health worker □ Traditional healer □ Village chief □ Neighbour □ Primary caregiver □ Other, please specify _____	1 2 3 4 5 6 7 8 9
64.	Have you received any information on nutrition and health in children?	□ Yes, if yes where- specify _____ □ No □ Don't know	1 2 99
65.	Do you have a mosquito bednet in your household?	□ Yes □ No- go to 67	1 2
66.	If yes, who sleeps under the bednet most nights?	□ The child □ Caregiver □ Husband □ Other children □ Other	1 2 3 4 5

Section I Feeding practices from birth till the child became sick:

Now I will ask you some question about feeding before the child became sick.

67.	When was the child (NAME) first breastfed after s/he was born?	□ Immediately after birth □ After ½ hour □ After some hours □ After ½ a day □ After 1 day □ After 2-3 days □ Later □ Don't know –go to 72 □ Mother not caregiver –go to 72	1 2 3 4 5 6 7 99 8

68.	Was the first thick, yellow milk (colostrum) that comes out of the breast after birth given to the child(NAME)?	□ Yes □ No □ Don't know	1 2 99
69.	Was anything given to the child (NAME) before s/he had breastmilk?	□ Yes- if yes, what specify _____ □ No	1 2
70.	How many months has the child (NAME) been breastfed for?	□_____months □ Still breastfeeding □ Have never been breastfed □ Mother is not primary caregiver	1 2 3 8
71.	If the child (NAME) is not still breastfed, why did breastfeeding cease?	□ It was time to stop □ Lack of breastmilk □ Pregnant caregiver □ The baby stopped suckling □ Other, specify _____	1 2 3 4 5
72.	How old was the child (NAME) when s/he first was given any other fluids than breastmilk?	_____ months □ Don't know – go to 74	99
73.	What kind of fluid was then given to the child(NAME)?	□ Water □ Tea- with milk added □ with sugar added □ □ Powdered milk □ Infant formula □ Cows milk □ Fruit juice □ Cordial □ Other, please specify _____	1 2 3 4 5 6 7 8 9 10
74.	How old was the child (NAME) when s/he first was given any other foodstuff (in addition to breastmilk) ?	_____ months □ Don't know- go to 76	99

75.	What kind of foodstuff was then given to the Child (NAME)?		
		□ Maize gruel-	1
		with oil added □	2
		with milk added □	3
		with sugar added □	4
		with groundnut flour □	5
		□ Likhuni Phala-	6
		with oil added □	7
		with milk added □	8
		with sugar added □	9
		with groundnut flour □	10
		□ Other porridge, specify- _____	11
		with oil added □	12
		with milk added □	13
		with sugar added □	14
		with groundnut flour□	15
		□ Fruit	16
		□ Vegetables/green leaves	17
		□ Meat	18
		□ Fish	19
		□ Other, please specify _____	20
76.	What did the child (NAME) usually drink during a normal day before the child got sick?		
		□ Cordial	1
		□ Breastmilk	2
		□ Animal milk	3
		□ Infant formula	4
		□ Powdered milk	5
		□ Rice water	6
		□ Water	7
		□ Tea-	8
		with milk added □	9
		with sugar added □	10
		□ Fruitjuice	11
		□ Other, please specif y	12

77.	What did the child (NAME) usually eat during a normal day before the child got sick?	□ Nsima	1
		□ Maize gruel-	2
		with oil added □	3
		with milk added □	4
		with sugar added □	5
		with groundnut flour added □	6
		□ Likhuni Phala-	7
		with oil added □	8
		with milk added □	9
		with sugar added □	10
		with groundnut flour added□	11
		□ Other porridge, specify- _____	12
		with oil added □	13
		with milk added □	14
		with sugar added □	15
		with groundnut flour added □	16
		□ Any type of fruit. If yes, specify_____	17
		□ Any type of vegetables/green leaves, if yes, specify _____	18
	p	□ Any type of meat. If yes, please specify_____	19
		□ Eggs	20
		□ Fish	21
		□ Other, please specify _____	22
78.	How many times per day do you think a child (NAME) this age should eat ?	□ 1-2 times	1
		□ 3-4 times	2
		□ 5-6 times	3
		□ 7-8 times	4
		□ More than 8 times	5
		□ Don't know	99
79.	How many times per day did the child (NAME) eat in a normal day before it became sick?	□ 1-2 times	1
		□ 3-4 times	2
		□ 5-6 times	3
		□ 7-8 times	4
		□ More than 8 times	5
		□ Don't know	99
80.	When the child (NAME) is served food, does s/he eat receive its own serving on its own plate?	□ Yes	1
		□ No	2
81.	Do you prepare specially for the child or does the child (NAME) eat the food that you prepare for the rest of the family?	□ Prepare for the child	1
		□ Child eats from the family food	2
		□ Varies	3

Section J Feeding Practices after the child became ill:

82.	Has the child (NAME) been breastfed afters/he became sick? □ Yes (only ask if child is still being breastfed) □ No. If no, why? _____ _____	1 2
83.	What kind of liquid (other than breastmilk) has the child (NAME) been drinking after s/he got sick? □Cordial 1 How often? □ Every day 2 □ 4-6 times per week 3□ 2-3 times per week 4 □ Once 5 □ Animal milk 6 How often? □ Every day 7□ 4-6 times per week 8□ 2-3 times per week 9□ Once 10 □ Powdered milk 11 How often? □ Every day 12 □ 4-6 times per week 13□ 2-3 times per week 14 □ Once 15 □ Infant formula 16 How often? □ Every day 17 □ 4-6 times per week 18□ 2-3 times per week 19 □ Once 20 □ Water 21 How often? □ Every day 22 □ 4-6 times per week 23□ 2-3 times per week 24 □ Once 25 □ Tea- 26 How often? □ Every day 27 □ 4-6 times per week 28□ 2-3 times per week 29 □ Once 30 is usually milk added □ Yes 31 □ No 32 is usually sugar added □ Yes 33 □ No 34 □ Fruitjuice 35 How often? □ Every day 36 □ 4-6 times per week 37□ 2-3 times per week 38 □ Once 39 □ Other, please specify 40 _____ How often? □ Every day 41 □ 4-6 times per week 42 □ 2-3 times per week 43 □ Once 44	
84.	Has the child (NAME) been drinking more, the same or less amounts of fluid after s/he got sick than before? □ More □ The same amount □ Less □ Don't know- go to 86	1 2 3 99
85.	Why has the child (NAME) been given more or less fluids than usual? _____ _____ _____	

86.	What kind of foods has the child (NAME) eaten after it got sick? □ Nsima 1 How often? □ Every day 2 □ 4-6 times per week 3 □ 2-3 times per week 4 □ Once 5 is milk usually added □ Yes 6 □ No 7 is sugar usually added □ Yes 8 □ No 9 is oil usually added □ Yes 10 □ No 11 □ Likuni Phala 12 How often? □ Every day 13 □ 4-6 times per week 14 □ 2-3 times per week 15 □ Once 16 is milk usually added □ Yes 17 □ No 18 is sugar usually added □ Yes 19 □ No 20 is oil usually added □ Yes 21 □ No 22 is groundnut flour usually added □ Yes 23 □ No 24 □ Maize gruel 25 How often? □ Every day 26 □ 4-6 times per week 27 □ 2-3 times per week 28 □ Once 29 is milk usually added □ Yes 30 □ No 31 is sugar usually added □ Yes 32 □ No 33 is oil usually added □ Yes 34 □ No 35 is groundnut flour usually added □ Yes 36 □ No 37 □ Other porridge 38 If yes, specify_____ How often? □ Every day 39 □ 4-6 times per week 40□ 2-3 times per week 41 □ Once 42 is milk usually added □ Yes 43 □ No 44 is sugar usually added □ Yes 45 □ No 46 is oil usually added □ Yes 47 □ No 48 is groundnut flour usually added □ Yes 49 □ No 50 □ Any type of fruit. 51 If yes specify_____ How often? □ Every day 52 □ 4-6 times per week 53 □ 2-3 times per week 54 □ Once 55 □ Any type of vegetables/green leaves 56 If yes specify _____ How often? □ Every day 57 □ 4-6 times per week 58□ 2-3 times per week 59 □ Once 60 □ Any type of meat. 61 If yes, please specify_____ How often? □ Every day 62 □ 4-6 times per week 63 □ 2-3 times per week 64 □ Once 65 □ Eggs 66 How often? □ Every day 67 □ 4-6 times per week 68 □ 2-3 times per week 69 □ Once 70 □ Fish 71 How often? □ Every day 72 □ 4-6 times per week 73□ 2-3 times per week 74 □ Once 75 □ Other, please specify 76 _____ How often? □ Every day 77 □ 4-6 times per week 78 □ 2-3 times per week 79 □ Once 80
87.	If you could afford it and it was available, is there any other food you would have liked to give to the child (NAME) after it got sick? □ Yes 1 □ No- go to 89 2

88.	If yes, what kind of food would you like to give to the child (NAME)?	□ Likuni phala	1
		□ Maize gruel	2
		□ Other porridge	3
		□ Fruit	4
		□ Vegetables/green leaves	5
		□ Meat	6
		□ Fish	7
		□ Nsima	8
		□ Don't know	99
		□ Other, specify	9
		_____	
89.	Has the child (NAME) eaten the same amount, less or more after s/he got sick?	□ More	1
		□ The same amount	2
		□ Less	3
		□ Don't know- go to 91	99
90.	Why has the child (NAME) eaten more or less foods than usual?		
	_____		
	_____		
91.	Who has been feeding the child (NAME) after s/he got sick?	□ Mother	1
		□ Primary caregiver	2
		□ Sibling	3
		□ Grandparent	4
		□ Great grandparent	5
		□ Neighbour	6
		□ House maid	7
		□ Other, please specify	8
		_____	
92.	How many times in an average day has the child (NAME) been fed?	□ 1-2 times	1
		□ 3-4 times	2
		□ 5-6 times	3
		□ 7-8 times	4
		□ More than 8 times	5
		□ Don't know	99

Section K Time allocation:

93.	How much time do you spend with the child (NAME) in a day?	□ 24 hours	1
		□ 18-23 hours	2
		□ 12-17 hours	3
		□ 7-11 hours	4
		□ 0-6 hours	5
94.	Who is taking care of the child (NAME) if you are not present?	□ Siblings- age_____	1
		□ Aunt/relative	2
		□ Neighbour	3
		□ Grandparent	4
		□ Great grandparent	5
		□ House maid	6
		□ Other, please specify	7
		_____	

95.	Where are you when the child (NAME) is not with you?	□ At work □ Working in the field □ Taking care of other children/family □ Other, please specify	1 2 3 4
96.	Do you think the child (NAME) would be fed more often if you had more time to spend with the child ?	□ Yes □ No □ Don't know	1 2 99

Section L: Household hygiene practices:

Now I will ask you some questions about household hygiene practices.

97.	At what time should a person wash his/her hands?	□ Before going to bed □ Before preparing food □ Before eating □ After eating □ Before feeding a child □ After being to the toilet □ Before going to the toilet □ After helping a child to the toilet □ Other, specify _____ □ Don't know	1 2 3 4 5 6 7 8 9 99
98.	When should one wash the child's hands?	□ After the child has eaten □ Before the child eats □ After the child has been to the toilet □ Before the child is put to bed □ When they are dirty □ When the child wakes up in the morning □ Other, specify _____ □ Don't know	1 2 3 4 5 6 7 99
99.	What should be done with vegetables and fruits before it is eaten or used for cooking?	□ Rinsed with water □ Boiled □ Thoroughly cooked □ Don't know □ Other, specify _____	1 2 3 99 4
100.	What should be done with the drinking water before it is given to the child(NAME)?	□ Boiled □ Nothing special □ Don't know □ Other, specify _____	1 2 99 3
101.	Do you think water can give diseases?	□ Yes □ No- finished □ Don't know – finished	1 2 99

102.	What kind of diseases do you think water can give?	□ Give diarrhoea □ Give nausea □ Give fever □ Give dysenteria □ Give cholera □ Don't know □ Other, specify _____	1 2 3 4 5 99 6

Anthropometry on discharge:

Date of discharge (dd/mm/yy) :_____ Weight: _____ MUAC:_____Height_____

Thank you for your help and cooperation.

Questionnaire for follow-up interview one month after discharge

Identification:

Child/caregiver no:____ Name of the caregiver:_____
Name of the child: _____
Where does the caregiver/child live:_____ Village ID-number □□□□

Date of follow-up interview (dd/mm/yy): _____ □ Completed
Follow-up of this child was not possible due to: □ Failed to trace the caregiver/child
□ Child deceased
□ Absconded from the NRU
□ Other causes

Anthropometry:

Weight: _____ MUAC: _____ Edema present: □ Yes □ No

Section A: Feeding practices after discharge:

I will first ask you some questions related to feeding practices after you and your child came home from the NRU.

1.	Has the child (NAME) been breastfed after you came home from the NRU? (only ask if the child is still being breastfed)	□ Yes □ No- Go to 3. If no-why?	1 2
2.	How many times was (NAME) breastfed yesterday?	□ 1-5 times □ 6-10 times □ 11-15 times □ 16-20 times □ More than 20 times □ All the time (frequent) □ Don't know	1 2 3 4 5 6 99
3.	What kind of liquid (other than breastmilk) has the child (NAME) been drinking after s/he came home from the NRU? □ Cordial 1 How often? □ Every day 2 □ 4-6 times per week 3 □ 2-3 times per week 4 □ Once 5 □ Animal milk 6 How often? □ Every day 7 □ 4-6 times per week 8 □ 2-3 times per week 9 □ Once 10 □ Powdered milk 11 How often? □ Every day 12 □ 4-6 times per week 13 □ 2-3 times per week 14 □ Once 15 □ Infant formula 16 How often? □ Every day 17 □ 4-6 times per week 18 □ 2-3 times per week 19 □ Once 20 □ Water 21 How often? □ Every day 22 □ 4-6 times per week 23 □ 2-3 times per week 24 □ Once 25 □ Tea- 26 How often? □ Every day 27 □ 4-6 times per week 28 □ 2-3 times per week 29 □ Once 30 is usually milk added □ Yes 31 □ No 32 is usually sugar added □ Yes 33 □ No 34 □ Fruitjuice 35 How often? □ Every day 36 □ 4-6 times per week 37 □ 2-3 times per week 38 □ Once 39 □ Other, please specify 40 _____ _____ How often? □ Every day 41 □ 4-6 times per week 42 □ 2-3 times per week 43 □ Once 44		

4.	What kind of fluids did the child drink yesterday?	□ Cordial	1
		□ Breastmilk	2
		□ Animal milk	3
		□ Infant formula	4
		□ Powdered milk	5
		□ Rice water	6
		□ Water	7
		□ Tea-	8
		with milk added □	9
		with sugar added □	10
		□ Fruitjuice	11
		□ Other, please specif y	12

5.	What kind of food has the child (NAME) eaten after s/he came home from the NRU? □ Nsima 1 How often? □ Every day 2 □ 4-6 times per week 3 □ 2-3 times per week 4 □ Once 5 is milk usually added □ Yes 6 □ No 7 is sugar usually added □ Yes 8 □ No 9 is oil usually added □ Yes 10 □ No 11 □ Likuni Phala 12 How often? □ Every day 13 □ 4-6 times per week 14 □ 2-3 times per week 15 □ Once 16 is milk usually added □ Yes 17 □ No 18 is sugar usually added □ Yes 19 □ No 20 is oil usually added □ Yes 21 □ No 22 is groundnut flour usually added □ Yes 23 □ No 24 □ Maize gruel 25 How often? □ Every day 26 □ 4-6 times per week 27 □ 2-3 times per week 28 □ Once 29 is milk usually added □ Yes 30 □ No 31 is sugar usually added □ Yes 32 □ No 33 is oil usually added □ Yes 34 □ No 35 is groundnut flour added □ Yes 36 □ No 37 □ Other porridge 38 If yes, specify_____ How often? □ Every day 39 □ 4-6 times per week 40 □ 2-3 times per week 41□ Once 42 is milk usually added □ Yes 43 □ No 44 is sugar usually added □ Yes 45 □ No 46 is oil usually added □ Yes 47 □ No 48 is groundnut flour added □ Yes 49 □ No 50 □ Any type of fruit. 51 If yes specify_____ How often? □ Every day 52 □ 4-6 times per week 53 □ 2-3 times per week 54 □ Once 55 □ Any type of vegetables/green leaves 56 If yes specify _____ How often? □ Every day 57 □ 4-6 times per week 58 □ 2-3 times per week 59 □ Once 60 □ Any type of meat. 61 If yes, please specify_____ How often? □ Every day 62 □ 4-6 times per week 63 □ 2-3 times per week 64 □ Once 65 □ Eggs 66 How often? □ Every day 67 □ 4-6 times per week 68 □ 2-3 times per week 69 □ Once 70 □ Fish 71 How often? □ Every day 72 □ 4-6 times per week 73 □ 2-3 times per week 74 □ Once 75 □ Other, please specify 76 _____ How often? □ Every day 77 □ 4-6 times per week 78 □ 2-3 times per week 79 □ Once 80

6.	What kind of foods did the child eat yesterday ? p	□ Nsima □ Maize gruel- with oil added □ with milk added □ with sugar added □ with groundnut flour added □ □ Likhuni Phala- with oil added □ with milk added □ with sugar added □ with groundnut flour added□ □ Other porridge, specify- _____ with oil added □ with milk added □ with sugar added □ with groundnut flour added □ □ Any type of fruit. If yes, specify_____ □ Any type of vegetables/green leaves, if yes, specify _____ □ Any type of meat. If yes, please specify_____ □ Eggs □ Fish □ Other, please specify _____	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
7.	Who fed the child (NAME) yesterday?	□ Mother □ Primary caregiver □ Sibling-age_____ □ Grandparent □ Great grandparent □ Neighbour □ Aunt/relative □ House maid □ Other, please specify _____	1 2 3 4 5 6 7 8 9
8.	How many times was the child (NAME) fed yesterday?	□ 1-2 times □ 3-4 times □ 5-6 times □ 7-8 times □ More than 8 times □ Other, please specify _____	1 2 3 4 5 6
9.	When the child (NAME) is served food, does s/he eat receive its own serving on its own plate?	□ Yes □ No	1 2
10.	Do you prepare specially for the child (NAME) or does the child eat the food that you prepare for the rest of the family?	□ Prepare for the child □ Child eats from the family food □ Varies	1 2 3

11.	If you could afford it and it was available, is there any other food you would have liked to give to the child (NAME) after s/he got home from the NRU?	□ Yes □ No- go to 13	1 2
12.	If yes, what kind of food would you like to give to the child (NAME)?	□ Likuni phala □ Maize gruel □ Other porridge □ Fruit □ Vegetables/green leaves □ Meat □ Fish □ Nsima □ Other, specify _____	1 2 3 4 5 6 7 8 9
13.	Has the household experienced any difficulties in obtaining adequate foods after the child (NAME) came home from the NRU?	□ Yes □ No- go to 15 □ Don't know- go to 15	1 2 99
14.	What kind of difficulties has this been? _____ _____		
15.	Have you received any supplementary food to give to the child (NAME) in the last two weeks?	□ Yes □ No – go to 18	1 2
16.	How often did the child (NAME) eat this kind of supplementary food with this yesterday?	_____	
17.	Does it happen that this food has been shared with other children?	□ Yes □ No	1 2

Section C: Time allocation after arrival home from the NRU:

I will now ask you some questions regarding time spent with the child.

18.	How much time have you spent with the child (NAME) in an normal day after you came home from the NRU?	□ 24 hours □ 18-23 hours □ 12-17 hours □ 7-11 hours □ 0-6 hours	1 2 3 4 5
19.	Who is taking care of the child (NAME) when you are not present?	□ Siblings- age_____ □ Aunt/relative □ Neighbour □ Grandparent □ Great grandparent □ House maid □ Other, please specify _____	1 2 3 4 5 6 7

20.	Where are you when the child (NAME) is not with you?	□ At work □ Working in the field □ Taking care of other children/family □ Other, please specify _____	1 2 3 4
21.	Do you think the child (NAME) would be fed more often if you had more spare time?	□ Yes □ No □ Don't know	1 2 99

Section D: Illness in caregiver:

22.	Is or have you been sick in any way after the child (NAME) came home from the NRU?	□ Yes □ No-go to 26. □ Don't know – go to 26	1 2 99
23.	If yes, what kind of sickness have you experienced?	□ Malaria □ Diarrhoea □ Vomiting □ Malaise □ Fever □ Cough □ Pneumonia □ Bilharzia □ Other, specify _____	1 2 3 4 5 6 7 8 9
24.	If yes, who has been taking care of the child (NAME) while you were sick?	□ Sibling-age_____ □ Father □ Neighbour □ Grandparent □ Great grandparent □ Respondant/self □ House maid □ Other, please specify _____ □ Don't know	1 2 3 4 5 6 7 8 99
25.	In general, how many times have you been sick since the child came home from the NRU?	□ All the time □ Five times □ Four times □ Three times □ Two times □ One time □ Have not been sick □ Don't know □ Other, specify _____	1 2 3 4 5 6 7 99 8

Section D illness in the child after arrival home from the NRU:

I will now ask you some questions about the child's health after s/he came home from the NRU.

26.	Has the child (NAME) been sick after s/he came home from the NRU?	□ Yes □ No- go to 40	1 2

27.	What has the child (NAME) been suffering from in the last four weeks?	□ Malaria	1
		□ Diarrhoea- ask 34-39.	2
		□ Malnutrition	3
		□ Cough	4
		□ Pneumonia	5
		□ Measles	6
		□ Vomiting	7
		□ Malaise	8
		□ Fever	9
		□ Other, specify _____	10
28.	When you noticed that the child (NAME) was sick, who were initially sought for medical assistance?	□ Health centre/hospital	1
		□ Mobile clinic	2
		□ Health surveillance assistant	3
		□ Community health worker	4
		□ Traditional healer	5
		□ Village chief	6
		□ Neighbour	7
		□ Other, please specify _____	8
29.	How many days had you noticed that the child (NAME) was sick before this assistance was sought ?	□ 1 day	1
		□ 2 days	2
		□ 3-4 days	3
		□ 5-7 days	4
		□ Don't know	99
30.	Who, if any, did you go to after this first consultation?	□ Health centre/hospital	1
		□ Mobile clinic	2
		□ Health surveillance assistant	3
		□ Community health worker	4
		□ Traditional healer	5
		□ Village chief	6
		□ Neighbour	7
		□ Other, please specify _____	8
31.	Has the child (NAME) received any medications?	□ Yes	1
		□ No – go to 32	2
32.	Where did you get this medication from?	□ Shop/marked	1
		□ Garden/bush	2
		□ Health facility/hospital	3
		□ Mobile clinic	4
		□ Health surveillance assistant	5
		□ Community health worker	6
		□ Traditional healer	7
		□ Village chief	8
		□ Neighbour	9
		□ Other, please specify _____	10

33.	What kind of medications was this?	□ Traditional medicines □ Antibiotics □ Antimalarials □ ORT □ Analgesics □Other, specify _____	1 2 3 4 5 6
	Only ask if the child has had diarrhoea:		
34.	Do you think the child (NAME) should receive less, more or the same amount of fluids when s/he has diarrhoea compared to when s/he does not have diarrhoea?	□ Less fluids □ The same amount □ More fluids □ No fluids □ Don't know – go to 36	1 2 3 4 99
35.	Why should the child (NAME) receive less, more, the same amount? _____ _____		
36.	What type of fluids do you think is good for the child (NAME) when s/he has diarrhoea?	□ Water □ Rice water □ ORT/ORS- go to 38 □ Tea □ Juice □ Milk □ Other, please specify _____	1 2 3 4 5 6 7
37.	Have you ever heard about Oral Rehydration Therapy?	□ Yes □ No □ Don't know	1 2 99
38.	Do you think the child (NAME) should receive, less, more or the same amount of food when s/he has diarrhoea compared to when s/he does not have diarrhoea?	□ Less food □ The same amount □ More food □ No food at all □ Don't know – go to 40	1 2 3 4 99
39.	Why should the child (NAME) receive less, more, the same amount? _____ _____		
	Ask all:		
40.	Do you have a mosquito bednet in your household?	□ Yes □ No- go to 42.	1 2
41.	If yes, who slept under the bednet last night?	□ The child □ Caregiver □ Spouse □ Other children □ Other	1 2 3 4 5

Section E Household hygiene:

Now I will ask you some questions about household hygiene practices.

42.	At what times should a person wash his/her hands?		
		□ Before going to bed	1
		□ Before preparing food	2
		□ Before eating	3
		□ After eating	4
		□ Before feeding a child	5
		□ After being to the toilet	6
		□ Before going to the toilet	7
		□ After helping a child to the toilet	8
		□ Don't know	99
43.	When should one wash the child's hands?		
		□ After the child has eaten	1
		□ Before the child eats	2
		□ After helping the child to the toilet	3
		□ Before the child is put to bed	4
		□ When they are dirty	5
	m	□ When the child wakes up in the morning	6
		□ Don't know	99
44.	What should be done with vegetables and fruits before it is eaten or used for cooking?		
		□ Rinsed with water	1
		□ Boiled	2
		□ Thoroughly cooked	3
		□ Don't know	99
		□ Other, specify	4
45.	What should be done with the drinking water before it is given to the child (NAME)?		
		□ Boiled	1
		□ Nothing special	2
		□ Don't know	99
		□ Other, specify	3
46.	Do you think water can give diseases?	□ Yes	1
		□ No -finished	2
		□ Don't know- finished	99
47.	What kind of diseases do you think water can give?	□ Give diarrhoea	1
		□ Give nausea	2
		□ Give fever	3
		□ Give dysentery	4
		□ Give kolera	5
		□ Don't know	99
		□ Other, specify	6
	Additional question for absconded cases:		

48.	Why is it that you decided to go home from the NRU before the child was discharged? _____ _____ _____ _____

Thank you for your help and cooperation.

Appendix 3: Interview guides

Interview guide for homecraft workers:

As you already know, through interviewing the caregivers I gain information about several issues of the history of the child, caring practices and their perceptions about what causes malnutrition in these children. However, it would be very valuable information for me to know what you think about the causes of malnutrition in these children and the care they receive in their home environment.

1) As you know, there are many different reasons for why children become malnourished. What do you think are some of the main reasons why these children admitted to the NRU have become malnourished?

2) Do you think there can be any other reasons for why these children have become malnourished? If yes, what are these reasons?

3) Do you think there are some common characteristics in the home setting of the children admitted to the NRU compared to the children that stay healthy?

4) Can you tell me what you think can be done in order to prevent malnutrition in the children in Malawi?

5) Do you think that there are any special types of diseases that are related to why these children become malnourished?
If yes, what are common diseases do you often see in these children?

6) Can you tell me about some of the main health problems (apart from malnutrition) that you see are the problems in these children?

7) What do you think could be done in order to prevent some of these problems?

8) You also see the children on follow-up when they come. Are there any particular problems you encounter during the follow-up?

9) What do you think are the main causes why some of the children relapse after discharge?

10) What do you think are the main reasons for why some caregivers are able to maintain the child's nutritional status after discharge while some are not even if they are all living under the same poor circumstances? In what ways do these caregivers differ?

11) Some of the caregivers are taking the children home before discharge. What do you think is the reason for this? What do you think can be done to prevent absconding?

12) What are your experiences of what the caregivers think about staying in the NRU up to three weeks?

13) What do you see as some common problems for the caregivers to stay in the NRU for three weeks?

Interview guide for research project for caregivers

Caregiver's perception of the causes of malnutrition:

Introduction:

As you know, here in the NRU there are many children who are coming in from different villages in Mangochi because they have become malnourished. I would now like to have a talk with you where you can tell me about your experiences and understandings about the problem of malnutrition and disease in the children of Malawi. This information is important for me because I want to learn more about what you think causes sickness and malnutrition in children and why you think this has happened to your child. This information can help me to understand the several possible reasons for why child malnutrition is a problem that is faced by many families in Malawi.

1) In the village you live in, how common is it for small children to become malnourished? Is there some children that are more affected than others? If yes, why is this so?

2) There are many reasons for why children become malnourished. What do you think are some of the main causes for why small children become malnourished in your village?

3) What do you think are the main reasons for why (NAME) has become malnourished?

4) Do you think there can be any other reasons for why (NAME) has become malnourished? If yes, what are these reasons?

5) Can you tell me what you think can be done to prevent malnutrition in children in your village?

6) Do you think that there are any other types of sickness is related to why (NAME) has become malnourished?
If yes, in what way?

7) Why do you think this happened to (NAME)?

8) Has it been any difference in your daily routines after (NAME) became sick compared to before it became sick? In what way, please describe?

9) What do you think causes diarrhoea in small children?

10) Do you think diarrhoea can be a health hazard for young children? If yes, please tell me more about this?

11) What other types of sicknesses do you know that is common in children in your village?

12) Can you tell me about some of the main health problems that you see in small children in

your village?

13) What do you think could be done in order to prevent some of these problems?

Caregiver's perceptions of obstacles in giving adequate care to the child:

Introduction:

As you know, there are many circumstances that can play a role in the amount of care that the child receives. I will therefore talk to you about what you think about the time and resources you have available to care for your child.

1) Please tell me, in general- do you feel that there is enough time for child-care? If no, please tell me what you feel is restricting your time available for (NAME)?

2) Is there anything that you think would be different if you had more time available to spend with (NAME)?
If yes, what would be different?
If yes, how would this be different?

3) If you had more time available, do you think that you would cook for the child and/ or feed (NAME) more often?

4) Do you feel that there are any limitations in your life to give (NAME) enough attention? If yes, what kind of limitations are these?

5) Do you sometimes feel that you cannot give (NAME) the food it needs? Why?
If yes, are there any alternate sources of food? Which?

6) Probe through a normal day- what happens in the morning, midday, afternoon etc. where are you, where is the child?
Can you tell me about a usual day with (NAME)?
Do you go to work, is (NAME) coming with you?
Who is taking care of (NAME) then?