NUTRITION SURVEYS OF 6 TO 59 MONTH CHILDREN

MAUNGDAW AND BUTHIDAUNG TOWNSHIPS
November 2013 - December 2013

RAKHINE STATE, REPUBLIC OF THE UNION OF MYANMAR

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ACF	Action Contra la Faim
CI	Confidence Interval
CHW	Community Health Worker
CMAM	Community Management of Acute Malnutrition
CM	Centimeter
CDR	Crude Death Rate
DR	Death Rate
ENA	Emergency Nutrition Assessment
FCS	Food Consumption Score
FSL	Food Security and Livelihood
GAM	Global Acute Malnutrition
HAZ	Height for Age Z-score
HDDS	Household Dietary Diversity Score
IDDS	Individual Dietary Diversity Score
MAM	Moderate Acute Malnutrition
MHCP	Mental Health and Care Practices
MICS	Multiple Indicator Cluster Survey
MM	Millimeter
MOH	Ministry of Health
MUAC	Mid Upper Arm Circumference
MW	Mean Weight
MSF	Médecin Sans Frontière
NCHS	National Centre for Health Statistics

NGO	Non-Governmental Organization
PLW	Pregnant and Lactating Women
RHC	Rural Health Center
SAM	Severe Acute Malnutrition
SMART	Standardized and Monitoring Assessment for Relief and Transition
SD	Standard Deviation
TMO	Township Medical Officer
TBA	Traditional Birth Attendant
UNDP	United Nation Development Program
UNHCR	United Nations High Commissioner for Refugee
UNICEF	United Nations International Children's Emergency Fund
WASH	Water, Sanitation and Hygiene
WAZ	Weight for Age Z-score
WHO	World Health Organization
WHM	Weight for Height Mean
WHZ	Weight for Height Z- score
WFP	World Food Program

EXECUTIVE SUMMARY

Action Contre la Faim (ACF) has been implementing nutrition interventions in Maungdaw district since 2003, based on a nutrition and mortality survey carried out in the Northern part of Rakhine State in 2000 showing a critical level of global acute malnutrition (GAM) according to WHO expert Committee classification for wasting.[1]

Two separate nutrition surveys were conducted in Maungdaw and Buthidaung Townships, Rakhine District during the period from the 6th of November to the 21st November 2013 in Maungdaw Township and from the 3rd December to 19th December 2013 in Buthidaung Township. The main objective of the surveys was to assess the prevalence of global and severe acute malnutrition among children from 6 to 59 months old in the two Townships.

The surveys were part of the monitoring of the nutritional situation in the two Townships.

The surveys were conducted using a two stage random cluster sampling methodology, randomly selecting clusters at both the village track and household level. The target population for the anthropometric survey was children between 6-59 months as they represent the most vulnerable part of a population with regards to malnutrition. Standardized Monitoring and Assessment of Relief and Transitions (SMART) methodology was used for all components of the survey from the preparation phase to the report writing. Analysis of the data was performed using ENA for SMART Nov 2011, Epi Info version 7, SPSS, and excel. Data collected pertained to anthropometric measurements, morbidity, mortality, Infant & Young Child Feeding practices (IYCF), food security (FSL), water, sanitation and hygiene (WASH), mental health and care practices (MHCP).

Maungdaw township

A total of 429 children aged 6-59 month were included in the survey.

The prevalence of global acute malnutrition (GAM) was 20.0% (15.1 – 26.1 95% C.I) and severe acute malnutrition (SAM) was 3.0% (1.5- 6.0 95% C.I).

Total stunting was 47.6% (38.7-56.6 95% C.I) and severe stunting was 22.4% (16.9- 29.1 95% C.I).

Total underweight was 42.9% (35.8-50.3 95% C.I.) and severe underweight was 15.6 % (11.0 - 21.7 95% C.I.)

A total of 194 Pregnant and Lactating women aged 15-45 year were included in the survey.

44.3% of them were found with MUAC <230mm and 55.6% with MUAC ≥230mm.

The retrospective mortality survey included 2,273 people, including 460 under 5 children. The crude death rate was 0.27 deaths /10.000 (0.11 – 0.66 95% C.I) and under 5 death rate was 0.68 deaths/10.000 (0.23 – 2.05 95% C.I). Both of these statistics were within acceptable limits.

[1] WHO Expert Committee. 1995. Physical Status: The Use and Interpretation of Anthropometry, WHO Technical Report Series #854., Geneva, WHO.

The infant and Young Child feeding practices portion of the survey included 155 children (6-23 months). The percentage of children receiving a minimal acceptable diet was extremely low**:** 3.2%

The household dietary diversity score (HDDS) was 5.5 which was above the minimum acceptable score of 4. The Food Consumption Score (FCS) revealed that 88.8% of households had an adequate FCS score, 10.7% had a borderline and 0.5% had a poor FCS score.

Regarding mental health status, 76.5% of respondents showed a low score on general well-being (measured by WHO scale), with an average of 9.7 (under the threshold of 13, with maximum of 25) and high percentage of depressive mood.

The Maungdaw villages assessed had a low sanitation coverage with 55% of households without latrine. On the other hand, 89% of the schools had a latrine. In terms of drinking water source, 67% of villages in Maungdaw had an improved water source (66% of households drank borehole water and 1% of households used protected wells). Among the 33% of villages with unimproved water access, 92% did not have an effective water treatment system at home.

Buthidaung Township

A total of 430 children aged 6-59 months were included in the survey.
The prevalence of GAM was 21.4% (17.9 – 25.3 95% C.I) and SAM was 3.7% (2.3 – 6.0 95% C.I).
Total stunting was 58.6 % (50.1 – 66.6 95% C.I) and severe stunting was 28.6 % (22.6 – 35.5 95% C.I).
Total underweight was 51.9% (45.4 – 58.3 95% C.I.) and severe underweight was 17.2 % (12.9 – 22.6 95% C.I.)

A total of 215 Pregnant and Lactating women aged 15-45 year were included in the survey.
53.5% of them were found with MUAC <230mn and 46.5% with MUAC ≥230mm.

The retrospective mortality survey included 2619 people including 464 under 5 children. The crude death rate was 0.51 deaths/10.000 (0.27 – 0.95 95% CI) and the less than 5 death rate was 1.15 deaths/10.000 (0.41 – 3.17 95% CI). Both of these statistics were within acceptable limits.

The Infant and Young Child Feeding practices portion of the survey included 143 children 6-23 months. The percentage of children receiving a minimal acceptable diet was extremely low**:** 2.1%.

Food security information from 441 households was collected. The HDDS was 5.2 which were above the minimum acceptable score of 4. The FCS revealed that 92.1% of households had an adequate FCS score, 7.7% had borderline and 0.2% had a poor FCS score.

Regarding mental health status, 76% of 441 respondents showed a low score for their general well-being, (measured by WHO scale) with an average of 10.7 (under the threshold of 13, with maximum of 25) and high percentage of depressive mood.

The villages assessed in Buthidaung had a low sanitation coverage with 58% of households without latrines. On the other hand, 85% of the schools had latrines. In terms of drinking water source, 33% of villages in Buthidaung had an improved water source (28% of households drank borehole water and 5% of households used protected wells). Among the 67% of villages with unimproved water access, 92% did not have an effective water treatment system at home.

1. INTRODUCTION

The first ACF projects in Myanmar were implemented in Eastern Rakhine in 1994 with the aim of reducing morbidity and mortality through water and sanitation activities. From 1995, activities were expanded in the Maungdaw District through supporting returnees from Bangladesh with water and sanitation activities. Activities aiming to support household food security started later on in 2000. The positioning was then re-centred on therapeutic nutrition in Maundgaw District in 2003 and evolved gradually to Community Management of Acute Malnutrition (CMAM) integrating Wash, Food Security, Reproductive Health and Care Practices projects to tackle the underlying causes of malnutrition.

The first nutrition and mortality survey in Maungdaw District was carried out by ACF in November 2000. A second one was conducted in January 2003. Based on their results showing a prevalence of global acute malnutrition (GAM) above the emergency threshold, ACF started its nutrition activities in the area in November 2003. Since then, the situation has been regularly monitored through nutrition surveys implemented in 2006, 2007, 2008 , 2009 and 20011, all taking place during the cold, dry season (November – January) as part of ACF monitoring and evaluation activities. Retrospective mortality surveys were conducted in conjunction with the nutrition survey until 2008. Retrospective mortality surveys have not been carried out in the last years as the demographic and epidemiological situation remains stable in the area, without any main event potentially changing mortality patterns among the population in the area.

Anthropometric results in the report are presented using WHO standards, consistent with previous surveys in the area. Result using NCHS can be found in annex 6 for Maungdaw and Annex 7 for Buthidaung.

2. CONTEXT

2.1 General Context

The Union of Myanmar is the second largest country by geographical area in the Southeast Asian region. The country shares borders with Thailand, Laos and the People's Republic of China to the east and north-east and Bangladesh and India to the west and northwest. One third of Myanmar's total perimeter forms an uninterrupted coastline to the Bay of Bengal and the Andaman Sea.

Myanmar is made up of 7 divisions and 7 states. The divisions are mostly populated by ethnic Bamars (Ayeyarwaddy, Sagaing, Tanintharyi, Magway, Bago, Yangon and Mandalay divisions) and the states are

predominately populated by ethnic minorities (Kachin, Kayan, Kayin, Chin, Mon, Rakhine, Shan states). Each division and state is further broken down into districts, townships, village tracks (rural areas) or wards (urban areas) and hamlets.

In the 2011 United Nations human development index report, Myanmar ranked 149th out of 187 countries[2]. Maugdaw District is one of the poorest, most densely populated and vulnerable areas of the country characterized by protracted high rates of acute and chronic malnutrition. The majority of households do not have the ability to access sufficient levels of nutritious food and income as well as basic services such as clean water, health and education.

The 2011 WFP Vulnerability Assessment & Mapping surveys estimate that 45% of households are severely food insecure and 33% are moderate in Maungdaw District with low access to agricultural land, limited purchasing power and exposure to natural disasters as underlying factors to prolonged food insecurity. Additional determinants such as inadequate care practices coupled with limited access to water, hygiene and sanitation, and poor access and quality of health services have also been identified as contributors to malnutrition.

In Rakhine State, the tensions that flared from June 2012 resulted in wide displacements and settlement in camps, loss of housing, productive assets, and livelihoods, disrupted crop planting, limited to no access to market, restricted access to basic services including health and education, and impacted heavily on families' psycho-social condition. All INGOs and UN agencies working in Maungdaw District evacuated their international and delocalised staff in the beginning of June 2012, thereby leaving the population without any humanitarian assistance. INGOs returned to Maungdaw district in late 2012 but were not able to resume their full humanitarian activities before several months.

2.2 Geography, demography and climate

2.2.1 Geography

The two surveys areas of Maugdaw and Buthidaung Townships are both situated in Maungdaw District in the northern part of the Rakhine state and in the north western part of Myanmar. The Townships are surrounded by Bangladesh to the north and west, by Kyauktaw Township (Eastern Rakhine State) to the east, Rathidaung Township to the south-east and the Bay of Bengal to the south west.
The two Townships have similar topography composed of successive low plains and mountains ranges (oriented north west/south east). These mountain ranges mark the administrative limits of both Townships. The south of Maungdaw Township is a long plain between the coast and the mountains.

The hydro-geological composition of Maungdaw and Buthidaung offers challenges to groundwater development projects. Groundwater salinity is high in Maungdaw district. Indeed 20% of the drillings done by ACF found groundwater with conductivity superior at 3000 µS/cm (WHO standard being 1400 µS/cm).

[2] UNDP. 2011. Human development index.

Based on ACF's Report "Evaluation of the Impact and Sustainability of ACF 15-Year Water Supply Interventions in Northern Rakhine State," groundwater in Buthidaung south and Maungdaw north-west are saline or ferrous in Buthidaung south and Maungdaw north. In 10% of the village tracks, mostly in Maungdaw, the average amount of iron in the water of the boreholes is above 2mg/L, making the water undrinkable. Furthermore, Maungdaw north has a good and quality aquifer where positive drillings are common place. On the other hand, negative drilling is commonplace in Buthidaung south and west and in Maungdaw south-east and north-east.

2.2.2 Demography, population structure

Rakhine State has a surface of 14,200 square miles and a population of about 3.3 million[3] people.
The capital of the state is Sittwe. The size of Maungdaw is 1,758 km_2 and for Buthidaung 2,136 km_2. Maungdaw Township has a population of ± 474,000 people. It is composed of 104 village tracts that are sub-divided into 444 hamlets. Buthidaung Township has a population of ± 277,000 people. It is composed of 86 villages that are sub-divided into 411 hamlets.

In terms of ethnic composition, these two Townships are different from the other parts of the state. The dominant ethnic group is the Muslim, followed by Rakhine. Others ethnical groups are Mro, Chin, Khami, Kaman, Dyet and Marmagri, all mainly of Buddhist faith while a minority of population is hindu.

The population is very young, with 55.3% in Maungdaw under 18 years old and 55.5% in Buthidaung. The dependency ratio in Maungdaw (100.4) and Buthidaung (89.9) is far higher than the one at national level (58.73) or at Rakhine state level (73.61). With an average of 6.8 people per household, the household size is the biggest in both Townships than the national average of around 5 people.

Since the unrest in June 2012, a part of the Muslim population has been emigrating from Maungdaw District to Bangladesh or Malaysia.

2.2.3 Climate

The climate is tropical with a monsoon regime. Three distinct seasons are observed: the dry and hot season lasting from March to May; the rainy season lasting from June to October and the dry and cold season lasting from November to February.

2.3 Education

Most village tracks in Maungdaw district have at least one primary school (0 to 4 grades).

[3] 2011 Statistical yearbook- Myanmar

35 middle schools (5 to 8 grades) and 6 high schools (9 to 10 grades) are present in Maungdaw and Buthidaung Townships.

In remote areas access is sometimes impaired by distance and lack of communication during the rainy season. Sittwe has the only university in Rakhine state. During the household survey in 2010, UNHCR evaluate the literacy rate and found out only 9.8% of the population in Maungdaw declaring being able to speak and write Burmese and 20% in Buthidaung.

2.4 Economy

Both Townships present an economical potential due to their geographical location with large paddy field areas, forests, access to the sea and rivers as well as close proximity to the Bangladesh border for trade. However, the living conditions of the population remain below the normal standards regarding access to food, safe water, heath, hygiene practices and education.

The industry sector is nearly inexistent as well as transport infrastructures limited especially in remote areas. This reduces exchange and development of the zone. Job opportunities are limited to casual labor and the unemployment rate remains high.

2.5 Food Security

The livelihood context in Rakhine State “one of the least developed part of Myanmar” is that of chronic poverty, high population density, malnutrition and food insecurity, aggravated from time to time by transitory factors (i.e. the recent conflict in June 2012). Food security remains fragile and depends on seasonality.

Rakhine State receives plenty of rain throughout the year and rice is the main crop, occupying around 85% of the total agricultural lands. The technology is however limited and there is lack of appropriate inputs as well as limited access to high yielding seeds and to fertilizers. Coconuts and nipa palm plantations are also important crops. Fishing is a major industry but most of the catch is transported to Yangon.

The lean season takes place between June and October, and is traditionally the most difficult period of the year. There are 2 planting seasons in Maungdaw and Buthidaung Townships. All farmers are planting paddy for the rainy season but a large part is not able to plant the summer paddy due to lack of irrigation system such as dams. This is limiting the rice production to only one major harvest per year. Others crops cultivated such as vegetables are mainly available in cold dry season.

30% of the total population had access to land. The remaining 70% has to rely on the output of this limited number of farmers. The average land size for farmers in the townships of Maungdaw and Buthidaung was 2.4 acres in October 2010, not sufficient to produce enough rice for the whole population.

During the rainy season (June to October), the labor work opportunities are limited and households are typically food stocks shortages and deterioration of the nutritional situation.

A majority of people depends upon casual paid employment for a living. During the lean period, when access to rice is reduced, the vulnerable households develop a range of copying mechanisms such as the consumption of food stocks, reduction of food quality and commodity loans from relatives. As a result, the majority of the families lives in precarious conditions as they do not own land, depends on daily jobs, or relies on neighbors and relatives 'assistance to ensure their day-to-day subsistence.

2.6 Water, sanitation and hygiene

The overall supply of safe water remains poor in both Townships. Community hand-pumps have been set up by ACF throughout the years mainly in Buthidaung North and Maungdaw North but cannot be installed in the other areas due to geological constraints. A limited number of households own their individual hand pump but most of the population use water from ponds and shallow open wells. The main cities of Maungdaw and Buthidaung are supplied neither by any water treatment plant nor by any piped distribution network. Poor hygiene practices and lack of point-of-use water treatment also lead to the recontamination of safe water before consumption. Most of the households do not have access to adequate sanitation facilities. Sanitary latrines coverage is lower than 70% in all Rakhine State[4].

Previous ACF studies showed that in a context where family income and food security aspects are a daily concern for the majority of the population, water, and even more so sanitation, is not seen as a priority concern. The importance of improved water quality, safe disposal of wastes and improved hygiene practices is not recognized, despite the significant prevalence of waterborne diseases in the area. Consequently, there is a high prevalence of water and sanitation related diseases in the target area, which represent the primary underlying causes of malnutrition.

2.7 Health

The health system and situation in Myanmar is consistently classified as one of the poorest in the world by the World Health Organization. Public hospitals lack the basic facilities, equipment and human resources. The situation is particularly grim in remote area such Rakhine State.[5]
There is one general hospital with special services, 39 general hospitals and 87 rural health centers and 412 sub-rural health centers in the whole of Rakhine State.
Maungdaw district has 7 hospitals, 14 rural health centers and 72 sub-rural health centers.

[4] HMIS Department of Health Planning , Ministry of health
[5] Myanmar Department of Health Planning(2002-2203) : Hospital and dispensaries by state and division

Table 1: Health facilities in Maungdaw and Buthidaung townships

	Maungdaw	Buthidaung
Hospital	5	2
Maternal and child health	1	1
Rural health center	8	6
Sub-rural health center	41	31

Medical treatment costs and hospitalization fees are unaffordable to a large majority of the population.
Use of the traditional "doctors" or self –medication is common and widely accepted and encouraged by the local population. They are the first resort and often the only one accessible for most of the population due to their affordable services. They work at the community level by providing treatment for basic diseases and delivery at home.

Most recent medical statistics for Rakhine state from MoH reveal that together with pregnancy and birth related complication, malaria, tuberculosis, diarrhea and respiratory infections are the mains causes of illness and death in Rakhine state.[6]

The infant mortality rate for Rakhine State is per 61.60 per 1000 live births.[7] The under-five mortality rate is 70.2 per 1000 live births. Maternal mortality rate is 3.44 per 1000 live births. The incidence rate for malaria is 41 per 1000 population. The morbidity of diarrhoea is in Rakhine state 11.11 per 1000 population and the mortality 0.98 per 100.000 populations.

Regular free immunization campaigns were conducted by the MoH in both Townships before the 2012 unrest.

2.8 Mental health and Care practices

A national mental health policy is incorporated to the general health policy, and the last mental health plan was revised in 2006. Mental Health expenditure is 0.3% of total health care expenditures[8]. In all the country, there are 25 outpatient mental health facilities, 2 day treatment facilities, 17 community-based psychiatric inpatients units and 2 mental hospitals. Psychiatrists represent 0.016 per 100,000 populations, psychologists 0.01 per 100,000 population and social workers 0.04 per 100,000 populations. No mental health services are provided in Maungdaw District; the majority of the people with mental health concerns consult mainly traditional healers, eventually community health workers when present.

According to databases and baselines of ACF psychosocial component, an extreme vulnerability is visible for a huge number of people in Maungdaw District. Psychosocial and mental health difficulties are persistent: most mothers of beneficiaries suffer from general anxiety disorders, have difficulties to control their worry,

[6] Annual hospital statistic report 2008, government of Myanmar, ministry of health
[7] Statistical Yearbook 2008
[8] WHO-AIMS report on Mental Health System in Myanmar 2006

show symptoms of stress and depression (as sadness for more common), and have perception of limited control over their life. Relationships among families are weak, with negative consequences on the families and communities, as deterioration of maternal and child care and lack of capacities and resources for women to cope with daily problems. Maternal and child care deterioration (due to mental health problems, high workload, high number of children, limited social support, lack of knowledge, isolation because husband left or arrested, etc.) have negative consequences on risks of child mortality, morbidity, under-nutrition and health. Moreover, poor socio-economic conditions, lack of food at household level and limited access to health care have still a strong impact on families and communities' capacities to deal with related problems.

2.9 Nutrition

In the Myanmar Multiple Indicators Cluster Survey (MICS) done in 2009-2010, the nutrition status in Rakhine State was ranked as the poorest of the country, with more than 35% underweight prevalence and more than 10% wasting prevalence. It also showed that Rakhine State had the lowest (1%) percentage of exclusive breastfeeding and the 3rd lowest percentage of children receiving Vitamin A supplementation.

From 2003 up to the last Nutrition Survey carried out in 2010 per ACF, GAM prevalence in Maungdaw and Buthidaung Townships remained critical and above WHO emergency threshold of 15%. These surveys were conducted two months after the lean season, during the harvest period when food access and job opportunities are available.

Although malnutrition comes from a complex range of factors, three determinants can be highlighted:

- Poor food access due to poor crop production, limited/no access to land and inputs, low market access, indebtedness and insufficient incomes resulting in reduced food intake both qualitatively and quantitatively.
- Lack of access to safe water and lack of basic knowledge of what constitutes a healthy diet, links between nutrition and health, limited hygiene practice, limited access to health centre.
- Poor infant and children feeding practices, poor maternal and child care and limited hygiene practices.

Table 2: Acute Malnutrition Prevalence in intervention area (2000-2010)

Township	Period	Acute malnutrition prevalence							
		NCHS[9] reference				WHO standards			
		SAM[10]	(95%CI)[11]	GAM[12]	(95% CI)	SAM	(95% CI)	GAM	(95% CI)
Maungdaw and Buthidaung Townships	Nov-2000	**2.0%**	1.0 -3.9	**22.3%**	18.6 – 26.6	**2.7%**	1.9-3.8	**24.4%**	18.6-31.2
	Jan -2003	**3.0%**	0.9-3.9	**16.4%**	10.5 – 17.2	**3.9%**	2.8-5.4	**18.5%**	13.9-24.1
	Jan -2006	**1.4%**	0.5- 3.0	**18.9%**	15.5 – 22.9	**1.9%**	1.4-2.7	**21.0%**	15.9-27.2
	Oct-2007	**1.8%**	0.6- 3.0	**25.6%**	19.7 – 31.5	**4.6%**	2.5-6.7	**24.8%**	19.2- 30.5
Maungdaw	Nov-2008	**0.7%**	0.0 -1.5	**18.7%**	15.0 – 22.4	**2.3 %**	1.3 - 3.4	**20.1 %**	16.8 - 23.3
	Nov-2009	**1.0%**	0.4-2.2	**17.5%**	14.0-21.6	**2.6%**	1.2 – 5.2	**20.8%**	16.7- 25.6
	Dec-2010	**0.4%**	**0.1- 1.7**	**19.9%**	**15.2-25.6**	**2.9%**	1.5 – 5.5	**19.7%**	14.8- 25.8
Buthidaung	Nov-2008	**1.2%**	0.5 -1.9	**22.7%**	18.8 – 26.6	**2.9%**	1.7 – 4.0	**22.7%**	18.8- 26.6
	Nov-2009	**1.1%**	0.5-2.5	**20.2%**	15.1-26.5	**3.2%**	1.8 – 5.8	**21.3%**	17.1 -26.2
	Dec-2010	**0.7%**	**0.2- 2.2**	**19.8%**	**15.5-25.0**	**2.6%**	1.5 – 4.3	**20.3%**	16.2- 25.3

In order to evaluate the potential impact of the unrest on the nutritional status for children under 5, ACF conducted a Rapid Nutrition Assessment in February 2013 to appraise the nutrition situation in the intervention area. This study was implemented in urban and peripheral Village Tracts of Maungdaw and Buthidaung. The outcomes tended to show a deterioration of the situation, given that it was implemented at a period which is normally expected "better" after harvest period. In Maungdaw, the GAM rate amounted to 24.9% with 4.7% SAM. In Buthidaung, the GAM rate amounted to 26.5% with 1.7% SAM.

It is important to mention that Rapid Nutrition Assessment methodology is still under development and that results provide by SMART survey are more robust.

Official nutritional surveillance, i.e. "nutrition surveillance for timely warning and intervention system" was established in Rakhine Sate in June 2010 by the MoH but ceased to be operational following the 2012 unrest.

[9] National Center for Health Statistics

[10] Severe Acute Malnutrition

[11] Confidence Interval

[12] Global Acute Malnutrition

3. HUMANITARIAN RELIEF AND INTERVENTION ACTORS

Various NGOs and UN agencies are present in both townships and run projects in Food security, WASH, Health, Nutrition, Mental Health& care practices and protection.

3.1 Food Security

- **ACF** has been operating in Maungdaw district since 1996 through its Food Security and Livelihood (FSL) program based on food production activities, income generating activities and food surveillance system. ACF aims to address the underlying causes of malnutrition[13] through a prevention approach. One of these projects is mainly funded by the European Union through the project entitled: "Poverty and Hunger Alleviation through Support, Empowerment and Increased Networking (PHASE IN)". The FSL component aims to support food production through provision of inputs and know-hows as well as development of infrastructures (agriculture, aquaculture, livestock) and income diversification through off-farm activities (income generation activities in a value chain approach), with potential increase in access to financial services. The project is implemented in Consortium with CARE (implementing agency and consortium lead) and GRET, the latter for technical backstopping at Yangon level on agriculture production and agriculture infrastructure construction / rehabilitation).
- **Cooperative for Assistance & Relief Everywhere (CARE)** has been implementing a livelihood project entitled "SPARC". The SPARC project aims to improve target households' livelihood security, particularly as regards income, food production and asset holdings. The project focuses on activities such as the establishment community forestry plots, increased agricultural production, home gardening, and winter cropping. CARE is also in PHASE IN consortium.
- **Community Family Services International (CFSI**) is running education, vocational training and Income Generation Activities in Maungdaw and Buthidaung Townships.
- **UNDP** ran in 2013 livelihoods projects to support conflict-affected villages through provision of livelihoods grants aiming to develop agricultural production, income generating activities and livestock.
- **UNHCR** provided the 244 rowing boats and fishing nets to the fishermen in order to improve their income. . It also supported the rehabilitation of markets in Maungdaw Township.
- **WFP** manages the "Protracted Relief", "Food for Education", "School Feeding" and "Food for Access creation" programs are implemented in both Townships. WFP provides relief assistance for extremely food insecure and destitute households in Maugdaw district by bridging the annual seven-month food gap during lean seasons.

[13] Cf. "Conceptual Framework of Malnutrition", UNICEF, 1990.

3.2 WASH

- **ACF** started its intervention in Maungdaw district in 1995 with the implementation of WASH programs in both Townships. Currently the WASH actions are undertaken under the PHASE IN consortium with CARE. The WASH component aims to increase access and use of safe water and sanitation facilities while reducing the morbidity risks related to poor hygiene practices in villages.
- **CARE** WASH actions are implemented under the PHASE IN program. Alike ACF, the WASH component of the program aims to increase access and use of safe water and sanitation facilities and to improve hygiene practices to reduce the WASH-related morbidity risks in villages.
- **Malteser** has an activity of WASH in Maungdaw to renovate ponds and support construction of family and school latrines.
- **MRCS** renovated ponds in both Townships in 2013: improvement of catchment volume, protection of access.

3.3 Health

- **Malteser** has health activities covering in Maungdaw North and Buthidaung Townships.
  - Primary Health Care centers in remote areas, 1 Mother and Child health-care (MCH) with training and support to TBAs and a network of CHWs in all village-tracts of Maungdaw North.
  - Tuberculosis program in each town of Maungdaw and Buthidaung township collaborating with the MoH hospitals.
  - The only activity run in Buthidaung is for Tuberculosis program.
- **Medecin Sans Frontières - Holland (MSF-H)** has been working with its own objectives that to reduce the morbidity and mortality in vulnerable population of Rakhine State by collaboration with MoH.
  - 3 Primary Health Care centers in Maungdaw (1 in Maungdaw downtown and 2 in Maungdaw South) and 1 in Buthidaung north;
  - 4 Reproductive Health centers in Maundaw (1 in Maungdaw downtown and 2 in south and 1 in north);
  - 1 Antiretroviral treatment center in both Townships;
  - 1 mobile clinic 'Malaria diagnosis and treatment' covering for both Townships.
  - Community Health worker team

Please note that the above describes the situation at the time the survey was conducted (November – December 2013).

3.4 Nutrition

- **ACF** is the only actor in the treatment of malnutrition in Maungdaw District. Its nutrition activities started in 2003 in Maungdaw and Buthidaung Townships.

  Through therapeutic treatment, community awareness and care practices, the nutrition program works at three levels: detection, prevention and treatment. ACF run the followings activities:

- 2 stabilization centers (SC) treating infants and severely malnourish children with medical complication
- 7 Outpatient Therapeutic Programs (OTP) with 11 distribution points treating severely malnourished children without complication
- 7 seasonal Supplementary Feeding Programs (SFP) with 11 distributions points treating moderately malnourished children. Pregnant and Lactating women were admitted in this program from 2003 to 2008.
- Community awareness component involving training of Super Community CareTakers (SCCT) providing light health education and doing screening activities. These activities also include market awareness activities, community leaders meeting to sensitize communities about ACF activities and promote adherence to the nutrition treatment.
- Care practices component integrated in nutrition centers. These activities aim at encouraging healthy interactions between mothers and children through playing sessions, psychomotor activities and breastfeeding counselling.

Since beginning of 2010, ACF admissions and discharges criteria used in nutrition centers are based on percentage of the median according to NCHS reference following MoH request. The CMAM national guideline is currently under revision and would adopt the WHO criteria. It should be released in the following months

- **WFP** runs blanket distributions of blended food along with relief rations for children under 2, Pregnant & Lactating women in selected villages.

3.5 Protection

- **UNHCR** has been present in Maungdaw district since 1993 with a specific mandate for the protection of the refugee's population (without citizenship) and IDPs (internal displaced people) in the region. UNHCR works as the lead-agency in Maungdaw coordinates humanitarian works on behalf of Humanitarian community. In 2012-13, UNHCR provided 1268 family tents to accommodate the displaced people distributed NFLs items to 5395 families and constructed 227 permanent shelters to IDP people since 2012 event and 5 markets are constructing (4 in Maungdaw and 1 in Buthidaung). UNHCR is constructing the new schools in Maungdaw to promote peaceful co-existence and social cohesion.

4. OBJECTIVES

Main objective of both surveys:

- To assess the prevalence of global and severe acute malnutrition among children from 6 to 59 months old.

Specific objectives of both surveys:

- To evaluate the prevalence of severe and global chronic malnutrition among 6-59 month children.
- To evaluate the prevalence of severe and global underweight among 6-59 month children.
- To monitor mortality, morbidity, Infant & Young child feeding practices, Mental health , WASH and food security factors linked to malnutrition
- To compare the results with the previous nutrition surveys and to analyze the evolution of the nutritional situation in both townships;
- To propose recommendations in terms of program implementation and nutritional surveillance according to the findings.

5. METHODOLOGY

5.1 Survey type

A standard SMART two stage random clustering method[14] was applied for the anthropometric and retrospective mortality data collected in Maungdaw and Buthidaung Townships.

5.2 Population included in survey

The most recent population figures are from UNHCR 2011 Population survey.
Based on the previous surveys done by ACF, it was estimated that 18% of the total population are less than 5 years of age.
After exclusion criteria was applied, an estimated population of 368 from 409 villages was determined to be eligible to be included in the survey for Maungdaw Township and an estimated population of 244 from 283 villages was determined to be eligible to be included in the survey for Buthidaung Township.
Exclusion criteria are mentioned below.

5.2.1 Exclusion criteria

Including all villages in the random cluster selection process was not feasible due to the context. The following village exclusion criteria were applied:

- Lack of accessibility

[14] SMART. June 2012. Sampling Methods and Sample Size Calculation for the SMART Methodology

- Security concerns

5.3 Sampling procedure and sample size for anthropometric data

Households were the primary sampling unit and the intended sample size was to give acceptable representative results. The statistics listed below were entered into ENA for SMART[15] software.
A representative sample of 350 households (378 including 7.5% non-response), including 397 children (6-59 month) was identified for Maungdaw. This figure was rounded up to 396 households, using 33 clusters with 12 households per cluster.

A sample of 358 households (387 including 7.5% non-response), including 406 children (6-59 month) was identified for Buthidaung. This figure was rounded up to 396 households, using 37 clusters with 12 households per cluster.

The total number of households was increased in order to ensure that a representative sample was met as well as to evenly distribute the number of clusters among the teams depend on locations.

- 19.7% estimated prevalence for Maungdaw and 20.3% estimated prevalence for Buthidaung[16]
- 5% ± precision[17]
- 1.5 design effect[18]
- 7 average HH[19]
- 18% children under 5
- 7.5 % non-response HH

5.3.1 Household selection

Household definition: People who currently sleep in the same house and eat from the same cooking pot.

For each selected cluster the team sought the assistance of the village leader or another person who had a lot of local community knowledge. The village leader was asked to help the team with the following:

- Identify the village boundaries
- Identify houses that were abandoned or the inhabitants were not available during the data collection period
- Identify houses that were occupied by multiple families

Each team then proceeded to map each cluster.

[15] ENA for SMART, version May 4, 2011
[16] ACF SMART survey Maungdaw & Buthidaung 2010.
[17] SMART. June 2012. Sampling Methods and Sample Size Calculation for the SMART Methodology
[18] SMART. June 2012. Sampling Methods and Sample Size Calculation for the SMART Methodology
[19] Township Government. 2011. Demographic data.

- For villages with less than approximately 150 households, each household in the cluster was mapped and then arbitrarily numbered.
- For villages with more than 150 households, random segmentation selection[20] was implemented and then each household in the selected segment was arbitrary numbered.
- In the last phase of random household selection, the village leader was asked to assist the team by selecting 12 households with the aid of a random number table. The selected 12 households could be visited in any order because they were randomly selected.

5.3.2 Selection of the Individual

All children 6-59 months in the selected households were included in the survey. Age was determined for all children.

5.3.3 Selection of individuals for various sections of the questionnaire

The anthropometric and morbidity sections of the questionnaire were asked at the 12 selected households of each cluster for Maungdaw and Buthidaung that contained 6-59 month children and the child feeding practices section was asked at households with 6-23 month children.

5.3.4 Special cases

- During the mapping stage the village leader identified households that were abandoned or households those occupants would not be present during the data collection period. These households were not numbered to be eligible for random selection. In the rare occasion that one of the households described above was inadvertently numbered and randomly selected, the household was skipped and not replaced with another household
- In one incidence the mother refused to participate in the survey. The household was not replaced.
- If a house was empty, the team returned at the end of the day or the following day. A house was never substituted for an alternate one.
- Orphan children taken in by a family were considered as part of the household. If their age could not be determined it was left blank on the questionnaire and a note was made.
- If a child had a MUAC less than 115mm or oedema the team leader informed the caretaker that the child was severely malnourished and advised them to go to the nearest health clinic or hospital.

5.4 Sampling procedure and sample size for retrospective mortality survey

Household definition for retrospective mortality survey: All people who slept in the house last night and ate from the same cooking pot[21].

[20] SMART. June 2012. Sampling Methods and Sample Size Calculation for the SMART Methodology
[21] SMART. June 2012. Sampling Methods and Sample Size Calculation for the SMART Methodology.

The household definition used for the retrospective mortality survey was slightly different than the definition used for the anthropometric survey. The mortality survey used the phrase 'slept in the house last night' whereas the anthropometric survey used the phrase 'sleep in the same house'. The reason for the difference was because the mortality survey focused on a recall period for each household that began and finished on specific days, whereas, the anthropometric survey was determined by the people who lived in the household at the present time of the survey.

The statistics listed below were entered into ENA for SMART software and a representative sample of 309 households including a minimum population of 2000 was identified for Maungdaw. This 309 household minimum sample size was increased to 396 households so that it was consistent with the anthropometric survey and to also ensure a representative sample.
A representative sample of 315 households including a minimum population of 2042 was identified for Buthidaung. This 315 household minimum sample size was increased to 444 households.

- 2 estimated death rate per 10 000/day
- 0.8 ± desired precision per 10 000/day[22]
- 1.5 design effect[23]
- 98 recall period in days for Maungdaw and 97 recall period in days for Buthidaung
- 7 average household
- 7.5% on non-response households

The target recall period was a minimum of 90 days. However, the only well-known event in Maungdaw at least three months prior to the middle of data collection was Eid-Dul Fitri (9 August) and 30 days after Eid-Dul Fitri was called "First Moon day" (6th September) for Buthidaung.

The mortality questionnaire was asked at all 12 households in each cluster and all members of the household were included, regardless of age.

5.5 Training of survey team

For both Townships, four teams of three members conducted the data collection in the field included 1 female in each team. Each team consisted of two data collectors and one team leader.

The survey manager was a specialized ACF SMART program manager. The head of project and the team leaders were ACF employees with nutrition program experience in Maungdaw district. These people participated to both surveys. The data collectors were recruited locally. The recruitment process included being shortlisted to write a position specific test followed by an in charge person interview.

The team received 7 days of nutritional training, including training on SMART methodology and all of the practical aspects. A standardization test was conducted on the 4th day in order to evaluate the accuracy and

[22] SMART. June 2012. Sampling Methods and Sample Size Calculation for the SMART Methodology.
[23] SMART. June 2012. Sampling Methods and Sample Size Calculation for the SMART Methodology.

precision of the data collectors in taking anthropometric measurements. Results from the standardization test were used in part to determine balanced team selection.

A field test was also conducted on the 6th day of training to evaluate the teams in a 'real life' setting and improvements were made where needed. As well, a concerted effort was taken during training to teach the staff various methods of how to properly determine a child's age if a mother could not remember or if there was no record of a child's birth.

5.6 Supervision of survey team

The survey included 16 days of data collection for Maungdaw Township and 17 days for Buthidaung Township.

5.7 Anthropometric equipment and tool

5.7.1 Age

A detailed local event calendar was used extensively to help determine or verify a child's age in months (see Annex 8).

5.7.1 Height

A standard wooden anthropometric height board was used for measuring height, with a precision of 0.1 cm. All children less than 2 years old were measured by lying down.

5.7.2 Weight

A standard Salter brand 25 kg hanging scale was used to measure all children to the nearest 100g (0.1kg). All scales were calibrated with a 2kg weight using SMART methods[24] before weighing each child.

5.7.3 Mid Upper Arm Circumference tape

A standard 30cm all-white ACF MUAC tape was used to measure all children. An all-white MUAC tape was used as opposed to a colored green, yellow, red MUAC tape in order to reduce the incidences of rounding to the nearest centimeter.

5.8 Nutritional indices, definition of terms

5.8.1 Weight-for-height index (W/H)

The prevalence of acute malnutrition (or wasting) is determined using the weight-for-height index, as an

[24] SMART. April 2006. SMART methodology version 1

indicator of current nutritional status. A child's nutritional status is estimated by comparing it to the weight-for-height curve of a reference population (NCHS references and WHO standards data[25]). This curve has a normal shape and is characterized by the median weight (value separating the population into two groups of the same size) and its standard deviation (SD). The weight-for-height index of a child from the studied population can be expressed either as a percentage of the median or as a Z-score according to NCHS reference and only as a Z-score according to WHO standards.

- The expression of the weight-for-height index as a percentage of the median measures the difference between the observed weight value (OW) and the median weight (MW) of the reference population, for children of the same height: WHM = (OW / MW) * 100
- The expression of the weight-for-height index as a Z-score (WHZ) compares the observed weight (OW) of the surveyed child to the mean weight (MW) of the reference population, for a child of the same height. The Z-score represents the number of standard deviations (SD) separating the observed weight from the mean weight of the reference population: WHZ = (OW - MW) / SD

The weight-for-height index in percentage of the median is calculated on the field for each child, written on the anthropometric questionnaire in order to refer malnourished cases to the appropriate centre. The weight-for-height index as a Z-score will be calculated according to NCHS references, as well as WHO standards data, which enable comparison of results with the previous surveys.
The weight for height index as a percentage of the median is calculated only according to NCHS references, the WHO standards data being not fully reliable so far. WHO recommends the use of Z-scores as it is considered to be more reliable in terms of statistical theory.

Table 3: Definition of acute malnutrition according to weight for height index (W/H)

Z-scores
Global Acute Malnutrition (GAM) : < -2 Z-Scores and/or oedema
Severe Acute Malnutrition (SAM) : < -3 Z-Scores and/or oedema
Percent of median
Global Acute Malnutrition (GAM) : < 80% median and/or oedema
Severe Acute Malnutrition (SAM) : < 70% median and/or oedema

5.8.2 Bilateral oedema

Bilateral oedema is a sign of Kwashiorkor, one of the major clinical forms of severe acute malnutrition. When associated with Marasmus (severe wasting), it is called Marasmic-Kwashiorkor. Children with bilateral oedema are automatically categorized as being severely malnourished, regardless of their weight-for-height index[26].

[25] NCHS: National Centre for Health Statistics .1977. NCHS growth curves for children birth-18 years.

[26] SMART. April 2006. SMART methodology version 1

5.8.3 Height-for-Age index (H/A)

The height-for-age index indicates if a child of a given age is stunted. This index reflects the nutritional history of a child rather than his/her current nutritional status. This is mainly used to identify chronic malnutrition. The same principle is used as for weight-for-height, except that a child's chronic nutritional status is estimated by comparing its height with NCHS reference or WHO standards height-for-age curves, as opposed to weight-for-height curves. The height-for-age index of a child from the studied population is expressed in Z-score (HAZ). The following HAZ cut-off points are used:

Table 4: Cut off points of the height for age index (HAZ) expressed as a Z-score

Not stunted:	≥ -2 z-score
Moderate stunting	-3 z-score ≤ H/A < -2 z-score
Severe stunting	< -3 z-score

As for the weight-for-height index, the height-for-age index as a Z-score is calculated according to NCHS references, as well as WHO standards data, which enable comparison of results with the previous surveys.

5.8.4 Weight-for-Age (W/A)

The weight-for-age index indicates if a child is underweight. The weight-for-age indicator is a combination of part of the wasting (weight) and stunting (age) nutritional indices. Evidence has shown that the mortality risk of children who are even mildly underweight is increased, and severely underweight children are at even greater risk[27].

Table 5: Cut off points of the weight for age (WAZ) expressed as a z-score

Not underweight:	≥ -2 z-score
Moderate underweight	-3 z-score ≤ H/A < -2 z-score
Severe underweight	< -3 z-score

5.8.5 Mid Upper Arm Circumference (MUAC)

MUAC directly assess the fat free mass. The reason that measuring this component is important is that fat free mass, usually muscle is a good indicator of the protein reserves of a body.

5.8.5.1 MUAC for children

The mid upper arm circumference does not need to be related to any other anthropometric measurement. It is a reliable indicator of the muscular status of the child and is mainly used to identify children acute malnutrition and risk of mortality. The MUAC cut-off used by ACF in this survey is as in the table below:

[27] WHO. 2010. Background paper 4 nutrition indicators.

Table 6: Cut off points of the Mid Upper Arm Circumference for children

MUAC (mm)	Nutritional status
135 ≤ MUAC	No malnutrition
125 ≤ MUAC < 135	At risk of malnutrition
115 ≤ MUAC < 125	Moderate malnutrition
MUAC < 115	Severe malnutrition

5.8.5.2 MUAC for Pregnant and Lactating Women

While there is very limited literature available on optimal targeting cut offs, data from a recent global mapping exercise indicates that for targeted supplementary feeding, over 90% of countries implementing targeted supplementary feeding programs for PLW were using MUAC as the anthropometric admission criteria; with an even split between countries using cut-offs for admission of <21.0 and 23.0cm (WFP/Valid 2013- Ververs [28]et al, in press).
These two MUACs cut-off to define acute malnutrition have been used by ACF in this survey.

5.9 Mortality rates formula

The mortality rate of a given population is good indicator of health conditions in the area surveyed. The mortality rate is determined for children under 5 years old and for the whole population. It is expressed in relation to 10,000 people and per day. The mortality rate is calculated by ENA software 2011 version.

The crude death mortality or CDR is calculated using the following formula:

$$CDR = \frac{\text{Number of deaths}}{\frac{\text{Total population}}{10\,000} \times \text{Time interval}} = \text{Deaths/10 000/day}$$

The total population is the population present at the midpoint of the time interval. The time interval is the length of time within which the respondents are asked to state if any deaths have occurred; this is usually referred to as the recall period.

Total population = total number of people present at the time of the survey in the household + ½ death + ½ people present at the beginning of the investigated period but gone at the time of the survey - ½ people arriving during the investigated period and present at the moment of the survey -½ birth during the investigated period.

The time interval is the number of days between the first day of retrospective period and the last day of the survey.

[28] Identification of acute malnutrition, adverse birth outcomes and nutritional care for pregnant, lactating women in emergency or protracted crises-2011

The mortality rate for the 0-5 years old or 0-5 DR is calculated using the following formula:

$$0\text{-}5DR = \frac{\text{Number of death for children 0 to 5 years old}}{\frac{\text{Population under 5 years old}}{10\,000} \times \text{Time interval}} = \text{Deaths/10,000/day}$$

The total population of children under 5 = total number of children under 5 present at the time of the survey in the household + ½ death 0-5 years + ½ children present at the beginning of the investigated period but gone at the time of the survey – ½ children arrived during the investigated period and present at the time of the survey – ½ birth during the investigated period.

Interpretation references [29] of mortality rate thresholds are:

- For children under five years old:
  - Alert level: 0-5DR ≥ 2 deaths/10,000 children/day
  - Emergency level: 0-5DR ≥ 4 deaths /10,000 children/day
- For the total population:
  - Alert level: CDR ≥ 1 death / 10.000 people /day
  - Emergency level: CDR ≥ 2 deaths / 10.000 people /day

5.10 Morbidity indices, definition of terms

Acute infections such as acute respiratory infections, fever, and diarrhoea, in children are responsible for rapid weight loss. In combination there is a vicious downward cycle of infection and malnutrition, where undernourished children are unable to fight off disease because of decreased immune response, increasing the severity of disease and at the same time increasing rapid weight loss. Children who are severely malnourished have a greater risk of death due to acute infection than normally nourished children[30].

5.10.1 Morbidity definitions

Diarrhoea: minimum 3 watery stools within 24 hours[31]

Fever: body temperature higher than normal determined by a child having a warm forehead and exhibiting symptoms common with fever such as lethargy

Acute respiratory infection: acute infections pertaining to the lungs including cough, pneumonia, chest in drawing, rapid breathing[32]

[29] ACC, SCN, Moren. Nov 1995. Health and nutrition information systems among refugees and displaced persons, Workshop report on refugees nutrition.
[30] WHO. 1999. WHO report on infectious diseases; removing obstacles to healthy development.
[31] WHO. April 2013.Diarrhoeal disease fact sheet 330.
[32] WHO. 2013. Acute respiratory infections

5.11 Infant feeding indices, definitions of terms

Infant and young child feeding practices directly affect the nutritional status of children under two years of age and, ultimately, impact child survival. Improving infant and young child feeding practices in children 0-23 months of age is therefore critical to improved nutrition, health and development of children[33]

5.11.1 Infant feeding definitions

Exclusive breastfeeding: only breast milk (including milk expressed or from wet nurse) as well as ORS, drops, syrups (vitamins, minerals, medicines). [34]

Complementary feeding: breast milk (including milk expressed or from wet nurse) as well as any food or liquid including non-human milk and formula. [35]

5.11.2 Continued breastfeeding at 1 year:

$$\frac{\text{Children 12-15 months of age who received breastmilk during the previous day}}{\text{Children 12-15 months of age}}$$

5.11.3 Timely complementary feeding:

$$\frac{\text{Children 6-9 months of age who were breastfed in the past 24 hours and who also received at least one food in the past 24 hours}}{\text{Children 6-9 months of age}}$$

5.11.4Introduction of solid, semi-solid or soft foods:

$$\frac{\text{Infant 6-8 months of age who received solid, semi-solid or soft foods during the previous day}}{\text{Infant 6-8 months of age}}$$

5.11.5 Individual dietary diversity for infants (Minimum dietary diversity score, IDDS)

Individual dietary diversity for infants 6-23 months can be calculated using the Minimum dietary diversity score, IDDS, in order to determine if a child is consuming a diet from a variety of foods groups. The calculation of IDDS for children 6-23 months is based on food groups (grains/roots/tubers, legumes/nuts, flesh foods/meat, eggs, dairy, vitamin A rich fruit and vegetables, and other fruit and vegetables). Consuming a minimum of four of the above food groups in the 24h prior to the survey is considered

[33] UNICEF, WHO, USAID et al (2007) Indicators for assessing infant and young child feeding practices
[34] UNICEF, WHO, USAID et al (2007) Indicators for assessing infant and young child feeding practices
[35] UNICEF, WHO, USAID et al (2007) Indicators for assessing infant and young child feeding practices

acceptable[36].

5.11.6 Minimal Meal Frequency

Minimum meal frequency: Proportion of breastfed and non-breastfed children 6–23 months of age who receive solid, semi-solid, or soft foods (but also including milk feeds for non-breastfed children) the minimum number of times or more.

The indicator is calculated from the following two fractions:

$$\frac{\text{Breastfed children 6–23 months of age who received solid, semi-solid or soft foods the minimum number of times or more during the previous day}}{\text{Breastfed children 6–23 months of age}}$$

and

$$\frac{\text{Non-breastfed children 6–23 months of age who received solid, semi-solid or soft foods or milk feeds the minimum number of times or more during the previous day}}{\text{Non-breastfed children 6–23 months of age}}$$

Minimum is defined as:

- 2 times for breastfed infants 6–8 months
- 3 times for breastfed children 9–23 months
- 4 times for non-breastfed children 6–23 months

5.11.7 Minimum acceptable diet

Minimum acceptable diet: Proportion of children 6–23 months of age who receive a minimum acceptable diet (apart from breast milk).

This composite indicator is calculated from the following two fractions[37]:

$$\frac{\text{Breastfed children 6–23 months of age who had at least the minimum dietary diversity and the minimum meal frequency during the previous day}}{\text{Breastfed children 6–23 months of age}}$$

And

Non-breastfed children 6–23 months of age who received at least 2 milk feedings and had at least the minimum dietary diversity not including milk feeds and the minimum

[36] UNICEF, WHO, USAID et al (2007) Indicators for assessing infant and young child feeding practices
[37] UNICEF, WHO, USAID et al (2007) Indicators for assessing infant and young child feeding practices

meal frequency during the previous day

Non-breastfed children 6–23 months of age

5.11.8 Children ever breastfed:

Children born in the last 24 months who were ever breastfed

Children born in the last 24 months

5.11.9 Continued breastfeeding at 2 years:

Children 20–23 months of age who received breast milk during the previous day

Children 20–23 months of age

5.12 Food security indices

There are currently two primary indicators used at household level, the Household Dietary Diversity Score (HDDS) and the Food Consumption Score (FCS).

5.12.1 Household Dietary Diversity Score (HDDS)

The HDDS is used as a proxy measure of the socio-economic level of the household. The calculation of HDDS is based on consuming any amount of the following 12 food groups in the previous 24 hours of a normal day (cereals, roots/ tubers, vegetables, fruits, meat/poultry/offal, eggs, fish/seafood, pulses/legumes/nuts, dairy, oil/fats, sugar/honey, miscellaneous)[38]. Preliminary information suggests that 3 or fewer food groups adequately reflect severe dietary inadequacy while consumption of only 4 food groups indicates moderate dietary inadequacy. Anything above 4 would indicate adequate dietary diversity. Please note that these cutoffs continue to be assessed so recommendations may change over time[39].

5.12.2 Food Consumption Score (FCS)

The frequency weighted diet diversity score or Food Consumption Score (FCS) is a score calculated using the frequency of consumption of different food groups consumed by a household/individual during the 7 days before the survey. The food groups included are cereals/tubers, pulses, vegetables, fruits, meats/fish, dairy, fats/cooking oils, sugars. A score of 0-21 is poor, 21.5-35 is borderline, and over 35 is adequate[40].

[38] FANTA. Sept 2006. HDDS for measurement of household food access; indicator guide.

[39] FSIN Myanmar. Nov 2012. Recommended indicators to measure the food security status of households and communities

[40] FSIN Myanmar. Nov 2012. Recommended indicators to measure the food security status of households and communities

5.13 Mental Health

The WHO (Five) Well-Being Index (1998 version**)** has been designed by the Psychiatric Research Unit - WHO Collaborating Center for Mental Health, Frederiksborg General Hospital, DK-3400 Hillerød.

Instructions: The person has to indicate for each of the five statements, which is closest to how she/he has been feeling over the last two weeks. Higher numbers mean better well-being. For a better understanding during interview, categories of time have been précised as indicated in the table below.

Table 6: WHO (Five) Well-Being questionnaires in two weeks before the survey

	Over the last two weeks ...	**All of the time** *(14 days)*	**Most of the time** *(10 to 13 days)*	**More than half of the time** *(7 to 9 days)*	**Less than half of the time** *(4 to 6 days)*	**Some of the time** *(1 to 3 days)*	**At no time** *(0 days)*
1	**... have you felt cheerful and in good spirits ?**	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1	☐ 0
2	**... have you felt calm and relaxed ?**	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1	☐ 0
3	**... have you felt active and vigorous ?**	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1	☐ 0
4	**... did you woke up feeling fresh and rested ?**	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1	☐ 0
5	**... your daily life has been filled with things that interest you ?**	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1	☐ 0

Scoring: The raw score is calculated by totaling the figures of the five answers. The raw score ranges from 0 to 25, 0 representing worst possible and 25 representing best possible quality of life.
To obtain a percentage score ranging from 0 to 100, the raw score is multiplied by 4. A percentage score of 0 represents worst possible, whereas a score of 100 represents best possible quality of life.

Interpretation: WHO5 can be used for screening of depression in primary care. It is recommended to administer the Major Depression (ICD-10) Inventory if the raw score is below 13 or if the patient has answered 0 to 1 to any of the five items. A score below 13 indicates poor wellbeing and means that a psychosocial follow-up could be helpful.
WHO5 can also give light preliminary information about signs of unhappiness and changing mood (question 1), stress (question 2), loss of energy (question 3), sleeping problem (question 4) and lack of interests and social support (question 5).

5.14 WASH

This section focuses on Water and Sanitation indicators only. The hygiene indicators are covered under the Nutrition section.
Indicators herein correlate to the monitoring indicators of the Millenium Development Goal (MDG) 7 target C under the 2010-2015 strategy and mandate of the WHO/Unicef Joing Moniotiring Programme (JMP) which are “Proportion of population using an improved drinking water source” and “Proportion of population using improved sanitation facilities.”
Indicators demonstrate presence of water and sanitation facilities only. More details per indicator are described below.

5.14.1 Primary Drinking Water Source

Type of primary drinking water source was a water indicator used in this survey. This indicator demonstrates whether the primary drinking water source of the population is “improved” or “unimproved,” correlating with the MDG 7 indicator. Note that an “improved water source” means water separated from fecal contamination or “improved access”, but it does not guarantee “safe” drinking water source, therefore this indicator is used as a proxy indicator. In this survey, improved water sources included: boreholes and protected wells; while unimproved water sources included: open wells, ponds and rivers.

5.14.4 Water Treatment

This secondary water indicator is collected as a proxy indicator for water quality as laboratory water quality monitoring was not conducted. Effective and ineffective water treatment methods were considered in the survey and distinguished in the analysis.

5.14.1 Household Latrines

In the survey, presence of household latrine is an indicator used to demonstrate access to sanitation facility at the household level which ultimately provides safer environmental conditions at household and community level. This indicator does not classify the household latrine as improved or unimproved sanitation facility; and for purposes of analysis, it is assumed that households without a latrine are practicing open defecation.

5.14.2 School Latrines

School latrine is used as an indicator to show whether schools have basic sanitation infrastructure for safe waste disposal. As well, this indicator is extrapolated to demonstrate whether children have access to school sanitation facilities.

5.15 Data Analysis

The anthropometric and mortality data were analyzed using ENA for SMART software November 2011 version. All other data collected was analyzed using Excel, SPSS and Epi Info version 7.

6. RESULTS FOR MAUNGDAW TOWNSHIP

The anthropometric measurements of 429 children were recorded. The number of children was higher than the 397 required for a representative sample determined by the ENA for SMART sample size calculation. 32 cluster were done out of the 33 planned.

6.1 Age and gender distribution

The result showed that there was a moderate significant different in age distribution (p=0.001) with an under representation for the oldest group age 54-59 months.

The overall gender ration of the sample population was 1.0 which is within the normal range of 0.9 – 1.2[41].

Table 7: Distribution of age and sex of sample

AGE (mo)	Boys		Girls		Total		Ratio
	no.	%	no.	%	no.	%	Boy:girl
6-17	53	50.5	52	49.5	105	24.4	1
18-29	62	54.4	52	45.6	114	26.5	1.2
30-41	51	45.9	60	54.1	111	25.8	0.9
42-53	37	48.7	39	51.3	76	17.7	0.9
54-59	14	58.3	10	41.7	24	5.6	1.4
Total	217	50.5	213	49.5	430	100	1.0

6.2 Nutritional status based on WHO standards 2006

6.2.1 Acute malnutrition expressed in Z-score

A total of 429 children were included in the weight-for-height analysis.

The prevalence of GAM was 20.0% (15.1 – 26.1 95% C.I) and SAM was 3.0% (1.5 – 6.0 95% C.I). The prevalence of MAM in boys and girls were the same proportion as 17.1% (12.0 – 23.6 95% C.I) in boys and 17.0% (10.7 – 25.9 95% C.I) in girls.

The prevalence of SAM in boys was 2.3 % (1.0 - 5.2 95% C.I.) and for girls was 3.8 % (1.8 - 7.8 95% C.I.)). However no statistical difference was found between weight for height z scores and gender (p>0.05)

[41] Save the Children (2004). Emergency nutrition assessment: guidelines for field workers

Table 8: Prevalence of acute malnutrition based on weight-for-height z-score (and/or oedema) and by sex

	All n = 429	Boys n = 217	Girls n = 212
Prevalence of global malnutrition (<-2 z-score and/or oedema)	(86) 20.0 % (15.1 - 26.1 95% C.I.)	(42) 19.4 % (13.9 - 26.2 95% C.I.)	(44) 20.8 % (14.3 - 29.2 95% C.I.)
Prevalence of moderate malnutrition (<-2 z-score and >=-3 z-score, no oedema)	(73) 17.0 % (12.3 - 23.1 95% C.I.)	(37) 17.1 % (12.0 - 23.6 95% C.I.)	(36) 17.0 % (10.7 - 25.9 95% C.I.)
Prevalence of severe malnutrition (<-3 z-score and/or oedema)	(13) 3.0 % (1.5 - 6.0 95% C.I.)	(5) 2.3 % (1.0 - 5.2 95% C.I.)	(8) 3.8 % (1.8 - 7.8 95% C.I.)

The analysis per age group shows that among the survey sample, the youngest age group 6-17 months represented the highest prevalence of SAM with 6.7% of the children affected and the highest prevalence of MAM with 27.6% of the children affected which was similar with the previous latest two surveyed result of 2008 and 2010.

The result for MAM was quite similar in all age groups except the youngest group 6-17 month had 27.6% as mentioned above.

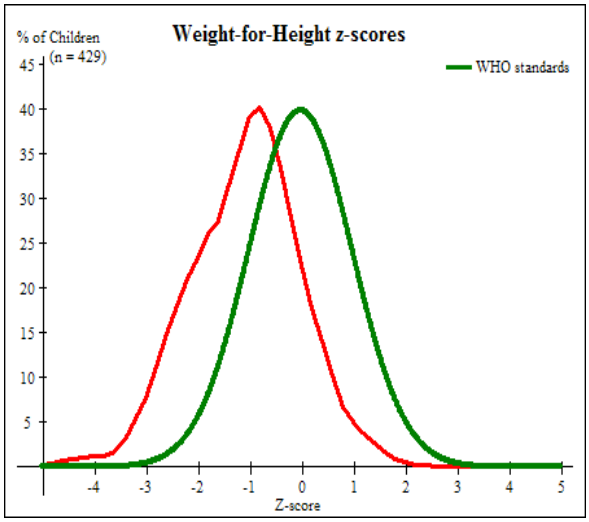
No case of oedema was found in the sample.

Table 9: Prevalence of acute malnutrition by age, based on weight-for-height z-score and/or oedema

Age (mo)	Total no.	Severe wasting (<-3 z-score)		Moderate wasting (>= -3 and <-2 z-score)		Normal (> = -2 z score)		Oedema	
		No.	%	No.	%	No.	%	No.	%
6-17	105	7	6.7	29	27.6	69	65.7	0	0
18-29	114	5	4.4	17	14.9	92	80.7	0	0
30-41	111	1	0.9	14	12.6	96	86.5	0	0
42-53	75	0	0	9	12	66	88	0	0
54-59	24	0	0	4	16.7	20	83.3	0	0
Total	429	13	3	73	17	343	80	0	0

The weight-for-height distribution curve of the observed population is shifted to the left showing a lower weight for any given height when compared to the reference population (WHO standards 2008).

Figure 1: Weight for height Z-score distribution curve, WHO standards, Maungdaw Township



6.2.2 Acute malnutrition expressed by MUAC

A total of 429 children were measured by MUAC and included in the analysis.
The prevalence of children with a MUAC <125 mm was 17.9% (13.7 – 23.2 95% C.I) and the prevalence of MUAC <115 mm was 5.8% (3.6 – 9.3 95% C.I).

The prevalence of MUAC (< 125 mm and >= 115 mm) and MUAC (<115) in boys was respectively 8.8% (5.9 - 12.7 95% C.I.) and 4.6 % (2.4 - 8.7 95% C.I.).

The prevalence of MUAC (< 125 mm and >= 115 mm) and MUAC (<115) in girls was respectively 15.6 % (11.2 - 21.2 95% C.I.) and 7.1 % (4.3 - 11.5 95% C.I.).

A statistical difference was found between MUAC scores and gender (p=0.031). Girls were found more at risk to be malnourished with MUAC than boy.

Table 10: Prevalence of acute malnutrition based on MUAC cut offs and by sex and oedema

	All n = 429	Boys n = 217	Girls n = 212
Prevalence of global malnutrition (< 125 mm and/or oedema)	(77) 17.9 % (13.7 - 23.2 95% C.I.)	(29) 13.4 % (9.1 - 19.1 95% C.I.)	(48) 22.6 % (16.5 - 30.2 95% C.I.)
Prevalence of moderate malnutrition (< 125 mm and >= 115 mm, no oedema)	(52) 12.1 % (9.6 - 15.2 95% C.I.)	(19) 8.8 % (5.9 - 12.7 95% C.I.)	(33) 15.6 % (11.2 - 21.2 95% C.I.)
Prevalence of severe malnutrition (< 115 mm and/or oedema)	(25) 5.8 % (3.6 - 9.3 95% C.I.)	(10) 4.6 % (2.4 - 8.7 95% C.I.)	(15) 7.1 % (4.3 - 11.5 95% C.I.)

All children under 65 cm were at risk of malnutrition or were malnourished.
Children in the length/height group of < 65 were the most affected by acute malnutrition, both severe and moderate according to the MUAC classification followed by the children in the length/height group of ≥65 – <75.

Table 11: Prevalence of acute malnutrition according to MUAC classification using height cut off

MUAC	Definition	Total		Length/Height (cm)							
				<65		≥65 – <75		≥75 – <90		≥90	
		N	%	N	%			N	%	N	%
<115 mm	**Severe malnutrition**	25	5.8%	8	53.3%	9	9.8%	8	4.0%	0	0.0%
≥115 – <125 mm	**Moderate malnutrition**	52	12.1%	5	33.3%	26	28.3%	17	8.5%	4	3.3%
≥125 – <135 mm	**At risk of malnutrition**	106	24.7%	2	13.3%	34	37.0%	54	27.0%	16	13.1%
≥135 mm	**No increased risk**	246	57.3%	0	0.0%	23	25.0%	121	60.5%	102	83.6%
Total		429	100.0%	15	100.0%	92	100.0%	200	100.0%	122	100.0%

6.3 Chronic malnutrition

A total of 429 children were included in the analysis. The global chronic malnutrition rate was 47.6% (38.7 – 56.6 95% C.I) and severe stunting was 22.4% (16.9 – 29.1 95% C.I).

The prevalence of moderate stunting in boys was respectively 28.6 % (22.0 - 36.2 95% C.I.) and 21.7 % (16.1 - 28.5 95% C.I.) in girls.
The prevalence of severe stunting in boys was respectively 23.0 % (16.5 - 31.3 95% C.I.) and 21.7 % (15.3 - 29.9 95% C.I.) in girls.

No statistical different was found between height for age z-score and gender (p >=0.05)

Table 12: Prevalence of stunting based on height-for-age z-score and by sex

	All n = 429	**Boys** n = 217	**Girls** n = 212
Prevalence of stunting (<-2 z-score)	(204) 47.6 % (38.7 - 56.6 95% C.I.)	(112) 51.6 % (41.3 - 61.8 95% C.I.)	(92) 43.4 % (32.9 - 54.5 95% C.I.)
Prevalence of moderate stunting (<-2 z-score and >=-3 z-score)	(108) 25.2 % (20.6 - 30.4 95% C.I.)	(62) 28.6 % (22.0 - 36.2 95% C.I.)	(46) 21.7 % (16.1 - 28.5 95% C.I.)
Prevalence of severe stunting (<-3 z-score)	(96) 22.4 % (16.9 - 29.1 95% C.I.)	(50) 23.0 %(16.5 - 31.3 95% C.I.)	(46) 21.7 % (15.3 - 29.9 95% C.I.)

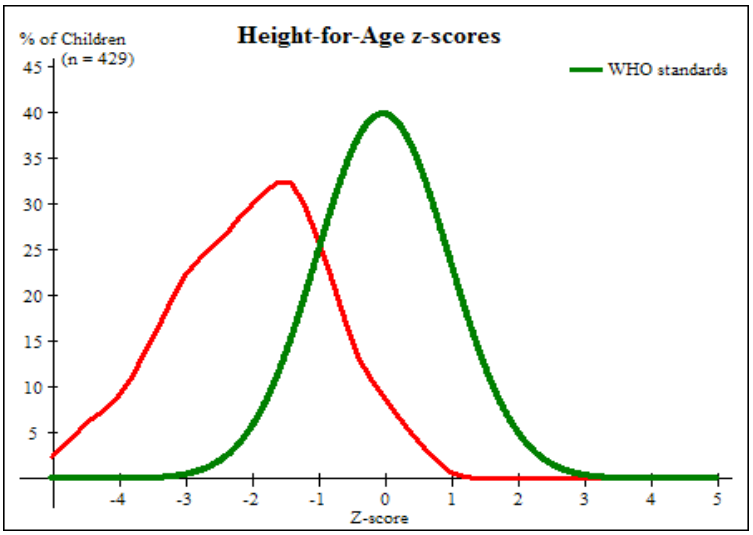
Severe stunting was over 20% in all age groups except the age group 54-59 month. Moderate stunting was over 20% for all age group.

Table 13: Prevalence of stunting by age based on height for age z-scores

		Severe stunting (<-3 z-score)		**Moderate stunting (>= -3 and <-2 z-score)**		**Normal (> = -2 z score)**	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	105	21	20	22	21	62	59
18-29	114	30	26.3	32	28.1	52	45.6
30-41	111	25	22.5	29	26.1	57	51.4
42-53	75	17	22.7	19	25.3	39	52
54-59	24	3	12.5	6	25	15	62.5
Total	429	96	22.4	108	25.2	225	52.4

The height for age distribution curve of the observed population is shifted to the left of the reference population indication including that children of the studied population have a lower height at a given when it is compared to the reference population. The mean height for age index z-score of the sample is 11.88±1.10.

Figure 2: Height for age z-score distribution, WHO standards



6.4 Underweight

A total of 429 children were included in the analysis. The global underweight malnutrition rate was 42.9% (35.8 – 50.3 95% C.I) and severe underweight was 15.6% (11.0 – 21.7 95% C.I). The prevalence of severe underweight rate in boys was 13.8% (9.4 - 19.9 95% C.I.) and girls were 17.5% (11.9 - 24.9 95% C.I.)
The prevalence of moderate underweight rate in boys was 29.5% (23.8 - 35.9 95% C.I.) and girls were 25% (18.3 - 33.2 95% C.I.)

No statistical difference was found between height for age z-scores and gender (p>0.05)

Table 14: Prevalence of underweight based on weight for age z scores by sex

	All n = 429	**Boys** n = 217	**Girls** n = 212
Prevalence of underweight (<-2 z-score)	(184) 42.9 % (35.8 - 50.3 95% C.I.)	(94) 43.3 % (35.7 - 51.2 95% C.I.)	(90) 42.5 % (33.6 - 51.8 95% C.I.)
Prevalence of moderate underweight (<-2 z-score and >=-3 z-score)	(117) 27.3 % (22.6 - 32.4 95% C.I.)	(64) 29.5 % (23.8 - 35.9 95% C.I.)	(53) 25.0 % (18.3 - 33.2 95% C.I.)
Prevalence of severe underweight (<-3 z-score)	(67) 15.6 % (11.0 - 21.7 95% C.I.)	(30) 13.8 % (9.4 - 19.9 95% C.I.)	(37) 17.5 % (11.9 - 24.9 95% C.I.)

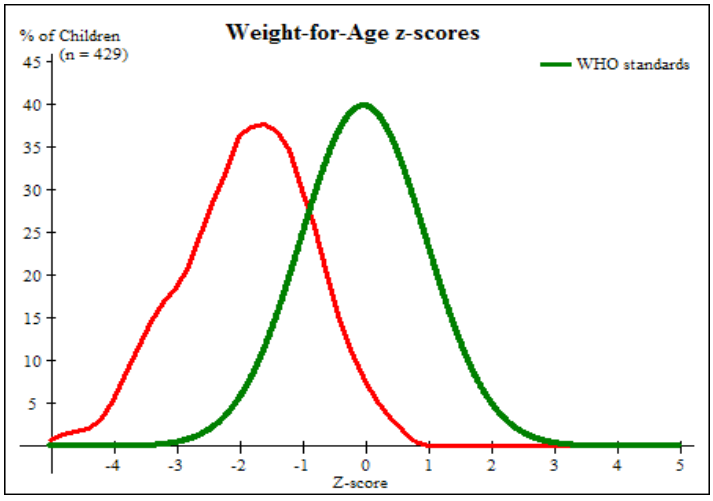
The prevalence of severe underweight in the sample surveyed was highest in the 18-29 age groups (21.9%) and 6-17 age groups (18.1%).
The prevalence of moderate underweight was above 20% in all age groups and above 30% for the 6-17 and 54-59 age groups.

Table 15: Prevalence of underweight by age, based on weight for age z-scores

		Severe underweight (<-3 z-score)		Moderate underweight (>= -3 and <-2 z-score)		Normal (> = -2 z score)	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	105	19	18.1	34	32.4	52	49.5
18-29	114	25	21.9	25	21.9	64	56.1
30-41	111	11	9.9	31	27.9	69	62.2
42-53	75	10	13.3	19	25.3	46	61.3
54-59	24	2	8.3	8	33.3	14	58.3
Total	429	67	15.6	117	27.3	245	57.1

The weight-for-age distribution curve of the observed population is shifted to the left and showing a lower weight for any given when it was compared to the reference population.

Figure 3: Weight for age Z-score distribution curve, WHO standards,



6.5. Pregnant and lactating women- Nutrition status based on MUAC

88.7% of the Pregnant and lactating women were in the ≥18 -< 35 years old age group.

44.4% of the Pregnant and Lactating women have a MUAC under 230mm. 12.4% of the Pregnant and Lactating women have a MUAC under 210 mm,
There is a statistical difference between Pregnant and Lactating women: Pregnant women are more prone to get a MUAC < 230 than lactating ones.

Table 16: Percent of pregnant and lactating women aged 15-45 years old based on MUAC cut off

MUAC	Total number	Percent	Pregnant	Percent	Lactating	Percent
MUAC <210 mm	24	12.4%	8	16.0%	16	11.1%
MUAC ≥210 and <230 mm	62	32.0%	19	38.0%	43	29.9%
MUAC ≥230 mm	108	55.6%	23	46.0%	85	59.0%
Total	194	100.0%	50	100.0%	144	100.0%

6.6 Retrospective mortality survey

6.6.1 Demographic data

A total of 383 households with an average of 5.9 people per household were included in the Maungdaw Township retrospective mortality survey.

The total population of the survey was 2273, including 460 under 5 years (1.2 under 5 per household), representing 20.2% of the sample population.

6.6.2 Crude Death and under five death rates

The crude death rate for the total population in the retrospective mortality was 0.27 and the under 5 death rate was 0.68.

Table 17: Crude death and under five death rate for Maungdaw retrospective mortality survey

Recall period	Population	Number of people surveyed	Number of deaths	Crude death rate	Design effect
98 days	Total	2273	3	0.27 (0.11-0.66 95%C.I.)	1
98 days	Under 5	460	3	0.68 (0.23-2.05 95%C.I.)	1

6.7 Morbidity

A total of 78.0% of children had an acute illness[42] during the time of the survey.

Table 18: Percentage of illness in children with acute illness two week prior to interview

Health Status	Number of Children		Percent of Children		Total	Percent
	M	F	M	F		
Illness	162	174	74.7%	81.3%	336	78.0%
No illness	55	40	25.3%	18.7%	95	22.0%
Total	217	214	100.00%	100.00%	431	100.00%

Of the 78.0% of the children reported to have an illness, the most common morbidity found were Fever and Acute respiratory infection: These incidences are high with 38.1% of children suffering from fever and 36.9% of the children suffering from ARI in the last 15 days. 11.5% of the children were affected by diarrhea.
13.5% of others sickness were divided as following: 51.5% scabies, 20.0% runny nose, 15.7% vomiting, 7.1% eye infection and 5.7% otitis media.
No statistical evidence was found between boys and girls and each of the illnesses below ($p>0.05$).

Table 19: Prevalence of type of illness for children with one or more acute illness reported two weeks prior to the survey

Illness	Number of Children		Percent of Children		Total	Percent
	M	F	M	F		
Diarrhea	35	35	50.0%	50.0%	70	11.5%
Fever	113	120	48.5%	51.5%	233	38.3%
ARI	108	116	48.2%	51.8%	224	36.8%
Other	43	39	52.4%	47.6%	82	13.5%

6.8 Child Feeding Practices

A total of 155, 6-23 month children were included in the survey. Three of the 155 children were exclusively breastfed. The mothers of these children were not asked questions pertaining to complementary feeding.

[42] Illness was defined as a child who had one or more morbidity; including diarrhea, fever, ARI or other, in the two weeks before the interview

6.8.1 Breastfeeding status and introduction of complementary foods

International recommendations are to exclusive breastfeed until the age of 6 months and then to timely introduce complementary foods while continuing breastfeeding until 24 months and onwards[43].

All surveyed children had been breastfed at one point.
Mothers were asked if the child was still breastfeeding. At the time of the survey, 81.3% of children were still breastfeeding while 18.7% had stopped breastfeeding with an average of 14 months. 1.9% of the children were still exclusively breastfed despite the fact that they already reached 6 months.

The result of the survey suggests high rates of continued breastfeeding. 90.2% of continued breastfeeding at 1 year (12-15 months) is observed. 79.4% if the children meet international recommendation to continue breastfeeding until 24 months.

81.4% of breastfed children (6-9 month) received a solid, semi-solid or soft food in the 24 hour recall period.
Food is introduced at an early age, by 6 months, 78.7% of the children were introduced to complementary foods, meaning that we can assume that 21.3% were exclusively breastfed until 6 months. See table 21 for details.
Rice porridge (60.5%), rice powder (20.4%) maize quicka (10.5%) and biscuit/cake (5.9%) accounted for 97.3% of the first food introduced to 6-23 month children.
94.7% of the 6-8 month children received a solid or semi-solid food in the previous 24 hours recall period.

The mean minimum dietary diversity score was 1.9 which is drastically below the minimum acceptable score of 4. Only 11.2% of children 6-23 months had acceptable dietary diversity in the 24 hours prior to the survey. A slight discrepancy can be observed between boy 1.8 and girl 2.0.
Grains for 93.4% were the most common IDDS foods group consumed in the 24 hours before the interview, followed by flesh foods (meat, fish, poultry and liver/organ meats) for 50.0%, then dairy products for 24.5% and vitamin A fruits and vegetables for 13.2%. The percentage of children consuming others fruit and vegetable, legumes and nuts and eggs were low.

45.4% of the non-breastfed and breastfed children consumed the minimum acceptable number of meals (4) in the 24 hours prior to the survey. This percentage was 24.4% for the none-breastfed children and 50.2% for the breastfed ones.
As a result of these 2 indicators mentioned above, the percentage of children receiving a minimal acceptable diet was extremely low**:** 3.2%. No significant discrepancy between none-breastfed children and breastfed children.

[43] UNICEF.2008. Recommendations for optimal breastfeeding

Table 20: Age of 6-23 month children were introduced to complementary foods before 6 months

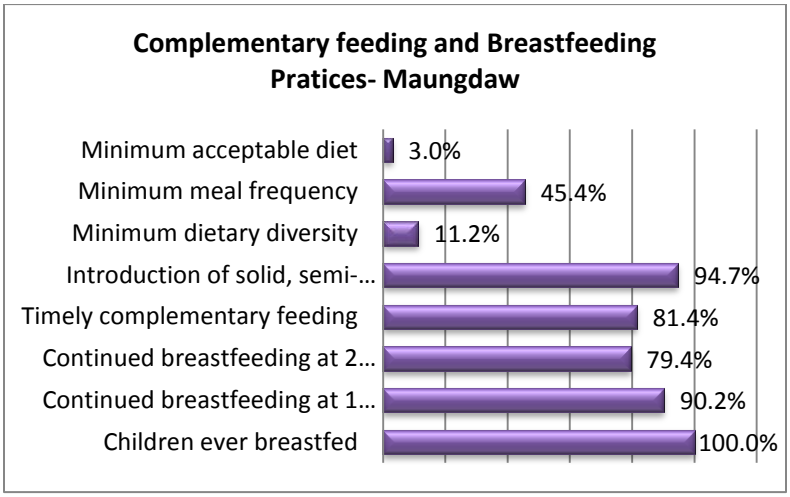
Months	Number of Children	Percent
1	42	27.1%
2	25	16.1%
3	26	16.8%
4	20	12.9%
5	9	5.8%
TOTAL	122	78.7%

Table 21: IDDS foods group consumption of 6-23 month children in 24 hours before the survey

IDDS Food Groups	Percent of Children
Grains, roots and tubers	93.4%
Vitamin A fruits and vegetables	13.2%
Other fruits and vegetables	11.2%
Flesh foods	50.0%
Eggs	5.3%
Legumes and nuts	10.5%
Dairy products	24.5%
Other food groups	
Cooking oils and fats	46.7%
Sugar	46.7%
infant formula	0.7%

Information from other food group were also collected but was not included in the IDDS score

Figure 4: Complementary feeding and Breastfeeding Practices- Maungdaw



6.9 Food Security

Food security information from 383 households was collected.

6.9.1 Household dietary diversity score (HDDS)

The mean HDDS score was 5.5 which is above the minimum acceptable of 4. There were 90.6% of households that met the minimum household dietary diversity requirement.

Table 22: Household dietary diversity score from the 24 hours before the survey

HDDS Score	Number of Households	Percent
=< 3	37	9.7%
4-6	253	66.1%
>=7	93	24.2%
Total	383	100.0%

Cereals and condiment 100% were the most common HDDS food group consumed in the 24 hours before the interview, followed by fish and sea foods 85.6%, vegetables 76.8%, oil/fat 65.8% and roots and tubers 39.7%. The highest protein contained food group was fish and sea food 85.6%. Fruits, eggs and dairy products food groups were consumed in a low proportion.

Figure 5: Percentage of households that consumed HDDS food groups in 24 hours before the survey

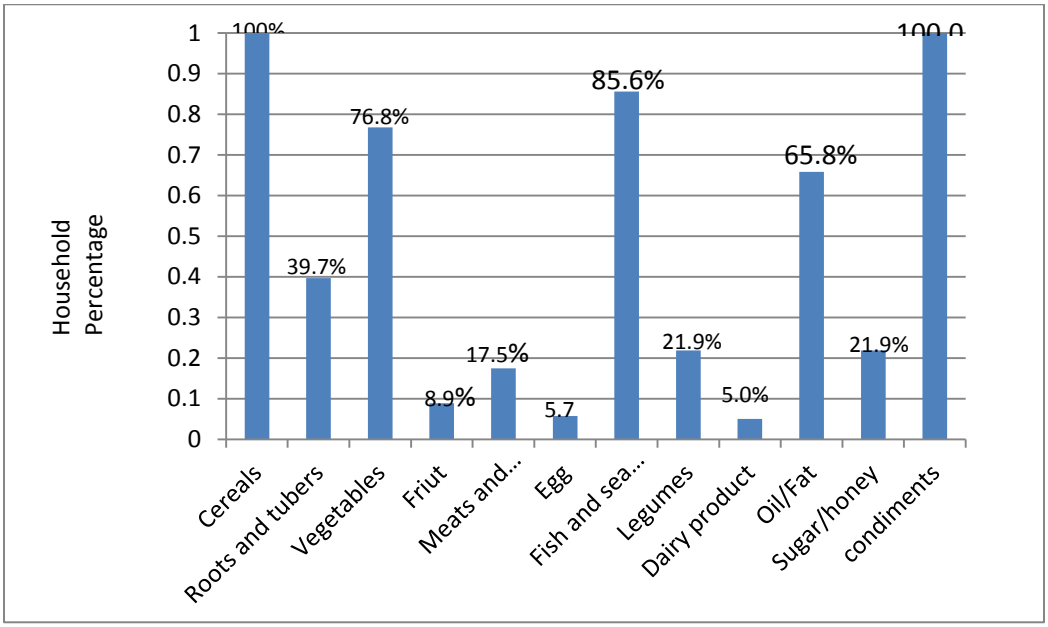


Table 23: Percentage of households that consumed HDDS food group in the 24 hours before the survey

HDDS Food Groups	Food	Percent of households
Cereals	Rice	100.0%
	Maize	0.8%
	Other Cereals	6.3%
Roots and tubers	Potatoes	39.7%
	Beans	18.0%
	Nuts	3.9%
Vegetables	Vegetables	76.8%
Fruits	Fruits	8.9%
Meat, poultry	Beef	9.7%
	Pork	1.0%
	Mutton	0.0%
	Poultry	6.8%
Eggs	Eggs	5.7%
Fish and seafood	Fish	85.6%
Milk products	Milk products	5.0%
Oil and fats	Oil and fats	65.8%
Sugar	Sugar	21.9%
Condiments	Condiments	100.0%

6.9.2 Food consumption score (FCS)

A total of 88.8% of households received an adequate FCS score, 10.7% borderline and 0.5% poor FCS score.

Table 24: Food Consumption Score (FCS) from the week before the survey

FCS Score	Number of Households	Percent
Poor (≤ 21)	2	0.5%
Borderline (21.5-35)	41	10.7%
Adequate (>35)	340	88.8%
Total	383	100.0%

The FCS food groups consumed in the most number of days in the week before the survey were cereals and tubers (7), meat and fish (6.3) and vegetable (4.6)

Figure 6: Mean Number of days FCS group were consumed in the week prior to the survey

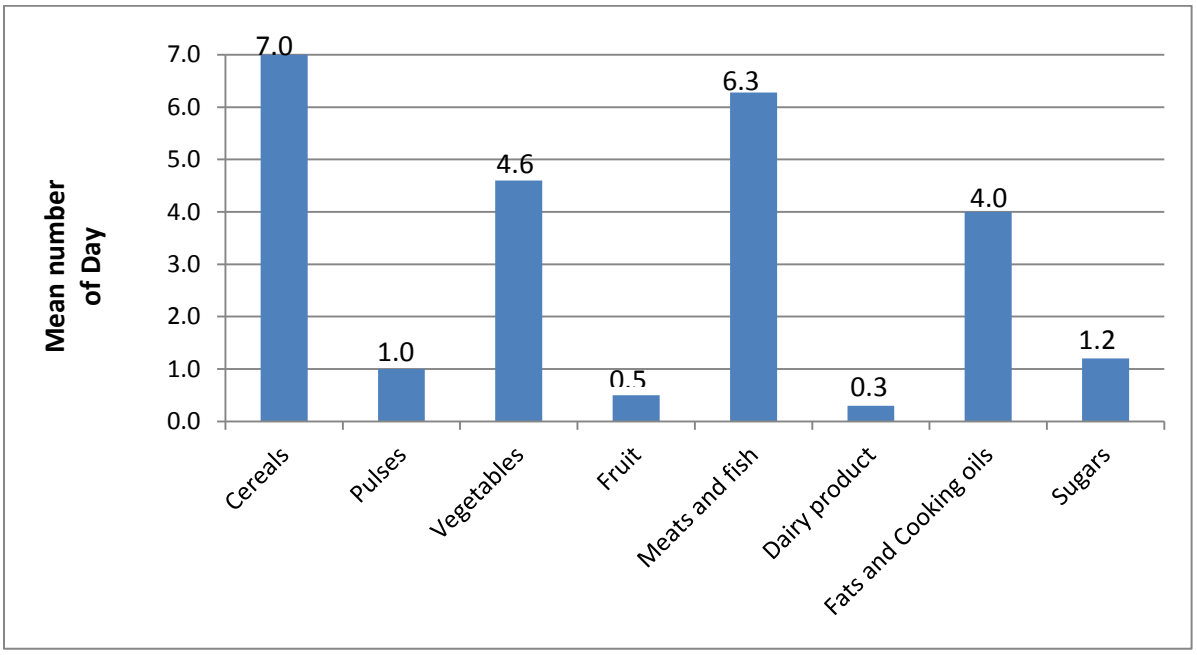


Table 25: Mean number of days FCS food groups was consumed in the week before the survey

FCS Food Group	Food	Mean Number of Days
Cereals and tubers	rice	6.9
	potatoes	2.1
	cereals	0.4
	maize	0.04
Pulses	beans	0.8
	nuts	0.2
Vegetables	vegetables	4.6
Fruits	fruits	0.5
Meat and Fish	fish	5.2
	eggs	0.3
	poultry	0.3
	pork	0.04
	beef	0.4
	mutton	0.04
Dairy	dairy	0.3
Fats and cooking oils	oil	4
Sugar	sugar	1.2

6.10 Mental health

Table 26: WHO (Five) Well-Being question results in two weeks before the survey in Maungdaw

Maungdaw	*Over the last two weeks ...*	All of the time	Most of the time	More than half of the time	Less than half of the time	Some of the time	At no time
1	... have you felt cheerful and in good spirits ?	4	26	63	112	130	48
2	... have you felt calm and relaxed ?	11	60	87	103	80	42
3	... have you felt active and vigorous ?	6	54	114	131	65	13
4	... did you woke up feeling fresh and rested ?	9	82	99	102	70	21
5	... your daily life has been filled with things that interest you ?	1	4	15	82	126	155

According to general score:

76.5% (293) of the respondents (383) show a score less than 13 (corresponding to a maximum of 48% well-being index), which is the threshold for poor well-being. Even a threshold of 10 is taken (corresponding to a maximum of 40% well-being index), still 48.8% (187) of the respondents show very poor well-being. The 9.7 average score for all the respondents is also under the threshold score of 13.

According to specific scores of "0" or "1":

46.5% (178) of the respondents felt cheerful and in a good spirit less than 4 days during the last 14 days.
31.8% (122) of the respondents felt calm and relax less than 4 days during the last 14 days.
20.4% (78) of the respondents felt active and vigorous less than 4 days during the last 14 days.
23.8% (91) of the respondents woke up feeling fresh and rested less than 4 days during the last 14 days.
73.4% (281) of the respondents showed that their daily life has been filled with things that interest them less than 4 days during the last 14 days.

Moreover, 31,6% (121) of the respondents had only answers into "Less than half of the time" or "Some of the time" or "At no time" categories, which indicate a weak well-being the half of the time or less, into the last 14 days period.

Results show significant general poor well-being and affected quality of life. The proportion of potential mental health issues, such as depression, is very high, showing serious vulnerabilities, particularly about loss of interests in life, unhapiness or mood depreciation, and stress.

6.11 WASH

Assuming households interviewed are a representative sample of their village, Maungdaw villages have low sanitation coverage with an average of 55% of households without a latrine. This result suggests that open defecation is commonplace and therefore environmental contamination is present including potential contamination of unprotected water sources. In terms of school sanitation, latrines are relatively commonplace with an average of 89% of schools having a latrine. The data suggests that even if the majority of households do not have a latrine, the households sending their children to school give them access to sanitation infrastructure such as school latrines.

33% of drinking water sources used by the communities are unimproved sources such as ponds, open wells, streams and rivers. The most common type of improved water source found were boreholes with 66% followed by 1% protected well coverage.

In addition to water sources, water treatment at household level was further investigated. On average 4% of households with improved or unimproved water sources in both townships use some sort of water treatment, although not all methods adopted yields safe drinking water. Out of the villages with unimproved water sources, only 8% of households in Maungdaw Township treated their water through effective means such as ceramic filtration or boiling. As for ineffective water treatment, methods found to be used included cloth, aluminium sulphate used as coagulant or sedimentation which reduces contamination but does not

guarantee safe drinking water. Thus, results suggest that 92% of households are drinking unsafe water in Maungdaw Township (unimproved source; ineffective treatment or no treatment) which can result in water-borne diseases such as diarrhea.

Table 27: WASH (Sanitation, primary drinking water source and water treatment) results

Question	Maungdaw
Sanitation	
HH without latrine	55%
School without latrines	11%
Primary Drinking Water Source	
Borehole (I)	66%
Protected Well (I)	1%
Open Well	11%
Pond	15%
River	7%
"Improved" (I)	67%
"Unimproved"	33%
Water Treatment	
Water Treatment Methods used (effective/ineffective)	4%
Unimproved Source with Effective Water Treatment	8%
Unimproved Source without Effective Water Treatment	**92%**

7. RESULTS FOR BUTHIDAUNG TOWNSHIP

The anthropometric measurements of 430 children were recorded. The number of children was higher than the 406 required for a representative sample determined by the ENA for SMART sample size calculation. 37 clusters were done.

7.1 Age and gender distribution

The result showed that there was a moderate significant different in age distribution (p=0.257) with an underrepresentation of the oldest group age 54-59 months. The overall gender ration of the sample population was 1.1 which is within the normal range of 0.9 – 1.2.[44]

[44] Save the Children (2004). Emergency nutrition assessment: guidelines for field workers

Table 28: Distribution of age and sex of sample

	Boys		Girls		Total		Ratio
AGE (mo)	**no.**	**%**	**no.**	**%**	**no.**	**%**	**Boy: Girl**
6-17	46	50	46	50	92	21.2	1
18-29	58	50	58	50	116	26.8	1
30-41	56	57.1	42	42.9	98	22.6	1.3
42-53	36	42.9	48	57.1	84	19.4	0.8
54-59	28	65.1	15	34.9	43	9.9	1.9
Total	224	51.7	209	48.3	433	100	1.1

7.2 Nutritional status based on WHO standards 2006

7.2.1 Acute malnutrition expressed in Z-score

A total of 430 children were included in the weight-for-height analysis.
The prevalence of GAM was 21.4% (17.9 – 25.3 95% C.I) and SAM was 3.7% (2.3 – 6.0 95% C.I).
The prevalence of MAM in boys was 15.8 % (11.7 - 21.0 95% C.I.) and for girls was 19.7 % (15.2 - 25.2 95% C.I.).
The prevalence of SAM in boys was 3.6 % (1.7 - 7.4 95% C.I.)and for girls was 3.8 % (2.0 - 7.2 95% C.I.)).
No statistical difference was found between weight for height z scores and gender (p>0.05)

Table 29: Prevalence of acute malnutrition based on weight-for-height z-score (and/or oedema) and by sex

	All n = 430	**Boys** n = 222	**Girls** n = 208
Prevalence of global malnutrition (<-2 z-score and/or oedema)	(92) 21.4 % (17.9 - 25.3 95% C.I.)	(43) 19.4 % (14.5 - 25.5 95% C.I.)	(49) 23.6 % (18.7 - 29.2 95% C.I.)
Prevalence of moderate malnutrition (<-2 z-score and >=-3 z-score, no oedema)	(76) 17.7 % (14.6 - 21.2 95% C.I.)	(35) 15.8 % (11.7 - 21.0 95% C.I.)	(41) 19.7 % (15.2 - 25.2 95% C.I.)
Prevalence of severe malnutrition (<-3 z-score and/or oedema)	(16) 3.7 % (2.3 - 6.0 95% C.I.)	(8) 3.6 % (1.7 - 7.4 95% C.I.)	(8) 3.8 % (2.0 - 7.2 95% C.I.)

The analysis per age groups shows that among the surveyed sample, the oldest age group, 54-59 months, presented the highest prevalence of SAM with 7% of the children affected followed by the youngest age group 6-17 months with 6.5% of SAM.
Children with moderate wasting are most prevalent in the youngest age group 6-17 months (27.2%), followed by the oldest age group with 23.3% of MAM. These results are similar to the surveys done in 2010.

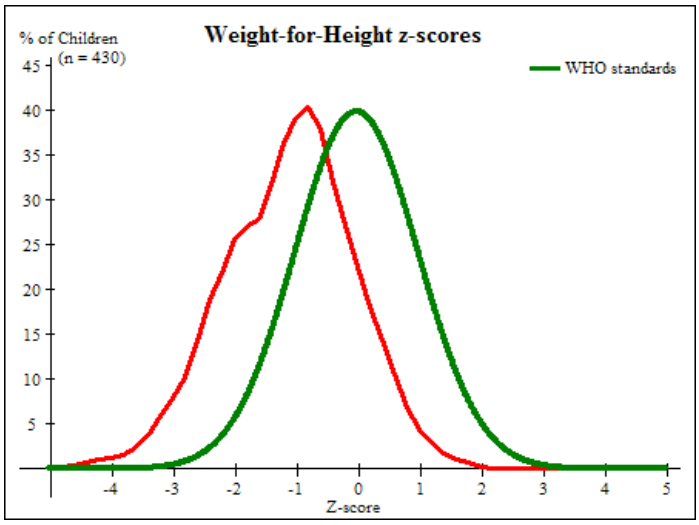
No case of oedema was found in the sample.

Table 30: Prevalence of acute malnutrition by age, based on weight-for-height z-score and/or oedema

		Severe wasting (<-3 z-score)		Moderate wasting (>= -3 and <-2 z-score)		Normal (> = -2 z score)		Oedema	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	92	6	6.5	25	27.2	61	66.3	0	0
18-29	116	0	0	19	16.4	97	83.6	0	0
30-41	96	3	3.1	8	8.3	85	88.5	0	0
42-53	83	4	4.8	14	16.9	65	78.3	0	0
54-59	43	3	7	10	23.3	30	69.8	0	0
Total	430	16	3.7	76	17.7	338	78.6	0	0

The weight-for-height distribution curve of the observed population is shifted to the left showing a lower weight for any given height when compared to the reference population (WHO standards 2008).

Figure 7: Weight for height Z-score distribution curve, WHO Standards, Buthidaung Township



7.2.2 Acute malnutrition expressed by MUAC

A total of 430 children were measured by MUAC and included in the analysis.
The prevalence of children with a MUAC <125 mm was respectively 14.2% (11.3 – 17.7 95% C.I) and the prevalence of MUAC <115 mm was 2.8% (1.6 – 4.8 95% C.I).

The prevalence of MUAC (< 125 mm and >= 115 mm) and MUAC (<115) in boys was respectively 5.9 % (3.4 - 9.9 95% C.I.) and 2.3 % (1.0 - 5.0 95% C.I.)

The prevalence of MUAC (< 125 mm and >= 115 mm) and MUAC (<115) in girls was respectively 17.3 % (12.7 - 23.1 95% C.I.) and 3.4 % (1.4 - 7.9 95% C.I.)

A statistical difference was found between MUAC scores and gender (p=0.00). Girls were found more at risk to be malnourished with MUAC than boy.

Table 31: Prevalence of acute malnutrition based on MUAC cut offs and by sex and oedema

	All n = 430	**Boys** n = 222	**Girls** n = 208
Prevalence of global malnutrition (< 125 mm and/or oedema)	(61) 14.2 % (11.3 - 17.7 95% C.I.)	(18) 8.1 % (5.2 - 12.4 95% C.I.)	(43) 20.7 % (15.9 - 26.4 95% C.I.)
Prevalence of moderate malnutrition (< 125 mm and >= 115 mm, no oedema)	(49) 11.4 % (9.0 - 14.3 95% C.I.)	(13) 5.9 % (3.4 - 9.9 95% C.I.)	(36) 17.3 % (12.7 - 23.1 95% C.I.)
Prevalence of severe malnutrition (< 115 mm and/or oedema)	(12) 2.8 % (1.6 - 4.8 95% C.I.)	(5) 2.3 % (1.0 - 5.0 95% C.I.)	(7) 3.4 % (1.4 - 7.9 95% C.I.)

Children in the length/height group of < 65 were the most affected by severe acute malnutrition, children in the length/height group of ≥65 – <75 were the most affected by Moderate acute malnutrition according to the MUAC classification.

Table 32: Prevalence of acute malnutrition according to MUAC classification using height cut off

MUAC	**Definition**	**Total**		**Length/Height (cm)**							
				<65		**≥65 – <75**		**≥75 – <90**		**≥90**	
		N	**%**	**N**	**%**			**N**	**%**	**N**	**%**
<115 mm	**Severe malnutrition**	12	2.8%	4	26.7%	7	7.4%	1	0.5%	0	0.0%
≥115 – <125 mm	**Moderate malnutrition**	49	11.4%	2	13.3%	32	33.7%	12	6.3%	3	2.3%
≥125 – <135 mm	**At risk of malnutrition**	118	27.4%	7	46.7%	29	30.5%	58	30.2%	24	18.8%
≥135 mm	**No increased risk**	251	58.4%	2	13.3%	27	28.4%	121	63.0%	101	78.9%
Total		430	100.0%	15	100.0%	95	100.0%	192	100.0%	128	100.0%

7.3 Chronic malnutrition

A total of 430 children were included in the analysis. The global chronic malnutrition was 58.6% (50.1 –66.6 95% C.I) and severe stunting was 28.6% (22.6 – 35.5 95% C.I).

The prevalence of moderate stunting in boys was respectively 31.1 % (24.6 - 38.4 95% C.I.)) and 28.8 % (22.8 - 35.8 95% C.I.) in girls.

The prevalence of severe stunting in boys was respectively 29.3 % (21.7 - 38.2 95% C.I.) and 27.9 % (21.4 - 35.5 95% C.I.) in girls.

No statistical different was found between height for age z-score and gender (p>0.05)

Table 33: Prevalence of stunting based on height-for-age Z-score and by sex

	All n = 430	**Boys** n = 222	**Girls** n = 208
Prevalence of stunting (<-2 z-score)	(252) 58.6 % (50.1 - 66.6 95% C.I.)	(134) 60.4 % (50.4 - 69.5 95% C.I.)	(118) 56.7 % (48.0 - 65.0 95% C.I.)
Prevalence of moderate stunting (<-2 z-score and >=-3 z-score)	(129) 30.0 % (25.3 - 35.1 95% C.I.)	(69) 31.1 % (24.6 - 38.4 95% C.I.)	(60) 28.8 % (22.8 - 35.8 95% C.I.)
Prevalence of severe stunting (<-3 z-score)	(123) 28.6 % (22.6 - 35.5 95% C.I.)	(65) 29.3 % (21.7 - 38.2 95% C.I.)	(58) 27.9 % (21.4 - 35.5 95% C.I.)

The prevalence of severe stunting was over 30% in age group 18-29 month, 30-41 month and 42-53 month. The highest was for 18-29 months.

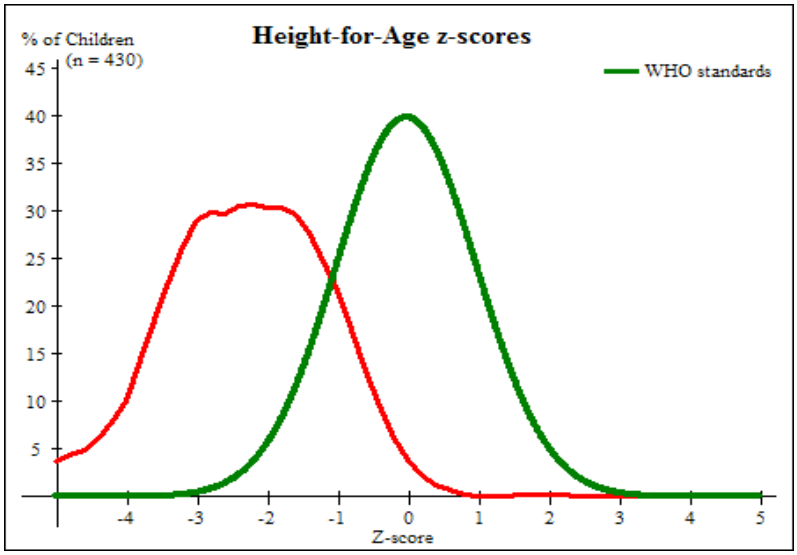
Moderate stunting was over 30% for all age group except the age group 6-17 months (27.2%).

Table 34: Prevalence of stunting by age based on height for age z-scores

		Severe stunting (<-3 z-score)		Moderate stunting (>= -3 and <-2 z-score)		Normal (> = -2 z score)	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	92	18	19.6	25	27.2	49	53.3
18-29	116	42	36.2	36	31	38	32.8
30-41	96	30	31.3	30	31.3	36	37.5
42-53	83	26	31.3	25	30.1	32	38.6
54-59	43	7	16.3	13	30.2	23	53.5
Total	430	123	28.6	129	30	178	41.4

The height for age distribution curve of the observed population is shifted to the left of the reference population indication including that children of the studied population have a lower height at a given when it is compared to the reference population. The mean height for age index z-score of the sample is 11.88±1.10.

Figure 8: Height for age z-score distribution, WHO standards



7.4 Underweight

A total of 430 children were included in the analysis. The global underweight malnutrition rate was 51.9% (45.4 – 58.3 95% C.I) and severe stunting was 17.2% (12.9 – 22.6 95% C.I). The prevalence of severe underweight rate in boys was 14.0% (9.5 - 20.1 95% C.I.) and girl rate was 20.7% (14.9 - 27.9 95% C.I.) The

prevalence of moderate underweight rate in boys was 36.0 % (28.7 - 44.1 95% C.I.) and girl rate was 33.2 % (27.1 - 39.8 95% C.I.).

No statistical difference was found between height for age z-scores and gender (p>0.05)

Table 35: Prevalence underweight based on weight for age z-score by sex

	All n = 430	**Boys** n = 222	**Girls** n = 208
Prevalence of underweight (<-2 z-score)	(223) 51.9 % (45.4 - 58.3 95% C.I.)	(111) 50.0 % (41.7 - 58.3 95% C.I.)	(112) 53.8 % (45.9 - 61.6 95% C.I.)
Prevalence of moderate underweight (<-2 z-score and >=-3 z-score)	(149) 34.7 % (29.6 - 40.0 95% C.I.)	(80) 36.0 % (28.7 - 44.1 95% C.I.)	(69) 33.2 % (27.1 - 39.8 95% C.I.)
Prevalence of severe underweight (<-3 z-score)	(74) 17.2 % (12.9 - 22.6 95 % C.I.)	(31) 14.0 % (9.5 - 20.1 95% C.I.)	(43) 20.7 % (14.9 - 27.9 95% C.I.)

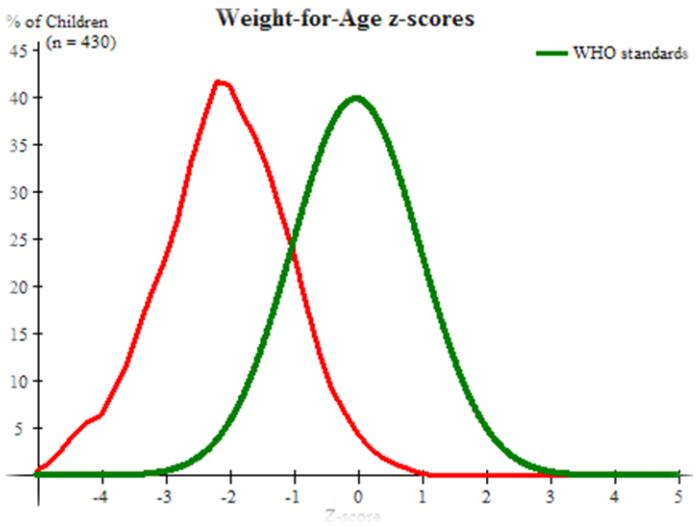
The prevalence of severe underweight in the sample surveyed was highest in the 6-17 month age group (20.7%). .
The prevalence of moderate underweight was above 30% in all age groups except 18-29 age groups (28.4%).

Table 36: Prevalence of underweight by age, based on weight for age z-scores

		Severe underweight (<-3 z-score)		**Moderate underweight (>= -3 and <-2 z-score)**		**Normal (> = -2 z score)**	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	92	19	20.7	29	31.5	44	47.8
18-29	116	23	19.8	33	28.4	60	51.7
30-41	96	11	11.5	35	36.5	50	52.1
42-53	83	17	20.5	33	39.8	33	39.8
54-59	43	4	9.3	19	44.2	20	46.5
Total	430	74	17.2	149	34.7	207	48.1

The weight-for-age distribution curve of the observed population is shifted to the left and showing a bit higher weight for any given when it was compared to the reference population.

Figure 9: Weight for age z-score distribution curve, WHO standards



7.5 Pregnant and lactating women- Nutrition status based on MUAC

84.2 % of the Pregnant and lactating women were in the ≥18 -< 35 years old.

53.5% of Pregnant and Lactating women have a MUAC under 230mm. 11.6% of Pregnant and Lactating women have a MUAC under 210mm.

No statistical difference between Pregnant and Lactating women.

Table 37: Percent of pregnant and lactating women aged 15-45 years old based on MUAC cut off

MUAC	Total Number	Percentage	Pregnant	*Percentage*	Lactating	*Percentage*
MUAC <210 mm	25	11.6%	7	13.2%	18	*11.1%*
MUAC ≥210 and <230 mm	90	41.9%	23	43.4%	67	*41.4%*
MUAC ≥230 mm	100	46.5%	23	43.4%	77	*47.5%*
Total	215	100.0%	53	100.0%	162	*100.0%*

7.6 Retrospective mortality survey

7.6.1 Demographic data

A total of 442 households with an average of 5.9 people per household were included in the Buthidaung Township retrospective mortality survey.

The total population of the survey was 2619, including 464 under 5 years (1.05 under 5 per household), representing 17.7% of the population.

7.6.2 Crude Death and under five death rates

The crude death rate for the total population in the retrospective mortality was 0.51 and the under 5 death rate was 1.15.

Main cause of death was Acute respiratory infection for children under 5 (2 out of 5 deaths)

Table 38: Crude death and under five death rate for Buthidaung retrospective mortality survey

Recall period	Population	Number of people surveyed	Number of deaths	Crude death rate	Design effect
97 days	Total	2619	8	0.51 (0.27-0.95 95%C.I.)	1
97 days	Under 5	464	5	1.15 (0.41-3.17 95%C.I.)	1

7.7 Morbidity

A total of 70.7% of children had an acute illness[45] .

Table 39: Percentage of illness in children with acute illness two weeks prior to the interview

Health Status	Number of Children		Percent of Children		Total	Percent
	M	F	M	F		
Illness	159	147	71.3%	70.0%	306	70.7%
No illness	64	63	28.7%	30.0%	127	29.3%
Total	223	210	100.0%	100.0%	433	100.0%

Of the 70.7% of children reported to have an illness, the most common morbidity were Acute respiratory infection and fever: These incidences are high with 38.4% of the children suffering from ARI and 32.5% of the children suffering from fever. 12.5% of the children were affected by diarrhea.

16.5% of others sickness were divided as following: 53.1% scabies, 27.5% runny nose, vomiting, 3.1% indigestion, 2.0% candida and 1 % in injury.

No statistical evidence was found between boys and girls and each of the illnesses below (p>0.05).

[45] Illness was defined as a child who had one or more morbidity; including diarrhea, fever, ARI or other, in the two weeks before the interview

Table 40: Prevalence of type of illness with one or more acute illness reported two weeks prior to the survey

Illness	Number of Children		Percent of Children		Total	Percent
	M	F	M	F		
Diarrhea	30	44	40.5%	59.5%	74	12.5%
Fever	99	94	51.3%	48.7%	193	32.5%
ARI	121	107	53.1%	46.9%	228	38.4%
Other	46	52	46.9%	53.1%	98	16.5%

7.8 Child Feeding Practices

A total of 143, 6-23 month children were included in the survey. Two of the143 children were exclusively breastfed. The mothers of these children were not asked questions pertaining to complementary feeding.

7.8.1 Breastfeeding status and introduction of complementary foods

International recommendations are to exclusive breastfeed until the age of 6 months and then to timely introduce complementary foods while continuing breastfeeding until 24 months and onwards[46].

All surveyed children had been breastfed at one point.
Mothers were asked if the child was still breastfeeding. At this time of the survey, 83.9 of children were still breastfeeding while 16.1% of the children were not anymore breastfed. 1.4% of the children were still exclusively breastfed.

The result of the survey suggests high rates of continued breastfeeding. 91.6% of continued breastfeeding at 1 year (12-15 months) is observed. 82.5% if the children meet international recommendation to continue breastfeeding until 24 months.

84.4 % of breastfed children (6-9 month) received a solid, semi-solid or soft food in the 24 hour recall period. Food is introduced at an early age, by 6 months, 89.4% of 6-23 month children were introduced to complementary foods, meaning that we can assume that 10.6% were exclusively breastfed until 6 months. See table 42 for details.
Rice porridge (65.2%), maize quicka (12.1%), rice powder (9.2%) and small cakes & biscuits (5.0%) accounted for 91.5%of the first foods introduced to 6-23 children.
88.4% of the 6-8 month children received a solid or semi-solid food in the previous 24 hours.

The mean minimum dietary diversity score was 1.9 which is drastically below the minimum acceptable score of 4. Only 7.8% of children 6-23 months had acceptable dietary diversity in the 24 hours prior to the survey.

[46] UNICEF.2008. Recommendations for optimal breastfeeding

A slight discrepancy can be observed between boy 1.8 and girl 2.0.
Grains 94.3% were the most common IDDS foods group consumed in the 24 hours before the interview, followed by sugar 47.5%, flesh foods 43.3%, Vitamin A fruits and vegetable 26.2%. The percentage of children consuming others fruit and vegetable, legumes and nuts and eggs were low.

A total of 63.6% children consumed the minimum acceptable number of meal (excluding beast-milk) in 24 hours prior to the survey. This percentage was 17.4% for the none-breastfed children and 72.6% for the breastfed children.
When comparing the two aforementioned indicators it can be determined that the in the 24 hours prior to the survey most children non breastfed or breastfed did not consume enough calories and that the food was lacking in variety and micronutrients. Indeed, only 2.1% of the children have a minimal acceptable diet. This result is very low. No significant discrepancy between none-breastfed children and breastfed children.

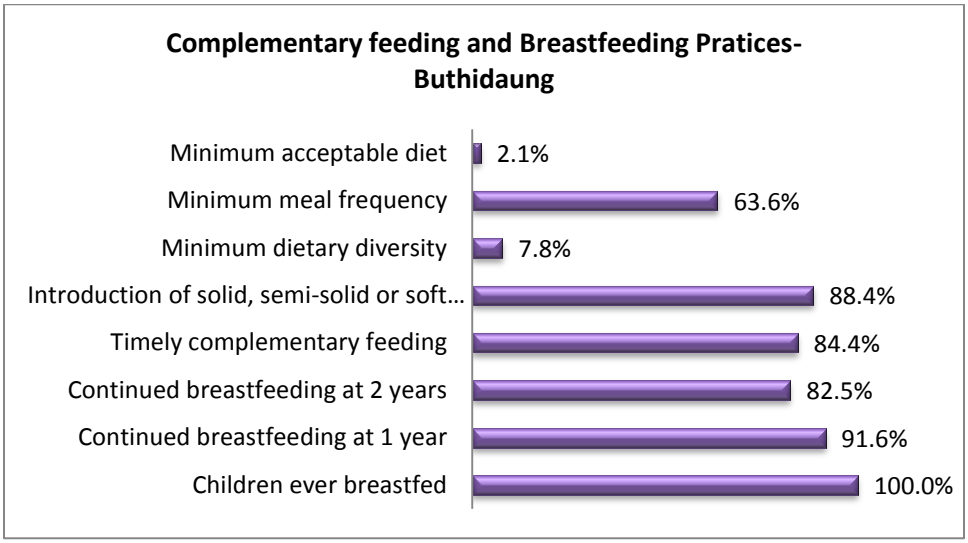
Table 41: Age of 6-23 month children were introduced to complementary foods before 6 months

Months	Number of Children	Percent
1	48	34.0%
2	30	21.3%
3	24	17.0%
4	16	11.3%
5	8	5.7%
TOTAL	126	89.4%

Table 42: IDDS foods group consumption (excluding breast milk) of 6-23 month children in 24 hours before the survey

IDDS Food Groups	Percent of Children
Grains, roots and tubers	94.3%
Vitamin A fruits and vegetables	26.2%
Other fruits and vegetables	9.9%
Flesh foods	43.3%
Eggs	9.2%
Legumes and nuts	6.4%
Dairy products	6.3%
Other food groups	
Cooking oils and fats	25.5%
Sugar	47.5%
infant formula	0.0%

Figure 10: Complementary feeding and Breastfeeding Practices- Buthidaung



7.9 Food Security

Food security information from 442 households was collected.

7.9.1 Household dietary diversity score (HDDS)

The mean HDDS score was 5.2 which is above the minimum acceptable number of 4. There were 94.6% of households that met the minimum household dietary diversity requirement.

Table 43: Household dietary diversity score from the 24 hours before the survey

HDDS Score	Number of Households	Percent
=< 3	24	5.4%
4-6	355	80.5%
>=7	62	14.1%
Total	441	100.0%

Cereal and condiment 100% were the most common HDDS food group consumed in 24 hours before the interview, followed by vegetables 90%, fish and sea food 84%, oil and fats 53%. The highest protein containing food group was fish and seafood. Fruits, eggs and dairy products food groups were consumed in a low proportion.

Figure 11: Percent of households that consumed HDDS foods group in the 24 hours before the survey

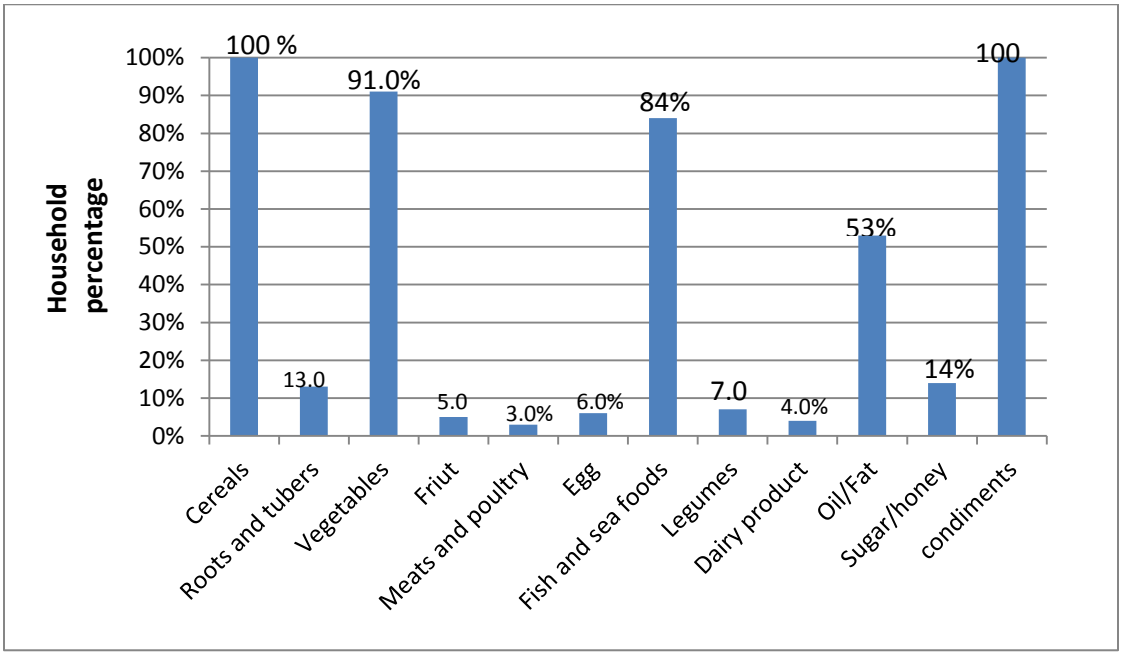


Table 44: Percentage of households that consumed HDDS food group in the 24 hours before the survey

HDDS Food Groups	Food	Percent of households
Cereals	Rice	100.00%
	Maize	0.2%
	Other Cereals	5.0%
Roots and tubers	Potatoes	35.8%
	Beans	14.0%
	Nuts	0.9%
Vegetables	Vegetables	91.0%
Fruits	Fruits	5.0%
	Beef	6.0%
Meat, poultry	Pork	1.0%
	Mutton	0.4%
	Poultry	4.0%
Eggs	Eggs	6.0%
Fish and seafood	Fish	84.0%
Milk products	Milk products	4.0%
Oil and fats	Oil and fats	53.0%
Sugar	Sugar	14.0%
Condiments	Condiments	100.0%

7.9.2 Food consumption score (FCS)

A total of 92.1% of households received an adequate FCS score, 7.7 % borderline and 0.2% had poor FCS score.

Table 45: Food Consumption Score (FCS) from the week before the survey

FCS Score	Number of Households	Percent
Poor (≤ 21)	1	0.2%
Borderline (21.5-35)	34	7.7%
Adequate (>35)	406	92.1%
Total	441	100.0%

The FCS food groups consumed in the most number of days in the week before the survey were cereals and tubers (7), meat and fish (6.4) and vegetable (5.4)

Figure 12: Mean Number of days FCS group were consumed in the week prior to the survey

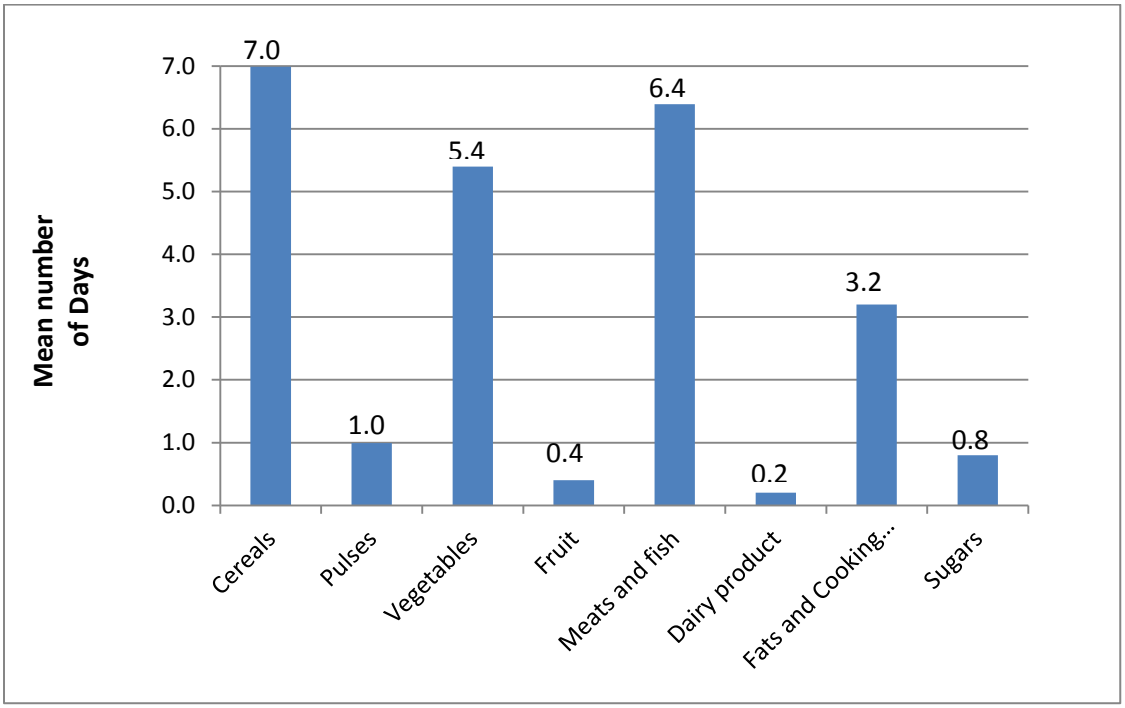


Table 46: Mean number of days FCS food groups was consumed in the week before the survey

FCS Food Group	Food	Mean Number of Days
Cereals and tubers	rice	6.9
	potatoes	1.9
	cereals	0.4
	maize	0.0
Pulses	beans	0.9
	nuts	0.1
Vegetables	vegetables	5.4
Fruits	fruits	0.4
Meat and Fish	fish	5.4
	eggs	0.4
	poultry	0.2
	pork	0.1
	beef	0.3
	mutton	0.0
Dairy	dairy	0.2
Fats and cooking oils	oil	3.2
Sugar	sugar	0.8

7.10 Mental Health:

Table 47: WHO (Five) Well-Being question result in two weeks prior to the survey in Buthidaung

Buthidaung	*Over the last two weeks* ...	All of the time	Most of the time	More than half of the time	Less than half of the time	Some of the time	At no time
1	... have you felt cheerful and in good spirits ?	7	39	67	155	103	70
2	... have you felt calm and relaxed ?	10	86	109	135	79	22
3	... have you felt active and vigorous ?	14	68	169	127	49	14
4	... did you woke up feeling fresh and rested ?	23	109	129	108	61	11
5	... your daily life has been filled with things that interest you ?	1	7	22	57	138	216

According to general score:

76% (335) of the respondents (441) show a score less than 13 (corresponding to a maximum of 48% well-being index), which is the threshold for poor well-being. Even if we took a threshold of 10 (corresponding to a maximum of 40% well-being index), still 42.4% (187) of the respondents show very poor well-being. The 10.4 average score for all the respondents is also under the threshold score of 13.

According to specific scores of "0" or "1":

39.2% (173) of the respondents felt cheerful and in a good spirit less than 4 days during the last 14 days.
22.9% (101) of the respondents felt calm and relax less than 4 days during the last 14 days.
14.3% (63) of the respondents felt active and vigorous less than 4 days during the last 14 days.
16.3% (72) of the respondents woke up feeling fresh and rested less than 4 days during the last 14 days.
80.3% (354) of the respondents showed that their daily life has been filled with things that interest them less than 4 days during the last 14 days.

Moreover, 21.3% (94) of the respondents had only answers into "Less than half of the time" or "Some of the time" or "At no time" categories, which indicate a weak well-being the half of the time or less, into the last 14 days period.

Results show significant general poor well-being and affected quality of life. The proportion of potential mental health issues, such as depression, is very high, showing serious vulnerabilities, particularly about loss of interests in life, unhapiness or mood depreciation, and stress.

7.11 WASH

Buthidaung villages have low sanitation coverage with an average of 58% of households without a latrine. This result suggests that open defecation is commonplace and therefore environmental contamination is present including potential contamination of unprotected water sources. In terms of school sanitation, latrines are relatively commonplace with an average of 85% of schools in Buthidaung having a latrine. The data suggests that even if the majority of households do not have a latrine, the households sending their children to school in Buthidaung give them access to sanitation infrastructure such as school latrines.

As for the water infrastructure, Buthidaung falls notably behind Maungdaw with only 33% of improved water sources such as boreholes (28%) and protected wells (5%). 66% of drinking water sources used by the communities are unimproved sources such as ponds, open wells, streams and rivers.

As for water treatment at household level, out of the villages with unimproved water sources, only 8% of households in Buthidaung Township treated their water through effective means such as ceramic filtration or boiling. As for ineffective water treatment, methods found to be used included cloth, aluminium sulphate used as coagulant or sedimentation which reduces contamination but does not guarantee safe drinking water. Thus, results suggest that in Buthidaung, 92% of households are drinking unsafe water (unimproved source; ineffective treatment or no treatment) which can result in water-borne diseases such as diarrhea.

Table 48: WASH (Sanitation, primary drinking water source and water treatment) results

Question	Buthidaung
Sanitation	
HH without latrine	58%
School without latrines	15%
Primary Drinking Water Source	
Borehole (I)	28%
Protected Well (I)	5%
Open Well	10%
Pond	54%
River	3%
"Improved" (I)	33%
"Unimproved"	66%
Water Treatment	
Water Treatment Methods used (effective/ineffective)	10%
Unimproved Source with Effective Water Treatment	8%
Unimproved Source without Effective Water Treatment	**92%**

8. LIMITATIONS

Maungdaw Township:

- Due to exclusion criteria that had to be implemented as a result of lack of accessibility and security concerns not all villages in Maungdaw were eligible to be included in the survey (41 villages were excluded out of 409 in Maungdaw). Inaccessible villages were increased due to 2012 crisis if it is compared to previous surveys were done in Maungdaw.
- All excluded villages were in the north and north-west of Maungdaw Township mainly in the places that present along the border with Bangladesh and the mountain area.
- A total of 33 clusters were selected randomly by the ENA but 32 were done because 1 cluster (cluster number 5) wherein sub-township was not agreed by the local authority.

Buthidaung Township:

- 39 villages out of 283 were not eligible to be included in the survey due to accessibility and security concerns mainly in the southern part in border with Rathedaung..
- The most of inaccessible villages of Buthidaung were geographically separated from the rest of Township by a large mountain range towards the north and east. Those areas were mainly populated by the Mro and Kahumi ethnicities, a population of those two groups were culturally and socio-economically were different from the general population of Buthidaung.

9. Discussion for both Townships

9.1 Age and gender distribution

Result showed that there was a moderate significant different in age distribution (p=0.001) in Maungdaw and (p=0.257) in Buthidaung. These findings were similar in 2008 and 2010 SMART surveys. It might be a problem with data collection or age.
The overall gender ratio of the sample population for Maungdaw was 1.0 and 1.1 for Buthidaung which were within the normal range of 0.8 - 1.2.[47]

9.2 Malnutrition

Both surveys were conducted in the same period as the previous surveys, to allow comparison and follow-up of any trend change.
The data shows no statistical difference in acute wasting prevalence between the two townships in any of the surveys from 2010 to 2013 ($p > 0.05$).
However the data show significant difference in chronic malnutrition (stunting) and underweight between the two townships compared to 2010 result, especially in Buthidaung Township ($P<0.05$).

9.2.1 Acute malnutrition (wasting)

According to 2013 result, the global acute malnutrition rates remain critical according to WHO Expert committee classification for wasting with GAM prevalence of >15% in both Township, **20.0%** [15.1-26.1 95% C.I] in Maungdaw and **21.4%** [17.9-25.3 95% C.I] in Buthidaung).
Acute malnutrition expressed by MUAC is lower than the one expressed by Z.score with a prevalence of 17.9% (13.7 – 23.2 95% C.I) for MUAC <125 mm and a prevalence of 5.8% (3.6 – 9.3 95% C.I) for MUAC < 115 mm in Maungdaw. Same finding has been done in Buthidaung with a prevalence of 14.2% (11.3 – 17.7 95% C.I) for MUAC <125 mm) and a prevalence of 2.8% (1.6 – 4.8 95% C.I) for MUAC <115 mm.

Note that it is not the same population of children that MUAC and W/H detect; there is usually only around 23 % of overlap.

Using WHO standards, the data suggests no statistical difference in the prevalence of severe wasting between Maungdaw Township at 3.0% (1.5 – 6.0 95% C.I) and Buthidaung Township at 3.7% (2.3 – 6.0 95% C.I). The same observation can be done for the moderate wasting prevalence: in Maungdaw at 20.0% (15.1 – 26.1 95% C.I) and in Buthidaung at 21.4% (17.9 – 25.3 95% C.I) ($p> 0.05$).

No statistical difference was found between weight for height z scores and gender in both Townships ($p>0.05$). However a statistical difference was found between MUAC scores and gender ($p=0.00$). Girls were found more at risk to be malnourished with MUAC than boy in both Townships.

[47] Save the Children (2004). Emergency nutrition in assessment: guidelines for field workers

Data indicate that severe and moderate wasting are distributed similarly among the age groups in the two Townships samples showing that the youngest age group 6-17 months are the most affected by severe moderate acute malnutrition. Both Township show also a high prevalence of MAM for the oldest age group 54-59 months compare to the others age group.

Children in the length/height group of < 65cm were the most affected by severe acute malnutrition in both townships according to the MUAC classification.
The data show that children with a height under 75 cm are particularly exposed to a high risk of severe malnutrition, reflecting the vulnerability and the mortality risk for this age group.

However in order to these figures in perspective this is important to mention that through different surveys MUAC has been shown to be biased towards younger children and girls i.e. detects more young children and more girls.

9.2.2 Chronic malnutrition (stunting)

According to 2013 result, the chronic malnutrition rates are really high according to WHO Expert committee classification for stunting prevalence of >40% in both Township, 47.6% (40.3 – 52.3 95% C.I) in Maungdaw and 58.6% (50.1 – 66.6 95% C.I) in Buthidaung).
The data suggests no statistical difference in the prevalence of stunting between Maungdaw Township and Buthidaung Township. (P> 0.05)
The analysis per age groups shows that, among the surveyed sample, the 18-29 months age group represented the highest prevalence of severe and moderate stunting for both Townships.

The severe chronic malnutrition rate show a drastic deterioration compared to the SMART survey 2010, when the rates for both Townships were high (30%-39%).
The deterioration of the chronic malnutrition indicator may be partially explained by the 2012 unrest leading to an interruption of humanitarian assistance during 6 months and a deterioration of the food security. Moreover for Buthidaung the departure of the Health INGO AMI that left Maungdaw district at the end of 2009, leaving a substantial gap in free basic public health services is an additional explanation.

Stunting can be caused by a number of factors both individually and compounded. One of the main nutrition related cause of stunting in children over six months in both Townships could be that throughout the year there are several periods of time in which variety of foods is decreased due to availability and poverty concerned. Poor breast feeding and complementary feeding practices (see section 9.5) also lead to stunting.
These really high levels of chronic malnutrition have a direct impact on children's health and sickness resistance and thus increase the vulnerability to acute malnutrition.
These results show the urgent need to tackle stunting issue and work in a multisectorial approach as causes of stunting are multifactorial. Basic causes are quite diverse, ranging from maternal health status, food security, access to health and inadequate care practices.

9.2.3 Underweight

According to 2013 result, the underweight rates are really high according to WHO Expert committee classification for underweight prevalence of >30% in both Township, 42.9% (35.8-50.3 95% C.I) in Maungdaw and 51.9% (45.4-58.3 95% C.I) in Buthidaung. It was already the case in 2010. However the data suggest a statistical difference compared to the 2010 result regarding the severe underweight rate showing a deterioration of the underweight situation among both Townships.

The data suggests no major statistical difference in the prevalence of underweight between Maungdaw Township and Buthidaung Township. (P> 0.05)
The analysis per age groups shows that, among the surveyed sample, the youngest age group of 6-17 and 18-29 months represented the highest prevalence of severe underweight for both Townships.

The underweight (weight-for-age) classification is a combination of wasting and stunting. As both prevalence of stunting and wasting were high, the prevalence of underweight was also automatically to be higher.

9.2.4 Extrapolation of the number of children suffering from malnutrition for Maungdaw and Buthidaung Townships.

Based on malnutrition prevalence and children population estimation, the number of children suffering from Acute Malnutrition, Stunting and Underweight have been extrapolated at a given time.

Table 49: Number of children suffering from malnutrition according to the SMART survey 2013.

	Acute Malnutrition		**Stunting**		**Underweight**	
	Global Acute Malnutrition	Severe Acute Malnutrition	Global stunting	Severe stunting	Global underweight	Severe underweight
Maungdaw	17.064	2.560	40.612	19.112	36.602	13.310
Buthidaung	10.670	1.845	29.218	14.260	25.877	8.576
Total	27.734	4.405	69.830	33.372	62.479	21886

9.2.5 Pregnant and Lactating Women-Nutrition status based on MUAC

According to the result of these surveys, PLW' nutrition situation is worrying in both Townships with 44.4% in Maungdaw and 53.5% in Buthidaung of the PLW having a MUAC under 230.
Several studies as shown that women's nutrition status is most than important as the status of newborns and infants is intimately linked with the nutrition status of the mother before, during, and after pregnancy. Maternal malnutrition has been linked to low birth weight, which in turn results in high infant morbidity and mortality rates. In addition, malnutrition in mothers jeopardizes the quality of care giving they can offer their children by reducing the meaningful mother-child interaction that is necessary for proper growth. In essence, women with poor nutrition are caught in a vicious circle of poverty and under-nutrition.

One study done by ENN[48] shown that the maternal nutrition status defined by MUAC as a predictor of risk to the child of developing Acute Malnutrition during the hunger season. Possible explanations for this include increased intrahousehold food sharing, reduced capacity to contribute to household economy and reduced capacity to care for the child.

9.3 Mortality

After analysis for both Townships, it was determined that the crude death rate, 0.27 (0.11 – 0.66 95% C.I) and the under-five death rate, 0.68 (0.23 – 2.05 95% C.I) for Maungdaw and the crude death rate of 0.51 (0.27 – 0.95 95% C.I) and the under-five death rate of 1.15 (0.41 – 3.17 95% C.I) for Buthidaung.
Despite significant malnutrition prevalence, the crude death rates for the recall periods are below the alert level of 1 death/10,000 people/day for the total population and of 2 deaths/10,000 people/day for those under five years old[49] for both Townships.

The data suggests no major statistical difference between Maungdaw Township and Buthidaung Township. (P> 0.05)

9.4 Morbidity

It was found that more than 70% of children had an acute morbidity within two weeks prior to the survey in both Townships (78% for Maungdaw and 70.7% for Buthidaung). The highest morbidity was fever 38.3% for Maungdaw and ARI 38.4 % for Buthidaung.
The data collection was done in winter season with cold temperature. As a result, several cases of the common cold were identified which can typically start off as a fever then lead to ARI and fever.
Diarrhea morbidity is likely higher in rainy season period.

ARI and diarrhea are potential aggravating factors for acute malnutrition when not properly and rapidly identified and properly treated.
For both Township, in others illness 50% of the children suffered from scabies.

9.5 Infant feeding

Regarding IYCF practices, though breastfeeding is widely practiced, exclusive breastfeeding, timing of weaning and complementary feeding practices are below adequate standard. Moreover results also indicate that the majority of children did not receive an acceptable level of variety in their diet in the 24 hours prior to the survey. As a result of the lack of variety, a sufficient amount of micronutrients was most likely not consumed.
Moreover in the present surveys, less than 50% on average of the children consumed the minimum acceptable number of meal for both Townships.

[48] The effectiveness of blanket supplementary feeding programmes in preventing acute malnutrition- 2013
[49] ACC, SCN Moren, Nov 1995. Health and nutrition information systems among refugees and displaced persons, Workshop report refugee's nutrition.

As a result of these 2 indicators the percentage of children having a minimal acceptable diet is under 3 %
This type of diet, poor in micronutrient, leads to acute malnutrition and stunting as well as other cognitive and developmental problems that cannot be reversed.

Cultural believes and/or lack of knowledge also seems to not always be appropriate. These inappropriate practices contribute to acute and chronic malnutrition and developmental delays over a period of time and contribute to the very high rates of under nutrition as noted previously.
Effort must be continued to improve the knowledge and behaviors change of the community in order to increase the IYCF practices in both Townships.

9.5.3 Local cultural practices that could potentially affect child nutrition

During the data collection period staff noted several local cultures practices that could affect infant (maternal) nutrition. Most of these practices have been already mentioned in previous ACF MHCP and nutrition reports. Some of these local practices are common throughout Myanmar. In addition, Maungdaw district is a specific with his own cultural practices. The frequency of the following examples was not established as this information was not specifically asked during the interviews:

- Most of the time, mothers wean the child suddenly when they become pregnant again as they believe that the breast milk will make the child sick. Mothers tend to send the child away to be with siblings or grand-parents.
- This is a common belief that the colostrum is not good for children as it can cause diarrhea.
- After a woman delivers she should rest and avoid certain foods for 40 days: some fish, prawns, eggplant, pineapple… If the child is boy, the mothers should avoid food for 6 months but for girl is only for 3 months.
- Girls are longer breastfed than boy as they are more fragile.
- Some mothers chew rice until it has a soft porridge consistency before giving it to their infant. This practice can be harmful to the child because the mother can pass her bacteria to the child.
- Most of mothers have to go back to work (domestic) immediately after delivery.

9.6 Food Security

9.6.1 Household Dietary Diversity Score (HDDS)

The HDDS foods included cereals 100%, condiments 100.0%, vegetables >76% fish and sea foods > 84.0% and oil and fats > 53.0% for both Townships. The individual foods from these food groups would most likely have been rice, chilly, salt, turmeric powder, variety of vegetables, fish, soybean and coconut oil. The highest protein containing food group was fish and sea food. Meats (beef, pork and mutton), poultry and egg food groups were consumed in a low proportion (<23%).
The mean HDDS score was 5.5 for Maungdaw and 5.2 for Buthidaung that were above the minimum acceptable standard of 4[50]. A total of 9.7% for Maungdaw and 5.4% for Buthidaung of household were found

[50] FANTA, Sept 2006. HDDS for measurement of household food access

to have low dietary diversity (<3), 66.1% in Maungdaw and 80.5% in Buthidaung had medium dietary diversity (4-6) and 24.2 in Maungdaw and 14.1% had high dietary diversity (>7).

Caution should be made when interpreting the value of HDDS. The HDDS is a proxy measure of household access to food including socio economic change (ability to access/purchase food)[51]. The HDDDS is not intended to be a definitive indicator of the quality of diet as all food groups were weighted equally.

For example, in the south part of Maungdaw nearly all families will have access to rice, condiments and fish but difficult access to vegetable. In the north part of Maungdaw, nearly all families will have access to rice, condiments and variety of vegetables but more difficult access to fish.

Moreover these surveys were done during the dry season. HDDS base lines done by ACF during the loan season show an average of 4.5.

Since 1996 ACF has performed HDDS monitoring in two Townships where ACF is operating. The mean HDDS scores have typically between 4.7 to 5.1 depending on the time of yearly data collection. These scores were similar mean score of the present survey.

A comparison of urban and rural clusters is not possible because the sample size would not be representative. However, it may be suggested that urban areas may have a higher mean HDDS score as they have more access to a variety of product through local market.

9.6.2 Food Consumption Score (FCS)

FCS is a proxy measure of the quality of household diets[52]. The FCS weights food groups differently based on their micronutrient density. The general assumption is that the most circumstances if food (s) from a particular food groups are consumed several times a week than the amount (quantity) of the food group consumed will be adequate.

A total of 88.8% in Maungdaw and 92.1% in Buthidaung of households had an adequate FCS score, followed by 10.7% in Maungdaw and 7.7% in BtF with a borderline adequate FCS and 0.5% in Maungdaw and 0.2 in Buthidaung of households with a poor FCS score; therefore more than 99.5% of households in both Township had at least a borderline adequate food consumption score. This was nearly identical to HDDS score which revealed that 90.3% in Maungdaw and 94.6 in Buthidaung of households had at least a minimum acceptable score.

The top four FCS food group consumed (higher mean number of days) in the week prior to the survey were cereal (7.0 days), meats and fish (6.3 days), vegetables (4.3 days for Maungdaw and 5.4 for Buthidaung) and fat and cooking oils (4.0 days for Maungdaw and 3.2 day for Buthidaung).

When the HDDS and FCS food groups are compared (removing condiments from HDDS because it is not included in FCS) they were listed in a very similar order from top to bottom. This is an indicator that the same type of food groups are being consumed daily or somewhat frequently over a seven day period. Based on these findings as well as staff observations from the field, foods consumed daily or somewhat frequently

[51] FANTA, Sept 2006 HDDS for measurement of household food access

[52] FSIN Myanmar. 2012. Recommended indicators to measure the food security status of households and communities.

(≥3 days per week) over seven day period included rice, green leafy vegetables, soybean and coconut oil, dried and fresh fish. Pulses, fruit and diary product were very few consumed daily or frequently (<3 days from week).
A fair amount of variety of foods within FCS food groups was observed by the staff in the field as well as show in the FCS scores. The predominated staple food was rice; potatoes and wheat flour were inaccessible during the survey because it was not the season of potato. The predominated protein food was fresh/dried fish and the fat was cooking oils, poultry and eggs are not often consumed.
Although the HDDS score was found that above minimum acceptable of 4 and the fact than more than 88.8% of households for both Township had an adequate foods consumed (FCS), the lack of variety need to be taken into consideration.
It should be noted that in Maungdaw district the peak season for food shortages is between June and August, during the rainy season and just before the harvesting season. The data collection for the present surveys took place at the end of the year: November and December.

9.7 Mental Health

Regarding mental health status, the results are showing an alarming general poor well-being and affected quality of life: 76.2% of the 824 respondents have a well-being score under the threshold of 13 (maximum 25), with an average of 10.2. Main findings are that 77.1% of the 824 respondents show signs of loss of interests in their life, and 42.6% show signs of unhapiness or mood depreciation.
Results are very similar in Buthidaung and Maungdaw for general score and specific scores. The proportion of potential mental health issues, such as depression, is very high, showing serious vulnerabilities, particularly about loss of interests in life, unhapiness, mood depreciation, and stress. In Buthidaung and Maungdaw, the vulnerabilities observed are due to the same population' conditions of living, poor women conditions, fears about security context, limited access to (mental) health resources and weak capacities to develop copying and mutual-aid mechanisms. These survey results are similar to those observed in 2013 for the ACF Therapeutic Feeding Program and Prevention Project beneficiaries (who benefit from a psychosocial follow-up), which are impacting negatively the maternal and child care, therefore increasing risks of malnutrition, as well as morbidity factors, with difficulties to cope with daily and chronic problems.

These results show an important and urgent need of specific mental health assessments and provision of psychosocial services in Maungdaw District.

9.8 WASH

As mentioned on Section 5, the WASH section has focused on Water and Sanitation infrastructure due to Nutrition encompassing the Hygiene indicators. Based on the results of this section for both Buthidaung and Maungdaw townships, improving sanitation coverage in surveyed villages is needed and will result in positive public health outcomes for the population considering only 43% of households in both townships had latrines. Household level sanitation programs should be further completed with WASH program in schools to ensure sustained behavior practices of children and their households as well as access to safe excreta disposal in the schools.

To complement environmental sanitation programs, improving drinking water sources can go long ways for the population in both townships, especially in Buthidaung where only 33% of villages visited had an improved water source. In addition to water infrastructure development at source, appropriate point-of-use water treatment options should be promoted at the household level to ensure safe water consumption. Effective and locally available water treatment options should be prioritized with ceramic filters or boiling being acceptable methods. Water and sanitation infrastructure interventions should be further integrated with hygiene promotion programs to ensure the underlying causes of malnutrition are addressed in Buthidaung and Maungdaw Townships.

10. CONCLUSION

The overall situation in both Townships remains crucial with global acute malnutrition, chronic malnutrition and underweight prevalence remaining above the WHO emergency threshold of respectively 15%, 40% and 30%.

If the situation for acute malnutrition seems to be stable, a worrying deterioration of the chronic malnutrition and underweight situation has been identified compared to the previous surveys done. Half of children surveyed, were suffering from stunting in both Townships.

These general poor indicators highlight the fact that a multisectorial approach is needed. Moreover this it is recognised that impact of therapeutic approach on the population' nutritional status is considerably reduced if appropriate general support for the population is not in place especially in area with acute and protracted food insecurity.

Improvements in both maternal nutrition status and children and young child feeding practices could significantly contribute to a reduction in chronic malnutrition and improve child growth, health and survival.

11. RECOMMENDATIONS

These recommendations are for all stakeholders involved in Maungdaw district including NGOs and UN agencies.

General recommendations:

1. To conduct an anthropologic study in order to:
   - ✓ Explore knowledge, perceptions and practices related to gender, care, health, nutrition, WASH, food security and livelihoods.
   - ✓ Provide operational recommendations for designing adapted interventions.

2. To continue to have an integrated approach through Food Security and Livelihood, WASH, Health, Mental Health and Care Practices and nutrition activities in Maungdaw and Buthidaung Townships.
3. To improve the communication with the community leaders in order to contribute to their better understanding of NGO's activities.
4. To ensure that all programs take into account the opinions, needs and skills of women, and that every effort is made to empower women, particularly in matters related to household food security and livelihoods, health childcare and access to water sanitation and appropriate hygiene practices.

Nutrition and Health recommendations:

5. To continue the nutrition programme in both Townships including prevention, detection and treatment activities for acute malnourished children.
6. To enroll acute malnourished Pregnant and Lactating Women in nutrition programs.
7. To conduct a nutrition program coverage survey to evaluate the current coverage, the impact of nutrition program and evaluate the barrier/booster to the nutrition program.
8. To Conduct SMART surveys every two years to monitor and compare nutrition anthropometric indicators.
9. To promote health and nutrition education through educational sessions in health and nutrition centers and through community awareness at household level.
10. To advocate getting a better health services coverage and for free access to health care for children under 5 and pregnant and Lactating women in both Townships.
11. To drastically improve vaccination coverage in both townships.
12. To strengthen collaboration between MoH and nutrition and health humanitarian actors at local level to ensure complementarity of actors

Food Security and Livelihood recommendations:

13. To increase staple food availability through production intensification by promoting innovative yet feasible systems and technologies.
14. To improve access to nutrient rich diet through supporting household level production of wholesome crops through home gardens - taking into account the cultural preferences and involving, when possible, fortified varieties.
15. To improve linkage of households to markets by facilitating better understanding of market mechanisms and increasing access to productive assets.

Mental Health & Care Practices recommendations:

16. To conduct specific assessments and studies on mental health status in the aim to develop adapted psychosocial prevention and intervention projects among vulnerable population.
17. To develop provision of Mental Health and Psychosocial Support (MHPSS) services, by strengthening capacity building for Traditional Birth Attendants, Traditional healers and health workers.
18. To scale-up Care Practices and Infant and Young Child feeding activities through psychosocial support, health services and communities mobilization activities.

WASH recommendations:

19. To facilitate access to improved water sources including operation and maintenance; and promote effective water treatment to ensure safe drinking water consumption at household and village level.
20. To facilitate access to improved sanitation facilities and behavior change practices towards sanitation.
21. To conduct hygiene promotion programs focused on sustained behavior change, with a component of hygiene education for caregivers
22. To integrate the management of water resources at community level between WASH and FSL programmes (i.e. home gardens)

Education recommendations:

23. To improve female access to education. It will ensure that girls have good caregiving skills and will help them achieve better nutrition for themselves and their future children.

Annex 1: MAUNGDAW – BUTHIDAUNG Questionnaire

1. DEMOGRAPHIC

DATE: _____ VILLAGE TRACK: _____ VILLAGE: _____

TEAM: _____ CLUSTER: _____ HOUSEHOLD: _____ HOUSEHOLD id _____

2. ANTHROPOMETRIC (6-59 months)

Start with the youngest child first

Child	Sex (M/F)	Age (Months)	Age determined by (must use at least 2 including 1 from 1-6) *1.event calendar 2.CHW 3.vaccination card 4.family list/village track clerk 5.mother 6.birth certificate 7.other*	Weight (kg) ±0.1kg	Height/Length (cm) ±0.1cm	Oedema (Y/N)	MUAC (mm)
1							
2							
3							

3. ANTHOPOMETRIC PREGNANT and LACTATING WOMAN- Ask for all pregnant and lactating woman in the HH

Women Child bearing age (15 to 45 years old)	Age (years)	MUAC (mm)
1		
2		
3		

4. MORBIDITY (6-59 months)

In the past 2 WEEKS has your child/children had any of the following illnesses?

Child	Diarrhoea (Y/N) (minimum 3 watery stools in 24h period)	Fever (Y/N) (body temp higher than normal including a hot forehead)	ARI (Y/N) (eg. cough, pneumonia, chest indrawing, rapid breathing etc)	Other (runny nose, scabies, red eye etc)
1				
2				
3				

5. CHILD FEEDING PRACTICES (6-23 months)

1. Is your 6-23 MONTH child/children currently exclusively breastfed? *Exclusively breastfed: breast milk (including milk expressed) as well as water, ORS, drops, syrups (vitamins, minerals, medicines) but does not allow anything else*	Child 1 (Y/N)	Child 2 (Y/N)	Child 3 (Y/N)

If yes to Q 1, skip to Section 5 Household Food Security

2. Is your 6-23 MONTH child/children currently breastfed as well as given complementary foods? *Complementary feeding: breast milk (including milk expressed) as well as any food or liquid including non-human milk and formula*	Child 1 (Y/N	Child 2 (Y/N)	Child 3 Y/N)

If yes to Q 2 skip to Q 4

3. At what age (MONTHS) did your 6-23 MONTH child/children completely stop breastfeeding?	Child 1 (months)	Child 2 (months)	Child 3 (months)

4. At what age (MONTHS) was your 6-23 MONTH child/children introduced to food or other fluid (excluding breast milk, water) for the first time?	Child 1 (months)	Child 2 (months)	Child 3 (months)

5. What was the first food (excluding water , breast milk) introduced to your 6-23 MONTH child/children? *1. rice porridge 2. rice powder 3. Small cake/biscuit 4. fruit/juice 5. Maize Quicka 6. other*	Child 1 (food)	Child 2 (food)	Child 3 (food)

Refer to 6. Child Feeding Introduction in Supplementary Guide 6. Did your 6-23 MONTH child/children eat any of the following food groups in the PAST 24 HOURS? For example, from yesterday at ___ o'clock until now, has your 6-23 month child/children consumed____ food group? *Consumption of any amount of food from each food group is sufficient to 'count'. For example, there is no minimum quantity, except if an item is used as a condiment.*	Child 1 (Y/N)	Child 2 (Y/N)	Child 3 (Y/N)
A. Grains, roots, tubers or any food made from them: rice, bread, maize flour, tarot, katat, pelopanan etc			
B. Legumes, nuts or any food made from them: lentils, peas, check peas, gram ground nuts, beans (lablab, lima, butter bean etc)			
C. Dairy products: milk (canned, powdered) cheese, yogurt etc (NO breast milk)			
D. Flesh foods: meat, fish, poultry, organs, etc			
E. Eggs			
F. Vitamin A rich fruits and vegetables: Orange inside and dark green: carrot, pumpkin, sweet potato, mango, dark green vegetable, papayas etc			
G. Other fruits and vegetables bananas, apples, watermelon, corn, eggplant, tomato, potato etc			
H. Sugar : in tea, coffee, Myanmar snacks, packaged snacks, candy, sweet snacks			
I. Oil: groundnut, sesame, palm etc Fat: butter, animal fat etc			
J. Infant formula			

7. How many meals did your 6-23 month child/children have in the past 24h (NOT including breast milk)?	Child 1 (meals)	Child 2 (meals)	Child 3 (meals)

6. HOUSEHOLD FOOD SECURITY

For this entire section, if possible, ask the person in the household who does most of the cooking.

Refer to 1. Household Food security Introduction in Supplementary Guide

1. The following includes foods that were consumed by household members in the household. This does NOT include foods purchased and eaten outside of the household by individual members.

Food Items	A) Was the food consumed in the PAST 24 HOURS (Y/N)	B) Number of DAYS the food was eaten in the PAST 7 DAYS (0-7)
A. Rice: rice, rice noodles etc		
B. Maize: millet, corn, etc		
C. Other cereals: wheat, wheat noodles, bread		
D. Potatoes/tubers: sweet potato, taro, etc		
E. Beans: lablab bean, lima bean, butter bean, etc, lentils, peas, check pea, gram, etc		
F. Nuts: peanut, groundnut, etc		
G. Vegetables: gourd, brinjal, cucumber, tomato, leafy vegetable etc		
H. Fruits: banana, orange, apple, pineapple etc		
I. Beef: cows, buffalo		
J. Pork		
K. Mutton: goat, sheep		
L. Poultry: chicken, duck		
M. Eggs: hen, duck, ngone		
N. Fish: fish, prawn, dried fish etc., seafood		
O. Milk/ milk products: milk (canned, powdered), yogurt, cheese		
P. Oil: groundnut, sesame, palm etc Fat: butter, animal fat etc		
Q. Sugar: : in tea, coffee, Myanmar snacks, packaged snacks, candy, sweet snacks		
R. Condiments: spices, fish paste, salt etc		

Must ask follow up questions for:

- *Combination foods such as soups and curries: (vegetable Y/N) + (flesh meat, fish etc Y/N) + (oil Y/N) + (condiment Y/N)*
- *If the 7 day total for any of the following food groups is under 5: rice, vegetables, oil, sugar, condiments*

7. Mental Health

	Over the last two weeks ...	All of the time *(14 days)*	Most of the time *(10 to 13 days)*	More than half of the time *(7 to 9 days)*	Less than half of the time *(4 to 6 days)*	Some of the time *(1 to 3 days)*	At no time *(0 days)*
1	... have you felt cheerful and in good spirits ? *(happy and positive)*	5	4	3	2	1	0
2	... have you felt calm and relaxed ? *(no stress)*	5	4	3	2	1	0
3	... have you felt active and vigorous ? *(body energy)*	5	4	3	2	1	0
4	... did you woke up feeling fresh and rested ? *(sleep well)*	5	4	3	2	1	0
5	... your daily life has been filled with things that interest you ? *(social or funny activities)*	5	4	3	2	1	0

8. WATER and SANITATION

1. Do you have a latrine in your house?	Yes or No	

2. Does the school (not madrassa) your children attend have a functional latrine?	Yes or No or do no go to school	

3. What is your primary drinking water source?	1=Borehole 2=Open Well 3=Protected Well 4=Pond 5=River	Number

	6=Other :_____ _____	

4. Do you treat your drinking water?	Yes or No	

5. If yes, how do you treat it?	1=Ceramic Filter 2=Cloth filter 3=Boiling 4=Chlorination 5=Basic sedimentation 6=Other:_____ _____	Number

Annex 2: MAUNGDAW MORTALITY SURVEY QUESTIONNAIRE

Village Track _____ Village _____ Date: _____

Team Number _____ Cluster Number _____ Household Number _____

No	1. HH member	2. Sex M/F	3. Age (years) *most concerned <5	4. Born since Eid-du-Fitir (9th August) (Y/N)	5. Joined since Eid-du-Fitir (9th August) (Y/N)	6. left HH since Eid-du-Fitir (9th August) (Y/N)	7. Cause of under 5 death
1) How many members slept last night in the HH? * *start with the oldest member of the HH and continue to the youngest*							
2) How many members were living in this HH on Eid-du-Fitir (9th August) but have since left this HH?							
3) Have any members of the HH died since Eid-du-Fitir (9th August)?							

Cause of death:

For Team leader to fill out

HH member Total	**HH < 5 Total**	**Joined HH Total (excluding births)**	**Joined HH < 5**	**Left HH total (excluding deaths)**	**Left HH under 5**	**Births Total**	**Deaths Total**	**<5 deaths**

Annex 3: BUTHIDAUNG Mortality Questionnaire

Village Track _____ Village _____ Date: _____

Team Number _____ Cluster Number _____ Household Number _____

No	1. HH member	2. Sex M/F	3. Age (years) *most concerned <5	4. Born since First Moon Day (30 days after Eid-du-Fitir; 6th Sep) (Y/N)	5. Joined since First Moon Day (30 days after Eid-du-Fitir; 6th Sep) (Y/N)	6. left HH since First Moon Day (30 days after Eid-du-Fitir; 6th Sep) (Y/N)	7. Cause of under 5 death
1) How many members slept last night in the HH? * *start with the oldest member of the HH and continue to the youngest*							
2) How many members were living in this HH on First Moon Day (30 days after Eid-du-Fitir; 6th Sep) but have since left this HH?							
3) Have any members of the HH died since First Moon Day (30 days after Eid-du-Fitir; 6th Sep)?							

Cause of death:

For Team leader to fill out

HH member Total	**HH < 5 Total**	**Joined HH Total (excluding births)**	**Joined HH < 5**	**Left HH total (excluding deaths)**	**Left HH under 5**	**Births Total**	**Deaths Total**	**<5 deaths**

Annex 4: Maungdaw Plausibility Report

Plausibility check for: Maungdaw SMART NOVEMBER 2013.as

Standard/Reference used for z-score calculation: WHO standards 2006
(If it is not mentioned, flagged data is included in the evaluation. Some parts of this plausibility report are more for advanced users and can be skipped for a standard evaluation)

Overall data quality

Criteria	Flags*	Unit	Excel.	Good	Accept	Problematic	**Score**
Missing/Flagged data	Incl	%	0-2.5	>2.5-5.0	>5.0-10	>10	
(% of in-range subjects)			0	5	10	20	**0** (1.2 %)
Overall Sex ratio	Incl	p	>0.1	>0.05	>0.001	<0.000	
(Significant chi square)			0	2	4	10	**0** (p=0.847)
Overall Age distrib	Incl	p	>0.1	>0.05	>0.001	<0.000	
(Significant chi square)			0	2	4	10	**4** (p=0.001)
Dig pref score - weight	Incl	#	0-5	5-10	10-20	> 20	
			0	2	4	10	**0** (4)
Dig pref score - height	Incl	#	0-5	5-10	10-20	> 20	
			0	2	4	10	**0** (3)
Standard Dev WHZ	Excl	SD	<1.1	<1.15	<1.20	>1.20	
			0	2	6	20	**0** (1.00)
Skewness WHZ	Excl	#	<±1.0	<±2.0	<±3.0	>±3.0	
			0	1	3	5	**0** (-0.07)
Kurtosis WHZ	Excl	#	<±1.0	<±2.0	<±3.0	>±3.0	
			0	1	3	5	**0** (-0.23)
Poisson dist WHZ-2	Excl	p	>0.05	>0.01	>0.001	<0.000	
			0	1	3	5	**3** (p=0.004)
Timing	Excl	Not determined yet					
			0	1	3	5	
OVERALL SCORE WHZ =			0-5	5-10	10-15	>15	**7** %

At the moment the overall score of this survey is 7 %, this is good.

There were no duplicate entries detected.

Missing data:

WEIGHT: Line=126/ID=71 The child went to relative of another village and she didn't back home UNTIL team did revisit.
HEIGHT: Line=126/ID=71 Same child as mentioned above.

Percentage of children with no exact birthday: 100 %

Anthropometric Indices likely to be in error (-3 to 3 for WHZ, -3 to 3 for HAZ, -3 to 3 for WAZ, from observed mean - chosen in Options panel - these values will be flagged and should be excluded from analysis for a nutrition survey in emergencies. For other surveys this might not be the best procedure e.g. when the percentage of overweight children has to be calculated):

Line=23/ID=82: **WHZ (-5.386)**, WAZ (-6.562), Weight may be incorrect, Team recheck the all measurements and age; it was because the child was severely malnourished.
Line=200/ID=52: **WHZ (-4.454)**, WAZ (-5.132), Weight may be incorrect, Team did second measurement and check age of child.
Line=268/ID=9: **WHZ (2.078)**, Weight may be incorrect, Team did second measurement
Line=310/ID=22: HAZ (-7.470), WAZ (-6.198), Age may be incorrect, This child is twin with below line 311 child. Both are very thin and malnourished.
Line=311/ID=22: HAZ (-7.251), WAZ (-6.327), Age may be incorrect, Same as above
Line=340/ID=15: **WHZ (-4.315)**, Weight may be incorrect, The child was malnourished and very thin, team did second measurement.
Line=347/ID=19: **WHZ (-4.307)**, Weight may be incorrect, Team did second measuremnt and check the age of child.

Percentage of values flagged with SMART flags:WHZ: 1.2 %, HAZ: 0.5 %, WAZ: 0.9 %

Age distribution:

Month 6 : ####
Month 7 : ########
Month 8 : ########
Month 9 : ########
Month 10 : ##########
Month 11 : #########
Month 12 : ###########
Month 13 : #########
Month 14 : ##########
Month 15 : ###########
Month 16 : ##########
Month 17 : #######
Month 18 : #######
Month 19 : ########
Month 20 : ##########
Month 21 : #####
Month 22 : ############
Month 23 : #######
Month 24 : ##########
Month 25 : ##############
Month 26 : ##########
Month 27 : ###########

Month 28 : #########
Month 29 : ###########
Month 30 : ####
Month 31 : ######
Month 32 : ##########
Month 33 : ####
Month 34 : #########
Month 35 : ###########
Month 36 : ###########
Month 37 : ##############
Month 38 : ########
Month 39 : ###########
Month 40 : ##############
Month 41 : ###########
Month 42 : #######
Month 43 : ##########
Month 44 : #####
Month 45 : #######
Month 46 : ######
Month 47 : ########
Month 48 : #####
Month 49 : ######
Month 50 : #######
Month 51 : #####
Month 52 : #######
Month 53 : ###
Month 54 : ###
Month 55 : ####
Month 56 : ###
Month 57 : #####
Month 58 : #####
Month 59 : ####

Age ratio of 6-29 months to 30-59 months: 1.04 (The value should be around 1.0).

Statistical evaluation of sex and age ratios (using Chi squared statistic):

Age cat.	mo.	boys	girls	total	ratio boys/girls
6 to 17	12	53/50.3 (1.1)	52/49.4 (1.1)	105/99.8 (1.1)	1.02
18 to 29	12	62/49.1 (1.3)	52/48.2 (1.1)	114/97.3 (1.2)	1.19
30 to 41	12	51/47.6 (1.1)	60/46.7 (1.3)	111/94.3 (1.2)	0.85
42 to 53	12	37/46.8 (0.8)	39/46.0 (0.8)	76/92.8 (0.8)	0.95
54 to 59	6	14/23.2 (0.6)	10/22.7 (0.4)	24/45.9 (0.5)	1.40
6 to 59	54	217/215.0 (1.0)	213/215.0 (1.0)		1.02

The data are expressed as observed number/expected number (ratio of obs/expect)

Overall sex ratio: p-value = 0.847 (boys and girls equally represented)
Overall age distribution: p-value = 0.001 (significant difference)
Overall age distribution for boys: p-value = 0.050 (as expected)
Overall age distribution for girls: p-value = 0.015 (significant difference)
Overall sex/age distribution: p-value = 0.000 (significant difference)

Digit preference Weight:

Digit .0 : ##
Digit .1 : ###################################
Digit .2 : ##
Digit .3 : ##
Digit .4 : ##
Digit .5 : ##
Digit .6 : ##
Digit .7 : ##
Digit .8 : ##
Digit .9 : ###################################

Digit Preference Score: **4** (0-5 good, 6-10 acceptable, 11-20 poor and > 20 unacceptable)

Digit preference Height:

Digit .0 : ##
Digit .1 : ####################################
Digit .2 : ##
Digit .3 : ##
Digit .4 : ##
Digit .5 : ##
Digit .6 : ##
Digit .7 : ##
Digit .8 : ##
Digit .9 : ##

Digit Preference Score: **3** (0-5 good, 6-10 acceptable, 11-20 poor and > 20 unacceptable)

Digit preference MUAC:

Digit .0 : ##
Digit .1 : ##
Digit .2 : ##
Digit .3 : ##

Digit .4 : ##
Digit .5 : ###################################
Digit .6 : ##
Digit .7 : ##
Digit .8 : ##
Digit .9 : ####################################

Digit Preference Score: **3** (0-5 good, 6-10 acceptable, 11-20 poor and > 20 unacceptable)

Evaluation of Standard deviation, Normal distribution, Skewness and Kurtosis using the 3 exclusion (Flag) procedures

.	**no exclusion**	**exclusion from reference mean (WHO flags)**	**exclusion from observed mean (SMART flags)**
WHZ			
Standard Deviation SD:	1.07	1.05	1.00
(The SD should be between 0.8 and 1.2)			
Prevalence (< -2)			
observed:	20.0%	19.9%	19.3%
calculated with current SD:	19.7%	19.0%	17.5%
calculated with a SD of 1:	18.1%	17.9%	17.5%
HAZ			
Standard Deviation SD:	1.24	1.18	1.18
(The SD should be between 0.8 and 1.2)			
Prevalence (< -2)			
observed:	47.6%	47.3%	47.3%
calculated with current SD:	51.3%	50.5%	50.5%
calculated with a SD of 1:	51.6%	50.6%	50.6%
WAZ			
Standard Deviation SD:	1.08	1.02	1.00
(The SD should be between 0.8 and 1.2)			
Prevalence (< -2)			
observed:	42.9%	42.5%	42.4%
calculated with current SD:	46.2%	44.8%	44.4%
calculated with a SD of 1:	45.9%	44.7%	44.4%

Results for Shapiro-Wilk test for normally (Gaussian) distributed data:

WHZ	p= 0.023	p= 0.219	p= 0.299
HAZ	p= 0.000	p= 0.013	p= 0.013
WAZ	p= 0.000	p= 0.010	p= 0.012

(If p < 0.05 then the data are not normally distributed. If p > 0.05 you can consider the data normally distributed)

Skewness

WHZ	-0.29	-0.18	-0.07

HAZ	-0.50	-0.20	-0.20
WAZ	-0.67	-0.30	-0.25

If the value is:
-below minus 2 there is a relative excess of wasted/stunted/underweight subjects in the sample
-between minus 2 and minus 1, there may be a relative excess of wasted/stunted/underweight subjects in the sample.
-between minus 1 and plus 1, the distribution can be considered as symmetrical.
-between 1 and 2, there may be an excess of obese/tall/overweight subjects in the sample.
-above 2, there is an excess of obese/tall/overweight subjects in the sample

Kurtosis

WHZ	0.58	0.19	-0.23
HAZ	0.80	-0.40	-0.40
WAZ	1.28	-0.16	-0.28

(Kurtosis characterizes the relative peakedness or flatness compared with the normal distribution, positive kurtosis indicates a relatively peaked distribution, negative kurtosis indicates a relatively flat distribution)
If the value is:
-above 2 it indicates a problem. There might have been a problem with data collection or sampling.
-between 1 and 2, the data may be affected with a problem.
-less than an absolute value of 1 the distribution can be considered as normal.

Test if cases are randomly distributed or aggregated over the clusters by calculation of the Index of Dispersion (ID) and comparison with the Poisson distribution for:

WHZ < -2: ID=1.81 (p=0.004)
WHZ < -3: ID=1.20 (p=0.204)
GAM: ID=1.81 (p=0.004)
SAM: ID=1.20 (p=0.204)
HAZ < -2: ID=2.50 (p=0.000)
HAZ < -3: ID=2.33 (p=0.000)
WAZ < -2: ID=1.75 (p=0.006)
WAZ < -3: ID=1.95 (p=0.001)

Subjects with SMART flags are excluded from this analysis.

The Index of Dispersion (ID) indicates the degree to which the cases are aggregated into certain clusters (the degree to which there are "pockets"). If the ID is less than 1 and p > 0.95 it indicates that the cases are UNIFORMLY distributed among the clusters. If the p value is between 0.05 and 0.95 the cases appear to be randomly distributed among the clusters, if ID is higher than 1 and p is less than 0.05 the cases are aggregated into certain cluster (there appear to be pockets of cases). If this is the case for Oedema but not for WHZ then aggregation of GAM and SAM cases is likely due to inclusion of oedematous cases in GAM and SAM estimates.

Are the data of the same quality at the beginning and the end of the clusters?
Evaluation of the SD for WHZ depending upon the order the cases are measured within each cluster (if one cluster per day is measured then this will be related to the time of the day the measurement is made).

Time SD for WHZ

point 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3

01: 1.09 (n=32, f=1) ############

02: 1.04 (n=32, f=0) ##########

03: 1.24 (n=31, f=1) ####################

04: 0.76 (n=32, f=0)

05: 1.07 (n=31, f=0) ###########

06: 1.21 (n=29, f=0) ##################

07: 1.09 (n=29, f=1) ############

08: 1.16 (n=27, f=0) ################

09: 1.07 (n=26, f=0) ###########

10: 0.79 (n=26, f=0)

11: 1.09 (n=26, f=1) ############

12: 0.95 (n=23, f=0) ######

13: 1.27 (n=21, f=1) ####################

14: 1.05 (n=16, f=0) ###########

15: 1.25 (n=12, f=0) OOOOOOOOOOOOOOOOOO

16: 0.90 (n=09, f=0) OOOO

17: 0.92 (n=07, f=0) OOOOO

18: 1.27 (n=05, f=0) ~~~~~~~~~~~~~~~~~~~~

19: 1.21 (n=05, f=0) ~~~~~~~~~~~~~~~~~~

20: 0.54 (n=03, f=0)

21: 0.14 (n=02, f=0)

22: 0.35 (n=02, f=0)

(when n is much less than the average number of subjects per cluster different symbols are used: 0 for n < 80% and ~ for n < 40%; The numbers marked "f" are the numbers of SMART flags found in the different time points)

Analysis by Team

Team	**1**	**2**	**3**	**4**
n =	94	105	124	107
Percentage of values flagged with SMART flags:				
WHZ:	0.0	1.0	3.3	0.9
HAZ:	0.0	1.9	0.8	0.0
WAZ:	0.0	2.9	0.8	0.9
Age ratio of 6-29 months to 30-59 months:				
	1.29	1.28	0.77	0.98
Sex ratio (male/female):				
	0.96	0.94	1.07	1.10
Digit preference Weight (%):				
.0 :	10	10	11	8
.1 :	10	6	10	8
.2 :	11	10	6	16

.3 :	13	12	11	9	
.4 :	13	14	10	9	
.5 :	10	12	10	13	
.6 :	11	9	13	10	
.7 :	7	8	13	7	
.8 :	10	10	11	9	
.9 :	7	9	7	8	
DPS:	6	8	7	8	Digit preference score (0-5 good, 5-10 acceptable, 10-20 poor and > 20 unacceptable)
Digit preference Height (%):					
.0 :	11	8	10	12	
.1 :	13	8	9	6	
.2 :	12	9	8	10	
.3 :	13	15	9	13	
.4 :	10	14	10	12	
.5 :	11	8	9	13	
.6 :	7	11	10	9	
.7 :	10	10	13	6	
.8 :	9	8	11	9	
.9 :	6	10	11	9	
DPS:	7	9	5	9	Digit preference score (0-5 good, 5-10 acceptable, 10-20 poor and > 20 unacceptable)
Digit preference MUAC (%):					
.0 :	7	9	12	8	
.1 :	9	10	11	12	
.2 :	12	13	13	7	
.3 :	13	10	7	9	
.4 :	16	11	7	11	
.5 :	7	5	9	12	
.6 :	10	9	11	10	
.7 :	6	11	11	12	
.8 :	12	10	12	8	
.9 :	9	11	7	8	
DPS:	9	7	7	6	Digit preference score (0-5 good, 5-10 acceptable, 10-20 poor and > 20 unacceptable)
Standard deviation of WHZ:					
SD	0.99	1.14	1.09	1.03	
Prevalence (< -2) observed:					
%		24.8	15.4	19.6	
Prevalence (< -2) calculated with current SD:					
%		21.9	17.7	21.5	
Prevalence (< -2) calculated with a SD of 1:					
%		18.8	15.6	20.8	
Standard deviation of HAZ:					
SD	0.76	1.38	1.21	1.18	
observed:					
%		54.3	52.0	64.5	

calculated with current SD:

%	58.4	51.9	63.8

calculated with a SD of 1:

%	61.5	52.3	66.2

Statistical evaluation of sex and age ratios (using Chi squared statistic) for:

Team 1:

Age cat.	mo.	boys	girls	total	ratio boys/girls
6 to 17	12	13/10.7 (1.2)	16/11.1 (1.4)	29/21.8 (1.3)	0.81
18 to 29	12	15/10.4 (1.4)	9/10.9 (0.8)	24/21.3 (1.1)	1.67
30 to 41	12	11/10.1 (1.1)	14/10.5 (1.3)	25/20.6 (1.2)	0.79
42 to 53	12	6/9.9 (0.6)	8/10.4 (0.8)	14/20.3 (0.7)	0.75
54 to 59	6	1/4.9 (0.2)	1/5.1 (0.2)	2/10.0 (0.2)	1.00
6 to 59	54	46/47.0 (1.0)	48/47.0 (1.0)		0.96

The data are expressed as observed number/expected number (ratio of obs/expect)

Overall sex ratio: p-value = 0.837 (boys and girls equally represented)
Overall age distribution: p-value = 0.017 (significant difference)
Overall age distribution for boys: p-value = 0.122 (as expected)
Overall age distribution for girls: p-value = 0.114 (as expected)
Overall sex/age distribution: p-value = 0.005 (significant difference)

Team 2:

Age cat.	mo.	boys	girls	total	ratio boys/girls
6 to 17	12	9/11.8 (0.8)	17/12.5 (1.4)	26/24.4 (1.1)	0.53
18 to 29	12	16/11.5 (1.4)	17/12.2 (1.4)	33/23.8 (1.4)	0.94
30 to 41	12	17/11.2 (1.5)	10/11.8 (0.8)	27/23.0 (1.2)	1.70
42 to 53	12	7/11.0 (0.6)	8/11.7 (0.7)	15/22.7 (0.7)	0.88
54 to 59	6	2/5.4 (0.4)	2/5.8 (0.3)	4/11.2 (0.4)	1.00
6 to 59	54	51/52.5 (1.0)	54/52.5 (1.0)		0.94

The data are expressed as observed number/expected number (ratio of obs/expect)

Overall sex ratio: p-value = 0.770 (boys and girls equally represented)
Overall age distribution: p-value = 0.020 (significant difference)
Overall age distribution for boys: p-value = 0.059 (as expected)
Overall age distribution for girls: p-value = 0.118 (as expected)
Overall sex/age distribution: p-value = 0.002 (significant difference)

Team 3:

Age cat.	mo.	boys	girls	total	ratio boys/girls
6 to 17	12	21/14.8 (1.4)	7/13.9 (0.5)	28/28.8 (1.0)	3.00
18 to 29	12	11/14.5 (0.8)	15/13.6 (1.1)	26/28.1 (0.9)	0.73
30 to 41	12	13/14.0 (0.9)	19/13.2 (1.4)	32/27.2 (1.2)	0.68
42 to 53	12	13/13.8 (0.9)	13/12.9 (1.0)	26/26.8 (1.0)	1.00
54 to 59	6	6/6.8 (0.9)	6/6.4 (0.9)	12/13.2 (0.9)	1.00
6 to 59	54	64/62.0 (1.0)	60/62.0 (1.0)		1.07

The data are expressed as observed number/expected number (ratio of obs/expect)

Overall sex ratio: p-value = 0.719 (boys and girls equally represented)
Overall age distribution: p-value = 0.885 (as expected)
Overall age distribution for boys: p-value = 0.462 (as expected)
Overall age distribution for girls: p-value = 0.184 (as expected)
Overall sex/age distribution: p-value = 0.043 (significant difference)

Team 4:

Age cat.	mo.	boys	girls	total	ratio boys/girls
6 to 17	12	10/13.0 (0.8)	12/11.8 (1.0)	22/24.8 (0.9)	0.83
18 to 29	12	20/12.7 (1.6)	11/11.5 (1.0)	31/24.2 (1.3)	1.82
30 to 41	12	10/12.3 (0.8)	17/11.2 (1.5)	27/23.5 (1.2)	0.59
42 to 53	12	11/12.1 (0.9)	10/11.0 (0.9)	21/23.1 (0.9)	1.10
54 to 59	6	5/6.0 (0.8)	1/5.4 (0.2)	6/11.4 (0.5)	5.00
6 to 59	54	56/53.5 (1.0)	51/53.5 (1.0)		1.10

The data are expressed as observed number/expected number (ratio of obs/expect)

Overall sex ratio: p-value = 0.629 (boys and girls equally represented)
Overall age distribution: p-value = 0.238 (as expected)
Overall age distribution for boys: p-value = 0.230 (as expected)
Overall age distribution for girls: p-value = 0.148 (as expected)
Overall sex/age distribution: p-value = 0.014 (significant difference)

Evaluation of the SD for WHZ depending upon the order the cases are measured within each cluster (if one cluster per day is measured then this will be related to the time of the day the measurement is made).

Team: 1

Time SD for WHZ
point 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3
01: 1.00 (n=07, f=0) ########
02: 1.40 (n=07, f=0) ########################
03: 1.08 (n=07, f=0) ############
04: 0.73 (n=07, f=0)
05: 0.78 (n=07, f=0)
06: 1.40 (n=07, f=0) ########################
07: 0.73 (n=07, f=0)
08: 1.12 (n=07, f=0) #############
09: 0.92 (n=07, f=0) #####
10: 0.83 (n=07, f=0) #
11: 0.66 (n=07, f=0)
12: 0.88 (n=05, f=0) ###
13: 0.36 (n=05, f=0)
14: 1.09 (n=03, f=0) OOOOOOOOOOOO
15: 1.07 (n=02, f=0) ~~~~~~~~~~

(when n is much less than the average number of subjects per cluster different symbols are used: 0 for n < 80% and ~ for n < 40%; The numbers marked "f" are the numbers of SMART flags found in the different time points)

Team: 2

Time SD for WHZ
point 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3
01: 0.79 (n=08, f=0)
02: 0.75 (n=08, f=0)
03: 1.35 (n=08, f=0) ########################
04: 0.81 (n=08, f=0)
05: 1.02 (n=07, f=0) #########
06: 1.02 (n=06, f=0) #########
07: 0.92 (n=06, f=0) #####
08: 0.93 (n=06, f=0) #####
09: 1.31 (n=06, f=0) ######################
10: 1.24 (n=06, f=0) ##################
11: 1.86 (n=06, f=1) ##
12: 1.30 (n=06, f=0) ######################
13: 1.12 (n=06, f=0) #############
14: 1.08 (n=05, f=0) ############
15: 1.96 (n=03, f=0) OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO
16: 0.56 (n=03, f=0)
17: 1.13 (n=02, f=0) ~~~~~~~~~~~~~~~
18: 1.92 (n=02, f=0) ~~~~~~
19: 1.15 (n=02, f=0) ~~~~~~~~~~~~~~~~

(when n is much less than the average number of subjects per cluster different symbols are used: 0 for n < 80% and ~ for n < 40%; The numbers marked "f" are the numbers of SMART flags found in the different time points)

Team: 3

Time SD for WHZ
point 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3
01: 1.42 (n=08, f=1) ##########################
02: 0.68 (n=08, f=0)
03: 1.31 (n=07, f=1) ####################
04: 0.82 (n=08, f=0) #
05: 1.28 (n=08, f=0) ####################
06: 1.49 (n=07, f=0) ##############################
07: 1.54 (n=07, f=1) ################################
08: 1.08 (n=07, f=0) ############
09: 1.15 (n=07, f=0) ################
10: 0.59 (n=07, f=0)
11: 0.97 (n=07, f=0) #######
12: 0.44 (n=07, f=0)
13: 1.20 (n=05, f=0) ##################
14: 0.91 (n=05, f=0) #####
15: 1.26 (n=05, f=0) ####################
16: 0.68 (n=04, f=0)
17: 0.78 (n=03, f=0)
18: 0.67 (n=02, f=0)
19: 2.06 (n=02, f=0) OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO
20: 0.68 (n=02, f=0)
21: 0.14 (n=02, f=0)
22: 0.35 (n=02, f=0)

(when n is much less than the average number of subjects per cluster different symbols are used: 0 for n < 80% and ~ for n < 40%; The numbers marked "f" are the numbers of SMART flags found in the different time points)

Team: 4

Time SD for WHZ
point 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3
01: 1.02 (n=09, f=0) #########
02: 1.28 (n=09, f=0) ####################
03: 1.12 (n=09, f=0) ##############
04: 0.77 (n=09, f=0)
05: 1.10 (n=09, f=0) ##############
06: 0.70 (n=09, f=0)
07: 0.85 (n=09, f=0) ##
08: 1.25 (n=07, f=0) ####################
09: 1.02 (n=06, f=0) #########
10: 0.46 (n=06, f=0)
11: 0.61 (n=06, f=0)
12: 1.11 (n=05, f=0) ##############

13: 1.59 (n=05, f=1) ##################################
14: 1.02 (n=03, f=0) OOOOOOOOO
15: 0.59 (n=02, f=0)

(when n is much less than the average number of subjects per cluster different symbols are used: 0 for n < 80% and ~ for n < 40%; The numbers marked "f" are the numbers of SMART flags found in the different time points)

Annex 5: Buthidaung Plausibility Report

Plausibility check for: Buthidaung SMART DECEMBER 2013.as

Standard/Reference used for z-score calculation: WHO standards 2006
(If it is not mentioned, flagged data is included in the evaluation. Some parts of this plausibility report are more for advanced users and can be skipped for a standard evaluation)

Overall data quality

Criteria	Flags*	Unit	Excel.	Good	Accept	Problematic	**Score**
Missing/Flagged data	Incl	%	0-2.5	>2.5-5.0	>5.0-10	>10	
(% of in-range subjects)			0	5	10	20	**0** (0.5 %)
Overall Sex ratio	Incl	p	>0.1	>0.05	>0.001	<0.000	
(Significant chi square)			0	2	4	10	**0** (p=0.471)
Overall Age distrib	Incl	p	>0.1	>0.05	>0.001	<0.000	
(Significant chi square)			0	2	4	10	**0** (p=0.257)
Dig pref score - weight	Incl	#	0-5	5-10	10-20	> 20	
			0	2	4	10	**0** (3)
Dig pref score - height	Incl	#	0-5	5-10	10-20	> 20	
			0	2	4	10	**0** (3)
Standard Dev WHZ	Excl	SD	<1.1	<1.15	<1.20	>1.20	
			0	2	6	20	**0** (1.00)
Skewness WHZ	Excl	#	<±1.0	<±2.0	<±3.0	>±3.0	
			0	1	3	5	**0** (-0.12)
Kurtosis WHZ	Excl	#	<±1.0	<±2.0	<±3.0	>±3.0	
			0	1	3	5	**0** (-0.22)
Poisson dist WHZ-2	Excl	p	>0.05	>0.01	>0.001	<0.000	
			0	1	3	5	**0** (p=0.085)
Timing	Excl	Not determined yet					
			0	1	3	5	
OVERALL SCORE WHZ =			0-5	5-10	10-15	>15	**0** %

At the moment the overall score of this survey is 0 %, this is excellent.

There were no duplicate entries detected.

Missing data:

WEIGHT: Line=96/ID=61, Line=261/ID=21, Line=295/ID=69 (3 children were refused to take their anthropometric and fleed from home.
HEIGHT: Line=96/ID=61, Line=261/ID=21, Line=295/ID=69 (As mentioned above

Percentage of children with no exact birthday: 100 %

Anthropometric Indices likely to be in error (-3 to 3 for WHZ, -3 to 3 for HAZ, -3 to 3 for WAZ, from observed mean - chosen in Options panel - these values will be flagged and should be excluded from analysis for a nutrition survey in emergencies. For other surveys this might not be the best procedure e.g. when the percentage of overweight children has to be calculated):

Line=2/ID=87: HAZ (-5.376), Age may be incorrect (The team did revisit and cheeked height, weight and age.
Line=10/ID=34: HAZ (3.808), Height may be incorrect (As mentioned above
Line=140/ID=30: **WHZ (-4.332)**, Weight may be incorrect (As mentioned above
Line=197/ID=70: **WHZ (-4.303)**, HAZ (1.821), Height may be incorrect (As mentioned above
Line=340/ID=7: HAZ (-5.795), Height may be incorrect (As mentioned above
Line=368/ID=17: HAZ (-5.324), Height may be incorrect (As mentioned above

Percentage of values flagged with SMART flags:WHZ: 0.5 %, HAZ: 1.2 %, WAZ: 0.0 %

Age distribution:

Month 6 : #######
Month 7 : ############
Month 8 : #######
Month 9 : ######
Month 10 : #######
Month 11 : ###############
Month 12 : #######
Month 13 : #####
Month 14 : ####
Month 15 : ########
Month 16 : #########
Month 17 : ######
Month 18 : ##############
Month 19 : ##########
Month 20 : ######
Month 21 : ##########
Month 22 : ######
Month 23 : ######
Month 24 : ###########
Month 25 : ###################

Month 26 : #####
Month 27 : #########
Month 28 : ##########
Month 29 : ###########
Month 30 : ######
Month 31 : #######
Month 32 : ######
Month 33 : ####
Month 34 : ########
Month 35 : ###########
Month 36 : #########
Month 37 : #########
Month 38 : ########
Month 39 : ###########
Month 40 : ############
Month 41 : #######
Month 42 : #########
Month 43 : ##########
Month 44 : ####
Month 45 : #####
Month 46 : #####
Month 47 : #####
Month 48 : ####
Month 49 : #######
Month 50 : ########
Month 51 : ############
Month 52 : ########
Month 53 : #######
Month 54 : ##########
Month 55 : ######
Month 56 : ####
Month 57 : #####
Month 58 : ############
Month 59 : ######

Age ratio of 6-29 months to 30-59 months: 0.92 (The value should be around 1.0).

Statistical evaluation of sex and age ratios (using Chi squared statistic):

Age cat.	mo.	boys	girls	total	ratio boys/girls
6 to 17	12	46/52.0 (0.9)	46/48.5 (0.9)	92/100.5 (0.9)	1.00
18 to 29	12	58/50.7 (1.1)	58/47.3 (1.2)	116/98.0 (1.2)	1.00
30 to 41	12	56/49.1 (1.1)	42/45.8 (0.9)	98/94.9 (1.0)	1.33
42 to 53	12	36/48.3 (0.7)	48/45.1 (1.1)	84/93.4 (0.9)	0.75
54 to 59	6	28/23.9 (1.2)	15/22.3 (0.7)	43/46.2 (0.9)	1.87

6 to 59 54 224/216.5 (1.0) 209/216.5 (1.0) 1.07

The data are expressed as observed number/expected number (ratio of obs/expect)

Overall sex ratio: p-value = 0.471 (boys and girls equally represented)
Overall age distribution: p-value = 0.257 (as expected)
Overall age distribution for boys: p-value = 0.161 (as expected)
Overall age distribution for girls: p-value = 0.243 (as expected)
Overall sex/age distribution: p-value = 0.014 (significant difference)

Digit preference Weight:

Digit .0 : ##
Digit .1 : ##
Digit .2 : ##
Digit .3 : ##
Digit .4 : ##
Digit .5 : ##
Digit .6 : ##
Digit .7 : ##
Digit .8 : ##
Digit .9 : ##

Digit Preference Score: **3** (0-5 good, 6-10 acceptable, 11-20 poor and > 20 unacceptable)

Digit preference Height:

Digit .0 : ##
Digit .1 : ##
Digit .2 : ##
Digit .3 : ##
Digit .4 : ##
Digit .5 : ##
Digit .6 : ##
Digit .7 : ##
Digit .8 : ##
Digit .9 : ################################

Digit Preference Score: **3** (0-5 good, 6-10 acceptable, 11-20 poor and > 20 unacceptable)

Digit preference MUAC:

Digit .0 : ##
Digit .1 : ##

Digit .2 : ##
Digit .3 : ###################################
Digit .4 : ##
Digit .5 : ##
Digit .6 : ###
Digit .7 : #####################################
Digit .8 : ##
Digit .9 : ##

Digit Preference Score: **4** (0-5 good, 6-10 acceptable, 11-20 poor and > 20 unacceptable)

Evaluation of Standard deviation, Normal distribution, Skewness and Kurtosis using the 3 exclusion (Flag) procedures

.	**no exclusion**	**exclusion from reference mean (WHO flags)**	**exclusion from observed mean (SMART flags)**
WHZ			
Standard Deviation SD:	1.03	1.03	1.00
(The SD should be between 0.8 and 1.2)			
Prevalence (< -2)			
observed:	21.4%	21.4%	21.0%
calculated with current SD:	19.3%	19.3%	18.4%
calculated with a SD of 1:	18.7%	18.7%	18.3%
HAZ			
Standard Deviation SD:	1.19	1.19	1.11
(The SD should be between 0.8 and 1.2)			
Prevalence (< -2)			
observed:	58.6%	58.6%	58.6%
calculated with current SD:	60.1%	60.1%	60.9%
calculated with a SD of 1:	62.0%	62.0%	62.1%
WAZ			
Standard Deviation SD:	0.98	0.98	0.98
(The SD should be between 0.8 and 1.2)			
Prevalence (< -2)			
observed:			
calculated with current SD:			
calculated with a SD of 1:			

Results for Shapiro-Wilk test for normally (Gaussian) distributed data:

WHZ	p= 0.210	p= 0.210	p= 0.370
HAZ	p= 0.000	p= 0.000	p= 0.021
WAZ	p= 0.390	p= 0.390	p= 0.390

(If p < 0.05 then the data are not normally distributed. If p > 0.05 you can consider the data normally distributed)

Skewness

WHZ	-0.21	-0.21	-0.12
HAZ	0.10	0.10	-0.22
WAZ	-0.12	-0.12	-0.12

If the value is:
-below minus 2 there is a relative excess of wasted/stunted/underweight subjects in the sample
-between minus 2 and minus 1, there may be a relative excess of wasted/stunted/underweight subjects in the sample.
-between minus 1 and plus 1, the distribution can be considered as symmetrical.
-between 1 and 2, there may be an excess of obese/tall/overweight subjects in the sample.
-above 2, there is an excess of obese/tall/overweight subjects in the sample

Kurtosis

WHZ	-0.01	-0.01	-0.22
HAZ	1.37	1.37	-0.32
WAZ	-0.06	-0.06	-0.06

(Kurtosis characterizes the relative peakedness or flatness compared with the normal distribution, positive kurtosis indicates a relatively peaked distribution, negative kurtosis indicates a relatively flat distribution)
If the value is:
-above 2 it indicates a problem. There might have been a problem with data collection or sampling.
-between 1 and 2, the data may be affected with a problem.
-less than an absolute value of 1 the distribution can be considered as normal.

Test if cases are randomly distributed or aggregated over the clusters by calculation of the Index of Dispersion (ID) and comparison with the Poisson distribution for:

WHZ < -2: ID=1.34 (p=0.085)
WHZ < -3: ID=0.79 (p=0.817)
GAM: ID=1.34 (p=0.085)
SAM: ID=0.79 (p=0.817)
HAZ < -2: ID=3.14 (p=0.000)
HAZ < -3: ID=2.82 (p=0.000)
WAZ < -2: ID=2.53 (p=0.000)
WAZ < -3: ID=2.17 (p=0.000)

Subjects with SMART flags are excluded from this analysis.

The Index of Dispersion (ID) indicates the degree to which the cases are aggregated into certain clusters (the degree to which there are "pockets"). If the ID is less than 1 and p > 0.95 it indicates that the cases are UNIFORMLY distributed among the clusters. If the p value is between 0.05 and 0.95 the cases appear to be randomly distributed among the clusters, if ID is higher than 1 and p is less than 0.05 the cases are aggregated into certain cluster (there appear to be pockets of cases). If this is the case for Oedema but not for WHZ then aggregation of GAM and SAM cases is likely due to inclusion of oedematous cases in GAM and SAM estimates.

Are the data of the same quality at the beginning and the end of the clusters?

Evaluation of the SD for WHZ depending upon the order the cases are measured within each cluster (if one cluster per day is measured then this will be related to the time of the day the measurement is made).

```
Time                              SD for WHZ
point          0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3
01: 1.07 (n=37, f=0)  ###########
02: 1.10 (n=36, f=0)  ############
03: 0.96 (n=36, f=0)  #######
04: 1.00 (n=35, f=0)  ########
05: 1.15 (n=35, f=0)  ################
06: 0.99 (n=34, f=0)  ########
07: 0.88 (n=32, f=0)  ####
08: 1.03 (n=30, f=1)  ##########
09: 0.83 (n=28, f=0)  #
10: 1.18 (n=24, f=1)  ################
11: 0.85 (n=22, f=0)  ##
12: 0.92 (n=17, f=0)  OOOOO
13: 1.47 (n=15, f=0)  OOOOOOOOOOOOOOOOOOOOOOOOOO
14: 0.77 (n=12, f=0)
15: 0.94 (n=13, f=0)  OOOOOO
16: 1.23 (n=12, f=0)  OOOOOOOOOOOOOOOO
17: 1.07 (n=06, f=0)  ~~~~~~~~~~
18: 0.92 (n=05, f=0)  ~~~~~
```

(when n is much less than the average number of subjects per cluster different symbols are used: 0 for n < 80% and ~ for n < 40%; The numbers marked "f" are the numbers of SMART flags found in the different time points)

Analysis by Team

Team	**1**	**2**	**3**	**4**
n =	106	85	118	124
Percentage of values flagged with SMART flags:				
WHZ:	0.0	3.6	0.9	0.8
HAZ:	0.0	3.6	3.4	0.8
WAZ:	0.0	2.4	0.9	0.0
Age ratio of 6-29 months to 30-59 months:				
	1.21	1.13	0.90	0.65
Sex ratio (male/female):				
	0.93	1.66	0.82	1.18
Digit preference Weight (%):				
.0 :	10	7	12	6
.1 :	8	7	9	11
.2 :	9	14	10	10
.3 :	7	14	13	10
.4 :	9	11	10	10
.5 :	10	7	10	11
.6 :	10	6	7	14
.7 :	12	8	8	9

.8 :	12	12	11	6	
.9 :	10	12	10	12	
DPS:	5	10	6	8	Digit preference score (0-5 good, 5-10 acceptable, 10-20 poor and > 20 unacceptable)
Digit preference Height (%):					
.0 :	9	10	14	8	
.1 :	11	12	11	10	
.2 :	9	13	9	9	
.3 :	13	11	9	9	
.4 :	11	11	9	13	
.5 :	11	10	11	9	
.6 :	8	10	11	13	
.7 :	9	10	9	11	
.8 :	9	8	8	10	
.9 :	7	6	9	8	
DPS:	6	6	6	6	Digit preference score (0-5 good, 5-10 acceptable, 10-20 poor and > 20 unacceptable)
Digit preference MUAC (%):					
.0 :	10	7	10	9	
.1 :	10	8	10	10	
.2 :	10	10	14	15	
.3 :	8	7	9	10	
.4 :	12	12	11	10	
.5 :	10	12	9	9	
.6 :	9	13	8	11	
.7 :	9	8	9	9	
.8 :	9	11	11	9	
.9 :	10	11	10	9	
DPS:	4	7	6	6	Digit preference score (0-5 good, 5-10 acceptable, 10-20 poor and > 20 unacceptable)
Standard deviation of WHZ:					
SD	0.96	1.08	0.91	1.15	
Prevalence (< -2) observed:					
%		18.1		29.0	
Prevalence (< -2) calculated with current SD:					
%		18.9		23.7	
Prevalence (< -2) calculated with a SD of 1:					
%		17.1		20.6	
Standard deviation of HAZ:					
SD	1.08	0.94	1.25	1.07	
observed:					
%	58.5		67.5	74.2	
calculated with current SD:					
%	61.0		64.6	75.5	
calculated with a SD of 1:					
%	61.9		68.1	76.9	

Statistical evaluation of sex and age ratios (using Chi squared statistic) for:

Team 1:

Age cat.	mo.	boys	girls	total	ratio boys/girls
6 to 17	12	13/11.8 (1.1)	19/12.8 (1.5)	32/24.6 (1.3)	0.68
18 to 29	12	12/11.5 (1.0)	14/12.4 (1.1)	26/24.0 (1.1)	0.86
30 to 41	12	15/11.2 (1.3)	9/12.1 (0.7)	24/23.2 (1.0)	1.67
42 to 53	12	6/11.0 (0.5)	11/11.9 (0.9)	17/22.9 (0.7)	0.55
54 to 59	6	5/5.4 (0.9)	2/5.9 (0.3)	7/11.3 (0.6)	2.50
6 to 59	54	51/53.0 (1.0)	55/53.0 (1.0)		0.93

The data are expressed as observed number/expected number (ratio of obs/expect)

Overall sex ratio: p-value = 0.698 (boys and girls equally represented)
Overall age distribution: p-value = 0.233 (as expected)
Overall age distribution for boys: p-value = 0.441 (as expected)
Overall age distribution for girls: p-value = 0.156 (as expected)
Overall sex/age distribution: p-value = 0.031 (significant difference)

Team 2:

Age cat.	mo.	boys	girls	total	ratio boys/girls
6 to 17	12	13/12.3 (1.1)	6/7.4 (0.8)	19/19.7 (1.0)	2.17
18 to 29	12	14/12.0 (1.2)	12/7.2 (1.7)	26/19.2 (1.4)	1.17
30 to 41	12	14/11.6 (1.2)	8/7.0 (1.1)	22/18.6 (1.2)	1.75
42 to 53	12	8/11.4 (0.7)	5/6.9 (0.7)	13/18.3 (0.7)	1.60
54 to 59	6	4/5.7 (0.7)	1/3.4 (0.3)	5/9.1 (0.6)	4.00
6 to 59	54	53/42.5 (1.2)	32/42.5 (0.8)		1.66

The data are expressed as observed number/expected number (ratio of obs/expect)

Overall sex ratio: p-value = 0.023 (significant excess of boys)
Overall age distribution: p-value = 0.171 (as expected)
Overall age distribution for boys: p-value = 0.666 (as expected)
Overall age distribution for girls: p-value = 0.216 (as expected)
Overall sex/age distribution: p-value = 0.014 (significant difference)

Team 3:

Age cat.	mo.	boys	girls	total	ratio boys/girls

6 to 17	12	11/12.3 (0.9)	12/15.1 (0.8)	23/27.4 (0.8)	0.92
18 to 29	12	12/12.0 (1.0)	21/14.7 (1.4)	33/26.7 (1.2)	0.57
30 to 41	12	13/11.6 (1.1)	12/14.3 (0.8)	25/25.9 (1.0)	1.08
42 to 53	12	10/11.4 (0.9)	14/14.0 (1.0)	24/25.5 (0.9)	0.71
54 to 59	6	7/5.7 (1.2)	6/6.9 (0.9)	13/12.6 (1.0)	1.17
6 to 59	54	53/59.0 (0.9)	65/59.0 (1.1)		0.82

The data are expressed as observed number/expected number (ratio of obs/expect)

Overall sex ratio: p-value = 0.269 (boys and girls equally represented)
Overall age distribution: p-value = 0.678 (as expected)
Overall age distribution for boys: p-value = 0.938 (as expected)
Overall age distribution for girls: p-value = 0.433 (as expected)
Overall sex/age distribution: p-value = 0.189 (as expected)

Team 4:

Age cat.	mo.	boys	girls	total	ratio boys/girls
6 to 17	12	9/15.5 (0.6)	9/13.2 (0.7)	18/28.8 (0.6)	1.00
18 to 29	12	20/15.2 (1.3)	11/12.9 (0.9)	31/28.1 (1.1)	1.82
30 to 41	12	14/14.7 (1.0)	13/12.5 (1.0)	27/27.2 (1.0)	1.08
42 to 53	12	12/14.5 (0.8)	18/12.3 (1.5)	30/26.8 (1.1)	0.67
54 to 59	6	12/7.2 (1.7)	6/6.1 (1.0)	18/13.2 (1.4)	2.00
6 to 59	54	67/62.0 (1.1)	57/62.0 (0.9)		1.18

The data are expressed as observed number/expected number (ratio of obs/expect)

Overall sex ratio: p-value = 0.369 (boys and girls equally represented)
Overall age distribution: p-value = 0.168 (as expected)
Overall age distribution for boys: p-value = 0.090 (as expected)
Overall age distribution for girls: p-value = 0.368 (as expected)
Overall sex/age distribution: p-value = 0.009 (significant difference)

Evaluation of the SD for WHZ depending upon the order the cases are measured within each cluster (if one cluster per day is measured then this will be related to the time of the day the measurement is made).

Team: 1

Time SD for WHZ
point 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3
01: 1.46 (n=09, f=0) ############################
02: 1.28 (n=09, f=0) ####################
03: 0.82 (n=09, f=0) #

04: 0.88 (n=08, f=0) ####
05: 0.88 (n=08, f=0) ###
06: 0.98 (n=08, f=0) ########
07: 0.78 (n=08, f=0)
08: 0.65 (n=08, f=0)
09: 0.72 (n=07, f=0)
10: 1.08 (n=06, f=0) ############
11: 0.86 (n=05, f=0) ###
12: 0.46 (n=04, f=0)
13: 1.51 (n=04, f=0) OOOOOOOOOOOOOOOOOOOOOOOOOOOOO
14: 0.76 (n=03, f=0)
15: 0.79 (n=03, f=0)
16: 0.68 (n=03, f=0)
17: 0.53 (n=02, f=0)
18: 0.57 (n=02, f=0)

(when n is much less than the average number of subjects per cluster different symbols are used: 0 for n < 80% and ~ for n < 40%; The numbers marked "f" are the numbers of SMART flags found in the different time points)

Team: 2

Time SD for WHZ
point 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3
01: 0.77 (n=10, f=0)
02: 1.05 (n=10, f=0) ##########
03: 0.95 (n=09, f=0) ######
04: 1.38 (n=09, f=0) ########################
05: 1.31 (n=09, f=0) ######################
06: 0.83 (n=08, f=0) #
07: 0.97 (n=08, f=0) #######
08: 1.74 (n=06, f=1) ##
09: 0.44 (n=05, f=0)
10: 0.75 (n=03, f=0)
11: 0.05 (n=02, f=0)

(when n is much less than the average number of subjects per cluster different symbols are used: 0 for n < 80% and ~ for n < 40%; The numbers marked "f" are the numbers of SMART flags found in the different time points)

Team: 3

Time SD for WHZ
point 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3
01: 0.67 (n=09, f=0)
02: 0.84 (n=08, f=0) ##
03: 1.19 (n=09, f=0) ################
04: 1.04 (n=09, f=0) ##########
05: 1.36 (n=09, f=0) ########################

06: 1.03 (n=09, f=0) ##########
07: 0.60 (n=08, f=0)
08: 0.71 (n=08, f=0)
09: 0.93 (n=08, f=0) #####
10: 0.72 (n=07, f=0)
11: 0.56 (n=07, f=0)
12: 0.66 (n=06, f=0)
13: 1.12 (n=05, f=0) ##############
14: 1.10 (n=04, f=0) OOOOOOOOOOOOO
15: 0.86 (n=04, f=0) OO
16: 0.41 (n=03, f=0)
17: 1.78 (n=02, f=0) ~~~~~~

(when n is much less than the average number of subjects per cluster different symbols are used: 0 for n < 80% and ~ for n < 40%; The numbers marked "f" are the numbers of SMART flags found in the different time points)

Team: 4

Time SD for WHZ
point 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3
01: 1.25 (n=09, f=0) ####################
02: 1.19 (n=09, f=0) #################
03: 0.99 (n=09, f=0) ########
04: 0.74 (n=09, f=0)
05: 1.14 (n=09, f=0) ###############
06: 1.03 (n=09, f=0) ##########
07: 1.19 (n=08, f=0) #################
08: 0.98 (n=08, f=0) ########
09: 1.10 (n=08, f=0) #############
10: 1.70 (n=08, f=1) ##
11: 1.15 (n=08, f=0) ###############
12: 1.27 (n=06, f=0) ####################
13: 0.92 (n=05, f=0) OOOOO
14: 0.63 (n=05, f=0)
15: 1.29 (n=05, f=0) OOOOOOOOOOOOOOOOOOOO
16: 1.83 (n=05, f=0) OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO
17: 1.22 (n=02, f=0) ~~~~~~~~~~~~~~~~~~
18: 1.19 (n=02, f=0) ~~~~~~~~~~~~~~~~~

(when n is much less than the average number of subjects per cluster different symbols are used: 0 for n < 80% and ~ for n < 40%; The numbers marked "f" are the numbers of SMART flags found in the different time points)

Annex 6: Maungdaw Result tables for NCHS growth references 1977

Table1: Prevalence of acute malnutrition based on weight-for-height z-score (and/or oedema) and by sex

	All n = 429	Boys n = 217	Girls n = 212
Prevalence of global malnutrition (<-2 z-score and/or oedema)	(78) 18.2 % (14.3 - 22.8 95% C.I.)	(33) 15.2 % (11.4 - 20.0 95% C.I.)	(45) 21.2 % (15.6 - 28.2 95% C.I.)
Prevalence of moderate malnutrition (<-2 z-score and >=-3 z-score, no oedema)	(71) 16.6 % (12.9 - 20.9 95% C.I.)	(30) 13.8 % (10.2 - 18.4 95% C.I.)	(41) 19.3 % (14.0 - 26.2 95% C.I.)
Prevalence of severe malnutrition (<-3 z-score and/or oedema)	(7) 1.6 % (0.6 - 4.5 95% C.I.)	(3) 1.4 % (0.4 - 4.3 95% C.I.)	(4) 1.9 % (0.7 - 5.0 95% C.I.)

Table 2: Prevalence of acute malnutrition by age, based on weight-for-height z-score and/or oedema

		Severe wasting (<-3 z-score)		Moderate wasting (>= -3 and <-2 z-score)		Normal (> = -2 z score)		Oedema	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	105	2	1.9	23	21.9	80	76.2	0	0.0
18-29	114	5	4.4	23	20.2	86	75.4	0	0.0
30-41	111	0	0.0	13	11.7	98	88.3	0	0.0
42-53	75	0	0.0	8	10.7	67	89.3	0	0.0
54-59	24	0	0.0	4	16.7	20	83.3	0	0.0
Total	429	7	1.6	71	16.6	351	81.8	0	0.0

Table 3: Distribution of acute malnutrition and oedema based on weight-for-height z-score

	<-3 z-score	>=-3 z-score
Oedema present	Marasmic kwashiorkor No. 0 (0.0 %)	Kwashiorkor No. 0 (0.0 %)
Oedema absent	Marasmic No. 7 (1.6 %)	Not severely malnourished No. 422 (98.4 %)

Table 4: Prevalence of acute malnutrition based on MUAC cut off's (and/or oedema) and by sex

	All n = 429	Boys n = 217	Girls n = 212
Prevalence of global malnutrition (< 125 mm and/or oedema)	(77) 17.9 % (13.7 - 23.2 95% C.I.)	(29) 13.4 % (9.1 - 19.1 95% C.I.)	(48) 22.6 % (16.5 - 30.2 95% C.I.)

Prevalence of moderate malnutrition (< 125 mm and >= 115 mm, no oedema)	(52) 12.1 % (9.6 - 15.2 95% C.I.)	(19) 8.8 % (5.9 - 12.7 95% C.I.)	(33) 15.6 % (11.2 - 21.2 95% C.I.)
Prevalence of severe malnutrition (< 115 mm and/or oedema)	(25) 5.8 % (3.6 - 9.3 95% C.I.)	(10) 4.6 % (2.4 - 8.7 95% C.I.)	(15) 7.1 % (4.3 - 11.5 95% C.I.)

Table 5: Prevalence of acute malnutrition by age, based on MUAC cut off's and/or oedema

		Severe wasting (< 115 mm)		Moderate wasting (>= 115 mm and < 125 mm)		Normal (> = 125 mm)		Oedema	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	105	15	14.3	29	27.6	61	58.1	0	0.0
18-29	114	8	7.0	16	14.0	90	78.9	0	0.0
30-41	111	1	0.9	5	4.5	105	94.6	0	0.0
42-53	75	0	0.0	2	2.7	73	97.3	0	0.0
54-59	24	1	4.2	0	0.0	23	95.8	0	0.0
Total	429	25	5.8	52	12.1	352	82.1	0	0.0

Table 6: Prevalence of acute malnutrition based on the percentage of the median and/or oedema

	n = 429
Prevalence of global acute malnutrition (<80% and/or oedema)	(52) 12.1 % (8.7 - 16.6 95% C.I.)
Prevalence of moderate acute malnutrition (<80% and >= 70%, no oedema)	(47) 11.0 % (7.8 - 15.2 95% C.I.)
Prevalence of severe acute malnutrition (<70% and/or oedema)	(5) 1.2 % (0.4 - 3.3 95% C.I.)

Table 7: Prevalence of malnutrition by age, based on weight-for-height percentage of the median and oedema

		Severe wasting (<70% median)		Moderate wasting (>=70% and <80% median)		Normal (> =80% median)		Oedema	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	105	1	1.0	17	16.2	87	82.9	0	0.0
18-29	114	4	3.5	15	13.2	95	83.3	0	0.0
30-41	111	0	0.0	7	6.3	104	93.7	0	0.0

42-53	75	0	0.0	5	6.7	70	93.3	0	0.0
54-59	24	0	0.0	3	12.5	21	87.5	0	0.0
Total	429	5	1.2	47	11.0	377	87.9	0	0.0

Table 8: Prevalence of underweight based on weight-for-age z-score by sex

	All n = 429	**Boys** n = 217	**Girls** n = 212
Prevalence of underweight (<-2 z-score)	(220) 51.3 % (44.4 - 58.1 95% C.I.)	(113) 52.1 % (45.4 - 58.7 95% C.I.)	(107) 50.5 % (41.8 - 59.1 95% C.I.)
Prevalence of moderate underweight (<-2 z-score and >=-3 z-score)	(150) 35.0 % (30.1 - 40.2 95% C.I.)	(81) 37.3 % (31.8 - 43.2 95% C.I.)	(69) 32.5 % (26.4 - 39.4 95% C.I.)
Prevalence of severe underweight (<-3 z-score)	(70) 16.3 % (11.5 - 22.6 95% C.I.)	(32) 14.7 % (10.0 - 21.2 95% C.I.)	(38) 17.9 % (12.2 - 25.6 95% C.I.)

Table 9: Prevalence of underweight by age, based on weight-for-age z-score

		Severe underweight (<-3 z-score)		**Moderate underweight (>= -3 and <-2 z-score)**		**Normal (> = -2 z score)**		**Oedema**	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	105	22	21.0	43	41.0	40	38.1	0	0.0
18-29	114	27	23.7	40	35.1	47	41.2	0	0.0
30-41	111	11	9.9	35	31.5	65	58.6	0	0.0
42-53	75	8	10.7	24	32.0	43	57.3	0	0.0
54-59	24	2	8.3	8	33.3	14	58.3	0	0.0
Total	429	70	16.3	150	35.0	209	48.7	0	0.0

Table 10: Prevalence of stunting based on height-for-age z-score and by sex

	All n = 429	**Boys** n = 217	**Girls** n = 212
Prevalence of stunting (<-2 z-score)	(177) 41.3 % (33.3 - 49.7 95% C.I.)	(92) 42.4 % (33.5 - 51.9 95% C.I.)	(85) 40.1 % (30.0 - 51.1 95% C.I.)
Prevalence of moderate stunting (<-2 z-score and >=-3 z-score)	(111) 25.9 % (21.4 - 31.0 95% C.I.)	(63) 29.0 % (22.7 - 36.2 95% C.I.)	(48) 22.6 % (17.1 - 29.4 95% C.I.)
Prevalence of severe stunting (<-3 z-score)	(66) 15.4 % (11.1 - 20.9 95% C.I.)	(29) 13.4 % (8.6 - 20.2 95% C.I.)	(37) 17.5 % (11.9 - 24.9 95% C.I.)

Table 11: Prevalence of stunting by age based on height-for-age z-score

		Severe stunting (<-3 z-score)		Moderate stunting (>= -3 and <-2 z-score)		Normal (> = -2 z score)	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	105	15	14.3	24	22.9	66	62.9
18-29	114	20	17.5	32	28.1	62	54.4
30-41	111	16	14.4	29	26.1	66	59.5
42-53	75	12	16.0	20	26.7	43	57.3
54-59	24	3	12.5	6	25.0	15	62.5
Total	429	66	15.4	111	25.9	252	58.7

Table 12: Mean z-score, design Effects and excluded subjects

Indicator	n	Mean z-scores ± SD	Design Effect (z-score < -2)	z-scores not available*	z-scores out of range
Weight-for-Height	429	-1.20±0.84	1.26	1	0
Weight-for-Age	429	-2.07±0.95	1.95	1	0
Height-for-Age	429	-1.82±1.18	2.90	1	0

* contains for WHZ and WAZ the children with edema.

Annex 7: Buthidaung Result tables of NCHS growth references 1977

Table 1: Prevalence of acute malnutrition based on weight-for-height z-score (and/or oedema) and by sex

	All n = 430	**Boys** n = 222	**Girls** n = 208
Prevalence of global malnutrition (<-2 z-score and/or oedema)	(75) 17.4 % (14.2 - 21.3 95% C.I.)	(31) 14.0 % (9.7 - 19.8 95% C.I.)	(44) 21.2 % (16.5 - 26.7 95% C.I.)
Prevalence of moderate malnutrition (<-2 z-score and >=-3 z-score, no oedema)	(68) 15.8 % (12.7 - 19.6 95% C.I.)	(29) 13.1 % (9.0 - 18.5 95% C.I.)	(39) 18.8 % (14.3 - 24.2 95% C.I.)
Prevalence of severe malnutrition (<-3 z-score and/or oedema)	(7) 1.6 % (0.7 - 3.6 95% C.I.)	(2) 0.9 % (0.2 - 3.6 95% C.I.)	(5) 2.4 % (1.0 - 5.6 95% C.I.)

There is no case of oedema.

Table 2: Prevalence of acute malnutrition by age, based on weight-for-height z-score and/or oedema

	Severe wasting	**Moderate wasting (>= -3 and <-2 z-**	**Normal (> = -2 z score)**	**Oedema**

		(<-3 z-score)		score)					
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	92	3	3.3	15	16.3	74	80.4	0	0.0
18-29	116	0	0.0	19	16.4	97	83.6	0	0.0
30-41	96	0	0.0	11	11.5	85	88.5	0	0.0
42-53	83	3	3.6	12	14.5	68	81.9	0	0.0
54-59	43	1	2.3	11	25.6	31	72.1	0	0.0
Total	430	7	1.6	68	15.8	355	82.6	0	0.0

Table 3: Distribution of acute malnutrition and oedema based on weight-for-height z-scores

	<-3 z-score	**>=-3 z-score**
Oedema present	Marasmic kwashiorkor No. 0 (0.0 %)	Kwashiorkor No. 0 (0.0 %)
Oedema absent	Marasmic No. 7 (1.6 %)	Not severely malnourished No. 423 (98.4 %)

Table 4: Prevalence of acute malnutrition based on MUAC cut off's (and/or oedema) and by sex

	All n = 430	**Boys** n = 222	**Girls** n = 208
Prevalence of global malnutrition (< 125 mm and/or oedema)	(61) 14.2 % (11.3 - 17.7 95% C.I.)	(18) 8.1 % (5.2 - 12.4 95% C.I.)	(43) 20.7 % (15.9 - 26.4 95% C.I.)
Prevalence of moderate malnutrition (< 125 mm and >= 115 mm, no oedema)	(49) 11.4 % (9.0 - 14.3 95% C.I.)	(13) 5.9 % (3.4 - 9.9 95% C.I.)	(36) 17.3 % (12.7 - 23.1 95% C.I.)
Prevalence of severe malnutrition (< 115 mm and/or oedema)	(12) 2.8 % (1.6 - 4.8 95% C.I.)	(5) 2.3 % (1.0 - 5.0 95% C.I.)	(7) 3.4 % (1.4 - 7.9 95% C.I.)

Table 5: Prevalence of acute malnutrition by age, based on MUAC cut off's and/or oedema

		Severe wasting (< 115 mm)		**Moderate wasting (>= 115 mm and < 125 mm)**		**Normal (> = 125 mm)**		**Oedema**	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	92	9	9.8	23	25.0	60	65.2	0	0.0
18-29	116	3	2.6	18	15.5	95	81.9	0	0.0
30-41	96	0	0.0	3	3.1	93	96.9	0	0.0
42-53	83	0	0.0	4	4.8	79	95.2	0	0.0
54-59	43	0	0.0	1	2.3	42	97.7	0	0.0
Total	430	12	2.8	49	11.4	369	85.8	0	0.0

Table 6: Prevalence of acute malnutrition based on the percentage of the median and/or oedema

	n = 430
Prevalence of global acute malnutrition (<80% and/or oedema)	(46) 10.7 % (7.9 - 14.3 95% C.I.)
Prevalence of moderate acute malnutrition (<80% and >= 70%, no oedema)	(43) 10.0 % (7.2 - 13.7 95% C.I.)
Prevalence of severe acute malnutrition (<70% and/or oedema)	(3) 0.7 % (0.2 - 2.1 95% C.I.)

Table 7: Prevalence of malnutrition by age, based on weight-for-height percentage of the median and oedema

		Severe wasting (<70% median)		Moderate wasting (>=70% and <80% median)		Normal (> =80% median)		Oedema	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	92	2	2.2	12	13.0	78	84.8	0	0.0
18-29	116	0	0.0	12	10.3	104	89.7	0	0.0
30-41	96	0	0.0	4	4.2	92	95.8	0	0.0
42-53	83	1	1.2	9	10.8	73	88.0	0	0.0
54-59	43	0	0.0	6	14.0	37	86.0	0	0.0
Total	430	3	0.7	43	10.0	384	89.3	0	0.0

Table 8: Prevalence of underweight based on weight-for-age z-scores by sex

	All n = 430	**Boys** n = 222	**Girls** n = 208
Prevalence of underweight (<-2 z-score)	(260) 60.5 % (54.7 - 66.0 95% C.I.)	(130) 58.6 % (50.8 - 65.9 95% C.I.)	(130) 62.5 % (55.1 - 69.4 95% C.I.)
Prevalence of moderate underweight (<-2 z-score and >=-3 z-score)	(187) 43.5 % (38.6 - 48.5 95% C.I.)	(102) 45.9 % (39.0 - 53.1 95% C.I.)	(85) 40.9 % (34.1 - 48.0 95% C.I.)
Prevalence of severe underweight (<-3 z-score)	(73) 17.0 % (12.9 - 22.0 95% C.I.)	(28) 12.6 % (8.7 - 18.0 95% C.I.)	(45) 21.6 % (15.6 - 29.1 95% C.I.)

Table 9: Prevalence of underweight by age, based on weight-for-age z-scores

	Severe underweight	Moderate underweight (>= -3 and <-2 z-	Normal (> = -2 z score)	Oedema

		(<-3 z-score)		score)					
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	92	17	18.5	36	39.1	39	42.4	0	0.0
18-29	116	28	24.1	46	39.7	42	36.2	0	0.0
30-41	96	10	10.4	42	43.8	44	45.8	0	0.0
42-53	83	15	18.1	41	49.4	27	32.5	0	0.0
54-59	43	3	7.0	22	51.2	18	41.9	0	0.0
Total	430	73	17.0	187	43.5	170	39.5	0	0.0

Table 10: Prevalence of stunting based on height-for-age z-scores and by sex

	All n = 430	**Boys** n = 222	**Girls** n = 208
Prevalence of stunting (<-2 z-score)	(218) 50.7 % (41.9 - 59.5 95% C.I.)	(109) 49.1 % (39.2 - 59.1 95% C.I.)	(109) 52.4 % (43.7 - 61.0 95% C.I.)
Prevalence of moderate stunting (<-2 z-score and >=-3 z-score)	(123) 28.6 % (23.5 - 34.3 95% C.I.)	(63) 28.4 % (22.3 - 35.4 95% C.I.)	(60) 28.8 % (22.4 - 36.3 95% C.I.)
Prevalence of severe stunting (<-3 z-score)	(95) 22.1 % (16.7 - 28.7 95% C.I.)	(46) 20.7 % (14.2 - 29.2 95% C.I.)	(49) 23.6 % (17.4 - 31.1 95% C.I.)

Table 11: Prevalence of stunting by age based on height-for-age z-scores

		Severe stunting (<-3 z-score)		**Moderate stunting (>= -3 and <-2 z-score)**		**Normal (> = -2 z score)**	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	92	12	13.0	27	29.3	53	57.6
18-29	116	30	25.9	35	30.2	51	44.0
30-41	96	22	22.9	27	28.1	47	49.0
42-53	83	24	28.9	22	26.5	37	44.6
54-59	43	7	16.3	12	27.9	24	55.8
Total	430	95	22.1	123	28.6	212	49.3

Table 12: Mean z-scores, Design Effects and excluded subjects

Indicator	n	Mean z-scores ± SD	Design Effect (z-score < -2)	z-scores not available*	z-scores out of range

Weight-for-Height	430	-1.22±0.84	1.00	3	0
Weight-for-Age	430	-2.21±0.86	1.42	3	0
Height-for-Age	430	-2.09±1.14	3.31	3	0

* contains for WHZ and WAZ the children with edema.

Annex 8: Event Calendar of Maungdaw and Buthidaung Townships

	2009		2010		2011		2012		2013	
JAN	59	Independence day starting summer crop Mohorom Fatiyah	47	Family photo by NaSaKa Independence day	35	Independence day starting summer crop	23	Independence day starting summer crop NaSaKa family photo	11	Independence day starting summer crop NaSaKa family photo
FEB	58	Hindu Festival Family photo	46	Hindu Festival Family photo	34	Maha Tamandaw day Hindu Festival	22	Maha Tamandaw day Hindu Festival	10	Maha Tamandaw day, Hindu Festival
MAR	57	10 standard examination Lower price of rice Start study	45	10 standard examination Start summer holiday	33	10 standard examination Start hot season	21	10 standard examination Started hot season	9	10 standard examination Started hot season
APR	56	Water festival Myanmer new year	44	Water festival Hot season	32	Water festival	20	Water festival New road opened in the river site of Maungdaw north	8	Water festival New road opened in the river site of Maungdaw north
MAY	55	Cyclone Mango ripper Full moon of kason	43	Starting of SFP program (More Ration distribution) Mangoes ripping	31	FSL seed fair in PPAP VT Mango ripper	19	FSL seed fair in Kye Kan Pyin VT Mango ripper Rain start to fall a little but too hot at night.(people can't sleep)	7	Mango ripper Rain start to fall a little but too hot at night.(people can't sleep) NSK stopped Ma Har San Cyclone
JUN	54	Beginning of raining season (end of june) Enrollement of student	42	Big Water Flooded and heavy rain in Maungdaw district World CUP(Wakka Wakka)	30	Government school start opening	18	Government school start opening Crisis start in Maungdaw district Government ordered 144	6	Government school start opening
JUL	53	Heavy rain NaSAKa checked the house and family list Beginning of buddhist Lent,Matyr's day	41	Heavy rain Beginning of trasplantation NaSAKa checked the house and family list Catch white elephant	29	Lai La Tul Barat Heavy rain	17	Heavy rain, Ramadan Beginning of trasplantation NaSAKa checked the house and family list Catch white elephant	5	Full Moon day of Waso Ramadan Month More availible of Da Nyinthee
AUG	52	Earthquake Laila Tul Brat NaSaKa check houses	40	Laila Tul Barat Starting Ramadan End of rainy season Burn 2 children and houses	28	Ramadan Eid festival	16	Edul-Fitir	4	Edul-Fitir Heavy rain Finished Transplaning OTP/SFP Opened in TMT
SEP	51	Earthquake Ramadan,shobokodor(fatiya), Eidul- fetiir	39	Ramadan,shobokodor(fatiya) Eidul- fetiir	27	Eid festival Start to harvest first term paddy	15	Appeared first term harvest	3	Appeared first term harvest

OCT	50	Day Wali End of Buddhist lent festival(wakute) Beginning of harvest ACF nut -monitoring	**38**	GIRI cycle in South and East Rakhine Second Water Flooded in Maungdaw Campaign for election GRET close White elephant found in M	**26**	Start to stop raining season Famers start nursery for winter crop Famers start to cultivate the carrot.	**14**	Eiddul Azhar Full Moon day of Thadinkyat	**2**	Eiddul Azhar Full Moon day of Thadinkyat Burnt Kyein Chaung Market
NOV	49	Kurban (last week of November) Start Winter Crop in Maungdaw district AMI stop	**37**	Election (first week of November) Kurban (3rd week of November) Start Winter Crop in Maungdaw district *Release (Su Kyi)*	**25**	Kurban (2nd week of November)	**13**	Starting cold Start radish Starting winter cultivation OTP/SFP Opened in DT Starting Winter crop	**1**	Starting cold Start radish Robiulrawal Fatiyah
DEC	48	Christmas	**36**	Starting of cold Christmas	**24**	Starting cold People take walking early morning	**12**	Dog delivery		