Save the Children

Nutritional Anthropometric Assessment

(Based on SMART methodology)

Children aged 6 to 59 months living in IDP camps

Sittwe and Pauktaw Townships

Rakhine State – Republic of the Union of Myanmar

March 2014

Data collection period: 26^{th} November-20^{th} December 2013

Humanitarian Aid
and Civil Protection

BILL & MELINDA GATES foundation

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Special thanks to the SMART nutrition team for their good work:

Data Collection & Field Team Manager

Saw Aye Emaric
with Annemarie Kueter

Sittwe Urban team	1	Ko Ko Oo	7	Ye` Myat Tun
	2	Hla Hla Yee	8	May Myat Thu
	3	Hnin Ei Ei Tun	9	Ko Lin Tun
	4	Myat Kay Khaing	10	Hnin Yamone
	5	Aye Thandar	11	Khine Khine Zan
	6	Khaing Ye` Lin	12	Mg Khin Nyunt
Sittwe Rural team	1	Khin Nandar Win	5	Khin Hnin Mar
	2	Khin Tint	6	Myint Myo Thuzar
	3	Yee Yee Than	7	Hla Hla Khin
	4	Khin Mar Cho	8	Khin Khin Lay
Pauktaw Rural team	1	Ko Win Nyunt	5	Ma Lai Yee Win
	2	Ko Zaw Win	6	Thidar Pyone
	3	U Bo Ni	7	Nu Nu Aye
	4	Khaing Htoo Zaw	8	Yin Mon Swe

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List of Acronyms

ACF	Action Contre la Faim
ANC	Ante-Natal Care
CCCM	Camp Coordination and Camp Management
CI	Confidence Interval
CP	Child Protection
ENA	Emergency Nutrition Assessment (software)
EPI	Extended Programme of Immunisation
FSL	Food Security and Livelihoods
GAM	Global Acute Malnutrition
GFD	General Food Distribution
H/A	Height-for-Age
HAZ	Height-for-Age Z-score
IDP	Internally Displaced Person
IYCF	Infant and Young Child Feeding
IYCF-E	Infant and Young Child Feeding in Emergencies
KAP	Knowledge, Attitudes and Practices
MAM	Moderate Acute Malnutrition
MHAA	Myanmar Healthcare Assistants Association
MICS	Multiple Indicator Cluster Survey
MoH	Ministry of Health
MUAC	Mid-Upper Arm Circumference
NCHS	National Centre for Health Statistics
NFI	Non-Food Item
NGO	Non-Governmental Organization
NR	Non-Response
OR	Odds Ratio
OTP	Out-patient Therapeutic Programme
PHC	Primary Health Care
PLW	Pregnant and Lactating Women
PNC	Post-Natal Care
RNA	Rapid Nutrition Assessment
RSB	Rice Soya Blend
SAM	Severe Acute Malnutrition
SC	Stabilization Centre
SCI	Save the Children International
SD	Standard Deviation
SHD	State Health Department
SMART	Standardized Monitoring and Assessment of Relief and Transitions
TFP	Therapeutic Feeding Programme
TSFP	Targeted Supplementary Feeding Programme
U5	Under five
UNICEF	United Nations Children's Fund
UNOCHA	United Nations Office for the Coordination of Humanitarian Affairs
WASH	Water, Sanitation and Hygiene
WAZ	Weight-for-Age Z-score
WFP	World Food Programme
W/H	Weight-for-Height
WHZ	Weight-for-Height Z-score
WHO	World Health Organization

Executive Summary

Assessment area: Sittwe and Pauktaw Townships IDP camps, rural area and (Sittwe only) urban area

Date of the assessment: 26th November-20th December 2013

OBJECTIVES

Main Objective:

To determine the nutritional status of children aged 6 to 59 months living in IDP camps in Sittwe and Pauktaw Townships, Rakhine State, Myanmar.

Specific Objectives:

- To estimate prevalence of global and severe acute malnutrition among children aged from 6 to 59 months
- To estimate prevalence of global and severe chronic malnutrition among children aged from 6 to 59 months
- To determine prevalence of under nutrition prevalence among children aged from 6 to 59 months
- To estimate incidence of diarrhea during the preceding two weeks among children aged from 6 to 59 months
- To assess vitamin A supplementation coverage among children aged from 6 to 59 months
- To determine measles vaccination coverage among children aged 9-59 months

METHODOLOGY

- Simple Random Sampling, using the 6-59 month old child as primary sampling unit and the following sample sizes as determined by ENA for SMART software: 217 for Sittwe Urban (recalculated as Pauktaw urban was no longer accessible at survey-start), 396 for Sittwe Rural, 307 for Pauktaw Rural
- Population figures were obtained from the Save the Children International nutrition program's updated exhaustive under-five population lists and cross-checked with UNOCHA camp figures

RESULTS

Acute Malnutrition Rates (Wasting)

No cases of oedema were found. Based on weight-for-height z-scores, the three samples indicated the following Global Acute Malnutrition (GAM) and Severe Acute Malnutrition (SAM) rates:

- Sittwe Urban (n=117) - GAM: (19) 10.7 % (7.0 - 16.2 95% CI), SAM : (2) 1.1 % (0.3 - 4.0 95% CI)
- Sittwe Rural (n=348) - GAM : (33) 9.5 % (6.8 - 13.0 95% CI), SAM: (0) 0.0 % (0.0 - 1.1 95% CI)
- Pauktaw Rural (n=274) - GAM: (45) 16.4 % (12.5 - 21.3 95% CI), SAM: (5) 1.8 % (0.8 - 4.2 95% CI)

Chronic Malnutrition Rates (Stunting)

Height-for-age z-scores results were as follows for global and severe stunting:

- Sittwe Urban (n=176) - Global: (74) 42.0 % (35.0 - 49.4 95% CI), Sev.: (27) 15.3 % (10.8 - 21.4 95%CI)

- Sittwe Rural (n=342) - Global: 37.8%, (at calculated SD of 1, as original SD=1.29)
- Pauktaw Rural (n=267) - Global: 52.4% ((at calculated SD of 1, as original SD=1.4)

Underweight

Global and severe underweight results by weight-for-age z-score highlighted:

- Sittwe Urban (n=178) - Global: (64) 36.0 % (29.3 - 43.2 95% CI), Sev.: (6) 3.4 % (1.6 - 7.2 95% CI)
- Sittwe Rural (n=354) - Global: (112) 31.6 % (27.0 - 36.7 95% CI), Sev.: (18) 5.1 % (3.2 - 7.9 95% CI)
- Pauktaw Rural (n=277) - Global: (132) 47.7 % (41.8 - 53.5 95% CI), Sev.: (49) 17.7 % (13.6 - 22.6 95% CI)

Diarrhea, Supplementation, Vaccination

3.7% of caretakers in urban Sittwe IDP camps reported that their child had had diarrhea in the preceding two weeks. In rural Sittwe camps this was 33.1%, and in rural Pauktaw camps it was 46.6%.

Vitamin A supplementation in the last six months had occurred in 78.9% of children from urban Sittwe camps, 81.5% in rural Sittwe camps and 34.5% in Pauktaw rural camps.

Findings revealed a measles vaccination coverage of 84.4% for 9-59 months old children in urban Sittwe camps, 50.3% coverage in rural Sittwe and 32.2% in rural Pauktaw camps.

CONCLUSION

Immediate Life Saving

- GAM rate above WHO's 15% emergency threshold in Pauktaw rural camps, with SAM close to UNICEF's 2% critical threshold
- Concerning GAM rates in Sittwe urban and rural camps

Long-term Development

- Global stunting and underweight above or close to emergency thresholds in all three strata

RECOMMENDATIONS

- Regular multi-sectorial analysis of nutrition surveillance data and underlying causes, with ensuing coordinated action (Health, WASH, FSL, CP, Shelter, Education)
- Access to nutrition treatment & prevention services in all camps, adapted to the specific nutrition problematics of each target group (Infant & Young Child Feeding, Supplementary Feeding Programme)
- Access to primary health care services including ante-, post-natal and delivery assistance, as well as referral to secondary healthcare
- Re-establishment of routine immunisation services in all camps
- Further SMART survey during rainy season to monitor trends, as well as NCA/anthropological survey to clarify causes of malnutrition

1. Introduction

1.1 Context

The Republic of the Union of Myanmar is situated between the Bay of Bengal and the Andaman Sea to the south, India and Bangladesh to the northwest, and China, Laos and Thailand to the east. By geographical area it is the 40th largest country in the world, and in terms of population it ranks 24th with an estimated 61 million inhabitants. It became an independent nation in its current form in 1948, with the military dictatorship officially ending in 2011. The government recognizes 135 distinct ethnic groups, of which the Bamar make up 68% of the population, and the Rakhine 4%. Buddhism is the predominant religion, but there are also Christians, Muslism, Hindus and others. One of the longest-running civil wars continues to impact on nine of the 14 territories to this day, placing an estimated 834,000 people in need of humanitarian assistance[1]. Myanmar has natural riches (jade, gems, oil, gas and other mineral sources) but ranks as the 149th of 187 countries in the 2013 Human Development Index[2], the 5th lowest in the Asia/Oceania region.

1.1.1 Geographic description of survey area

Rakhine state is the western-most of Myanmar's 14 states and regions, and is separated from the rest of the country by the Arakan mountains to the east, and the Bay of Bengal to the west. The state is divided into 17 Townships, two of which are Sittwe and Pauktaw. Pauktaw Township is characterized by hills, whilst Sittwe is flat. Both are coastally situated.

The area has three seasons: the rainy season (June-October), winter (November-February) and summer (March-May). The rainy season brings with it recurrent seasonal flooding, and storms which in bad years can cause destruction and damage, as in the case of Cyclone Giri in October 2010. The rainy season is also called the 'hunger gap' as labor opportunities and access to natural products such as firewood decrease, while market prices increase slightly due to reduced access.

1.1.2 Description of the population

Rakhine State has an overall estimated population of 3.3 million. As one of the least developed parts of Myanmar it is characterized by high population density, malnutrition, low-income poverty and weak infrastructure. In recent times, the impact of conflict has exacerbated these challenges (as detailed in section 1.1.3 below).

The largest town in the zone is Sittwe, with numerous smaller towns stretched along the coast. In Sittwe and Pauktaw Townships, the majority of inhabitants lived in urban or peri-urban coastal settings before the conflict. There are however also rural villages, some of which are geographically isolated. Due to the coastal nature of the area and poor internal infrastructure, particularly during rainy season, many of these towns are only connected to each other by boat.

The main livelihood activities in the urban population revolve around business/trade and labor. For the more rural areas they are fishing and agriculture. In general, the production and trade in fish and seafood products is followed by in the production of basic commodities such as rice and other food items, as well as the provision of services including transportation (trishaw, motor tri-shaw etc) and food/drink outlets. Men largely conduct activities related to large-scale business, fishing, transportation and heavy manual labor, while women are largely engaged in petty trade, food/drink sales and casual labor involving the sorting and cleaning of seafood items. Prior to the conflict, the majority of middle income and better off households owned significant land and/or were engaged in fishing, while poorer laborers found work within fishing,

[1] UNOCHA (2014) Myanmar Strategic Response Plan (draft)
[2] UNDP. 2013. Human development index.

agriculture and petty trade. Since the conflict, rural camp populations face movement restrictions, and therefore have little access to sea, land or other productive assets. Main markets and business centres also remain inaccessible, limiting opportunities for work, and leading to an increase in commodity prices for most goods of 10-20%. All communities within the area have seen an increase in fish and labor prices, as these were primarily areas of high Muslim involvement[3].

The two main population groups in the state are the Rakhine, predominantly Buddhist, and the Rohingya, a Muslim minority not recognized as citizens by the Myanmar government and therefore stateless. There has been long-standing tension and division between them.

1.1.3 Conflict History

In early June 2012, conflict erupted between the two communities, resulting in the Myanmar government declaring a state of emergency. The widespread violence in and around the state capital of Sittwe claimed 78 lives, 4800 buildings were destroyed and population displacements forced 75,000 people from both communities to seek shelter in makeshift camps[4]. Widespread violence again broke out in surrounding Townships in October 2012, including Pauktaw. Eighty-eight people were reported killed and thousands of homes were razed. An estimated further 64,000 people were displaced, the majority to hard-to-reach areas.

Temporary shelters were built, and the government worked with international and national humanitarian agencies to cover life-saving needs such as food, non-food items, healthcare, Water, Sanitation and Hygiene (WASH) and education services. However, over a year and a half since the beginning of the crisis, the situation remains severe; for 2014, an estimated 314,000 people (almost 10% of the population) are deemed in need of humanitarian assistance across the state[5].

At the time of the survey, official figures from the Camp Coordination & Camp Management (CCCM) Cluster reported that there were still approximately 138,833 Internally Displaced People (IDP). 110,000 IDPs live in one of 68 camps across the state, whilst 28,000 others have sheltered in host communities. A further 36,000 people in isolated villages (both Muslim and Rakhine) are considered extremely vulnerable[6].

In Sittwe Township, the IDP camp population stands at 93,707[7]. 4,247 are Rakhine and the rest are Muslim. In Pauktaw Township, camps shelter 17,515 IDPs. The majority are Muslim IDPs, with the exception of 97 Rakhine. Numbers continue to fluctuate and further displacement is likely, both in light of camp-relocations instigated by local authorities, as well as by IDPs themselves. An estimated 24,000 Muslims have fled the country, mostly by dangerous sea crossings, which have already claimed some 400 lives[8]. Simultaneously, camp population sizes are increasing due to the movement restrictions and harsh conditions found in the host communities and surrounding areas[9]. Tensions remain high and there is a risk of further conflict in 2014.

1.1.4 Services and humanitarian assistance

After the latest camp re-organization by the Rakhine State Government in September 2013, there are officially 5 urban and 12 rural IDP camps in Sittwe Township, and 1 urban and 4 rural IDP camps in Pauktaw Township (see appendix 5 for names). In this context, urban camps host Rakhine populations and are defined by their closer proximity to town. Rural camps house Muslim populations and are mainly situated on flood plains (Pauktaw) and in coastal fields (Sittwe). All IDP communities, particularly rural ones, are still almost entirely reliant on humanitarian aid to cover all their basic needs.

[3] Rapid HEA, August 2013, SCI and Oxfam
[4] Official Ministry of Information figures, 28th June 2012
[5] UNOCHA (2014) Myanmar Strategic Response Plan (draft)
[6] UNOCHA (2014) Myanmar Strategic Response Plan (draft)
[7] CCCM November 2013
[8] UNOCHA (2014) Myanmar Strategic Response Plan (draft)
[9] Rapid HEA, August 2013, SCI and Oxfam

Although the majority of those affected are Muslim, both communities have suffered and have received humanitarian assistance. However, distrust and misperceptions about humanitarian aid continue to constrain access to vulnerable groups, as evidenced most recently with the suspension of MSF's activities in February 2014, as well as the anti-Non Governmental Organization (NGO) rioting in March 2014 and subsequent limited humanitarian activity.

1.1. 5 Nutrition & health context

A joint Rapid Nutrition Assessment (RNA) in Sittwe in July 2012 indicated a 23.4% (20.4 - 26.7 95% C.I) prevalence of Global Acute Malnutrition (GAM) in the IDP locations assessed, of which 7.5% (5.8-9.7 95% CI) were severely malnourished. Results highlighted an urgent need for blanket supplementary feeding, therapeutic feeding interventions and support for Infant and Young Child Feeding practices in emergencies (IYCF-E). It also revealed that a further 2,500 children were in a marginal state, and likely to develop acute malnutrition if adequate food, healthcare and water and sanitation were not provided. The high prevalence of respiratory and diarrheal disease in screened children was also a concern.[10]

According to Save the Children International (SCI)'s SMART survey conducted in urban and rural camps in Sittwe Township in late December 2012, low rates of acute malnutrition were found among children in urban IDP settings at 3.1% (1.3 –7.1 95% CI) GAM. However, children in rural IDP camps presented a mean prevalence of 14.4% (11.2 – 18.4 95% CI) GAM, very close to the World Health Organization's (WHO) emergency threshold of 15%[11]. More strikingly, in the same population, a high Severe Acute Malnutrition (SAM) prevalence of 4.5% (2.8 – 7.3 95% CI) was observed, which is above the 2% SAM threshold used by United Nations Children's Fund (UNICEF) to define a critical nutritional situation and immediate need for intervention. An RNA conducted by SCI Pauktaw in December 2012 indicated a similarly concerning scenario, with 20.8% GAM and 7.4% SAM rates. IDP camp children were more affected than those in the host community, with 0.5% SAM in the host communities but 9.8% SAM in the IDP camps.

Other survey data of interest includes the recent results in the northern part of Rakhine State. Some 800,000 Muslims live there without citizenship, and are subjected to restricted freedom of movement, marriage and birth registration, as well as forced labour, arbitrary arrest, ill treatment, and extortion[12]. November 2013's SMART survey conducted by Action Contre la Faim (ACF) in Maungdaw revealed GAM rates of 20.0% (15.1 – 26.1 95% CI) and SAM rates of 3.0% (1.5 – 6.0 95% C.I). Global stunting was 47.6% (38.7– 56.6 95% C.I) and severe stunting was 22.4% (16.9 –29.1 95% C.I). Similarly in neighbouring Buthidaung Township's December 2013 SMART survey, the GAM rate was 21.4% (17.9 – 25.3 95% C.I) and SAM was at 3.7% (2.3 – 6.0 95% C.I). Global stunting was 58.6% (50.1 – 66.6 95% C.I) and severe stunting was 28.6% (22.6 –35.5 95% C.I).

For a comparison to the rest of the country, the 2009-2010 Multiple Indicator Cluster Survey highlighted 10.0% GAM and 2.1% SAM rates globally. 47.8% of children were stunted, of which 12.7% were of the severe form. Underweight was present in 23.2% of children, with 5.6% in severe form. Rural areas were more affected by stunting and wasting, and undernutrition was most common in Rakhine and Chin states[13].

SCI's response in Pauktaw and Sittwe Townships encompasses nutrition, food aid, WASH, Child Protection (CP) and education activities. Its main approach is to strengthen community-based activities, and to continue fostering acceptance by working with all communities. In response to the needs identified in the above assessments, the SCI nutrition program started implementing Infant and Young Child Feeding (IYCF) activities in Sittwe Township in September 2012, expanding in August 2013 to Pauktaw Township. In addition, Ante-Natal and Post-Natal Care (ANC/ PNC) services to optimize mother and infant health were started in both Townships, as well the treatment of SAM through an Outpatient Therapeutic Programme (OTP) in Pauktaw.

[10]Revised Rakhine Response Plan July 2012-June 2013, 16 November 2012

[11] Nutritional anthropometric assessment based on the SMART methodology, Children aged 6-59 months living in IDP camps, Sittwe Township, Rakhine State, December 2012

[12] UNOCHA (2014) Myanmar Strategic Response Plan (draft)

[13] MNPED, MoH, UNICEF. 2010. Multiple Indicator Cluster Survey 2009-2010

Other nutrition actors cover the rest of the Therapeutic and Targeted Supplementary Feeding Programme (TFP, TSFP) in Sittwe and Pauktaw for all IDP camps (see appendix 6 for a map and list of actors per area). There was a Stabilisation Centre (SC) in in MSF's rural Sittwe clinic until February 2014, when the Myanmar government suspended all MSF activities in Rakhine state. Another SC is run by the Ministry of Health (MoH) in Sittwe hospital. It accepts referrals from Pauktaw, but caretakers are often afraid to go to Sittwe due to the tensions. SFP services delivered by the Myanmar Healthcare Assistants Association (MHAA) were suspended in November 2013 pending further funding. WFP has since started providing Gift in Kind rations to MHAA for the resumption of services, although at present MHAA receive no operational support for the implementation of SFP activities.

All IDPs receive World Food Programme (WFP) food rations, with supplementary rations given to Pregnant and Lactating Women (PLW) and children under five (U5) years of age[14].

A host of health actors run Primary Health Care (PHC) clinics across both Townships, including ANC/PNC and delivery services (see appendix 6 for maps and actor per camp). However, needs are not all met, particularly for Pauktaw communities who are more remote, and are often afraid to transfer to secondary care in Sittwe hospital. In addition, since MSF's weekly PHC clinic was suspended in February 2014, Pauktaw camps have not had regular mobile clinic services.

In terms of routine health activities, immunisation has not resumed since the start of the crisis. The last mass vaccination campaign in Rakhine State occurred in March 2012 (22nd-31st). The last vitamin A supplementation/ deworming campaign by MoH, in collaboration with NGOs was conducted from 28th-31st August 2013.

In order to monitor the nutritional situation in Sittwe and Pauktaw IDP camps, SCI conducted this SMART assessment from 26th November- 20th December 2013, a year on from the previous SMART survey. This period corresponds to the cold season, where lowest rates of malnutrition are usually observed.

[14] IDP emergency relief ration (per person per month): 13.5kg rice, 1.8kg pulses, 0.91l oil, 0.15kg salt, 3.8kg blended food (rice soya blend), supplementary ration: 3.8kg blended food

1.2 Survey Objectives

Main Objective

To determine the nutritional status among children aged 6 to 59 months living in IDP camps in Sittwe and Pauktaw Townships, Rakhine State, Myanmar.

Specific Objectives

- To estimate prevalence of global and severe acute malnutrition among children aged from 6 to 59 months
- To estimate prevalence of global and severe chronic malnutrition among children aged from 6 to 59 months
- To determine prevalence of under nutrition prevalence among children aged from 6 to 59 months
- To estimate incidence of diarrhea during the preceding two weeks among children aged from 6 to 59 months
- To assess vitamin A supplementation among children among children aged from 6 to 59 months
- To determine measles vaccination coverage among children aged 9-59 months

2. Methodology

Data collection took place from 26th November to 20th December 2013 in rural IDP camps of Sittwe and Pauktaw Townships, and in urban IDP camps in Sittwe Township.

The assessment was conducted following the Standardised Monitoring and Assessment of Relief and Transitions (SMART) methodology, a fast, standardized and simplified method meant to ensure each household/individual in a target population has the same chance of being chosen.

2.1 Sampling Method

The target population was children aged 6 to 59 months, living in Sittwe or Pauktaw Township IDP camps.

Simple random sampling was used as method of data collection. In statistical terms, all sampling methods are equivalent, as long as they result in a representative sample. The sampling scheme that should be chosen is determined mainly by the geographic population data available, the size of the population, the area's topography and its households' organization. If up-to-date, complete population address lists are available, simple random sampling should be used as method, as this introduces the least amount of sampling bias.

Population data was available from SCI nutrition program's exhaustive under-five population lists. These had been updated end October/ beginning November 2013, and were cross-checked with United Nations Organization for the Coordination of Humanitarian Affairs (UNOCHA) camp figures.

2.2 Sample Size

Three strata were identified, based on contextual homogeneity: Sittwe/ Pauktaw Urban, Sittwe Rural and Pauktaw Rural. Due to the lack of access upon starting the survey, which persisted two weeks into data-collection, the Sittwe/ Pauktaw urban sample was recalculated to include solely Sittwe, and the % non-response rate was increased to take into account the field teams' results up to that point.

The sample sizes were attained taking into account previous survey data and SMART recommendations as per below table:

Table 1: Sample sizes for nutritional component

Variable	Sittwe URBAN	Sittwe RURAL	Pauktaw RURAL	Comment
Total population <5	415	27,885	5,630	Data from SCI nutrition program (Oct/ Nov 2013), Sample for Pauktaw Rural adjusted using ENA small population correction
Expected GAM Prevalence	7.1	18.4	20.7	Sittwe: based on GAM estimates from SCI Dec 2012 SMART survey (upper limit of 95% CI); Pauktaw: based on SCI Dec 2012 Rapid Nutrition Assessment results (MUAC). Both take into account any expected changes in the preceding year
Precision	3.0%	4.0%	4.5%	Based on SMART recommendations for GAM estimate
Minimum Number (6-59	181	360	279	

months)				
% Non-response	20	10	10	Based on SCI Dec 2012 SMART survey and field experience
Target Sample (6-59 mos)	217	396	307	

Emergency Nutrition Assessment (ENA) software for SMART (version 16th Novemer 2013) thus produced the following final sample sizes per stratum:

- 217 for Sittwe Urban (re-calculated from 282 children for Sittwe/ Pauktaw Urban, adjusted using ENA small population correction and a 20% non-response rate)
- 396 for Sittwe Rural
- 307 for Pauktaw Rural

2.3 Sampling Procedure: Selecting Children

The 6-59 month old child, hereafter referred to as 'child', was classed as primary sampling unit. Unit selection was done via simple random sampling: all children in the population lists were given a unique number, and ENA software was used to generate random number tables taking into account the respective stratum's sample size.

The primary caretaker of all selected children was interviewed to collect further relevant data on morbidity and status of vaccination/ supplementation.

2.3.1 Special Cases

- **Absence**: when a selected child and caretaker were not present at the time of the visit, he/she was recorded on the data sheet. Neighbours were asked to confirm whether the family were due to return. If so, the team returned at a designated time within the following three days to take the child's measurements. If the child was still absent, he/she was not replaced, but was given an identifying number and recorded in the non-response category as absent.

- **Absence due to illness**: when a child was in a health structure, the team went to the health structure if possible in a reasonable time, to take their measurements. When not possible to visit the child in the structure, he/she was not replaced and an identifying number was given to him/her, with an annotation that the child was in a health structure.

- **Transfer**: Population movements from one camp to another camp, or outside the region occurred between the listing/ sampling time and the day of the interview. This was due to the end of the rainy season (a time of improved transport opportunities and safer routes, awaited by many to leave elsewhere in search of better job opportunities), as well as government-led camp-population movements. If neighbours were able to give the permanent new destination of the absent child and caretaker, and it fell within the target IDP camp area, the team went to look for them. If the child remained unfound despite consultation with local SCI volunteers, camp committee members and neighbours, he/she was not replaced, but was given an identifying number and recorded as absent. The children who were confirmed to have left the region were equally recorded as absent.

- **Disability**: disabled children were eligible and thus included in this assessment. They were given an identifying number and all anthropometric measurements not affected by the disability were taken, alongside the standard additional caretaker questions. This data was annotated mentioning the child's disability. Other data were recorded as missing.

- **Refusal:** when the team encountered refusal from the parents to measure their child, he/she was not replaced and an identifying number was given to him/her and recorded in the non-response category.

- **Death/ outside age range**: when a child was found to fall outside of the 6-59 month age range or to be dead, he/she was not replaced, but was given an identifying number and recorded in the non-response category.

Malnourished children detected during this assessment were referred to the nearest Out-patient Therapeutic Program (OTP) centre run by ACF or SCI. A referral slip was given to the caretaker, and an SCI staff member or volunteer accompanied them to the nearest OTP.

2.4 Case Definitions and Inclusion Criteria

The results are presented based on WHO standards in the body of the report[15], and as United States National Centre for Health Statistics (NCHS) reference[16] in appendix 3, for comparative value with previous assessments.

2.4.1 Acute Malnutrition/ Wasting Index

In this report, acute malnutrition (wasting) is estimated according to the Weight-for-Height (W/H) of each child and/or the presence of oedema. Weight-for-height expressed in z-score (WHZ) is calculated by comparing the anthropometric measurements of the sample to the WHO's 2006 standard population.

Acute malnutrition is defined as follows:

Table 2: Acute malnutrition classification according to W/H index and/or oedema

Classification	Criteria
Moderate acute malnutrition	*-3 z-score ≤ W/H < –2 z-score (80% - 70% of the median) and/or Oedema*
Severe acute malnutrition	*W/H < –3 z-score (70% of the median) and/or Oedema*

The weight for height index is used to quantify and qualify the prevalence of wasting in a population in emergency situations, where acute forms of malnutrition are the predominant pattern. However, the Mid-Upper Arm Circumference (MUAC) is a useful tool for rapid screening of children and detection of those who are at high risk of death.

The table below summarizes the classification of malnutrition using MUAC according to latest WHO recommendations and SPHERE standards[17] for children over 6 months of age.

Table 3: Acute malnutrition classification according to MUAC cut-off

MUAC in mm	Classification
≥135mm	Well nourished
125 – 134 mm	At risk of malnutrition
115 – 124 mm	moderate acute malnutrition
< 115 mm	severe acute malnutrition

15 WHO, use and interpretation of anthropometric indicators of nutritional status, Bulletin of the WHO,64 (6) : 929-941 (1995)
WHO: World Health Organization, WHO growth curves for children, 2005
16 National Centre for Health Statistics (1977) NCHS growth curves for children birth-18 years. United States. Vital Health Statistics. 165, 11-74.
17 The SPHERE project, 2011

2.4.2 Chronic Malnutrition/ Stunting Index

The height-for-age (H/A) index provides an indication of the nutritional history of a child rather than solely his/ her current nutritional status. This indicator is used to identify chronic malnutrition or stunting.

The same principle is used as for weight-for-height: the child's chronic nutritional status is interpreted by comparing its H/A ratio with WHO standards height-for-age curves. As for the weight-for-height index, the height-for-age index as a z-score (HAZ) was calculated according to WHO standard data and the following H/A cut-off points were applied:

Table 4: Chronic malnutrition classification

Classification	Criteria
No stunting	H/A ≥ -2 z-score
Moderate stunting	-3 z-score ≤ H/A < -2 z-score
Severe stunting	H/A < -3 z-score

2.4.3 Underweight

The weight-for-age index (W/A) is used to indicate whether a child is underweight. As a composite index of malnutrition, it highlights the presence of wasting, stunting or both. Underweight children are at greater risk of mortality[18]. As for the above-mentioned indices, the weight-for-age index as a z-score (WAZ) was calculated according to WHO standard data and the following cut-off points:

Table 5: Underweight classification

Classification	Criteria
No stunting	W/A ≥ -2 z-score
Moderate stunting	-3 z-score ≤ W/A < -2 z-score
Severe stunting	W/A < -3 z-score

2.4.4 Immunization and supplementation

WHO recommends that 90% of children aged from 9 to 59 months be vaccinated against measles, to ensure effective epidemic prevention. Myanmar MoH's current target is to achieve routine immunization coverage of 95% nationally with at least 80% coverage in every township for all antigens[19]. Improving case-based management and treatment with vitamin A forms part of the measles eradication strategy, and national guidelines follow the advice for countries with vitamin A deficiency problems for high-dose vitamin A supplementation every four to six months for all children aged 6-59 months[20].

[18] WHO. 2010. Background paper 4 nutrition indicators.
[19] MoH EPI Myanmar Multi Year Plan 2012-2016
[20] MoH EPI Myanmar Multi Year Plan 2012-2016

2.5 Questionnaire, Training and Supervision

2.5.1 Questionnaire

The questionnaire used is provided in appendix 6. For each eligible child aged 6 to 59 months, the following data were collected:

- **Age:** whenever available, the child's age was copied from his/her birth certificate and cross-checked with a local events calendar (appendix 4). The majority of children had no certificate and their birth date was unknown. In these instances, the local events calendar was used to approximate the child's age.

- **Gender:** the sex of each child was recorded as "M" for male/boys and "F" for female/girls.

- **Weight:** children were weighed to the nearest 100g with a 25kg Salter brand hanging scales. All scales were equilibrated daily by using a standard 5 kg weight, and were adjusted to "0" with an empty pair of weighing pants attached before each measurement, as per SMART methodology[21]. Children were weighed with a minimum of clothes (as per last year's SMART survey technique).

- **Height/Length:** each child was measured to the nearest 1mm with a standard wooden anthropometric height-board. Children below 85 cm were measured lying down and those equal to or above 85 cm were measured upright.

- **Oedema:** the presence of oedema was diagnosed by applying moderate thumb pressure for at least three seconds to the upper side of both feet. The level of oedema was not recorded. Only children with bilateral pitting oedema (a visible persisting dent in both feet after the above-mentioned pressure) were recorded as having nutritional oedema.

- **MUAC:** MUAC was measured to the nearest 1mm, at the midpoint of the unflexed left upper arm (between the tips of shoulder and elbow) using a standard coloured MUAC ribbon.

- **Diarrhea:** if the caretaker reported the presence of diarrhea in the past 15 days, the team cross-checked that the description of symptoms was compatible with the used definition of diarrhea as 'the emission of three or more liquid stools within 24 hours'. Coding was as follows: "0" for No, "1" for Yes, "3" for when the respondent did not know.

- **Vitamin A supplementation:** administration of vitamin A capsules within the last 6 months was considered, and verified with the caretaker by means of showing a capsule sample. Coding was as above: "0" for No, "1" for Yes, "3" for when the respondent did not know.

- **Measles vaccination:** immunization against measles was checked, and a vaccination card requested in the case of a positive response. Coding was as follows: "0" when the child was not vaccinated, "1" when vaccination was confirmed by a vaccination card, "2" when vaccination was only able to be confirmed verbally, "3" when the respondent did not know.

Weight-for-height z-score was not calculated in the field, to avoid possible introduction of bias in measurement, seeing as admission to the OTP program is considered desirable by some members of the population in question. Nevertheless, an SCI staff or volunteer accompanied any child suspected of SAM to ACF's or SCI's OTPs with a survey referral slip.

IYCF data was not collected as SCI conducted a concurrent Knowledge, Attitudes and Practices (KAP) survey on this subject[22]. WASH and Food Security and Livelihoods (FSL) surveys were being completed on the same population around the same time; such questions were therefore not included to avoid participant survey

[21] SMART. April 2006. SMART methodology version 1
[22] SCI. 2013. KAP survey on IYCF/ANC – Sittwe and Pauktaw Townships

fatigue. As in last year's SMART survey, no mortality data was collected; advocacy for the collection and dissemination of this type of information was made via existing State Health Department (SHD)/ health cluster systems.

2.5.2 Training and Supervision

Recruitment included a combination of local and national surveyors, with varying levels of survey experience. A total of 28 people were trained. They attended 3 days of theoretical training on assessment methodology, measurement, questionnaires and other assessment tools (event calendar). Theory was completed by various practical exercises. In addition, 3 standardization tests took place in order to evaluate and guarantee the enumerators' accuracy and precision in taking measurements (results in appendix 2). The field team manager used post-training and standardisation test results to determine optimal team composition.

The training was completed with a one-day field test on non-selected children to recreate real work conditions and enable each team to become familiar with all work aspects (introduction/ survey explanation, finding of selected children, questionnaire completion, anthropometric measurement, team organization). Children included in the field test were not part of the survey sample.

Each team was composed of two measurers and one (roving) team-leader. At least one woman was part of each of the 10 teams. One set of guidelines with the survey's main instructions and a materiel kit was provided to each team member.

During data collection, the teams were supervised on a daily basis by the field team manager. A meeting was held each morning between the teams and the field team manager, to discuss the results of the previous day's anthropometric measurement check results. Feed-back on age distribution, digit preference and measurements' errors was given and re-measurements were planned as required.

2.6 Data analysis

Data collected were entered by one data entry officer and checked by another every evening using the latest version of ENA software (16th November 2013), for daily data quality analysis and SMART/ WHO Flags identification. The team went back to re-measure children with abnormal data (weight, height, MUAC in addition to a second age estimation). Possible data entry errors were also checked.

Analysis then was performed using ENA, Excel (version 2010) and OpenEpi (version 2.3.1), using Chi^2 tests to explore statistical linkages between parameters where relevant.

Weight-for-height z-score was not calculated in the field, to avoid possible introduction of bias in measurement. When a child was identified as acutely malnourished during the data entry stage, the respective surveyors were questioned to ensure that the child had been referred to the nearest treatment services.

Overall data quality was only available after completion of all samples (full plausibility check reports available in appendix 1).

2.6.1 Data quality check

For the urban sample, the Standard Deviation (SD) and percentage of SMART flags for each index are quite low and within the acceptable range[23]. After exclusion of SMART flags, data quality is good with an overall survey score of 10%. Digit preference scores for weight and MUAC measurements were good, and

[23] Standard Deviation normal range = 0.8-1.2, % SMART flags normal range =

acceptable for height. The Shapiro-Wilks test highlighted abnormally distributed wasting data (P<0.05), with a significant skewness indicating an excess of obese/tall/overweight subjects in the sample[24].

For the Sittwe rural sample, the SD and percentage of SMART flags for WHZ and WAZ are low but both indicators for HAZ are slightly out of range (%HAZ flag=3.4%; SD=1.29). This data differed significantly from a normal distribution (p<0.05), suffering from kurtosis[25]. Thus, results for stunting in this sample have to be interpreted with caution. This can be attributed to errors in height measurement and/or age determination. Overall data quality is considered as good, with an overall survey score of 11%. Digit preference scores are excellent for weight and height measurements, and good for MUAC.

For the Pauktaw rural sample, the SD and percentage of SMART flags for WHZ and WAZ are low but again both indicators for HAZ are slightly higher or out of range (%HAZ flag=2.9%; SD=1.40). Kurtosis was present[26]; as above, results for HAZ have to be interpreted with caution. The overall data survey score for this stratum was good at 10%. Digit preference scores are excellent for weight and MUAC measurements, and acceptable for height. A summary of data quality is provided in the table below.

Table 6: Mean Z-scores and excluded subjects

Sample		N	Mean z-score ± SD	z-score not available*	Out of range z-score	SMART Flags
URBAN Sittwe	**WHZ**	177	-0.76±0.98	13	0	0.0%
	HAZ	176	-1.76±1.15	13	1	0.6%
	WAZ	178	-1.54±0.94	10	2	1.1%
RURAL Sittwe	**WHZ**	348	-0.84±0.88	3	6	1.7%
	HAZ	342	-1.69**±1.29**	3	12	3.4%
	WAZ	354	-1.50±0.97	2	1	0.3%
RURAL Pauktaw	**WHZ**	274	-1.12±0.98	5	0	0.0%
	HAZ	267	-2.06**±1.40**	4	8	2.9%
	WAZ	277	-1.93±1.07	1	1	0.4%

As Simple Random Sampling was used, Design Effect (=1.00) and Index of Dispersion are not of concern.

Regarding the minimisation of survey bias, the methodology section highlights how this was avoided in the data collection phase. Additionally, in light of the fact that results for the Sittwe urban sample were different to those of last year, and unexpected when triangulated with routine nutrition surveillance data, the measurements of 50 children were retaken by a different pair of measurers. The result indicated no significant discrepancy.

[24] Shapiro-Wilks: p=0.008, skewness: 0.53
[25] Shapiro-Wilks: p=0.003/ Kurtosis: -0.63
[26] Shapiro-Wilks: p=0.002/ Kurtosis: -0.85

3. Results

3.1 Anthropometric Results (based on WHO standards 2006)

3.1.1 Non-response rate

Not all selected children were found during the data collection period, particularly in Sittwe urban, where the initial non-response (NR) rate was over 20%. This was mainly due to ongoing population movements in rural camps and movements/ absence in urban camps, increased as a result of the post-rainy season, when movement is easier and more frequent. To ensure that an adequate sample was nevertheless reached in Sittwe urban, the recommendation from the contacted SMART expert was followed, and a further random sample of children was completed. Final non-response rates were 9.8% in Sittwe rural, 12.4% in Sittwe urban, and 9.4% in Pauktaw rural.

Finally, more than the minimum required number of children was reached for the urban sample. In Sittwe rural, 99.2% of the minimum number was reached, and for Pauktaw rural it was 99.6%. To ensure maximum validity of results via adequate minimum sample size, precision was adjusted by 0.1% for these two samples, from 4% to 4.1% for Sittwe rural, and from 4.5 to 4.6% for Pauktaw rural.

Table 7: Sample Non-Response Rate

Sample	Plan	Min. N°	Seen	% NR	*Camp transfer*		*Travel, absence, outside age range*		*Refusal*	
					n	%	n	%	n	%
URBAN Sittwe	217	181	190	12.4%	7	3.2%	19	8.7%	1	0.5%
RURAL Sittwe	396	360	357	9.8%	20	5.0%	19	4.8%	0	0.0%
RURAL Pauktaw	307	279	278	9.4%	8	2.6%	19	6.2%	2	0.6%

3.1.2 Gender and age distribution

For Sittwe urban, the 188 children with available age/gender data, the sex ratio was within the normal range of 0.8-1.2[27], at 1.0. Overall sex/age distribution was however significantly outside what was expected ($p<0.05$)[28]. Age distribution for girls was as expected, but significantly different for boys ($p<0.05$). However, overall age distribution was considered good in this sample. The age ratio of 6-29 months to 30-59 months was 0.92. The value should be around 0.85[29], indicating a slight over-representation of the younger age group.

In the Sittwe rural sample of 356 children, the sex ratio at 1.0 indicated a normal gender distribution. Again, age/gender data distribution was significantly different to what would be expected ($p<0.05$)[30]. Age distribution was significantly different for both boys and girls, however overall age distribution was rated as acceptable for this stratum. The age ratio of 6-29 months to 30-59 months at 0.88 was as expected.

Pauktaw rural's 278 children surveyed indicated a normal distribution regarding gender with a sex ratio of 1.1. Again, sex/age distribution was significantly outside what would be expected ($p<0.05$)[31]. Age distribution for girls was as expected, but significantly different for boys. Overall age distribution was

[27] Save the Children (2004) Emergency nutrition assessment: guidelines for field workers
[28] sittwe urban-age/sex distribution: p=0.002, boys age distribution: p=0.005
[29] SMART. April 2006. SMART methodology version 1
[30] sittwe rural-age/sex distribution: p=0.000, age distribution: p=0.044 for girls, p=0.035 for boys
[31] pauktaw rural-age/sex distribution: p=0.001, boys age distribution: p=0.023

nevertheless acceptable. The age ratio of 6-29 months to 30-59 months of 0.71 indicates a slight under-representation of the younger age group.

Table 6 : Distribution of Age and Sex per Sample

Sample		Boys		Girls		Total		Ratio
	Age (mo)	n	%	n	%	n	%	Boy/Girl
URBAN Sittwe	**6-17**	16	42.1	22	57.9	38	20.2	0.7
	18-29	34	65.4	18	34.6	52	27.7	1.9
	30-41	14	37.8	23	62.2	37	19.7	0.6
	42-53	24	49.0	25	51.0	49	26.1	1.0
	54-59	5	41.7	7	58.3	12	6.4	0.7
	Total	93	49.5	95	50.5	**188**	100.0	**1.0**
RURAL Sittwe	**6-17**	36	50.7	35	49.3	71	19.9	1.0
	18-29	48	50.0	48	50.0	96	27.0	1.0
	30-41	55	57.3	41	42.7	96	27.0	1.3
	42-53	39	52.7	35	47.3	74	20.8	1.1
	54-59	12	63.2	7	36.8	19	5.3	1.7
	Total	190	53.4	166	46.6	**356**	100.0	**1.1**
RURAL Pauktaw	**6-17**	28	53.8	24	46.2	52	18.7	1.2
	18-29	27	42.9	36	57.1	63	22.7	0.8
	30-41	41	53.9	35	46.1	76	27.3	1.2
	42-53	39	54.2	33	45.8	72	25.9	1.2
	54-59	7	46.7	8	53.3	15	5.4	0.9
	Total	142	51.1	136	48.9	**278**	100.0	**1.0**

Figure 1: Age and Sex Distribution - Sittwe Urban (N=188)

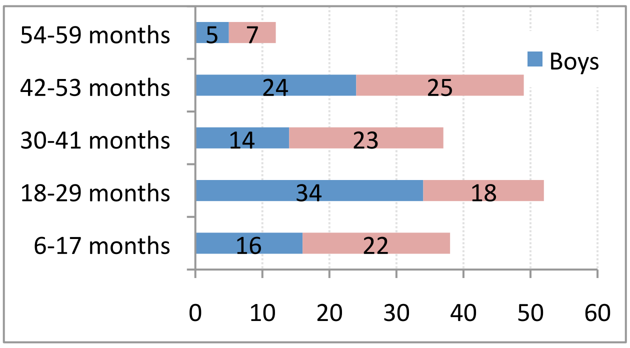


Figure 2 : Age and Sex Distribution - Pauktaw Rural (N=278)

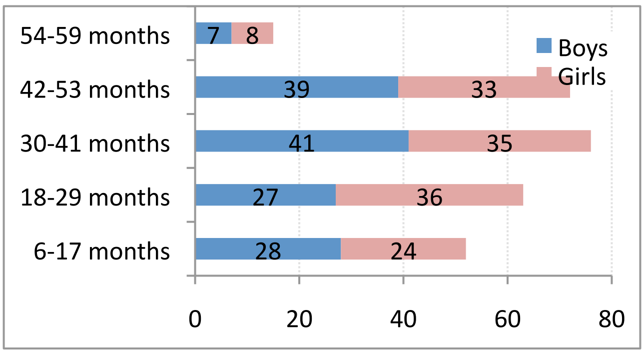
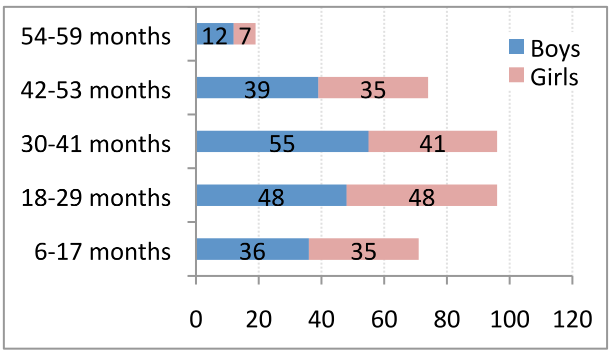


Figure 3 : Age and Sex Distribution - Sittwe Rural (N=356)



3.1.3 Prevalence of Acute Malnutrition

3.1.3.1 Weight-for-Height Z-Scores and/or Oedema

In Sittwe urban, 177 children were included in the analysis. Results showed a mean W/H index of -0.76 WHZ ± 0.98 SD[32]. As highlighted in the tables below, prevalence of GAM was 10.7% (7.0 - 16.2 95% CI) with 9.6% (6.1 - 14.8 95% CI) Moderate Acute Malnutrition (MAM) and 1.1% (0.3 - 4.0 95% CI) SAM.

For Sittwe rural, a total of 348 children were included in analysis, after exclusion of 6 SMART flags. A mean W/H index of -0.84 WHZ ± 0.88 SD was observed. GAM was at 9.5% (6.8 - 13.0 95% CI), with MAM=9.5% (6.8 - 13.0 95% CI) and SAM=0.0% (0.0 - 1.1 95% CI).

In Pauktaw rural, the results on 274 children indicated a mean W/H index of -1.12 WHZ ± 0.98 SD. This equated to a GAM rate of 16.4% (12.5 - 21.3 95% CI), consisting of 14.6% (10.9 - 19.3 95% CI) MAM and 1.8% ((0.8 - 4.2 95% CI) SAM.

No cases of bilateral pitting oedema were encountered in any of the samples.

Table 9: Prevalence of acute malnutrition by sample, based on WHZ and/or presence of bilateral pitting oedema

Prevalence	URBAN Sittwe (n=177)	RURAL Sittwe (n=348)	RURAL Pauktaw (n=274)
GAM	**10.7 % (19)** (7.0 - 16.2 95% CI)	**9.5 % (33)** (6.8 - 13.0 95% CI)	**16.4 % (45)** (12.5 - 21.3 95% CI)
MAM	**9.6 % (17)** (6.1 - 14.8 95% CI)	**9.5 % (33)** (6.8 - 13.0 95% CI)	**14.6 % (40)** (10.9 - 19.3 95% CI)
SAM	**1.1 % (2)** (0.3 - 4.0 95% CI)	**0.0 % (0)** (0.0 - 1.1 95% CI)	**1.8 % (5)** (0.8 - 4.2 95% CI)

No link was established between gender and malnutrition in urban and rural Sittwe IDP camps. However, in rural Pauktaw IDP camps, boys were 2.13 times more at risk of GAM than girls ($p<0.05$)[33].

Table 10: Prevalence of acute malnutrition by sex, based on WHZ and/or presence of bilateral pitting oedema

Sample	Prevalence	All	Boys	Girls
URBAN Sittwe		**All** (n = 177)	**Boys** (n = 85)	**Girls** (n = 92)
	GAM (<-2 z-score and/or oedema)	**(19) 10.7 %** (7.0 - 16.2 95% CI)	**(12) 14.1 %** (8.3 - 23.1 95% CI)	**(7) 7.6 %** (3.7 - 14.9 95% CI)
	MAM (<-2 z-score and ≥-3 z-score, no oedema)	**(17) 9.6 %** (6.1 - 14.8 95% CI)	**(10) 11.8 %** (6.5 - 20.3 95% CI)	**(7) 7.6 %** (3.7 - 14.9 95% CI)
	SAM (<-3 z-score and/or oedema)	**(2) 1.1 %** (0.3 - 4.0 95% CI)	**(2) 2.4 %** (0.6 - 8.2 95% CI)	**(0) 0.0 %** (0.0 - 4.0 95% CI)
RURAL Sittwe		**All** (n = 348)	**Boys** (n = 185)	**Girls** (n = 163)
	GAM (<-2 z-score and/or oedema)	**(33) 9.5 %** (6.8 - 13.0 95% CI)	**(17) 9.2 %** (5.8 - 14.2 95% CI)	**(16) 9.8 %** (6.1 - 15.3 95% CI)
	MAM (<-2 z-score and ≥-3 z-score, no oedema)	**(33) 9.5 %** (6.8 - 13.0 95% CI)	**(17) 9.2 %** (5.8 - 14.2 95% CI)	**(16) 9.8 %** (6.1 - 15.3 95% CI)
	SAM (<-3 z-score and/or oedema)	**(0) 0.0 %** (0.0 - 1.1 95% CI)	**(0) 0.0 %** (0.0 - 2.0 95% CI)	**(0) 0.0 %** (0.0 - 2.3 95% CI)

[32] Normal range for SD [0.8-1.2]

[33] OR=2.13 [1.086, 4.162], χ^2= 4.283, p=0.039

		All (n = 274)	Boys (n = 141)	Girls (n = 133)
RURAL Pauktaw	**GAM** (<-2 z-score and/or oedema)	**(45) 16.4 %** (12.5 - 21.3 95% CI)	**(30) 21.3 %** (15.3 - 28.7 95% CI)	**(15) 11.3 %** (7.0 - 17.8 95% CI)
	MAM (<-2 z-score and ≥-3 z-score, no oedema)	**(40) 14.6 %** (10.9 - 19.3 95% CI)	**(26) 18.4 %** (12.9 - 25.6 95% CI)	**(14) 10.5 %** (6.4 - 16.9 95% CI)
	SAM (<-3 z-score and/or oedema)	**(5) 1.8 %** (0.8 - 4.2 95% CI)	**(4) 2.8 %** (1.1 - 7.1 95% CI)	**(1) 0.8 %** (0.1 - 4.1 95% CI)

In both Sittwe and Pauktaw rural IDP camps, the 6-29 months age category did not appear at higher risk of malnutrition compared to the 30-59 months (p>0.05). However, in Sittwe urban, the 6-29 year olds were 3.39 times more at risk of GAM than the 30-59 age group.[34]

Table 11 : Prevalence of acute malnutrition by age, based on WHZ and/or presence of bilateral pitting oedema

Sample			SAM*		MAM		Normal		Oedema	
	Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
URBAN Sittwe	**6-17**	35	0	0.0	9	25.7	26	74.3	0	0.0
	18-29	50	1	2.0	4	8.0	45	90.0	0	0.0
	30-41	32	0	0.0	0	0.0	32	100.0	0	0.0
	42-53	47	0	0.0	2	4.3	45	95.7	0	0.0
	54-59	12	1	8.3	2	16.7	9	75.0	0	0.0
	Total	176	2	1.1	17	9.7	157	89.2	0	0.0
			SAM		**MAM**		**Normal**		**Oedema**	
	Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
RURAL Sittwe	**6-17**	70	0	0.0	7	10.0	63	90.0	0	0.0
	18-29	94	0	0.0	11	11.7	83	88.3	0	0.0
	30-41	95	0	0.0	8	8.4	87	91.6	0	0.0
	42-53	70	0	0.0	4	5.7	66	94.3	0	0.0
	54-59	19	0	0.0	3	15.8	16	84.2	0	0.0
	Total	348	0	0.0	33	9.5	315	90.5	0	0.0
			SAM		**MAM**		**Normal**		**Oedema**	
	Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
RURAL Pauktaw	**6-17**	51	3	5.9	6	11.8	42	82.4	0	0.0
	18-29	62	1	1.6	6	9.7	55	88.7	0	0.0
	30-41	75	0	0.0	11	14.7	64	85.3	0	0.0
	42-53	71	0	0.0	14	19.7	57	80.3	0	0.0
	54-59	15	1	6.7	3	20.0	11	73.3	0	0.0
	Total	274	5	1.8	40	14.6	229	83.6	0	0.0

* definitions as in table 10 above, normal = ≥-2 z-score

The below figures illustrate the samples' WHZ distribution curve compared to the WHO standards. Sample curves are all shifted to the left, indicating that the assessed populations had a poorer nutritional status than the WHO reference populations.

[34] OR=3.39 [1.165, 9.871], χ^2= 4.417, p=0.036

Figure 4: WHZ distribution curve, WHO standards: Sittwe Urban

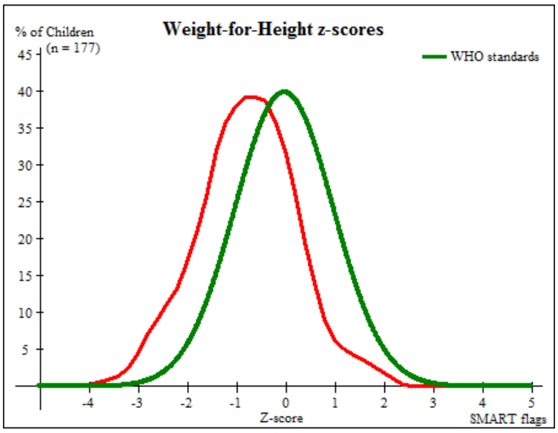


Figure 5 : WHZ distribution curve, WHO standards: Sittwe Rural

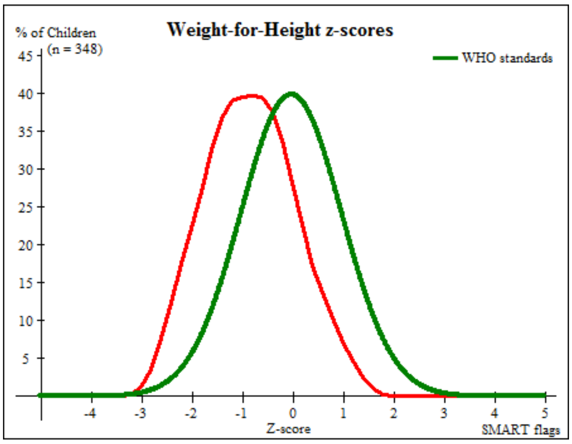
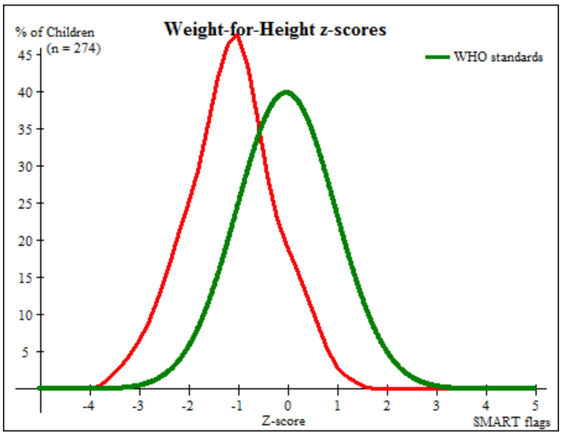


Figure 3 : WHZ distribution curve, WHO standards: Pauktaw Rural



3.1.3.2 MUAC

In urban Sittwe, 183 children in the analysis resulted in a prevalence rate of 2.2% (0.9 - 5.5 95% CI) MUAC <125 mm, with 0.0% (0.0 - 2.1 95% CI) recording a MUAC < 115 mm.

355 children were included in analysis in Sittwe rural. 3.4% (1.9 - 5.8 95% CI) had a MUAC < 125 mm, and 0.6% (0.2 - 2.0 95% CI) a MUAC < 115 mm.

For Pauktaw rural, 278 children highlighted a 5.4% (3.3 - 8.7 95% CI) MUAC <125 mm prevalence rate. MUAC <115 mm prevalence was at 1.4% (0.6 - 3.6 95% CI).

No statistical difference was found between MUAC scores and gender in urban Sittwe or rural Pauktaw, but a significantly increased risk for girls existed in rural Sittwe (p<0.01)[35].

Table 12: Prevalence of acute malnutrition by sex, based on MUAC and/or oedema

Sample	**Prevalence**	**All** (n = 183)	**Boys** (n = 89)	**Girls** (n = 94)
URBAN Sittwe	**GAM** (< 125 mm and/or oedema)	**(4) 2.2 %** (0.9 - 5.5 95% CI)	**(1) 1.1 %** (0.2 - 6.1 95% CI)	**(3) 3.2 %** (1.1 - 9.0 95% CI)
	MAM	**(4) 2.2 %**	**(1) 1.1 %**	**(3) 3.2 %**

35 OR=0.07407 [0.00946, 0.58], χ^2= 8.401, p=0.004

	(<125 mm & ≥ 115 mm, no oedema)	(0.9 - 5.5 95% CI)	(0.2 - 6.1 95% CI)	(1.1 - 9.0 95% CI)
	SAM (< 115 mm and/or oedema)	**(0) 0.0 %** (0.0 - 2.1 95% CI)	**(0) 0.0 %** (0.0 - 4.1 95% CI)	**(0) 0.0 %** (0.0 - 3.9 95% CI)
RURAL Sittwe		**All** (n = 355)	**Boys** (n = 190)	**Girls** (n = 165)
	GAM (< 125 mm and/or oedema)	**(12) 3.4 %** (1.9 - 5.8 95% CI)	**(1) 0.5 %** (0.1 - 2.9 95% CI)	**(11) 6.7 %** (3.8-11.5 95% CI)
	MAM (<125 mm & ≥ 115 mm, no oedema)	**(10) 2.8 %** (1.5 - 5.1 95% CI)	**(0) 0.0 %** (0.0 - 2.0 95% CI)	**(10) 6.1 %** (3.3-10.8 95% CI)
	SAM (< 115 mm and/or oedema)	**(2) 0.6 %** (0.2 - 2.0 95% CI)	**(1) 0.5 %** (0.1 - 2.9 95% CI)	**(1) 0.6 %** (0.1 - 3.4 95% CI)
RURAL Pauktaw		**All (**n = 278)	**Boys (**n = 142)	**Girls (**n = 136)
	GAM (< 125 mm and/or oedema)	**(15) 5.4 %** (3.3 - 8.7 95% CI)	**(6) 4.2 %** (2.0 - 8.9 95% CI)	**(9) 6.6 %** (3.5-12.1 95% CI)
	MAM (<125 mm & ≥ 115 mm, no oedema)	**(11) 4.0 %** (2.2 - 6.9 95% CI)	**(6) 4.2 %** (2.0 - 8.9 95% CI)	**(5) 3.7 %** (1.6 - 8.3 95% CI)
	SAM (< 115 mm and/or oedema)	**(4) 1.4 %** (0.6 - 3.6 95% CI)	**(0) 0.0 %** (0.0 - 2.6 95% CI)	**(4) 2.9 %** (1.1 - 7.3 95% CI)

There was no significant difference between age and malnutrition by MUAC in Sittwe urban, but the 6-29 months category was significantly more at risk in rural Sittwe and Pauktaw ($p<0.001$)[36].

3.1.4 Prevalence of Chronic Malnutrition

176 children were included in analysis for Sittwe urban camps. Mean H/A index was -1.76 HAZ ± 1.15 SD[37]. The prevalence of stunting fell at 42.0% (35.0 - 49.4 95% CI; n=74), with 26.7% (20.7 - 33.7 95% CI; n=47) moderate and 15.3% (10.8 - 21.4 95% CI, n=27) severe forms.

In rural Sittwe camps, the 342 included children gave a mean of -1.69 HAZ ± 1.29 SD. As this SD is out of range, results must be interpreted with caution. ENA's calculated prevalence with an SD of 1 is therefore more accurate, giving a prevalence of 37.8% global stunting.

For the 267 children in Pauktaw rural camps, mean H/A index was -2.06 HAZ ± 1.40 SD. As the SD is out of range, ENA's calculation with an SD of 1 is again used, giving a prevalence rate of global stunting at 52.4%.

No statistical difference was found between HAZ and gender ($p>0.05$).

No statistically significant link was found between age and HAZ in Sittwe urban. In Sittwe rural, the 30-59 months group was more at risk of stunting ($p<0.05$), whilst in Pauktaw rural, it was the 6-29 months group ($p<0.01$).[38]

Table 13: Prevalence of stunting by age, based on HAZ

Sample			Severe*		Moderate		Normal	
	Age (mo)	Total no.	No.	%	No.	%	No.	%
URBAN Sittwe	**6-17**	35	2	5.7	4	11.4	29	82.9
	18-29	49	8	16.3	15	30.6	26	53.1
	30-41	33	4	12.1	12	36.4	17	51.5
	42-53	47	8	17.0	15	31.9	24	51.1
	54-59	12	5	41.7	1	8.3	6	50.0
	Total	176	27	15.3	47	26.7	102	58.0
			Severe		**Moderate**		**Normal**	

[36] Sittwe rural: OR= χ^2= 12.01, p=0.0005; Pauktaw: OR=6.214 (1.712, 22.55), χ^2= 8.146, p=0.0043
[37] Normal range for SD [0.8-1.2]
[38] Sittwe rural: OR=0.5951 (0.3855, 0.9186), χ^2= 12.01, p=0.025; Pauktaw: OR=2.085 (1.266, 3.433), χ^2= 7.736, p=0.005

			Severe		Moderate		Normal	
	Age (mo)	Total no.	No.	%	No.	%	No.	%
RURAL Sittwe	6-17	68	3	4.4	15	22.1	50	73.5
	18-29	93	16	17.2	24	25.8	53	57.0
	30-41	92	20	21.7	20	21.7	52	56.5
	42-53	70	18	25.7	19	27.1	33	47.1
	54-59	19	4	21.1	7	36.8	8	42.1
	Total	342	61	17.8	85	24.9	196	57.3
			Severe		Moderate		Normal	
	Age (mo)	Total no.	No.	%	No.	%	No.	%
RURAL Pauktaw	6-17	48	11	22.9	13	27.1	24	50.0
	18-29	61	27	44.3	17	27.9	17	27.9
	30-41	72	19	26.4	21	29.2	32	44.4
	42-53	71	13	18.3	11	15.5	47	66.2
	54-59	15	3	20.0	3	20.0	9	60.0
	Total	267	73	27.3	65	24.3	129	48.3

* definitions: severe= < -3 z-score, moderate = <-2 z-score and ≥-3 z-score, normal = ≥-2 z-score

The figures below compare the samples' HAZ distribution curve to the WHO standards. Sample curves fall to the left of the reference curve, indicating that the assessed populations had a poorer nutritional status than the WHO reference population.

Figure 7: HAZ distribution curve, WHO standards: Sittwe Urban

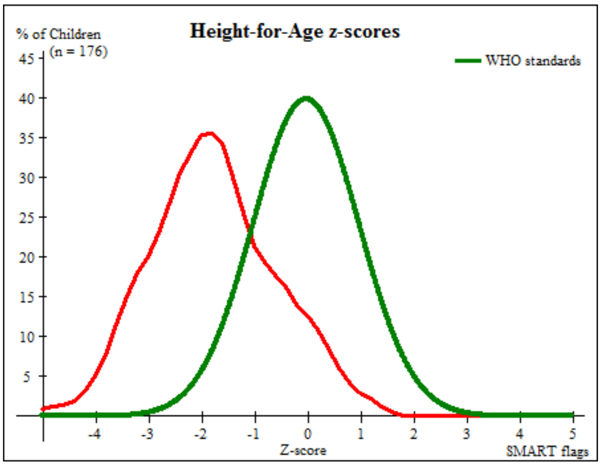


Figure 8 : HAZ distribution curve, WHO standards: Sittwe Rural

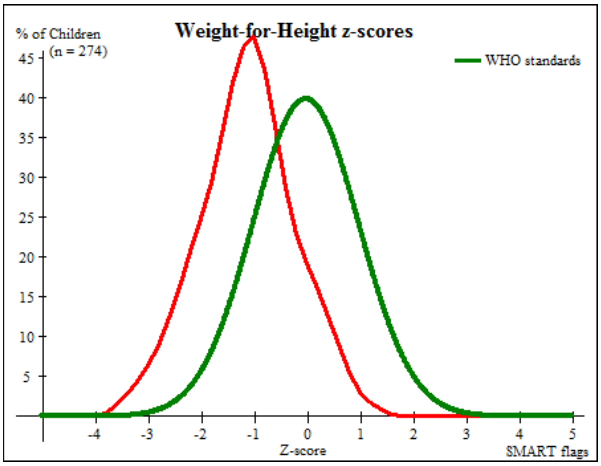
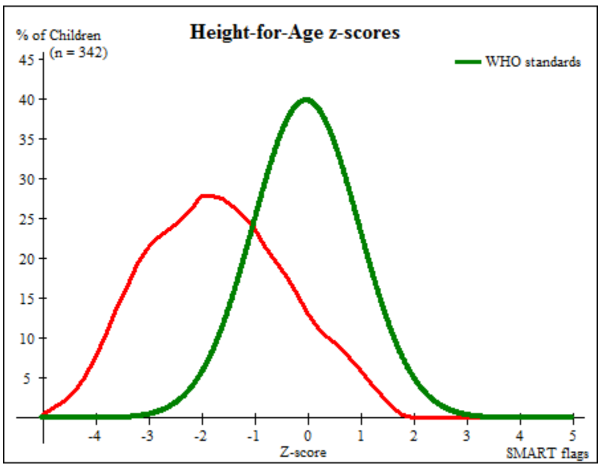


Figure 9 : HAZ distribution curve, WHO standards: Pauktaw Rural



3.1.5 Prevalence of Underweight

178 children were included in the urban sample analysis, and revealed a mean W/A index of -1.54 WAZ ±0.94 SD. Prevalence of underweight among children was 36.0% (29.3 - 43.2 95% CI) with 32.6% (26.1 - 39.8 95% CI) moderate and 3.4% (1.6 - 7.2 95% CI) severe forms.

In Sittwe rural, 354 children were analysed, and a mean W/A index of -1.50 WAZ ± 0.97 SD was found. This equated to 31.6% (27.0 - 36.7 95% CI) of the sample being underweight, with 26.6% (22.2 - 31.4 95% CI) of moderate form and 5.1% (3.2 - 7.9 95% CI) of severe form.

The 277 children in Pauktaw rural highlighted a higher mean W/A index of -1.93 WAZ ± 1.07 SD. In terms of prevalence, this translated as 47.7% (41.8 - 53.5 95% CI) underweight; 30.0% (24.9 - 35.6 95% CI) moderate and 17.7% (13.6 - 22.6 95% CI) severe.

There was no significant link between global underweight malnutrition and gender.

Table 14 : Prevalence of underweight by sex, based on WAZ

Sample	Prevalence	All (n = 178)	Boys (n = 87)	Girls (n = 91)
URBAN Sittwe	**Global Underweight** (< -2 z-score)	**(64) 36.0 %** (29.3 - 43.2 95% CI)	**(29) 33.3 %** (24.3 - 43.8 95% CI)	**(35) 38.5 %** (29.1 - 48.7 95% CI)
	Moderate Underweight (<-2 z-score and ≥-3 z-score)	**(58) 32.6 %** (26.1 - 39.8 95% CI)	**(27) 31.0 %** (22.3 - 41.4 95% CI)	**(31) 34.1 %** (25.2 - 44.3 95% CI)
	Severe Underweight (< -3 z-score)	**(6) 3.4 %** (1.6 - 7.2 95% CI)	**(2) 2.3 %** (0.6 - 8.0 95% CI)	**(4) 4.4 %** (1.7 - 10.8 95% CI)
RURAL Sittwe		**All** (n = 354)	**Boys** (n = 189)	**Girls** (n = 165)
	Global Underweight (< -2 z-score)	**(112) 31.6 %** (27.0 - 36.7 95% CI)	**(61) 32.3 %** (26.0 - 39.2 95% CI)	**(51) 30.9 %** (24.4 - 38.3 95% CI)
	Moderate Underweight (<-2 z-score and ≥-3 z-score)	**(94) 26.6 %** (22.2 - 31.4 95% CI)	**(51) 27.0 %** (21.2 - 33.7 95% CI)	**(43) 26.1 %** (20.0 - 33.2 95% CI)
	Severe Underweight (< -3 z-score)	**(18) 5.1 %** (3.2 - 7.9 95% CI)	**(10) 5.3 %** (2.9 - 9.5 95% CI)	**(8) 4.8 %** (2.5 - 9.3 95% CI)
RURAL Pauktaw		**All** (n = 277)	**Boys** (n = 142)	**Girls** (n = 135)
	Global Underweight (< -2 z-score)	**(132) 47.7 %** (41.8 - 53.5 95% CI)	**(66) 46.5 %** (38.5 - 54.7 95% CI)	**(66) 48.9 %** (40.6 - 57.2 95% CI)
	Moderate Underweight (<-2 z-score and ≥-3 z-score)	**(83) 30.0 %** (24.9 - 35.6 95% CI)	**(35) 24.6 %** (18.3 - 32.3 95% CI)	**(48) 35.6 %** (28.0 - 43.9 95% CI)
	Severe Underweight (< -3 z-score)	**(49) 17.7 %** (13.6 - 22.6 95% CI)	**(31) 21.8 %** (15.8 - 29.3 95% CI)	**(18) 13.3 %** (8.6 - 20.1 95% CI)

There was no significant difference between prevalence rates of underweight in the 6-29 and 30-59 months age categories either.

Table 15: Prevalence of underweight by age, based on AZ

Sample			Severe*		Moderate		Normal	
	Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**
URBAN Sittwe	**6-17**	34	1	2.9	11	32.4	22	64.7
	18-29	50	2	4.0	16	32.0	32	64.0
	30-41	35	0	0.0	10	28.6	25	71.4
	42-53	47	1	2.1	16	34.0	30	63.8
	54-59	12	2	16.7	5	41.7	5	41.7
	Total	178	6	3.4	58	32.6	114	64.0
RURAL			**Severe**		**Moderate**		**Normal**	
	Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**

Sittwe	**6-17**	71	2	2.8	12	16.9	57	80.3
	18-29	96	8	8.3	22	22.9	66	68.8
	30-41	95	2	2.1	26	27.4	67	70.5
	42-53	73	4	5.5	27	37.0	42	57.5
	54-59	19	2	10.5	7	36.8	10	52.6
	Total	354	18	5.1	94	26.6	242	68.4
			Severe		**Moderate**		**Normal**	
	Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**
RURAL Pauktaw	**6-17**	52	11	21.2	14	26.9	27	51.9
	18-29	63	15	23.8	20	31.7	28	44.4
	30-41	75	11	14.7	25	33.3	39	52.0
	42-53	72	9	12.5	21	29.2	42	58.3
	54-59	15	3	20.0	3	20.0	9	60.0
	Total	277	49	17.7	83	30.0	145	52.3

* definitions as in table 15 above, normal = ≥-2 z-score

As for the WHZ and HAZ curves, the figures below highlight a sample WAZ distribution curve to the left of the WHO reference curve, indicating a lower weight-for-age status when compared to the reference population.

Figure 10: WAZ distribution curve, WHO standards: Sittwe Urban

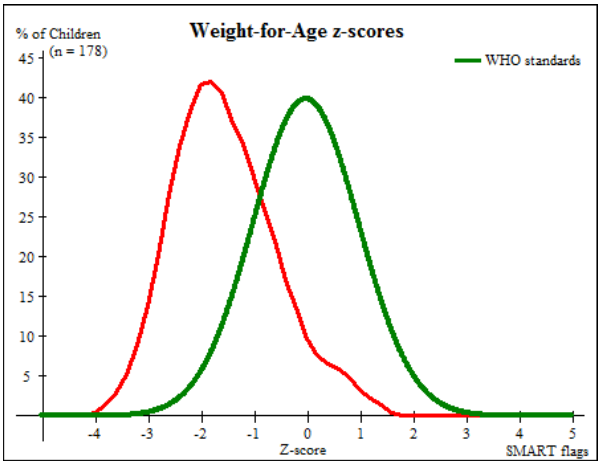


Figure 11: WAZ distribution curve, WHO standards: Sittwe Rural

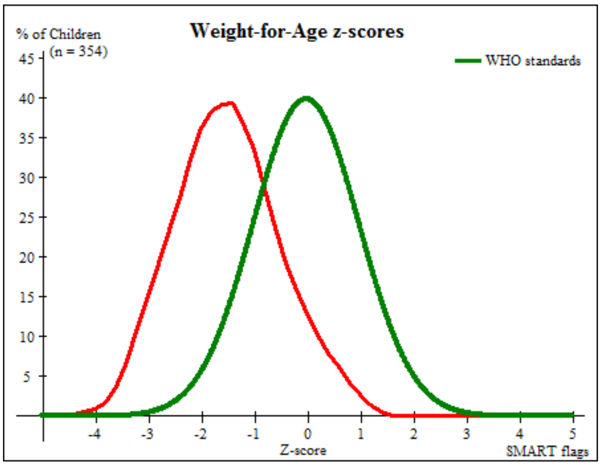
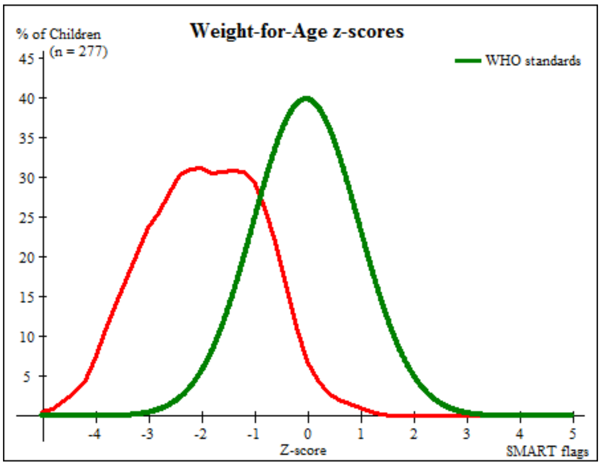


Figure 12: WAZ distribution curve, WHO standards: Pauktaw Rural



3.1.6 Malnutrition caseload estimation

The following figures summarise in graphic form the various nutritional indices prevalences mentioned above.

Figure 13 : Malnutrition prevalence in urban IDP camps of Sittwe Township

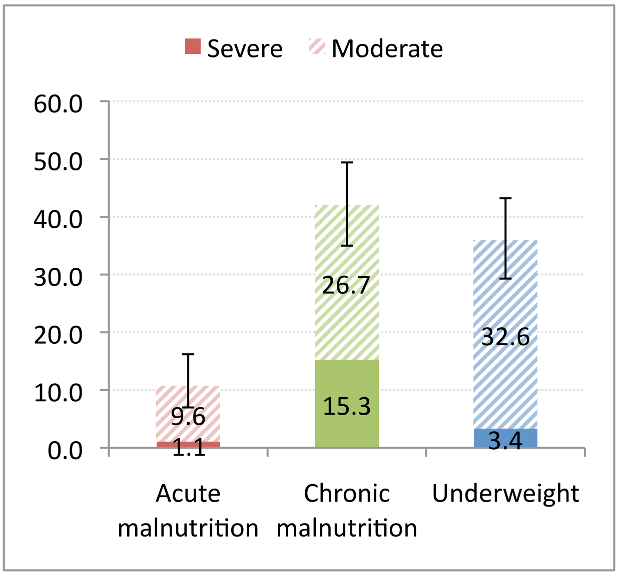


Figure 14 : Malnutrition prevalence in rural IDP camps of Sittwe Township

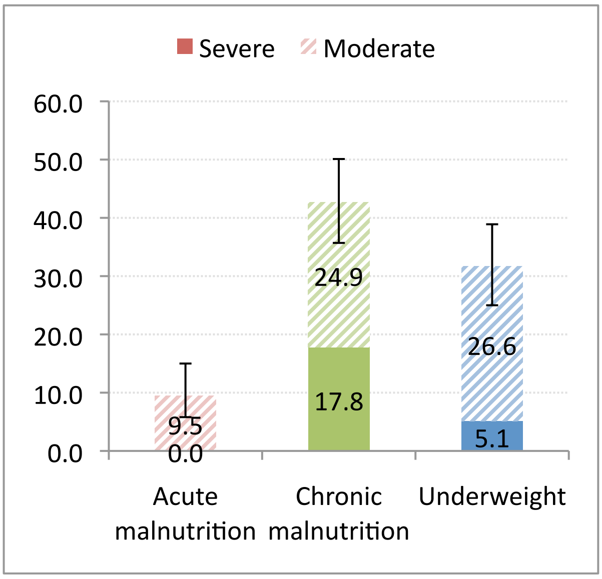
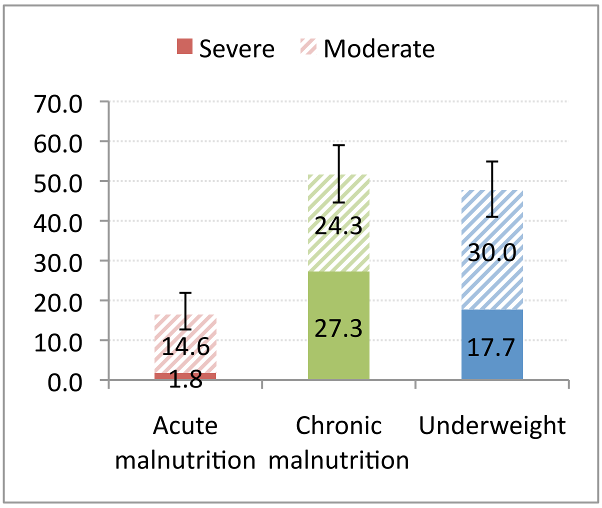


Figure 15 : Malnutrition prevalence in rural IDP camps of Pauktaw Township



Based on the population data mentioned in the methodology section, the above-indicated prevalence rates translate into the following caseloads at the time of the survey. It must be noted that for the number of SAM cases in rural Sittwe (0), this is based on the 0.0% prevalence rate found during this survey. However, data triangulation indicates that on average 70 cases of SAM are admitted monthly to rural Sittwe's OTPs (cf. discussion section).

Table 16: Estimated cases of acute, chronic malnutrition and underweight

		Acute malnutrition	Chronic Malnutrition	Underweight
URBAN SITTWE	Population 6-59 months*	374		
	Total cases	**40**	**157**	**134**
	Moderate form	36	100	122
	Severe form	4	57	13
RURAL SITTWE	Population 6-59 months*	25,097		
	Total cases	**2,384**	**10,716**	**7,930**
	Moderate form	2,384	6,249	6,676
	Severe form	0	4,467	1,280
RURAL PAUKTAW	Population 6-59 months*	5,067		
	Total cases	**831**	**2,620**	**2,417**
	Moderate form	740	1,231	1,520
	Severe form	91	1,383	897

* Estimation with 6-59 months=90% of U5 population

3.2 Children's Morbidity

3.2.1 Diarrhea

In Sittwe urban IDP camps, 3.7% of the U5 children were reported to have suffered from diarrhea in the previous two weeks. In Sittwe rural IDP camps, prevalence of diarrhea was reported as being almost 10 times higher, with 33.1% of children affected. In Pauktaw rural camps, the reported rate was highest at 46.6%.

There was no statistically significant link between diarrhea and malnutrition incidence in any of the samples.

Table 17: Prevalence of reported diarrhea in children two weeks prior to interview

Diarrhea*	**N**	**Does not know**		**No**		**Yes**	
		n	**%**	**n**	**%**	**n**	**%**
URBAN Sittwe	187	1	0.5%	179	95.7%	7	3.7%
RURAL Sittwe	356	0	0.0%	238	66.9%	118	33.1%
RURAL Pauktaw	277	0	0.0%	148	53.4%	129	46.6%

**= Diarrhea is defined as 3 or more liquid stools in 24 hours*

3.2.2 Vitamin A Supplementation Results

78.9% of children from urban Sittwe IDP camps were reported as having been supplemented with vitamin A in the last six months. Sittwe rural's coverage was higher at 81.5%, but Pauktaw rural camps were lowest at 34.5%.

Table 18: Vitamin A supplementation coverage for 6-59 months

	N	Does not know		No		Yes	
		n	%	n	%	n	%
URBAN Sittwe	190	6	3.2%	34	17.9%	150	78.9%
RURAL Sittwe	356	0	0.0%	66	18.5%	290	81.5%
RURAL Pauktaw	278	1	0.4%	181	64.9%	96	34.8%

3.2.3 Measles Vaccination Results

Findings revealed a measles vaccination coverage of 84.4% amongst 9-59 month-old children in urban Sittwe camps. In rural Sittwe it was 50.3% and in rural Pauktaw 32.2%.

Four children in urban Sittwe and one child in rural Sittwe were vaccinated against measles despite being less than 9 months old. The majority of vaccinated cases did not have cards, which indicate that they may have been reached through mass-campaign rather than routine immunization, where cards are usually provided.

Table 19: Measles vaccination coverage for 9-59 months

	N	Confirmed by card		Confirmed by respondent		Not vaccinated		Do not know		Total vaccinated*	
		n	%	n	%	n	%	n	%	n	%
URBAN Sittwe	180	24	13.3%	128	71.1%	25	13.9%	3	1.7%	152	84.4%
RURAL Sittwe	348	49	14.1%	126	36.2%	162	46.6%	11	3.2%	175	50.3%
RURAL Pauktaw	273	42	15.4%	46	16.8%	185	67.8%	0	0.0%	88	32.2%

**Confirmed by card+confirmed by respondent (no card)*

4. Discussion

4.1 Nutritional Status

4.1.1 Prevalence of Acute Malnutrition

Sittwe

GAM rates in the Sittwe samples are concerning, particularly in light of the below-mentioned aggravating factors, and the continued reliance on humanitarian organisations for food aid, access to WASH, shelter and health services, the latter particularly in the rural populations.

Results in Sittwe urban indicated a GAM rate of 10.7% (7.0 - 16.2 95% CI), with 9.6% (6.1 - 14.8 95% CI) MAM and 1.1% (0.3 - 4.0 95% CI) SAM. In Sittwe rural the GAM rate was at 9.5% (6.8 - 13.0 95% CI), with MAM=9.5% (6.8 - 13.0 95% CI) and SAM=0.0% (0.0 - 1.1 95% CI).

Both GAM results for the Sittwe samples are under WHO's 15% emergency threshold in the absence of aggravating factors[39], although the upper confidence interval (CI) of urban Sittwe falls above it at 16.2%. Rural Sittwe's upper CI is above 10%. This becomes relevant when one considers the presence of aggravating factors such as the ongoing risk of an epidemic of measles or other communicable diseases remains real, in light of sub-optimal vaccination rates. High diarrhea prevalence rates are also worth remembering. In this situation, WHO's use of 10% as the emergency threshold becomes relevant. Finally, it is worth remembering that this survey was done during the cold season, when the lowest annual levels of malnutrition are expected.

These GAM rates fall above the most recent national average of 10.0%[40], and below the rates recently found in Maungdaw/ Buthidaung in the north of Rakhine state. Regarding the latter, this is not surprising in light of the existence of more chronic contextual challenges in the north of the state (as described in the introduction), as well as the more limited number and diversity of humanitarian/ development actors intervening there.

Although this year's acute malnutrition prevalence is similar in both Sittwe samples, this was not the case in December 2012's SMART survey results. In urban IDP camps, the rates then were 3.1% (1.3-7.1 95% CI) GAM and 0.4% (1-3.5 95% CI) SAM, whilst in rural IDP camps the GAM rate was at 14.4% (11.2-18.4 95% CI) and the SAM rate at 4.5% (2.8-7.4 95% CI). The trends for rural and urban Sittwe seem to be opposite: an increase in urban, coinciding with a decrease in rural camps. As illustrated in the figures below, the difference between this year's and last year's survey results are statistically significant in both samples ($p<0.05$)[41]. Potential reasons for this difference are discussed below in section 4.3.

[39] WHO. 1995. The management of nutrition in major emergencies
[40] MNPED, MoH, UNICEF. 2010. Multiple Indicator Cluster Survey 2009-2010.
[41] Sittwe rural: p=0.049, Sittwe urban: p=0.0046

Figure 16: Acute Malnutrition Prevalence – 2012 vs. 2013 – Sittwe Rural

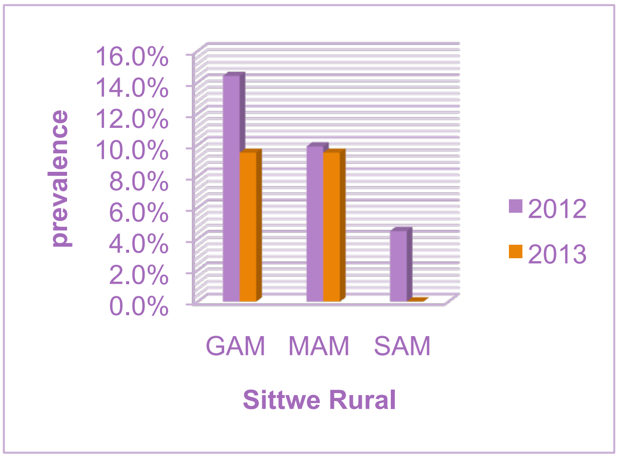
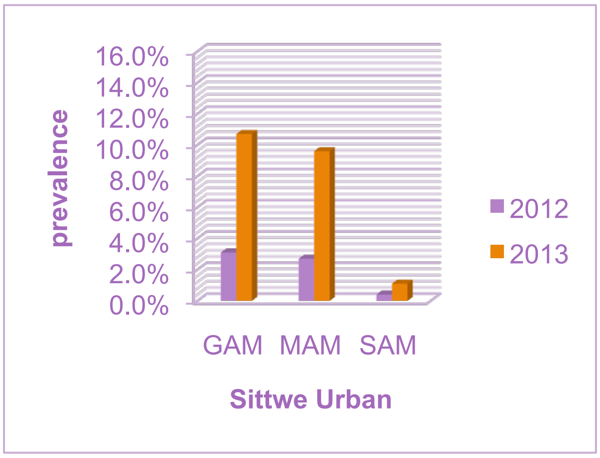


Figure 17: Acute Malnutrition Prevalence – 2012 vs. 2013 – Sittwe Urban



In the meantime, the following nutritional surveillance data is worth considering when interpreting this survey's results. Although Sittwe's rural SAM rate was 0.0%, the nutrition actor covering these camps (ACF) admits 70 cases/ month on average to their OTPs. The nutrition actor covering Sittwe urban camps (MHAA) admit on average 1 case/ month. Monthly nutrition cluster surveillance data indicates higher average GAM/ SAM rates in rural than in urban camps (8.5% versus 3.5% GAM), and a 1% SAM rate in rural camps[42]. Finally, when analysing the surprising 0.0% SAM rate in Sittwe rural, it is worth bearing in mind that SMART methodology is designed to measure GAM. As there are often not huge numbers of SAM cases in the target population as a whole, the probability that a SAM child is not found in the survey sample is higher than that for GAM. For instance, the Sittwe urban result of 1.1% equates to 2 SAM cases. Out of the ~25,000 children living in Sittwe rural, our sample covered 396. In addition, the rural sample recorded a 9.8% non-response rate, which means one in 10 children in the sample were not found or refused to be involved. This 9.8% could have potentially included some SAM cases. A future SMART survey would help confirm the continuation or not of the trend observed in this survey.

Pauktaw

GAM prevalence in rural Pauktaw IDP camps exceeds the WHO emergency threshold with 16.4% (12.5 - 21.3 95% CI). In addition, SAM prevalence at 1.8% (0.8 - 4.2 95% CI) is close to the 2.0% threshold used by UNICEF to define a critical situation. The MAM rate is 14.6% (10.9 - 19.3 95% CI).

As was the case for the Sittwe samples, this GAM rates fall above the most recent national average, and below the rates recently highlighted in Maungdaw/ Buthidaung in the north of Rakhine state.

For Pauktaw, no previous SMART Survey data exists. Programme and nutrition cluster data reflect similar results to those found in this survey.

Age and Gender

In all samples, overall sex/age distribution, and in some case age distribution was significantly different to what is expected in standard populations ($p<0.05$). The difficulty in determining age is most likely the main contributor to this. A child's exact birth date is not of major importance for families in the target population, and with the majority of children having no birth certificate (35% urban, 91% rural Sittwe, 97% urban Sittwe), teams faced difficulties in determining their age despite the updated local events calendar.

Regarding gender and malnutrition prevalence rates, boys were 2.13 times more at risk of GAM than girls in Pauktaw rural, but there was no significant link found in the Sittwe samples. Upon triangulation with OTP

[42] nutrition actor data/ nutrition sector monthly surveillance data jan-sept 2013

admissions data, both Sittwe and Pauktaw predominantly receive girls; the nutrition cluster and its actors are planning to monitor this more closely.

The <30 month-old children were 3.39 times more at risk of GAM in Sittwe urban, but again no such significant link was found in the other samples. Data triangulation highlights that the majority of SAM admissions are in the <23 months category. Again further data from future services will assist in determining whether this correlation continues over time. OTP admission data reiterates the importance of focusing on the first 1000 days of life, via IYCF activites as well adequate maternal health interventions. But the fact that age did not appear to be correlated to the high GAM rate across all samples also underlines the importance of targeting all U5 children in programming.

MUAC

Although the WHZ indicator is more rigorously verifiable with SMART survey methodology, MUAC is also a recognised SAM indicator. In the Sittwe samples, the MUAC rates were 2.2% (0.9 - 5.5 95% CI) <125 mm (GAM), with 0.0% (0.0 - 2.1 95% CI) < 115mm (SAM) in urban Sittwe IDP camps. In Sittwe rural, 3.4% (1.9 - 5.8 95% CI) were GAM by MUAC, and 0.6% (0.2 - 2.0 95% CI) were SAM. For Pauktaw rural, a 5.4% (3.3 - 8.7 95% CI) GAM prevalence rate was found, with SAM at 1.4% (0.6 - 3.6 95% CI).

Malnutrition rates according to MUAC are lower than those using the W/H index in this survey, although more similar for SAM than GAM. Furthermore, this time the SAM prevalence was 0.0% in the urban rather than rural Sittwe camps. Finally, although not significant across all samples, girls were found significantly more at risk of malnutrition as measured by MUAC in rural Sittwe. These different results can be due to several reasons.

Firstly, it must be remembered that only around 40% of SAM cases are classified as such by both MUAC and WHZ indicators generally[43]. As example, in this survey, of the 12 children classed as GAM by MUAC in Sittwe rural, eight also classified as GAM by WHZ. Inversely, of the 33 GAM cases found by WHZ, only six also classified as GAM by MUAC. In Pauktaw rural it was the same, 8 of the 15 GAM children found by MUAC were also GAM by WHZ. Of the 45 GAM found by WHZ, only 5 were identified as GAM. Finally in Sittwe urban, of the 19 children identified as GAM by WHZ, only 3 had MUAC that confirmed the same.

The level of variation between these indicators depends on the location; certain populations' common body-types demonstrate malnutrition more or less precociously via MUAC than WHZ. Secondly, mass screening for malnutrition is done via MUAC in these target populations, and the majority of cases admitted to OTP are done via MUAC. It is therefore possible that malnutrition as identified by MUAC is identified and treated more quickly than those defined via WHZ, resulting in lower malnutrition rates when defined via MUAC.

No statistical difference was found between MUAC scores and gender in urban Sittwe or rural Pauktaw, but a significantly increased risk for girls existed in rural Sittwe ($p<0.01$)[44]. There was no significant difference between age and malnutrition by MUAC in Sittwe urban, but the 6-29 months category was significantly more at risk in rural Sittwe and Pauktaw ($p<0.001$)[45].

In the 2012 SMART survey, only those >67cm were included in the MUAC results analysis. This year, height was not taken into account as chronic malnutrition is prevalent here, and height is not considered in MUAC admission criteria for programming. When however height is considered in this year's results, to compare them to the 2012 survey results, it indicates a decline in malnutrition rates across both Sittwe samples: in 2012, 5.2% GAM and 1.3% SAM was found in urban IDP camps. In rural IDP camps, the GAM rate was 9.8% and 2.1% SAM. This year, in the >67cm children, Sittwe urban had a 2.3% GAM and 0.0% SAM rate, whilst Sittwe rural the rates were 3.4% GAM and 1.6% SAM. This could be due to monthly exhaustive screening by

[43] WHO 2013 update
[44] OR=0.07407 [0.00946, 0.58], χ^2= 8.401, p=0.004
[45] Sittwe rural: OR= χ^2= 12.01, p=0.0005; Pauktaw: OR=6.214 (1.712, 22.55), χ^2= 8.146, p=0.0043

MUAC, or the same reasons mentioned below for the decline found in the Sittwe rural camps when looking at the WHZ indicator.

The RNA conducted by SCI in December 2012 in Pauktaw used MUAC as indicator. The GAM rate was 26.4% and the SAM rate 9.8%. This was much higher than the 5.4% GAM and 1.4% SAM rates found in this survey. This was before any nutritional intervention existed in the area. However, it is more likely that the substantial differences between SMART survey and RNA methodologies and sample sizes played a role. The RNA used mass screening for instance, but this was neither exhaustive nor representative in nature; caution must be used when comparing these two different data sources.

4.1.2 Chronic malnutrition (stunting)

Prevalence of stunting among children in urban camps was 42.0%(35.0 - 49.4 95% CI), with 26.7% (20.7 - 33.7 95% CI) moderate and 15.3% (10.8 - 21.4 95% CI) severe forms. Global stunting prevalence in rural Sittwe was 37.8% and 52.4% in rural Pauktaw.

Compared to last year's SMART survey, stunting prevalence has reduced: in 2012, global stunting among children in Sittwe urban camps was 49.6% and 59.4% in rural camps. Nevertheless, **these results are above or close to the 40% emergency threshold fixed by WHO and indicates that children are suffering from long term nutrient deprivation and micronutrients deficiencies.**

So far, insufficient activities have targeted stunting. There is therefore a need to tackle stunting and improve dietary diversity of U5 children to improve their overall nutritional status and health. For this to be successful however, adapted interventions for WASH are equally required. This is because high stunting prevalence is likely due to the ongoing presence of pathogens alongside inadequate intake and nutrient absorption. Education and CP activities are also necessary to counteract the developmental challenges that come with chronic malnutrition.

4.1.3 Underweight

For all areas, global underweight prevalence is above the 30% WHO emergency threshold[46]. In urban IDP camps, prevalence of underweight is 36.0% (29.3 - 43.2 95% CI). For Sittwe rural camps, 31.6% (27.0 - 36.7 95% CI) of the sample is affected by underweight, whilst for Pauktaw rural camps the prevalence is higher at 47.7% (41.8 - 53.5 95% CI). The 2012 SMART indicated 30.7% underweight prevalence in urban IDP camps and 50.0% in rural camps. As a composite indicator of stunting and wasting, this increase in urban-side and decrease in rural-side can be attributed to the WHZ and HAZ trends mentioned above. Despite the fact that most of this result is due to the very high prevalence of stunting, the wasting prevalence is serious enough in this fragile context to justify the focus being maintained on both stunting and wasting for nutrition programming.

4.2 Morbidity and Vaccination/ Supplementation Coverage

4.2.1 Diarrhea

In Sittwe urban, 3.7% of the under 5 children were reported to have suffered from diarrhea in the previous two weeks. In Sittwe rural, prevalence of diarrhea was reported as 33.1% and in Pauktaw rural camps, the reported rate was highest at 46.6%.

High diarrhea rates indicate issues around access to potable water, and poor sanitation and hygiene. Childcare practices and caretaker absence may also play a role, particularly in an unclean environment; if small children are frequently unsupervised or not prohibited from putting things in their mouth, it creates

[46] WHO. 1995. The management of nutrition in major emergencies

an easy entry point for disease. Variability in access to primary healthcare services may also have an impact on length and virulence of the infection and thus nutritional status.

In last year's SMART survey, rural camps exhibited a comparable 36.2% last year. Urban IDP camps however reported a statistically significant ($p<0.01$) higher rate[47] at 13.2%, compared to this year. This may be due to improved access to healthcare and sanitation (better service delivery and higher coverage in relation to population density), or also better implementation of hygiene and/or IYCF practices. It is interesting therefore to take into account the WASH sector's view that current urban camps have inadequate facilities, and that sanitation in these camps will become a priority in the future; further monitoring and analysis would help in determining whether the low diarrhea rates in this survey are confirmed over time. When interpreting these results, it may also be useful to remember the subjectivity in defining diarrhea.

Finally, it is worth bearing in mind that both SMART surveys were conducted outside of the rainy season; diarrhea rates would be expected to increase with the onset of the rains.

4.2.2 Vaccination and supplementation coverage

In this survey, measles vaccination coverage was 84.4% in urban Sittwe camps; above the 80% minimum recommended by WHO to prevent epidemics as well as the national minimum target, but below the 90% recommended by WHO and the 95% national ideal target. In the rural samples this was not the case, with 50.3% coverage in rural Sittwe and 32.2% in Pauktaw rural. These figures highlight a statistically significant ($P<0.05$) reduction on last year's SMART survey results, when 91.6% had been immunized in urban camps and 84.4% in rural camps[48]. This was expected in light of the lack of vaccination campaigns, despite advocacy by humanitarian actors and the health cluster.

Vitamin A supplementation had occurred in 78.9% of children from urban Sittwe IDP camps, 81.5% in Sittwe rural camps, and 34.5% in Pauktaw rural camps in the last six months, as per national and international guidelines. Last year in the Sittwe SMART survey, only 68.1% in urban IDP camps and 5.6% in rural IDP camps had received vitamin A supplementation in the six months prior to the survey. The improved supplementation rate could be due to the catch-up vitamin A/ deworming campaign organized by MOH in collaboration with NGOs in August 2013, in addition to the routine supplementation given to SAM cases when treated in OTPs, for instance. Measles vaccination was not part of the catch-up campaign. Work on improving Extended Programme of Immunisation (EPI) coverage by reinstating routine vaccination is currently one of the health cluster's priorities.

4.3 Causes of Malnutrition

Some of the major acute causes of malnutrition have remained the same from last year's SMART survey. As described in the conceptual framework of the causes of malnutrition[49], the impact of the conflict that resulted in population displacements continues to play a role. The ongoing instability, migration, and conflict means that the current reliance on restricted WFP rations, lack of access to livelihoods, poor shelter and WASH conditions, inadequate hygiene practices, and limited access to healthcare persists. In light of insufficient vaccination coverage and sanitation, the risk of disease outbreak remains real. In addition, the likelihood of having acquired an acute or chronic water-borne illness in this context makes nutrient absorption equally likely. This further perpetuates the development of stunting and wasting. One of the striking differences between Pauktaw and Sittwe are the WASH conditions, which are an example of the impact of inadequate practices and facilities on health and nutritional status.

[47] OR= 3.905 [1.678-9.085], χ^2= 10.2, p= 0.001401
[48] SIttwe urban: OR=2.48 [1.228, 5.008], χ^2= 5.885, p= 0.01527, Sittwe rural: OR= 5.974 [4.119, 8.665], χ^2= 96.32, p= <0.0000001
[49] UNICEF conceptual framework of malnutrition: immediate causes: inadequate dietary intake/ disease, underlying causes: inadequate access to food/ insufficient health services & unhealthy environment/ inadequate; care for children and women, basic causes: inadequate access to resources (human, economic and organisational) due to inadequate education, political and ideological factors and economic structures

Additionally, the underlying contributors that existed prior to the crisis remain relevant: the chronic food insecurity, poor IYCF[50] as well as maternal health practices, and insufficient access to maternal and child healthcare services. Reduced access to livelihoods, education and restricted movement due to geographic or political isolation put specific communities at even greater risk. Their impact is confirmed by the high rates of chronic malnutrition also.

In terms of which populations are worst affected, the survey results indicate that acute malnutrition prevalence is highest in Pauktaw IDP camps. This corresponds with a stronger prevalence of the above-mentioned causes of malnutrition. In terms of nutritional treatment, access to a SC is resisted due to fears of having to come to Sittwe hospital, and the SFP was interrupted in November 2013.

The acute malnutrition prevalence in Sittwe Township remains of concern, in light of the persistence of the above-mentioned causes also.

The trend of decreasing prevalence rates in Sittwe rural may be related to various contextual factors. Last year's SMART survey was soon after the October 2012 violence. Potentially, those in rural camps had been worse off in the months prior to the 2012 survey due to the recent move to remote camps and the ongoing frequent migration, compared to this year's population, which had experienced a more stable few months prior to the survey. Additionally, the recent relocation in 2012 could have impacted IYCF practices through trauma and reduced food access. A year on, the stabilised intervention of health and nutrition actors may have impacted on earlier generalised detection and treatment of malnutrition and other diseases.

The increased prevalence rate in Sittwe urban is more surprising as it appears to indicate a different pattern to that observed from regular nutrition surveillance data, as described above. The following contextual factors may contribute to data triangulation and analysis of the opposing trends observed in this survey for urban and rural Sittwe camps.

Since last year's SMART, the urban camps have been moved further out of town. This may well have impacted on access to healthcare, markets, livelihoods, sanitation. Last year's survey occurred just after the October violence, when the impact of relocation may have been less strong, as the IDPs were moved to camps that were still relatively close to Sittwe town's amenities. The camps they now inhabit are much further out of town, which inhabitants frequently cite during program activities as creating a heavier financial burden in terms of transport and access to affordable food.

In addition, ongoing migration may be playing a role. The teams interviewed a small sample (n=36) of caretakers found with GAM children during this survey, to complement the quantitative data collected. In terms of recent relocation, feedback from these questionnaires indicate that in urban camps, 71% of caretakers had been there for less than a year, whilst in rural side it was much lower at 13%. It could be that the cases of GAM found in Sittwe urban had been affected by factors outside of their current location. Additionally, field teams felt that more migration to Yangon or abroad by husbands occurs in urban camps than rural camps, which may result in urban caretakers having a greater need to seek an income outside the home, and therefore having less time to look after their young children. This trend of husband migration was however not confirmed in our small sample of interviewed caretakers; further data is required to confirm/ negate current migration trends.

In terms of food access, field teams report food prices as more expensive in urban than rural camps, that the selling of general food distribution rations is more frequent in urban camps (due to a more diverse household expenditure pattern), and that accessing markets is more expensive/ further away since the urban camps moved further out of town. 57% of interviewed urban caretakers felt their under 5 children's food intake had changed since last year, and of those, 60% felt this had been a decrease due to food unavailability/ expense. In rural camps, 73% of caretakers felt it had changed, and of these 89% felt it had

[50] 2012 SCI SMART survey

decreased due to lack of work/ income. It is worth bearing in mind that the FSL assessment in August 2013[51] highlighted a worse livelihoods situation in rural rather than urban camps.

With regards to healthcare access, the health cluster's '4Ws' document indicates that both urban and rural Sittwe camps have routine coverage by a variety of health actors; the health cluster has not identified urban camps as a gap in services. Feedback from the caretaker questionnaires indicated that 90% of caretakers felt that healthcare had improved since last year in urban camps, whilst this was felt by only 33% in rural camps .

As mentioned above in section 4.2.1., according to WASH actors, the WASH conditions are not ideal in the current urban camps; further work is planned pending funding. 67% of caretakers questioned in rural and 52% in urban Sittwe felt their child had been more sick this year than last, which may have had an impact on appetite and nutrient absorption. However, this was related to illness more generally, and is not confirmed by the lower diarrhea rates seen in this year's SMART survey.

Inadequate care practices are likely to contribute to the observed malnutrition prevalence. Field teams report that it is not uncommon for mothers in Sittwe urban camps to mention having to spend their day in town in casual labour, leaving their young children in the care of others, sometimes other children. Previously the urban camps were closer to town, so the caretakers could be home at lunch-time or earlier in the evening, but now that they are further from town, they are away all day. The child protection field teams report observing more regular cases of neglect in Sittwe urban also. In contrast however, of the small sample of caretakers interviewed in this survey, the majority said they were at home for most of their day-time activities. If they were not, in urban camps it was for casual labour, whilst in rural camps it was to collect firewood or water. Further information on who takes on looking after children, how and why are essential in deciphering with clarity what role this plays in child health.

These points indicate the need for ongoing vigilance by all sectors adressing the causes of malnutrition, to ensure a good understanding of the current and future situation. It also indicates that these different populations may be suffering from acute malnutrition for different reasons, and that therefore interventions should be tailored to their specific needs.

Finally, it is worth noting that both the 2012 and 2013 SMART surveys were conducted during the cold season. This is when the lowest rates of acute malnutrition are classically observed. The rates found at this time of year are therefore worrying, considering the coming rainy season and the likely worsening of the situation from potential re-occurrence of acute diarrhoeal disease outbreaks, on top of the continuing risk of violence and reduced freedom of movement. To complement routine nutrition surveillance, a SMART survey conducted during the hunger period would help to give a clearer all-year picture and evolution in this crisis.

[51] Joint FSL Assessment (August 2013) ACF, DRC, Oxfam, Relief International, Save the Children, Solidarites

5. Conclusion

The nutrition indicators wasting, stunting and underweight fall into different WHO categories across the three strata.

In terms of **immediate life saving**, the following points are noted:

- **GAM rate above the WHO emergency threshold in Pauktaw rural camps, with SAM rate close to UNICEF's 2% critical threshold**
- **Concerning GAM rates in Sittwe urban and rural camps**
- **Vaccination coverage in rural camps below WHO minimum threshold to avoid disease outbreak, combined with inadequate WASH conditions**

With no change in context expected soon, the above-mentioned causes of malnutrition will continue to undermine the nutritional status of children for the foreseeable future. The pending rainy season (June-October) will increase the risk of malnutrition-related death, as water-borne disease prevalence increases, and market prices increase due to reduced access.

The importance of access to nutrition treatment and prevention is therefore maintained across all target populations. In light of highest prevalence rates coming from the 0-23 months category, a particular focus on IYCF with links to maternal health services is required. As MAM prevalence is high, the continuation of effective SFP services is essential.

The prevention of malnutrition and child illness in general can only be ensured by the provision of adequate access to services of healthcare, WASH, FSL, child protection, education and IYCF.

Ongoing multi-sectorial monitoring and analysis of the nutritional situation by SHD and the humanitarian community is essential to ensure a clear understanding of the current and future nutritional issues and their causes. This must be done separately for different IDP camp settings, as causes vary. A SMART survey during the hunger-period will help clarify malnutrition prevalence trends. In addition, surveys that look at underlying causes of malnutrition, such as nutrition causal analyses or anthropological surveys, are also relevant.

With regards to **long-term development**:

- **Global stunting and underweight above or close to emergency threshold in all three strata**

When considering the consequences of the current nutritional situation, it is also worth remembering that chronic malnutrition remains an important part of the nutritional landscape in all target populations. Chronic malnutrition is a burden for the country. Not only does it sap the economic potential of future generations, it also impacts on current child survival, as the recurrent disease episodes that cause chronic malnutrition also mean that these children are more prone to acute illness and wasting. If chronic malnutrition is not properly tackled, acute malnutrition prevalence can increase. As such, the need for a comprehensive, coordinated and more mid- to long-term approach by MoH as well as health and nutrition actors is evident. To ensure child survival and optimal development, interventions targeting both types of malnutrition are required. It is well-known that chronic malnutrition is extremely complex and difficult to tackle effectively. The importance of IYCF as well as food diversification interventions is again reiterated, alongside the other essential basics such as adequate WASH facilities, access to healthcare and education.

6. Recommendations and Priorities

For all conflict-affected populations, in collaboration with MoH and other relevant government bodies:

Nutrition monitoring

- To strengthen and formalise regular multi-sectorial monitoring and analysis of and intervention in the current nutritional situation and its underlying causes (WASH, IYC, FSL, Protection, Health, Shelter and population movement): how it varies between the target populations, how it is evolving over time, which gaps require filling and which actions will be taken by whom. This strong coordination and integration is to be led by the nutrition sector.

- To strengthen MOH, nutrition sector and nutrition actors' nutritional surveillance including surveys to monitor nutrition trends and underlying causes as well as monthly program data. To complement this survey and provide a clearer understanding of the areas of higher prevalence, to include geographic analysis of recent admissions, to determine how many admitted SAM cases are coming from isolated/ host communities, and how many from camps.

- Further SMART survey during the hunger period/ rainy season for monitoring of malnutrition rates.

- Further surveys to collect data on underlying causes of malnutrition such as WASH, FSL, childcare and maternal healthcare practices, population movement, disease prevalence and mortality data.

Immediate

- To ensure access to the Therapeutic Feeding Programme (TFP) in order to cope with the high caseload of SAM children, including an Out Patient Therapeutic Programme (OTP) meeting international standards with active case-finding, close nutritional and medical follow up, ensured access/referral to the nearest in-patient treatment facility (SC) and support in care practices and infant and young child feeding.

- To ensure access to a TSFP to cope with the high caseload of MAM children, and to expand current services to the treatment of PLW suffering from MAM also.

- To continue and reinforce IYCF activities with quality one-to-one counselling tailored to the individual, peer-led support groups, interactive mass-media events, and implication/ capacity-building of health decision-makers at the community and family level for larger IYCF messaging and behaviour change.

- To restart routine immunization, deworming and supplementation, to impact on morbidity and avoid disease outbreaks such as measles or polio.

- To ensure access to, and safe storage of, potable water, sanitation services and hygiene education, that function effectively in all seasons and provide disease-outbreak prevention activities.

- To ensure adequate access to PHC and referral services to secondary care, particularly in Pauktaw Township.

- To ensure adequate access to ANC/PNC and obstetric care, especially in rural IDP camps, to take into account the importance of the first 1000 days.

- To maintain the General Food Distribution (GFD) in IDP communities including an additional Rice Soya Blend (RSB) ration for all PLW and children under 5 to prevent deterioration of their nutritional status, with expansion to the elderly, disabled and any other vulnerable groups.

Medium term

- To ensure the inclusion of micronutrient supplementation for the whole family such as Sprinkles to help prevent further deficiencies.

- To ensure that all nutrition services are tailored to the causes of malnutrition most prevalent in that particular target population with culture/ age/ gender-specific interventions.

- To advocate for the need for development initiatives to link with humanitarian services, to address the causes of the high rates of chronic malnutrition, which are affecting child as well as regional economic development.

- To ensure that children have access to safe, relevant development via adapted education and child protection services.

- To ensure that shelter for IDP populations meets Sphere Standards.

- To provide tailored FSL interventions, in light of the persisting lack of access to income-generating opportunities, in a way that fosters appropriate childcare practices

- To ensure that all humanitarian interventions have a conflict-sensitive approach and an effective communication/ participation strategy with surrounding populations, using advocacy in a way that provides durable solutions.

- To advocate for significant increase in freedom of movement so that displaced or conflict-affected people can restore their livelihoods and have adequate access to essential services.

Longer term

- To foster community ownership of health and nutrition programming as much as possible, via use of community-based individuals as staff and volunteers, interactive mass media events, and a clear communication/ involvement strategy with influential community leaders (religious leaders, camp committee members, traditional healers, traditional birth attendants).

- To continue the provision of Non Food Items (NFI) kits such as jerry cans, cooking utensils, plastic sheeting and clothing to displaced population in camps.

7. Appendixes

Appendix 1: Plausibility Reports

SITTWE URBAN

Plausibility check for: Sittwe URBAN_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 (% of in-range subjects)	Incl	%	0-2.5 0	>2.5-5.0 5	>5.0-7.5 10	>7.5 20	**0** (0.0 %)
Overall Sex ratio (Significant chi square)	Incl	p	>0.1 0	>0.05 2	>0.001 4	<=0.001 10	**0** (p=0.884)
Overall Age distrib (Significant chi square)	Incl	p	>0.1 0	>0.05 2	>0.001 4	<=0.001 10	**2** (p=0.082)
Dig pref score - weight	Incl	#	0-7 0	8-12 2	13-20 4	> 20 10	**2** (9)
Dig pref score - height	Incl	#	0-7 0	8-12 2	13-20 4	> 20 10	**4** (13)
Dig pref score - MUAC	Incl	#	0-7 0	8-12 2	13-20 4	> 20 10	**2** (8)
Standard Dev WHZ . .	Excl Excl	SD SD	<1.1 and >0.9 0	<1.15 and >0.85 2	<1.20 and >0.80 6	>=1.20 or <=0.80 20	**0** (0.98)
Skewness WHZ	Excl	#	<±0.2 0	<±0.4 1	<±0.6 3	>=±0.6 5	**0** (0.00)
Kurtosis WHZ	Excl	#	<±0.2 0	<±0.4 1	<±0.6 3	>=±0.6 5	**0** (0.12)
Poisson dist WHZ-2	Excl	p	>0.05 0	>0.01 1	>0.001 3	<=0.001 5	**0** (p=)
Timing	Excl	Not determined yet	0	1	3	5	
OVERALL SCORE WHZ =			0-9	10-14	15-24	>25	**10** %

The overall score of this survey is 10 %, this is good.

There were no duplicate entries detected.

Missing data:

MONTHS: Line=67/ID=1, Line=107/ID=6

WEIGHT: Line=5/ID=5, Line=53/ID=2, Line=67/ID=1, Line=70/ID=5, Line=85/ID=6, Line=106/ID=5, Line=120/ID=8, Line=146/ID=11, Line=149/ID=1
HEIGHT: Line=5/ID=5, Line=14/ID=8, Line=53/ID=2, Line=67/ID=1, Line=70/ID=5, Line=85/ID=6, Line=106/ID=5, Line=120/ID=8, Line=132/ID=6, Line=145/ID=10, Line=148/ID=13, Line=149/ID=1

Percentage of children with no exact birthday: 49 %

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=1/ID=1: HAZ (-5.904), WAZ (-4.671), Age may be incorrect
Line=90/ID=3: WAZ (1.557), Age may be incorrect

Percentage of values flagged with SMART flags:WHZ: 0.0 %, HAZ: 0.6 %, WAZ: 1.1 %

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 0.85).

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

Age cat.	mo.	boys	girls	total	ratio boys/girls
6 to 17	12	16/21.6 (0.7)	22/22.0 (1.0)	38/43.6 (0.9)	0.73
18 to 29	12	34/21.0 (1.6)	18/21.5 (0.8)	52/42.5 (1.2)	1.89
30 to 41	12	14/20.4 (0.7)	23/20.8 (1.1)	37/41.2 (0.9)	0.61
42 to 53	12	24/20.1 (1.2)	25/20.5 (1.2)	49/40.6 (1.2)	0.96
54 to 59	6	5/9.9 (0.5)	7/10.1 (0.7)	12/20.1 (0.6)	0.71
6 to 59	54	93/94.0 (1.0)	95/94.0 (1.0)		0.98

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

Overall sex ratio: p-value = 0.884 (boys and girls equally represented)
Overall age distribution: p-value = 0.082 (as expected)
Overall age distribution for boys: p-value = 0.005 (significant difference)
Overall age distribution for girls: p-value = 0.600 (as expected)
Overall sex/age distribution: p-value = 0.002 (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: **9** (0-7 excellent, 8-12 good, 13-20 acceptable and > 20 problematic)
p-value for chi2: 0.202

Digit preference Height:

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

Digit preference score: **13** (0-7 excellent, 8-12 good, 13-20 acceptable and > 20 problematic)
p-value for chi2: 0.001 (significant difference)

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: **8** (0-7 excellent, 8-12 good, 13-20 acceptable and > 20 problematic)
p-value for chi2: 0.304

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:	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:			
HAZ			

Standard Deviation SD:	1.18	1.18	1.15
(The SD should be between 0.8 and 1.2)			
Prevalence (< -2)			
observed:	42.4%	42.4%	42.0%
calculated with current SD:	42.9%	42.9%	41.9%
calculated with a SD of 1:	41.6%	41.6%	40.7%

WAZ

Standard Deviation SD:	0.99	0.99	0.94
(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= 0.687	p= 0.687	p= 0.687
HAZ	p= 0.290	p= 0.290	p= 0.335
WAZ	p= 0.017	p= 0.017	p= 0.008

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

Skewness

WHZ	0.00	0.00	0.00
HAZ	-0.04	-0.04	0.16
WAZ	0.44	0.44	0.53

If the absolute value is:
-below minus 0.4 there is a relative excess of wasted/stunted/underweight subjects in the sample
-between minus 0.4 and minus 0.2, there may be a relative excess of wasted/stunted/underweight subjects in the sample.
-between minus 0.2 and plus 0.2, the distribution can be considered as symmetrical.
-between 0.2 and 0.4, there may be an excess of obese/tall/overweight subjects in the sample.
-above 0.4, there is an excess of obese/tall/overweight subjects in the sample

Kurtosis

WHZ	0.12	0.12	0.12
HAZ	0.28	0.28	-0.23
WAZ	0.58	0.58	0.08

Kurtosis characterizes the relative size of the body versus the tails of the distribution. Positive kurtosis indicates relatively large tails and small body. Negative kurtosis indicates relatively large body and small tails.
If the absolute value is:
-above 0.4 it indicates a problem. There might have been a problem with data collection or sampling.
-between 0.2 and 0.4, the data may be affected with a problem.
-less than an absolute value of 0.2 the distribution can be considered as normal.

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
```

(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	**4**	**5**	**6**
n =	63	50	77
Percentage of values flagged with SMART flags:			
WHZ:	0.0	11.1	2.7
HAZ:	0.0	13.3	2.7
WAZ:	0.0	10.9	4.0
Age ratio of 6-29 months to 30-59 months:			
	0.82	1.45	0.75
Sex ratio (male/female):			

	1.25	1.08	0.75

Digit preference Weight (%):

.0 :	15	9	8
.1 :	12	15	8
.2 :	2	9	5
.3 :	7	15	15
.4 :	13	11	11
.5 :	3	7	12
.6 :	8	9	5
.7 :	8	7	11
.8 :	13	11	12
.9 :	18	9	13
DPS:	17	10	10

Digit preference score (0-7 excellent, 8-12 good, 13-20 acceptable and > 20 problematic)

Digit preference Height (%):

.0 :	9	33	12
.1 :	7	2	7
.2 :	22	16	13
.3 :	7	4	11
.4 :	17	0	7
.5 :	5	11	13
.6 :	14	7	9
.7 :	5	11	11
.8 :	7	2	1
.9 :	7	13	16
DPS:	18	31	13

Digit preference score (0-7 excellent, 8-12 good, 13-20 acceptable and > 20 problematic)

Digit preference MUAC (%):

.0 :	6	9	8
.1 :	11	11	12
.2 :	8	4	9
.3 :	11	9	12
.4 :	10	4	8
.5 :	3	15	7
.6 :	11	9	7
.7 :	13	9	19
.8 :	15	13	13
.9 :	11	17	5
DPS:	10	13	13

Digit preference score (0-7 excellent, 8-12 good, 13-20 acceptable and > 20 problematic)

Standard deviation of WHZ:

SD	1.02	1.08	0.87

Prevalence (< -2) observed:

%	15.8	11.1

Prevalence (< -2) calculated with current SD:

%	15.1	11.2

Prevalence (< -2) calculated with a SD of 1:

%	14.6	9.4

Standard deviation of HAZ:

SD	1.13	1.31	1.16

observed:

%	45.6	40.0	41.3

calculated with current SD:

%	44.0	42.9	42.2

calculated with a SD of 1:
% 43.2 40.8 40.9

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	4/8.1 (0.5)	5/6.3 (0.8)	9/14.4 (0.6)	0.80
18 to 29	12	13/7.9 (1.6)	6/6.1 (1.0)	19/14.0 (1.4)	2.17
30 to 41	12	5/7.7 (0.7)	10/5.9 (1.7)	15/13.6 (1.1)	0.50
42 to 53	12	10/7.6 (1.3)	3/5.8 (0.5)	13/13.4 (1.0)	3.33
54 to 59	6	3/3.7 (0.8)	3/2.9 (1.0)	6/6.6 (0.9)	1.00
6 to 59	54	35/31.0 (1.1)	27/31.0 (0.9)		1.30

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

Overall sex ratio: p-value = 0.310 (boys and girls equally represented)
Overall age distribution: p-value = 0.407 (as expected)
Overall age distribution for boys: p-value = 0.125 (as expected)
Overall age distribution for girls: p-value = 0.349 (as expected)
Overall sex/age distribution: p-value = 0.011 (significant difference)

Team 2:

Age cat.	mo.	boys	girls	total	ratio boys/girls
6 to 17	12	2/5.8 (0.3)	7/5.6 (1.3)	9/11.4 (0.8)	0.29
18 to 29	12	14/5.7 (2.5)	6/5.4 (1.1)	20/11.1 (1.8)	2.33
30 to 41	12	3/5.5 (0.5)	3/5.3 (0.6)	6/10.7 (0.6)	1.00
42 to 53	12	4/5.4 (0.7)	8/5.2 (1.5)	12/10.6 (1.1)	0.50
54 to 59	6	2/2.7 (0.7)	0/2.6 (0.0)	2/5.2 (0.4)	
6 to 59	54	25/24.5 (1.0)	24/24.5 (1.0)		1.04

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

Overall sex ratio: p-value = 0.886 (boys and girls equally represented)
Overall age distribution: p-value = 0.018 (significant difference)
Overall age distribution for boys: p-value = 0.002 (significant difference)
Overall age distribution for girls: p-value = 0.240 (as expected)
Overall sex/age distribution: p-value = 0.000 (significant difference)

Team 3:

Age cat.	mo.	boys	girls	total	ratio boys/girls
6 to 17	12	10/7.7 (1.3)	10/10.2 (1.0)	20/17.9 (1.1)	1.00
18 to 29	12	7/7.5 (0.9)	6/10.0 (0.6)	13/17.4 (0.7)	1.17
30 to 41	12	6/7.2 (0.8)	10/9.6 (1.0)	16/16.9 (0.9)	0.60
42 to 53	12	10/7.1 (1.4)	14/9.5 (1.5)	24/16.6 (1.4)	0.71
54 to 59	6	0/3.5 (0.0)	4/4.7 (0.9)	4/8.2 (0.5)	0.00
6 to 59	54	33/38.5 (0.9)	44/38.5 (1.1)		0.75

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

Overall sex ratio: p-value = 0.210 (boys and girls equally represented)
Overall age distribution: p-value = 0.143 (as expected)
Overall age distribution for boys: p-value = 0.227 (as expected)

Overall age distribution for girls: p-value = 0.430 (as expected)
Overall sex/age distribution: p-value = 0.029 (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
```

(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
```

(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
```

(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)

(for better comparison it can be helpful to copy/paste part of this report into Excel)

SITTWE RURAL

Plausibility check for: Sittwe RURAL_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 >5.0-7.5   >7.5
(% of in-range subjects)                0      5        10      20         0 (1.7 %)

Overall Sex ratio        Incl    p    >0.1  >0.05    >0.001   <=0.001
(Significant chi square)                0      2         4      10         0 (p=0.203)

Overall Age distrib      Incl    p    >0.1  >0.05    >0.001   <=0.001
(Significant chi square)                0      2         4      10         4 (p=0.001)

Dig pref score - weight  Incl    #    0-7   8-12     13-20     > 20
                                        0     2          4      10         0 (7)

Dig pref score - height  Incl    #    0-7   8-12     13-20     > 20
                                        0     2          4      10         0 (7)
```

Dig pref score - MUAC	Incl	#	0-7	8-12	13-20	> 20	
			0	2	4	10	**2** (9)
Standard Dev WHZ	Excl	SD	<1.1	<1.15	<1.20	>=1.20	
.			and	and	and	or	
.	Excl	SD	>0.9	>0.85	>0.80	<=0.80	
			0	2	6	20	**2** (0.88)
Skewness WHZ	Excl	#	<±0.2	<±0.4	<±0.6	>=±0.6	
			0	1	3	5	**0** (0.13)
Kurtosis WHZ	Excl	#	<±0.2	<±0.4	<±0.6	>=±0.6	
			0	1	3	5	**3** (-0.52)
Poisson dist WHZ-2	Excl	p	>0.05	>0.01	>0.001	<=0.001	
			0	1	3	5	**0** (p=)
Timing	Excl	Not determined yet					
			0	1	3	5	
OVERALL SCORE WHZ =			0-9	10-14	15-24	>25	**11** %

The overall score of this survey is 11 %, this is good.

There were no duplicate entries detected.

Missing data:

MONTHS: Line=81/ID=2
WEIGHT: Line=81/ID=2, Line=100/ID=4
HEIGHT: Line=81/ID=2, Line=100/ID=4, Line=184/ID=11

Percentage of children with no exact birthday: 90 %

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=13/ID=13:	**WHZ (3.190)**, HAZ (-5.634), Height may be incorrect
Line=66/ID=1:	**WHZ (-4.856)**, Height may be incorrect
Line=94/ID=3:	HAZ (-5.180), Age may be incorrect
Line=118/ID=7:	HAZ (-5.213), WAZ (-4.769), Age may be incorrect
Line=119/ID=8:	**WHZ (2.344)**, HAZ (-4.726), Height may be incorrect
Line=125/ID=14:	HAZ (2.071), Height may be incorrect
Line=142/ID=3:	HAZ (1.661), Age may be incorrect
Line=212/ID=4:	HAZ (1.511), Age may be incorrect
Line=217/ID=1:	HAZ (3.024), Age may be incorrect
Line=261/ID=2:	HAZ (-4.720), Age may be incorrect
Line=266/ID=7:	**WHZ (-3.878)**, Weight may be incorrect
Line=280/ID=3:	HAZ (1.459), Age may be incorrect
Line=283/ID=6:	HAZ (1.905), Age may be incorrect
Line=290/ID=13:	**WHZ (2.189)**, Height may be incorrect
Line=291/ID=14:	HAZ (3.571), Age may be incorrect
Line=326/ID=12:	**WHZ (-4.024)**, Weight may be incorrect

Percentage of values flagged with SMART flags:WHZ: 1.7 %, HAZ: 3.4 %, WAZ: 0.3 %

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 : #
Month 60 : #

Age ratio of 6-29 months to 30-59 months: 0.88 (The value should be around 0.85).

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

Age cat.	mo.	boys	girls	total	ratio boys/girls
6 to 17	12	36/44.1 (0.8)	35/38.5 (0.9)	71/82.6 (0.9)	1.03
18 to 29	12	48/43.0 (1.1)	48/37.6 (1.3)	96/80.5 (1.2)	1.00
30 to 41	12	55/41.7 (1.3)	41/36.4 (1.1)	96/78.1 (1.2)	1.34
42 to 53	12	39/41.0 (1.0)	35/35.8 (1.0)	74/76.8 (1.0)	1.11
54 to 59	6	12/20.3 (0.6)	7/17.7 (0.4)	19/38.0 (0.5)	1.71
6 to 59	54	190/178.0 (1.1)	166/178.0 (0.9)		1.14

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

Overall sex ratio: p-value = 0.203 (boys and girls equally represented)
Overall age distribution: p-value = 0.001 (significant difference)
Overall age distribution for boys: p-value = 0.044 (significant difference)
Overall age distribution for girls: p-value = 0.035 (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: **7** (0-7 excellent, 8-12 good, 13-20 acceptable and > 20 problematic)
p-value for chi2: 0.068

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: **7** (0-7 excellent, 8-12 good, 13-20 acceptable and > 20 problematic)
p-value for chi2: 0.069

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: **9** (0-7 excellent, 8-12 good, 13-20 acceptable and > 20 problematic)
p-value for chi2: 0.004 (significant difference)

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:	0.98	0.98	0.88
(The SD should be between 0.8 and 1.2)			
Prevalence (< -2)			
observed:			
calculated with current SD:			
calculated with a SD of 1:			
HAZ			
Standard Deviation SD:	1.44	1.44	1.29
(The SD should be between 0.8 and 1.2)			
Prevalence (< -2)			
observed:	42.7%	42.7%	42.7%
calculated with current SD:	40.7%	40.7%	40.5%
calculated with a SD of 1:	36.8%	36.8%	37.8%
WAZ			
Standard Deviation SD:	0.98	0.98	0.97
(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= 0.002	p= 0.002	p= 0.078
HAZ	p= 0.150	p= 0.150	p= 0.003
WAZ	p= 0.470	p= 0.470	p= 0.155

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

Skewness			
WHZ	0.09	0.09	0.13
HAZ	0.29	0.29	0.16
WAZ	0.12	0.12	0.20

If the absolute value is:
-below minus 0.4 there is a relative excess of wasted/stunted/underweight subjects in the sample
-between minus 0.4 and minus 0.2, there may be a relative excess of wasted/stunted/underweight

```
subjects in the sample.
-between minus 0.2 and plus 0.2, the distribution can be considered as symmetrical.
-between 0.2 and 0.4, there may be an excess of obese/tall/overweight subjects in the sample.
-above 0.4, there is an excess of obese/tall/overweight subjects in the sample

Kurtosis
WHZ                                           1.35              1.35            -0.52
HAZ                                           0.20              0.20            -0.63
WAZ                                          -0.09             -0.09            -0.28
Kurtosis characterizes the relative size of the body versus the tails of the distribution. Positive
kurtosis indicates relatively large tails and small body. Negative kurtosis indicates relatively
large body and small tails.
If the absolute value is:
-above 0.4 it indicates a problem. There might have been a problem with data collection or sampling.
-between 0.2 and 0.4, the data may be affected with a problem.
-less than an absolute value of 0.2 the distribution can be considered as normal.
```

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

(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	7	8	9
n =	47	41	53	82	71	63
Percentage of values flagged with SMART flags:						
WHZ:	2.1	2.4	1.9	3.7	1.4	3.2
HAZ:	6.4	2.4	5.8	6.2	1.4	3.2
WAZ:	2.1	0.0	0.0	1.2	0.0	1.6
Age ratio of 6-29 months to 30-59 months:						
	0.88	0.52	0.71	1.19	1.09	0.80
Sex ratio (male/female):						
	1.24	1.56	0.71	1.16	1.03	1.42
Digit preference Weight (%):						
.0 :	11	15	8	0	3	2
.1 :	11	0	6	16	10	10
.2 :	9	15	13	7	13	6
.3 :	9	10	9	10	6	13
.4 :	6	12	15	14	8	13
.5 :	15	7	13	9	6	10
.6 :	4	7	13	14	11	3
.7 :	11	17	6	14	20	15
.8 :	17	5	11	10	7	11
.9 :	9	12	6	7	17	18
DPS:	12	16	12	15	17	16
Digit preference score (0-7 excellent, 8-12 good, 13-20 acceptable and > 20 problematic)						
Digit preference Height (%):						
.0 :	26	34	19	0	14	0
.1 :	2	2	8	14	8	16
.2 :	23	7	13	10	10	13
.3 :	2	7	10	11	13	11

.4 :	4	5	6	16	8	15
.5 :	13	10	13	5	21	8
.6 :	11	7	17	14	7	16
.7 :	9	12	6	6	11	6
.8 :	4	15	4	10	6	5
.9 :	6	0	4	15	1	10
DPS:	27	30	18	16	17	17

Digit preference score (0-7 excellent, 8-12 good, 13-20 acceptable and > 20 problematic)

Digit preference MUAC (%):

.0 :	4	15	17	4	3	8
.1 :	6	7	4	11	9	14
.2 :	9	10	15	12	11	10
.3 :	15	7	4	5	6	8
.4 :	15	17	13	17	13	14
.5 :	15	12	15	14	10	13
.6 :	9	7	11	15	16	10
.7 :	15	7	6	12	13	6
.8 :	2	10	13	4	7	5
.9 :	11	7	2	6	13	13
DPS:	15	11	18	16	12	11

Digit preference score (0-7 excellent, 8-12 good, 13-20 acceptable and > 20 problematic)

Standard deviation of WHZ:

SD	1.02	1.10	0.81	1.07	0.93	0.96
Prevalence (< -2) observed:						
%	8.5	9.8		9.9		
Prevalence (< -2) calculated with current SD:						
%	11.4	11.1		13.6		
Prevalence (< -2) calculated with a SD of 1:						
%	10.9	8.9		12.0		

Standard deviation of HAZ:

SD	1.58	1.35	1.51	1.50	1.18	1.34
observed:						
%	31.9	46.3	51.9	30.9	60.6	35.5
calculated with current SD:						
%	31.1	49.1	41.8	30.7	55.5	42.4
calculated with a SD of 1:						
%	21.8	48.8	37.8	22.4	56.5	39.9

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	8/6.0 (1.3)	5/4.9 (1.0)	13/10.9 (1.2)	1.60
18 to 29	12	6/5.9 (1.0)	3/4.8 (0.6)	9/10.6 (0.8)	2.00
30 to 41	12	8/5.7 (1.4)	8/4.6 (1.7)	16/10.3 (1.6)	1.00
42 to 53	12	4/5.6 (0.7)	5/4.5 (1.1)	9/10.1 (0.9)	0.80
54 to 59	6	0/2.8 (0.0)	0/2.2 (0.0)	0/5.0 (0.0)	
6 to 59	54	26/23.5 (1.1)	21/23.5 (0.9)		1.24

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

Overall sex ratio: p-value = 0.466 (boys and girls equally represented)
Overall age distribution: p-value = 0.062 (as expected)

Overall age distribution for boys: p-value = 0.308 (as expected)
Overall age distribution for girls: p-value = 0.245 (as expected)
Overall sex/age distribution: p-value = 0.030 (significant difference)

Team 2:

Age cat.	mo.	boys	girls	total	ratio boys/girls
6 to 17	12	3/5.8 (0.5)	1/3.7 (0.3)	4/9.5 (0.4)	3.00
18 to 29	12	4/5.7 (0.7)	6/3.6 (1.7)	10/9.3 (1.1)	0.67
30 to 41	12	8/5.5 (1.5)	4/3.5 (1.1)	12/9.0 (1.3)	2.00
42 to 53	12	6/5.4 (1.1)	4/3.5 (1.2)	10/8.8 (1.1)	1.50
54 to 59	6	4/2.7 (1.5)	1/1.7 (0.6)	5/4.4 (1.1)	4.00
6 to 59	54	25/20.5 (1.2)	16/20.5 (0.8)		1.56

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

Overall sex ratio: p-value = 0.160 (boys and girls equally represented)
Overall age distribution: p-value = 0.343 (as expected)
Overall age distribution for boys: p-value = 0.444 (as expected)
Overall age distribution for girls: p-value = 0.406 (as expected)
Overall sex/age distribution: p-value = 0.047 (significant difference)

Team 3:

Age cat.	mo.	boys	girls	total	ratio boys/girls
6 to 17	12	4/5.1 (0.8)	7/7.2 (1.0)	11/12.3 (0.9)	0.57
18 to 29	12	4/5.0 (0.8)	7/7.0 (1.0)	11/12.0 (0.9)	0.57
30 to 41	12	6/4.8 (1.2)	9/6.8 (1.3)	15/11.6 (1.3)	0.67
42 to 53	12	5/4.7 (1.1)	5/6.7 (0.7)	10/11.4 (0.9)	1.00
54 to 59	6	3/2.3 (1.3)	3/3.3 (0.9)	6/5.7 (1.1)	1.00
6 to 59	54	22/26.5 (0.8)	31/26.5 (1.2)		0.71

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

Overall sex ratio: p-value = 0.216 (boys and girls equally represented)
Overall age distribution: p-value = 0.844 (as expected)
Overall age distribution for boys: p-value = 0.923 (as expected)
Overall age distribution for girls: p-value = 0.882 (as expected)
Overall sex/age distribution: p-value = 0.454 (as expected)

Team 4:

Age cat.	mo.	boys	girls	total	ratio boys/girls
6 to 17	12	10/10.2 (1.0)	10/8.6 (1.2)	20/18.8 (1.1)	1.00
18 to 29	12	12/10.0 (1.2)	12/8.4 (1.4)	24/18.3 (1.3)	1.00
30 to 41	12	14/9.6 (1.5)	9/8.1 (1.1)	23/17.8 (1.3)	1.56
42 to 53	12	7/9.5 (0.7)	6/8.0 (0.8)	13/17.5 (0.7)	1.17
54 to 59	6	1/4.7 (0.2)	0/3.9 (0.0)	1/8.6 (0.1)	
6 to 59	54	44/40.5 (1.1)	37/40.5 (0.9)		1.19

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

Overall sex ratio: p-value = 0.437 (boys and girls equally represented)
Overall age distribution: p-value = 0.023 (significant difference)
Overall age distribution for boys: p-value = 0.203 (as expected)
Overall age distribution for girls: p-value = 0.175 (as expected)
Overall sex/age distribution: p-value = 0.012 (significant difference)

Team 5:

Age cat.	mo.	boys	girls	total	ratio boys/girls
6 to 17	12	9/8.4 (1.1)	8/8.1 (1.0)	17/16.5 (1.0)	1.13
18 to 29	12	8/8.1 (1.0)	12/7.9 (1.5)	20/16.1 (1.2)	0.67
30 to 41	12	11/7.9 (1.4)	5/7.7 (0.7)	16/15.6 (1.0)	2.20
42 to 53	12	6/7.8 (0.8)	8/7.6 (1.1)	14/15.3 (0.9)	0.75
54 to 59	6	2/3.8 (0.5)	2/3.7 (0.5)	4/7.6 (0.5)	1.00
6 to 59	54	36/35.5 (1.0)	35/35.5 (1.0)		1.03

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

Overall sex ratio: p-value = 0.906 (boys and girls equally represented)
Overall age distribution: p-value = 0.592 (as expected)
Overall age distribution for boys: p-value = 0.634 (as expected)
Overall age distribution for girls: p-value = 0.424 (as expected)
Overall sex/age distribution: p-value = 0.169 (as expected)

Team 6:

Age cat.	mo.	boys	girls	total	ratio boys/girls
6 to 17	12	2/8.6 (0.2)	4/6.0 (0.7)	6/14.6 (0.4)	0.50
18 to 29	12	14/8.4 (1.7)	8/5.9 (1.4)	22/14.3 (1.5)	1.75
30 to 41	12	8/8.1 (1.0)	6/5.7 (1.1)	14/13.8 (1.0)	1.33
42 to 53	12	11/8.0 (1.4)	7/5.6 (1.2)	18/13.6 (1.3)	1.57
54 to 59	6	2/3.9 (0.5)	1/2.8 (0.4)	3/6.7 (0.4)	2.00
6 to 59	54	37/31.5 (1.2)	26/31.5 (0.8)		1.42

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

Overall sex ratio: p-value = 0.166 (boys and girls equally represented)
Overall age distribution: p-value = 0.012 (significant difference)
Overall age distribution for boys: p-value = 0.027 (significant difference)
Overall age distribution for girls: p-value = 0.567 (as expected)
Overall sex/age distribution: p-value = 0.002 (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
```

(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
```

(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
```

(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
```

(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: 5

```
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
```

(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: 6

```
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
```

(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)

(for better comparison it can be helpful to copy/paste part of this report into Excel)

PAUKTAW RURAL

Plausibility check for: Pauktaw RURAL_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	>5.0-7.5	>7.5	
(% of in-range subjects)			0	5	10	20	**0** (0.0 %)
Overall Sex ratio	Incl	p	>0.1	>0.05	>0.001	<=0.001	
(Significant chi square)			0	2	4	10	**0** (p=0.719)
Overall Age distrib	Incl	p	>0.1	>0.05	>0.001	<=0.001	
(Significant chi square)			0	2	4	10	**4** (p=0.003)
Dig pref score - weight	Incl	#	0-7	8-12	13-20	> 20	
			0	2	4	10	**0** (7)
Dig pref score - height	Incl	#	0-7	8-12	13-20	> 20	
			0	2	4	10	**4** (13)
Dig pref score - MUAC	Incl	#	0-7	8-12	13-20	> 20	
			0	2	4	10	**0** (6)

Standard Dev WHZ	Excl	SD	<1.1 and >0.9	<1.15 and >0.85	<1.20 and >0.80	>=1.20 or <=0.80	
.	Excl	SD	0	2	6	20	**2** (0.89)
Skewness WHZ	Excl	#	<±0.2	<±0.4	<±0.6	>=±0.6	
			0	1	3	5	**0** (-0.04)
Kurtosis WHZ	Excl	#	<±0.2	<±0.4	<±0.6	>=±0.6	
			0	1	3	5	**0** (-0.14)
Poisson dist WHZ-2	Excl	p	>0.05	>0.01	>0.001	<=0.001	
			0	1	3	5	**0** (p=)
Timing	Excl	Not determined yet					
			0	1	3	5	
OVERALL SCORE WHZ =			0-9	10-14	15-24	>25	**10** %

The overall score of this survey is 10 %, this is good.

There were no duplicate entries detected.

Missing data:

MONTHS: Line=26/ID=26
WEIGHT: Line=26/ID=26
HEIGHT: Line=26/ID=26

Percentage of children with no exact birthday: 97 %

Age/Height out of range for WHZ:

HEIGHT:
Line=53/ID=4: -1E5 cm
Line=72/ID=23: -1E5 cm
Line=104/ID=11: -1E5 cm

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=95/ID=2: HAZ (-5.383), Height may be incorrect
Line=106/ID=1: HAZ (3.708), Age may be incorrect
Line=159/ID=5: HAZ (-8.285), WAZ (-5.774), Age may be incorrect
Line=190/ID=15: HAZ (2.240), Age may be incorrect
Line=191/ID=16: HAZ (-5.338), Age may be incorrect
Line=203/ID=11: HAZ (-6.267), Height may be incorrect
Line=231/ID=1: HAZ (1.246), Age may be incorrect
Line=271/ID=15: HAZ (-5.737), Age may be incorrect

Percentage of values flagged with SMART flags:WHZ: 0.0 %, HAZ: 2.9 %, WAZ: 0.4 %

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: 0.71 (The value should be around 0.85).

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

Age cat.	mo.	boys	girls	total	ratio boys/girls
6 to 17	12	28/32.9 (0.8)	24/31.6 (0.8)	52/64.5 (0.8)	1.17
18 to 29	12	27/32.1 (0.8)	36/30.8 (1.2)	63/62.9 (1.0)	0.75
30 to 41	12	41/31.1 (1.3)	35/29.8 (1.2)	76/61.0 (1.2)	1.17
42 to 53	12	39/30.6 (1.3)	33/29.3 (1.1)	72/60.0 (1.2)	1.18
54 to 59	6	7/15.2 (0.5)	8/14.5 (0.6)	15/29.7 (0.5)	0.88
6 to 59	54	142/139.0 (1.0)	136/139.0 (1.0)		1.04

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 = 0.003 (significant difference)
Overall age distribution for boys: p-value = 0.023 (significant difference)
Overall age distribution for girls: p-value = 0.137 (as expected)
Overall sex/age distribution: p-value = 0.001 (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: **7** (0-7 excellent, 8-12 good, 13-20 acceptable and > 20 problematic)
p-value for chi2: 0.141

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: **13** (0-7 excellent, 8-12 good, 13-20 acceptable and > 20 problematic)
p-value for chi2: 0.000 (significant difference)

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: **6** (0-7 excellent, 8-12 good, 13-20 acceptable and > 20 problematic)
p-value for chi2: 0.494

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:	0.89	0.89	0.89
(The SD should be between 0.8 and 1.2)			
Prevalence (< -2)			
observed:			
calculated with current SD:			
calculated with a SD of 1:			
HAZ			
Standard Deviation SD:	1.57	1.51	1.40
(The SD should be between 0.8 and 1.2)			
Prevalence (< -2)			
observed:	52.0%	51.6%	51.7%
calculated with current SD:	52.2%	51.3%	51.7%
calculated with a SD of 1:	53.5%	52.0%	52.4%
WAZ			
Standard Deviation SD:	1.09	1.09	1.07
(The SD should be between 0.8 and 1.2)			
Prevalence (< -2)			
observed:	47.8%	47.8%	47.7%
calculated with current SD:	48.0%	48.0%	47.4%
calculated with a SD of 1:	47.8%	47.8%	47.3%
Results for Shapiro-Wilk test for normally (Gaussian) distributed data:			
WHZ	p= 0.533	p= 0.533	p= 0.533
HAZ	p= 0.097	p= 0.086	p= 0.002
WAZ	p= 0.196	p= 0.196	p= 0.143

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

Skewness			
WHZ	-0.04	-0.04	-0.04
HAZ	-0.07	0.18	0.01
WAZ	-0.17	-0.17	-0.05

If the absolute value is:
-below minus 0.4 there is a relative excess of wasted/stunted/underweight subjects in the sample
-between minus 0.4 and minus 0.2, there may be a relative excess of wasted/stunted/underweight subjects in the sample.
-between minus 0.2 and plus 0.2, the distribution can be considered as symmetrical.
-between 0.2 and 0.4, there may be an excess of obese/tall/overweight subjects in the sample.

-above 0.4, there is an excess of obese/tall/overweight subjects in the sample

Kurtosis

WHZ	-0.14	-0.14	-0.14
HAZ	0.62	-0.03	-0.85
WAZ	-0.17	-0.17	-0.51

Kurtosis characterizes the relative size of the body versus the tails of the distribution. Positive kurtosis indicates relatively large tails and small body. Negative kurtosis indicates relatively large body and small tails.
If the absolute value is:
-above 0.4 it indicates a problem. There might have been a problem with data collection or sampling.
-between 0.2 and 0.4, the data may be affected with a problem.
-less than an absolute value of 0.2 the distribution can be considered as normal.

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
```

(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**
n =	128	80	71
Percentage of values flagged with SMART flags:			
WHZ:	1.6	2.6	1.4
HAZ:	3.2	5.1	5.7
WAZ:	0.0	2.5	0.0
Age ratio of 6-29 months to 30-59 months:			
	0.71	0.68	0.73
Sex ratio (male/female):			
	1.17	0.82	1.09
Digit preference Weight (%):			
.0 :	8	5	14
.1 :	10	8	4
.2 :	8	8	4
.3 :	17	14	7
.4 :	9	13	10
.5 :	9	14	23
.6 :	9	10	7
.7 :	9	8	17
.8 :	14	10	4
.9 :	8	11	10
DPS:	10	10	19

Digit preference score (0-7 excellent, 8-12 good, 13-20 acceptable and > 20 problematic)

Digit preference Height (%):

.0 :	17	22	21
.1 :	5	9	4
.2 :	11	3	4
.3 :	13	10	11
.4 :	15	8	10
.5 :	9	11	24

.6 :	12	11	6
.7 :	9	5	7
.8 :	7	11	4
.9 :	3	10	8
DPS:	14	16	22

Digit preference score (0-7 excellent, 8-12 good, 13-20 acceptable and > 20 problematic)

Digit preference MUAC (%):

.0 :	13	8	17
.1 :	5	9	11
.2 :	9	14	8
.3 :	7	9	6
.4 :	12	13	10
.5 :	9	13	17
.6 :	9	9	8
.7 :	12	13	8
.8 :	13	8	7
.9 :	10	6	7
DPS:	8	9	13

Digit preference score (0-7 excellent, 8-12 good, 13-20 acceptable and > 20 problematic)

Standard deviation of WHZ:

SD 0.86 0.85 0.92

Prevalence (< -2) observed:

%

Prevalence (< -2) calculated with current SD:

%

Prevalence (< -2) calculated with a SD of 1:

%

Standard deviation of HAZ:

SD	1.39	1.67	1.75
observed:			
%	46.0	59.5	54.3
calculated with current SD:			
%	49.1	58.4	50.0
calculated with a SD of 1:			
%	48.7	63.9	50.0

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	14/16.0 (0.9)	14/13.7 (1.0)	28/29.7 (0.9)	1.00
18 to 29	12	14/15.6 (0.9)	11/13.3 (0.8)	25/29.0 (0.9)	1.27
30 to 41	12	16/15.1 (1.1)	14/12.9 (1.1)	30/28.1 (1.1)	1.14
42 to 53	12	23/14.9 (1.5)	15/12.7 (1.2)	38/27.6 (1.4)	1.53
54 to 59	6	2/7.4 (0.3)	5/6.3 (0.8)	7/13.7 (0.5)	0.40
6 to 59	54	69/64.0 (1.1)	59/64.0 (0.9)		1.17

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

Overall sex ratio: p-value = 0.377 (boys and girls equally represented)
Overall age distribution: p-value = 0.095 (as expected)
Overall age distribution for boys: p-value = 0.066 (as expected)
Overall age distribution for girls: p-value = 0.882 (as expected)

Overall sex/age distribution: p-value = 0.023 (significant difference)

Team 2:

Age cat.	mo.	boys	girls	total	ratio boys/girls
6 to 17	12	9/8.4 (1.1)	5/10.0 (0.5)	14/18.3 (0.8)	1.80
18 to 29	12	6/8.1 (0.7)	12/9.7 (1.2)	18/17.9 (1.0)	0.50
30 to 41	12	12/7.9 (1.5)	11/9.4 (1.2)	23/17.3 (1.3)	1.09
42 to 53	12	5/7.8 (0.6)	12/9.3 (1.3)	17/17.0 (1.0)	0.42
54 to 59	6	4/3.8 (1.0)	3/4.6 (0.7)	7/8.4 (0.8)	1.33
6 to 59	54	36/39.5 (0.9)	43/39.5 (1.1)		0.84

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

Overall sex ratio: p-value = 0.431 (boys and girls equally represented)
Overall age distribution: p-value = 0.537 (as expected)
Overall age distribution for boys: p-value = 0.442 (as expected)
Overall age distribution for girls: p-value = 0.328 (as expected)
Overall sex/age distribution: p-value = 0.059 (as expected)

Team 3:

Age cat.	mo.	boys	girls	total	ratio boys/girls
6 to 17	12	5/8.6 (0.6)	5/7.9 (0.6)	10/16.5 (0.6)	1.00
18 to 29	12	7/8.4 (0.8)	13/7.7 (1.7)	20/16.1 (1.2)	0.54
30 to 41	12	13/8.1 (1.6)	10/7.5 (1.3)	23/15.6 (1.5)	1.30
42 to 53	12	11/8.0 (1.4)	6/7.3 (0.8)	17/15.3 (1.1)	1.83
54 to 59	6	1/3.9 (0.3)	0/3.6 (0.0)	1/7.6 (0.1)	
6 to 59	54	37/35.5 (1.0)	34/35.5 (1.0)		1.09

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

Overall sex ratio: p-value = 0.722 (boys and girls equally represented)
Overall age distribution: p-value = 0.012 (significant difference)
Overall age distribution for boys: p-value = 0.091 (as expected)
Overall age distribution for girls: p-value = 0.051 (as expected)
Overall sex/age distribution: p-value = 0.002 (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
```

(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
```

(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

(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)
```

(for better comparison it can be helpful to copy/paste part of this report into Excel)

Appendix 2: Evaluation of Enumerators

1. Report for Evaluation of Enumerators – Relocatable Staff

Weight:

	Precision: Sum of Square [W2-W1]	Accuracy: Sum of Square [Superv.(W1+W2)-Enum.(W1+W2]	No. +/- Precision	No. +/- Accuracy
Supervisor	0.17		2/6	
Enumerator 1	0.02 OK	0.25 OK	0/2	1/6
Enumerator 2	0.07 OK	0.34 OK	1/3	3/7
Enumerator 3	0.04 OK	0.47 OK	2/2	3/7
Enumerator 4	0.01 OK	0.20 OK	0/1	1/7
Enumerator 5	0.04 OK	0.25 OK	2/2	1/7
Enumerator 6	0.02 OK	0.23 OK	1/1	2/4
Enumerator 7	0.04 OK	0.17 OK	2/2	3/3
Enumerator 8	6561.01 POOR	6545.08 POOR	1/1	2/5

Height:

	Precision: Sum of Square [H2-H1]	Accuracy: Sum of Square [Superv.(H1+H2)-Enum.(H1+H2]	No. +/- Precision	No. +/- Accuracy
Supervisor	0.42		4/5	
Enumerator 1	0.13 OK	0.41 OK	7/0	2/4
Enumerator 2	0.09 OK	4.09 POOR	5/1	3/6
Enumerator 3	0.17 OK	5.49 POOR	6/2	4/5
Enumerator 4	0.20 OK	0.56 OK	4/1	3/6
Enumerator 5	0.04 OK	0.62 OK	3/1	5/5
Enumerator 6	0.16 OK	0.44 OK	3/4	6/2
Enumerator 7	0.06 OK	0.26 OK	3/0	7/2
Enumerator 8	0.18 OK	0.58 OK	7/2	2/6

MUAC:

	Precision: Sum of Square [MUAC2-MUAC1]	Accuracy: Sum of Square [Superv.(MUAC1+MUAC2)-Enum.(MUAC1+MUAC2]	No. +/- Precision	No. +/- Accuracy
Supervisor	0.25		8/2	
Enumerator 1	0.09 OK	0.16 OK	7/2	3/2
Enumerator 2	0.09 OK	0.22 OK	1/5	4/4
Enumerator 3	0.11 OK	0.34 OK	4/4	2/5
Enumerator 4	0.07 OK	0.54 OK	2/5	5/4
Enumerator 5	0.04 OK	0.53 OK	1/3	4/6
Enumerator 6	0.07 OK	0.20 OK	3/4	5/3
Enumerator 7	0.07 OK	0.38 OK	6/1	5/2
Enumerator 8	0.08 OK	1.21 POOR	3/2	3/6

For evaluating the enumerators the precision and the accuracy of their measurements is calculated. For precision the sum of the square of the differences for the double measurements is calculated. This value should be less than two times the precision value of the supervisor.
For the accuracy the sum of the square of the differences between the enumerator values (weight1+weight2) and the supervisor values (weight1+weight2) is calculated. This value should be less than three times the precision value of the supervisor.
To check for systematic errors of the enumerators the number of positive and negative deviations can be used.

2. Report for Evaluation of Enumerators – Rural Team

Weight:

	Precision: Sum of Square [W2-W1]	Accuracy: Sum of Square [Superv.(W1+W2)-Enum.(W1+W2]	No. +/- Precision	No. +/- Accuracy
Supervisor	0.12		6/0	
Enumerator 1	0.12 OK	0.24 OK	6/0	2/6
Enumerator 2	0.10 OK	0.06 OK	0/10	6/0
Enumerator 3	4.02 POOR	4.14 POOR	0/6	8/2
Enumerator 4	0.14 OK	0.22 OK	4/4	6/4
Enumerator 5	0.08 OK	0.28 OK	0/2	4/2
Enumerator 6	1.32 POOR	1.32 POOR	4/2	4/2
Enumerator 7	0.08 OK	0.04 OK	2/0	2/4
Enumerator 8	0.10 OK	0.86 POOR	0/4	0/10
Enumerator 9	0.08 OK	0.12 OK	0/2	6/2

Height:

	Precision: Sum of Square	Accuracy: Sum of Square	No. +/- Precision	No. +/- Accuracy

	[H2-H1]	[Superv.(H1+H2)-Enum.(H1+H2]		
Supervisor	4.44		8/2	
Enumerator 1	4.24 OK	12.16 OK	6/2	2/8
Enumerator 2	1.72 OK	11.72 OK	8/2	2/8
Enumerator 3	39.46 POOR	59.42 POOR	8/2	2/8
Enumerator 4	14759.00 POOR	12056.40 POOR	2/6	0/10
Enumerator 5	16094.70 POOR	16469.10 POOR	4/6	2/8
Enumerator 6	121.82 POOR	132.38 POOR	2/6	4/6
Enumerator 7	1.12 OK	5.36 OK	8/2	2/8
Enumerator 8	2.92 OK	13.16 OK	4/2	4/6
Enumerator 9	2.18 OK	7.34 OK	4/6	2/8

MUAC:

	Precision: Sum of Square [MUAC2-MUAC1]	Accuracy: Sum of Square [Superv.(MUAC1+MUAC2)-Enum.(MUAC1+MUAC2]	No. +/- Precision	No. +/- Accuracy
Supervisor	0.12		2/4	
Enumerator 1	0.05 OK	0.23 OK	2/3	4/5
Enumerator 2	0.07 OK	0.41 POOR	3/4	9/1
Enumerator 3	0.17 OK	0.37 POOR	1/7	4/6
Enumerator 4	0.11 OK	0.19 OK	3/5	6/3
Enumerator 5	0.06 OK	0.48 POOR	4/2	3/7
Enumerator 6	0.07 OK	0.27 OK	0/4	6/4
Enumerator 7	0.15 OK	1.69 POOR	4/5	2/6
Enumerator 8	0.07 OK	0.35 OK	2/5	6/3
Enumerator 9	0.16 OK	0.32 OK	3/4	4/6

For evaluating the enumerators the precision and the accuracy of their measurements is calculated. For precision the sum of the square of the differences for the double measurements is calculated. This value should be less than two times the precision value of the supervisor.
For the accuracy the sum of the square of the differences between the enumerator values (weight1+weight2) and the supervisor values (weight1+weight2) is calculated. This value should be less than three times the precision value of the supervisor.
To check for systematic errors of the enumerators the number of positive and negative deviations can be used.

3. Report for Evaluation of Enumerators – Urban Team

Weight:

	Precision: Sum of Square [W2-W1]	Accuracy: Sum of Square [Superv.(W1+W2)-Enum.(W1+W2]	No. +/- Precision	No. +/- Accuracy

Supervisor	0.25		5/2	
Enumerator 1	0.28 OK	0.21 OK	5/3	0/7
Enumerator 2	1.68 POOR	1.53 POOR	6/4	4/5
Enumerator 3	0.19 OK	0.22 OK	3/2	3/2
Enumerator 4	0.34 OK	0.05 OK	4/5	3/3
Enumerator 5	0.45 OK	0.08 OK	5/5	2/5
Enumerator 6	0.54 POOR	0.15 OK	5/4	2/6
Enumerator 7	0.43 OK	0.10 OK	5/5	3/5
Enumerator 8	0.37 OK	0.10 OK	3/5	6/1
Enumerator 9	0.33 OK	0.12 OK	4/4	2/6
Enumerator 10	0.37 OK	0.06 OK	3/4	4/3

Height:

	Precision: Sum of Square [H2-H1]	Accuracy: Sum of Square [Superv.(H1+H2)-Enum.(H1+H2]	No. +/- Precision	No. +/- Accuracy
Supervisor	2.95		5/4	
Enumerator 1	6.54 POOR	6.91 OK	3/5	5/4
Enumerator 2	13.34 POOR	8.53 OK	2/6	4/6
Enumerator 3	2.26 OK	6.97 OK	3/7	4/6
Enumerator 4	431.23 POOR	442.70 POOR	5/5	5/5
Enumerator 5	3.83 OK	4.36 OK	6/4	2/8
Enumerator 6	3.91 OK	3.26 OK	6/4	3/7
Enumerator 7	1.90 OK	7.39 OK	4/6	5/5
Enumerator 8	2.01 OK	3.96 OK	5/5	4/5
Enumerator 9	5.04 OK	5.43 OK	5/3	2/8
Enumerator 10	22.62 POOR	28.21 POOR	6/3	4/6

MUAC:

	Precision: Sum of Square [MUAC2-MUAC1]	Accuracy: Sum of Square [Superv.(MUAC1+MUAC2)-Enum.(MUAC1+MUAC2]	No. +/- Precision	No. +/- Accuracy
Supervisor	0.52		6/2	
Enumerator 1	1.22 POOR	3.34 POOR	6/0	1/8
Enumerator 2	1.30 POOR	1.42 OK	6/2	8/2
Enumerator 3	0.71 OK	0.39 OK	0/9	3/6
Enumerator 4	3.01 POOR	24.89 POOR	1/9	0/10
Enumerator 5	0.54 OK	2.42 POOR	6/3	4/6
Enumerator 6	0.11 OK	1.09 OK	4/4	4/6
Enumerator 7	1.11 POOR	2.37 POOR	7/2	3/7
Enumerator 8	0.26 OK	0.76 OK	3/6	4/4
Enumerator 9	0.43 OK	0.99 OK	6/4	6/4
Enumerator 10	0.18 OK	0.96 OK	3/4	3/6

For evaluating the enumerators the precision and the accuracy of their measurements is calculated.

For precision the sum of the square of the differences for the double measurements is calculated. This value should be less than two times the precision value of the supervisor.
For the accuracy the sum of the square of the differences between the enumerator values (weight1+weight2) and the supervisor values (weight1+weight2) is calculated. This value should be less than three times the precision value of the supervisor.
To check for systematic errors of the enumerators the number of positive and negative deviations can be used.

Appendix 3: Result Tables for NCHS growth reference 1977

SITTWE URBAN

Table 3.2: Prevalence of acute malnutrition based on weight-for-height z-scores (and/or oedema) and by sex

	All n = 177	**Boys** n = 85	**Girls** n = 92
Prevalence of global malnutrition **(<-2 z-score and/or oedema)**	(18) 10.2 % (6.5 - 15.5 95% CI)	(10) 11.8 % (6.5 - 20.3 95% CI)	(8) 8.7 % (4.5 - 16.2 95% CI)
Prevalence of moderate malnutrition **(<-2 z-score and >=-3 z-score, no oedema)**	(16) 9.0 % (5.6 - 14.2 95% CI)	(8) 9.4 % (4.8 - 17.5 95% CI)	(8) 8.7 % (4.5 - 16.2 95% CI)
Prevalence of severe malnutrition **(<-3 z-score and/or oedema)**	(2) 1.1 % (0.3 - 4.0 95% CI)	(2) 2.4 % (0.6 - 8.2 95% CI)	(0) 0.0 % (0.0 - 4.0 95% CI)

The prevalence of oedema is 0.0 %

Table 3.3: Prevalence of acute malnutrition by age, based on weight-for-height z-scores 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	35	0	0.0	8	22.9	27	77.1	0	0.0
18-29	50	1	2.0	4	8.0	45	90.0	0	0.0
30-41	32	0	0.0	0	0.0	32	100.0	0	0.0
42-53	47	0	0.0	2	4.3	45	95.7	0	0.0
54-59	12	1	8.3	2	16.7	9	75.0	0	0.0
Total	176	2	1.1	16	9.1	158	89.8	0	0.0

Table 3.4: Distribution of acute malnutrition and oedema based on weight-for-height z-scores

	<-3 z-score	**>=-3 z-score**
Oedema present	Marasmic kwashiorkor	Kwashiorkor

	No. 0 (0.0 %)	No. 0 (0.0 %)
Oedema absent	Marasmic No. 2 (1.1 %)	Not severely malnourished No. 175 (98.9 %)

Table 3.5: Prevalence of acute malnutrition based on MUAC cut off's (and/or oedema) and by sex

	All n = 183	**Boys** n = 89	**Girls** n = 94
Prevalence of global malnutrition (< 125 mm and/or oedema)	(4) 2.2 % (0.9 - 5.5 95% CI)	(1) 1.1 % (0.2 - 6.1 95% CI)	(3) 3.2 % (1.1 - 9.0 95% CI)
Prevalence of moderate malnutrition (< 125 mm and >= 115 mm, no oedema)	(4) 2.2 % (0.9 - 5.5 95% CI)	(1) 1.1 % (0.2 - 6.1 95% CI)	(3) 3.2 % (1.1 - 9.0 95% CI)
Prevalence of severe malnutrition (< 115 mm and/or oedema)	(0) 0.0 % (0.0 - 2.1 95% CI)	(0) 0.0 % (0.0 - 4.1 95% CI)	(0) 0.0 % (0.0 - 3.9 95% CI)

Table 3.6: 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	35	0	0.0	4	11.4	31	88.6	0	0.0
18-29	52	0	0.0	0	0.0	52	100.0	0	0.0
30-41	36	0	0.0	0	0.0	36	100.0	0	0.0
42-53	47	0	0.0	0	0.0	47	100.0	0	0.0
54-59	12	0	0.0	0	0.0	12	100.0	0	0.0
Total	182	0	0.0	4	2.2	178	97.8	0	0.0

Table 3.5: Prevalence of acute malnutrition based on the percentage of the median and/or oedema

	n = 177
Prevalence of global acute malnutrition (<80% and/or oedema)	(12) 6.8 % (3.9 - 11.5 95% CI)
Prevalence of moderate acute malnutrition (<80% and >= 70%, no oedema)	(12) 6.8 % (3.9 - 11.5 95% CI)
Prevalence of severe acute malnutrition (<70% and/or oedema)	(0) 0.0 % (0.0 - 2.1 95% CI)

Table 3.6: 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	35	0	0.0	5	14.3	30	85.7	0	0.0
18-29	50	0	0.0	3	6.0	47	94.0	0	0.0
30-41	32	0	0.0	0	0.0	32	100.0	0	0.0
42-53	47	0	0.0	1	2.1	46	97.9	0	0.0
54-59	12	0	0.0	3	25.0	9	75.0	0	0.0
Total	176	0	0.0	12	6.8	164	93.2	0	0.0

Table 3.7: Prevalence of underweight based on weight-for-age z-scores by sex

	All n = 179	**Boys** n = 88	**Girls** n = 91
Prevalence of underweight (<-2 z-score)	(82) 45.8 % (38.7 - 53.1 95% CI)	(38) 43.2 % (33.3 - 53.6 95% CI)	(44) 48.4 % (38.4 - 58.5 95% CI)
Prevalence of moderate underweight (<-2 z-score and >=-3 z-score)	(73) 40.8 % (33.8 - 48.1 95% CI)	(34) 38.6 % (29.1 - 49.1 95% CI)	(39) 42.9 % (33.2 - 53.1 95% CI)
Prevalence of severe underweight (<-3 z-score)	(9) 5.0 % (2.7 - 9.3 95% CI)	(4) 4.5 % (1.8 - 11.1 95% CI)	(5) 5.5 % (2.4 - 12.2 95% CI)

Table 3.8: 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)**		**Oedema**	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	34	3	8.8	12	35.3	19	55.9	0	0.0
18-29	51	4	7.8	22	43.1	25	49.0	0	0.0
30-41	35	0	0.0	13	37.1	22	62.9	0	0.0
42-53	47	1	2.1	20	42.6	26	55.3	0	0.0

54-59	12	1	8.3	6	50.0	5	41.7	0	0.0
Total	179	9	5.0	73	40.8	97	54.2	0	0.0

Table 3.9: Prevalence of stunting based on height-for-age z-scores and by sex

	All n = 174	**Boys** n = 84	**Girls** n = 90
Prevalence of stunting **(<-2 z-score)**	(60) 34.5 % (27.8 - 41.8 95% CI)	(31) 36.9 % (27.4 - 47.6 95% CI)	(29) 32.2 % (23.5 - 42.4 95% CI)
Prevalence of moderate stunting **(<-2 z-score and >=-3 z-score)**	(44) 25.3 % (19.4 - 32.2 95% CI)	(24) 28.6 % (20.0 - 39.0 95% CI)	(20) 22.2 % (14.9 - 31.8 95% CI)
Prevalence of severe stunting **(<-3 z-score)**	(16) 9.2 % (5.7 - 14.4 95% CI)	(7) 8.3 % (4.1 - 16.2 95% CI)	(9) 10.0 % (5.4 - 17.9 95% CI)

Table 3.10: 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	35	0	0.0	5	14.3	30	85.7
18-29	49	5	10.2	12	24.5	32	65.3
30-41	32	1	3.1	11	34.4	20	62.5
42-53	46	5	10.9	15	32.6	26	56.5
54-59	12	5	41.7	1	8.3	6	50.0
Total	174	16	9.2	44	25.3	114	65.5

Table 3.11: Prevalence of overweight based on weight for height cut off's and by sex (no oedema)

	All n = 177	**Boys** n = 85	**Girls** n = 92
Prevalence of overweight (WHZ > 2)	(0) 0.0 % (0.0 - 2.1 95% CI)	(0) 0.0 % (0.0 - 4.3 95% CI)	(0) 0.0 % (0.0 - 4.0 95% CI)
Prevalence of severe overweight (WHZ > 3)	(0) 0.0 % (0.0 - 2.1 95% CI)	(0) 0.0 % (0.0 - 4.3 95% CI)	(0) 0.0 % (0.0 - 4.0 95% CI)

Table 3.12: Prevalence of overweight by age, based on weight for height (no oedema)

		Overweight (WHZ > 2)	**Severe Overweight (WHZ > 3)**		
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**
6-17	35	0	0.0	0	0.0
18-29	50	0	0.0	0	0.0
30-41	32	0	0.0	0	0.0

42-53	47	0	0.0	0	0.0
54-59	12	0	0.0	0	0.0
Total	176	0	0.0	0	0.0

Table 3.13: 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	177	-0.98±0.83	1.00	13	0
Weight-for-Age	179	-1.77±0.90	1.00	10	1
Height-for-Age	174	-1.58±1.07	1.00	13	3

* contains for WHZ and WAZ the children with edema.

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Table 3.2: Prevalence of acute malnutrition based on weight-for-height z-scores (and/or oedema) and by sex

	All n = 352	**Boys** n = 188	**Girls** n = 164
Prevalence of global malnutrition (<-2 z-score and/or oedema)	(45) 12.8 % (9.7 - 16.7 95% CI)	(22) 11.7 % (7.9 - 17.1 95% CI)	(23) 14.0 % (9.5 - 20.2 95% CI)
Prevalence of moderate malnutrition (<-2 z-score and >=-3 z-score, no oedema)	(42) 11.9 % (8.9 - 15.7 95% CI)	(20) 10.6 % (7.0 - 15.9 95% CI)	(22) 13.4 % (9.0 - 19.5 95% CI)
Prevalence of severe malnutrition (<-3 z-score and/or oedema)	(3) 0.9 % (0.3 - 2.5 95% CI)	(2) 1.1 % (0.3 - 3.8 95% CI)	(1) 0.6 % (0.1 - 3.4 95% CI)

The prevalence of oedema is 0.0 %

Table 3.3: Prevalence of acute malnutrition by age, based on weight-for-height z-scores 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	70	0	0.0	7	10.0	63	90.0	0	0.0
18-29	95	1	1.1	19	20.0	75	78.9	0	0.0
30-41	96	0	0.0	9	9.4	87	90.6	0	0.0
42-53	72	2	2.8	4	5.6	66	91.7	0	0.0
54-59	19	0	0.0	3	15.8	16	84.2	0	0.0
Total	352	3	0.9	42	11.9	307	87.2	0	0.0

Table 3.4: 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. 3 (0.8 %)	Not severely malnourished No. 351 (99.2 %)

Table 3.5: Prevalence of acute malnutrition based on MUAC cut off's (and/or oedema) and by sex

	All n = 355	Boys n = 190	Girls n = 165
Prevalence of global malnutrition (< 125 mm and/or oedema)	(12) 3.4 % (1.9 - 5.8 95% CI)	(1) 0.5 % (0.1 - 2.9 95% CI)	(11) 6.7 % (3.8 - 11.5 95% CI)
Prevalence of moderate malnutrition (< 125 mm and >= 115 mm, no oedema)	(10) 2.8 % (1.5 - 5.1 95% CI)	(0) 0.0 % (0.0 - 2.0 95% CI)	(10) 6.1 % (3.3 - 10.8 95% CI)
Prevalence of severe malnutrition (< 115 mm and/or oedema)	(2) 0.6 % (0.2 - 2.0 95% CI)	(1) 0.5 % (0.1 - 2.9 95% CI)	(1) 0.6 % (0.1 - 3.4 95% CI)

Table 3.6: 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	70	2	2.9	5	7.1	63	90.0	0	0.0
18-29	96	0	0.0	5	5.2	91	94.8	0	0.0
30-41	96	0	0.0	0	0.0	96	100.0	0	0.0
42-53	74	0	0.0	0	0.0	74	100.0	0	0.0
54-59	19	0	0.0	0	0.0	19	100.0	0	0.0
Total	355	2	0.6	10	2.8	343	96.6	0	0.0

Table 3.5: Prevalence of acute malnutrition based on the percentage of the median and/or oedema

	n = 352
Prevalence of global acute malnutrition (<80% and/or oedema)	(18) 5.1 % (3.3 - 7.9 95% CI)
Prevalence of moderate acute malnutrition (<80% and >= 70%, no oedema)	(16) 4.5 % (2.8 - 7.3 95% CI)
Prevalence of severe acute malnutrition (<70% and/or oedema)	(2) 0.6 % (0.2 - 2.0 95% CI)

Table 3.6: 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	70	0	0.0	5	7.1	65	92.9	0	0.0
18-	95	1	1.1	8	8.4	86	90.5	0	0.0

29									
30-41	96	0	0.0	1	1.0	95	99.0	0	0.0
42-53	72	1	1.4	2	2.8	69	95.8	0	0.0
54-59	19	0	0.0	0	0.0	19	100.0	0	0.0
Total	352	2	0.6	16	4.5	334	94.9	0	0.0

Table 3.7: Prevalence of underweight based on weight-for-age z-scores by sex

	All n = 355	**Boys** n = 189	**Girls** n = 166
Prevalence of underweight (<-2 z-score)	(149) 42.0 % (37.0 - 47.2 95% CI)	(79) 41.8 % (35.0 - 48.9 95% CI)	(70) 42.2 % (34.9 - 49.8 95% CI)
Prevalence of moderate underweight (<-2 z-score and >=-3 z-score)	(128) 36.1 % (31.2 - 41.2 95% CI)	(69) 36.5 % (30.0 - 43.6 95% CI)	(59) 35.5 % (28.7 - 43.1 95% CI)
Prevalence of severe underweight (<-3 z-score)	(21) 5.9 % (3.9 - 8.9 95% CI)	(10) 5.3 % (2.9 - 9.5 95% CI)	(11) 6.6 % (3.7 - 11.5 95% CI)

Table 3.8: 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)**	**Oedema**				
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	71	2	2.8	24	33.8	45	63.4	0	0.0
18-29	96	10	10.4	32	33.3	54	56.3	0	0.0
30-41	96	3	3.1	34	35.4	59	61.5	0	0.0
42-53	73	4	5.5	31	42.5	38	52.1	0	0.0
54-59	19	2	10.5	7	36.8	10	52.6	0	0.0
Total	355	21	5.9	128	36.1	206	58.0	0	0.0

Table 3.9: Prevalence of stunting based on height-for-age z-scores and by sex

	All n = 343	**Boys** n = 184	**Girls** n = 159
Prevalence of stunting (<-2 z-score)	(127) 37.0 % (32.1 - 42.3 95% CI)	(66) 35.9 % (29.3 - 43.0 95% CI)	(61) 38.4 % (31.2 - 46.1 95% CI)
Prevalence of moderate stunting (<-2 z-score and >=-3 z-score)	(80) 23.3 % (19.2 - 28.1 95% CI)	(40) 21.7 % (16.4 - 28.2 95% CI)	(40) 25.2 % (19.1 - 32.4 95% CI)
Prevalence of severe stunting (<-3 z-score)	(47) 13.7 % (10.5 - 17.7 95% CI)	(26) 14.1 % (9.8 - 19.9 95% CI)	(21) 13.2 % (8.8 - 19.3 95% CI)

Table 3.10: 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	69	3	4.3	13	18.8	53	76.8
18-29	95	10	10.5	23	24.2	62	65.3
30-41	90	14	15.6	21	23.3	55	61.1
42-53	70	16	22.9	16	22.9	38	54.3
54-59	19	4	21.1	7	36.8	8	42.1
Total	343	47	13.7	80	23.3	216	63.0

Table 3.11: Prevalence of overweight based on weight for height cut off's and by sex (no oedema)

	All n = 352	**Boys** n = 188	**Girls** n = 164
Prevalence of overweight (WHZ > 2)	(0) 0.0 % (0.0 - 1.1 95% CI)	(0) 0.0 % (0.0 - 2.0 95% CI)	(0) 0.0 % (0.0 - 2.3 95% CI)
Prevalence of severe overweight (WHZ > 3)	(0) 0.0 % (0.0 - 1.1 95% CI)	(0) 0.0 % (0.0 - 2.0 95% CI)	(0) 0.0 % (0.0 - 2.3 95% CI)

: Prevalence of overweight by age, based on weight for height (no oedema)

		Overweight (WHZ > 2)		Severe Overweight (WHZ > 3)	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**
6-17	70	0	0.0	0	0.0
18-29	95	0	0.0	0	0.0
30-41	96	0	0.0	0	0.0
42-53	72	0	0.0	0	0.0
54-59	19	0	0.0	0	0.0
Total	352	0	0.0	0	0.0

Table 3.13: 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	352	-1.07±0.81	1.00	3	2
Weight-for-Age	355	-1.73±0.93	1.00	2	0
Height-for-Age	343	-1.51±1.28	1.00	3	11

* contains for WHZ and WAZ the children with edema.

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Table 3.2: Prevalence of acute malnutrition based on weight-for-height z-scores (and/or oedema) and by sex

	All n = 275	**Boys** n = 141	**Girls** n = 134
Prevalence of global malnutrition (<-2 z-score and/or oedema)	(40) 14.5 % (10.9 - 19.2 95% CI)	(24) 17.0 % (11.7 - 24.1 95% CI)	(16) 11.9 % (7.5 - 18.5 95% CI)
Prevalence of moderate malnutrition	(40) 14.5 %	(24) 17.0 %	(16) 11.9 %

(<-2 z-score and >=-3 z-score, no oedema)	(10.9 - 19.2 95% CI)	(11.7 - 24.1 95% CI)	(7.5 - 18.5 95% CI)
Prevalence of severe malnutrition (<-3 z-score and/or oedema)	(0) 0.0 % (0.0 - 1.4 95% CI)	(0) 0.0 % (0.0 - 2.7 95% CI)	(0) 0.0 % (0.0 - 2.8 95% CI)

The prevalence of oedema is 0.0 %

Table 3.3: Prevalence of acute malnutrition by age, based on weight-for-height z-scores 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	51	0	0.0	8	15.7	43	84.3	0	0.0
18-29	62	0	0.0	5	8.1	57	91.9	0	0.0
30-41	76	0	0.0	10	13.2	66	86.8	0	0.0
42-53	71	0	0.0	14	19.7	57	80.3	0	0.0
54-59	15	0	0.0	3	20.0	12	80.0	0	0.0
Total	275	0	0.0	40	14.5	235	85.5	0	0.0

Table 3.4: 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. 0 (0.0 %)	Not severely malnourished No. 275 (100.0 %)

Table 3.5: Prevalence of acute malnutrition based on MUAC cut off's (and/or oedema) and by sex

	All n = 278	**Boys** n = 142	**Girls** n = 136
Prevalence of global malnutrition (< 125 mm and/or oedema)	(15) 5.4 % (3.3 - 8.7 95% CI)	(6) 4.2 % (2.0 - 8.9 95% CI)	(9) 6.6 % (3.5 - 12.1 95% CI)
Prevalence of moderate malnutrition (< 125 mm and >= 115 mm, no oedema)	(11) 4.0 % (2.2 - 6.9 95% CI)	(6) 4.2 % (2.0 - 8.9 95% CI)	(5) 3.7 % (1.6 - 8.3 95% CI)
Prevalence of severe malnutrition (< 115 mm and/or oedema)	(4) 1.4 % (0.6 - 3.6 95% CI)	(0) 0.0 % (0.0 - 2.6 95% CI)	(4) 2.9 % (1.1 - 7.3 95% CI)

Table 3.6: 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	52	0	0.0	7	13.5	45	86.5	0	0.0
18-29	63	2	3.2	3	4.8	58	92.1	0	0.0
30-41	76	0	0.0	0	0.0	76	100.0	0	0.0
42-53	72	1	1.4	1	1.4	70	97.2	0	0.0
54-59	15	1	6.7	0	0.0	14	93.3	0	0.0

Total	278	4	1.4	11	4.0	263	94.6	0	0.0

Table 3.5: Prevalence of acute malnutrition based on the percentage of the median and/or oedema

	n = 275
Prevalence of global acute malnutrition (<80% and/or oedema)	(21) 7.6 % (5.0 - 11.4 95% CI)
Prevalence of moderate acute malnutrition (<80% and >= 70%, no oedema)	(21) 7.6 % (5.0 - 11.4 95% CI)
Prevalence of severe acute malnutrition (<70% and/or oedema)	(0) 0.0 % (0.0 - 1.4 95% CI)

Table 3.6: 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	51	0	0.0	5	9.8	46	90.2	0	0.0
18-29	62	0	0.0	5	8.1	57	91.9	0	0.0
30-41	76	0	0.0	5	6.6	71	93.4	0	0.0
42-53	71	0	0.0	4	5.6	67	94.4	0	0.0
54-59	15	0	0.0	2	13.3	13	86.7	0	0.0
Total	275	0	0.0	21	7.6	254	92.4	0	0.0

Table 3.7: Prevalence of underweight based on weight-for-age z-scores by sex

	All n = 277	**Boys** n = 142	**Girls** n = 135
Prevalence of underweight (<-2 z-score)	(149) 53.8 % (47.9 - 59.6 95% CI)	(73) 51.4 % (43.3 - 59.5 95% CI)	(76) 56.3 % (47.9 - 64.4 95% CI)
Prevalence of moderate underweight (<-2 z-score and >=-3 z-score)	(96) 34.7 % (29.3 - 40.4 95% CI)	(43) 30.3 % (23.3 - 38.3 95% CI)	(53) 39.3 % (31.4 - 47.7 95% CI)
Prevalence of severe underweight (<-3 z-score)	(53) 19.1 % (14.9 - 24.2 95% CI)	(30) 21.1 % (15.2 - 28.6 95% CI)	(23) 17.0 % (11.6 - 24.3 95% CI)

Table 3.8: 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)**		**Oedema**	
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	52	12	23.1	17	32.7	23	44.2	0	0.0
18-29	63	17	27.0	26	41.3	20	31.7	0	0.0
30-41	75	12	16.0	27	36.0	36	48.0	0	0.0
42-53	72	9	12.5	23	31.9	40	55.6	0	0.0
54-59	15	3	20.0	3	20.0	9	60.0	0	0.0
Total	277	53	19.1	96	34.7	128	46.2	0	0.0

Table 3.9: Prevalence of stunting based on height-for-age z-scores and by sex

	All n = 266	Boys n = 136	Girls n = 130
Prevalence of stunting (<-2 z-score)	(125) 47.0 % (41.1 - 53.0 95% CI)	(64) 47.1 % (38.9 - 55.4 95% CI)	(61) 46.9 % (38.6 - 55.5 95% CI)
Prevalence of moderate stunting (<-2 z-score and >=-3 z-score)	(62) 23.3 % (18.6 - 28.7 95% CI)	(29) 21.3 % (15.3 - 28.9 95% CI)	(33) 25.4 % (18.7 - 33.5 95% CI)
Prevalence of severe stunting (<-3 z-score)	(63) 23.7 % (19.0 - 29.1 95% CI)	(35) 25.7 % (19.1 - 33.7 95% CI)	(28) 21.5 % (15.3 - 29.4 95% CI)

Table 3.10: 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	48	9	18.8	13	27.1	26	54.2
18-29	60	22	36.7	20	33.3	18	30.0
30-41	72	16	22.2	18	25.0	38	52.8
42-53	71	13	18.3	8	11.3	50	70.4
54-59	15	3	20.0	3	20.0	9	60.0
Total	266	63	23.7	62	23.3	141	53.0

Table 3.11: Prevalence of overweight based on weight for height cut off's and by sex (no oedema)

	All n = 275	Boys n = 141	Girls n = 134
Prevalence of overweight (WHZ > 2)	(0) 0.0 % (0.0 - 1.4 95% CI)	(0) 0.0 % (0.0 - 2.7 95% CI)	(0) 0.0 % (0.0 - 2.8 95% CI)
Prevalence of severe overweight (WHZ > 3)	(0) 0.0 % (0.0 - 1.4 95% CI)	(0) 0.0 % (0.0 - 2.7 95% CI)	(0) 0.0 % (0.0 - 2.8 95% CI)

Table 3.12: Prevalence of overweight by age, based on weight for height (no oedema)

		Overweight (WHZ > 2)	**Severe Overweight (WHZ > 3)**		
Age (mo)	**Total no.**	**No.**	**%**	**No.**	**%**
6-17	51	0	0.0	0	0.0
18-29	62	0	0.0	0	0.0
30-41	76	0	0.0	0	0.0
42-53	71	0	0.0	0	0.0
54-59	15	0	0.0	0	0.0
Total	275	0	0.0	0	0.0

Table 3.13: 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	275	-1.23±0.71	1.00	4	0
Weight-for-Age	277	-2.09±0.96	1.00	1	1

Height-for-Age	266	-1.84±1.35	1.00	4	9

* contains for WHZ and WAZ the children with edema.

Appendix 4: Local Events Calendars