FINAL REPORT
ANTHROPOMETRY AND RETROSPECTIVE MORTALITY SURVEY

MAIWUT COUNTY, UPPER NILE STATE, REPEBLIC OF SOUTH SUDAN

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List of abbreviation

ANC	Ante Natal Care
ARI	Acute Respiratory Infection
ART	Antiretroviral therapy
BCG	Bacillus Calmette–Guérin
CHF	Common Humanitarian Fund
CI	Confidence Interval
CLTS	Community-led total sanitation
cm	centimetre
CMR	Crude Mortality Rate
DBC	Designing behaviour change
DPT	Diphtheria, Pertussis, Tetanus
ECHO	European Commission's Humanitarian Aid and Civil Protection department
ENA	Emergency Nutrition Assessment
EPI	Extended Programme of Immunisation
FP	Family planning
GAM	Global Acute Malnutrition
GFD	General Food distribution
GoSS	Government of South Sudan
HAZ	Height-for-age z-scores
HFA	Height for Age
HIV	Human Immunodeficiency Virus
HH	Household
ID	Index of Distribution
IDP	Internally Displaced Person
IPSE	Innovative, progressive, successful entrepreneurs
IRS	Indoor residual spraying
ITN	Insecticide treated net
IYCF	Infant and young child feeding
kg	kilogram
LLITN	Long Lasting Insecticide Treated Net
mm	millimetre
MoH	Ministry of Health
MTCT	Mother to child transmission
MUAC	Mid Upper Arm Circumference
N	Total number
n	Number in sub group
NCHS	National Center For Health Statistics
NFI	Non Food Items

NGOs	Non-Government Organizations
NIPP	Nutrition impact positive practice
OFDA	Office of US Foreign Disaster Assistance
OPV	Oral polio vaccine
ORS	Oral Rehydration Salts
OTP	Outpatient therapeutic Programme
Penta	Pentavalent
PHC	Primary health care
PHCC	Primary health care centre
PHCU	Primary health care unit
PNC	Post Natal Care
PPS	Probability proportion to size
ROSS	Relief Organization of South Sudan
SAM	Severe Acute Malnutrition
SD	Standard Deviation
SFP	Supplementary feeding programme
SMART	Standardized Monitoring and Assessment of Relief and Transitions
SS	South Sudan
RRC	Relief and Rehabilitation Commission
U5MR	Under Five Mortality Rate
UN	United Nations
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
UNISFA	*United Nations Interim Security Force for Maiwut*
WASH	Water and Sanitation/ Hygiene programme
WAZ	Weight-for-age z-scores
WFP	World Food Programme
WFH	Weight For Height
WHO	World Health Organization
WHZ	Weight-for-height z-scores

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Executive Summary

Maiwut is a county in Upper Nile State. The name 'Maiwut' is also being shared by the town of Maiwut; the administrative council of county. Located at the border between Ethiopia and South Sudan, which is in the eastern-most of South Sudan along Ethiopian border.

The area is the home of variety speakers of Nilo-Saharan languages such as the Nuer and Burun/Majangir as well as their Anyuak brothers/sisters on the side of Ethiopia. The Nuer who lives in Pagak County are eastern Jikany branch, consisting of Gaatjaak, Gaatguang and Gaatjiok. These clans are the majority of the Nuer who live in the Upper Nile region of South Sudan

The county is characterized by deep, fertile clay plains and loamy soils. It is prone to seasonal flooding owing to the large swamps that cover much of the area. Livestock keeping and trade are far more prominent here. In addition to the traditional rain-fed farming, highly adaptive recessional agricultural farming is also practiced.
In a typical year, the dry season in Maiwut extends from November to April, followed by the start of heavy rains between May and June which extend through September and begin to dissipate October marking the end of rainy season.

In a typical year, cultivation starts at the onset of rain in May and continues through June and July. Sorghum and maize are the two varieties of crops grown and are planted at different times in order to spread risk and ensure cereal availability at different times during the year. Short-term varieties are planted in May and harvested August. Medium-term varieties are planted in June and harvested in October and/or November. Finally, long-term varieties are planted in June and/or July and harvested in November and/or December. The annual hunger gap typically extends from the point at which stocks from the November/December harvest are exhausted until August when short-term varieties are harvested.

Standardized Monitoring and Assessment of Relief and Transition (SMART) methodology was employed to undertake the nutrition and retrospective mortality survey in Maiwut County. The SMART methodology provides a basic integrated method for assessing nutritional status and mortality rate in emergency situations. It provides the basis for understanding the magnitude and severity of humanitarian crises.

Sample size was calculated using ENA for SMART, July 2015, with an expected 15.3% prevalence of malnutrition. A standard 4.7% precision was used with a design effect of 1.48 was used to inflate sample size estimates and to compensate for possible bias resulting from cluster sampling. Other factors were used such as an average household size of 7.1 and under-five year old children were estimated at 16.8% of the population. Five present was then added for non-response households, giving a sample size of 363 children, estimated to be found through visiting 358 households.

Similarly, a two stage cluster sampling was also used to estimate mortality rates. The sample size for the mortality survey was calculated using the ENA for SMART, July 2015 version. Crude Mortality Rate (CMR) of 0.36 was estimated to reflect retrospectively the morality rate in the County with a precision of 0.3 and a design effect of 1.3. The average household size was entered as 7.1. On top of this 5% was used for potential non-response households.

The sample sizes of households determined for Anthropometry and Mortality were different. In Mortality 358 households were determined whereas in Anthropometry it was 356. Therefore, 358 households were considered for both the Anthropometry and Mortality data collection for consistency. Twelve households were visited per cluster for both anthropometry and mortality survey. At the end of the survey, 458 children were measured in 30 clustered villages through visiting 344 households. Sixteen households reported as absent.

Table 1: Summary of survey findings

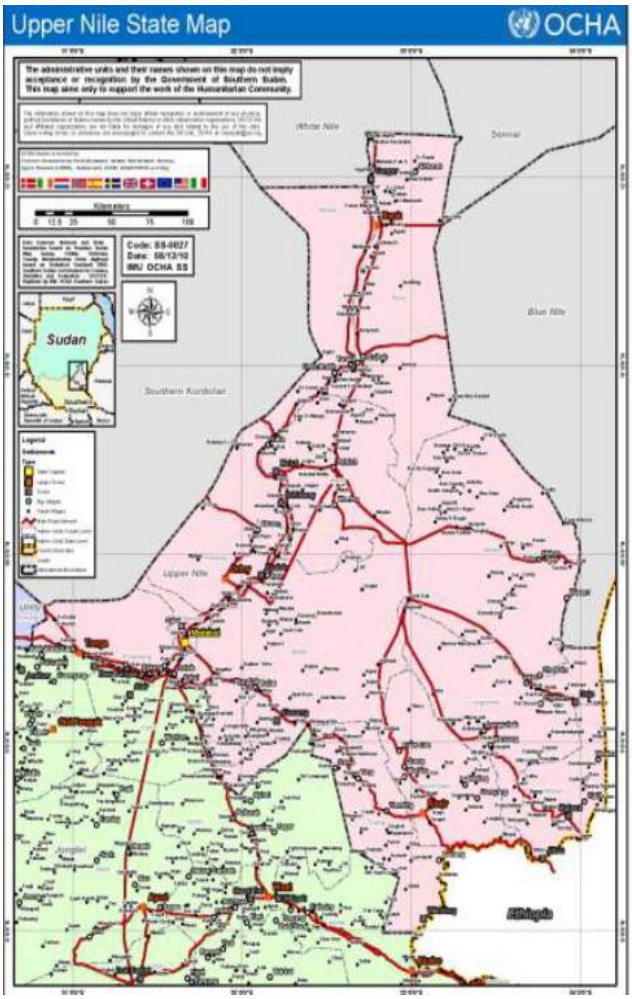
Anthropometry - Children 6-59 months based on WHO 2006 standard		
Index	**Indicator**	**Percent**
WHZ- scores	Prevalence of global malnutrition (<-2 z-score and/or oedema)	(109) 24.0 % (20.6 - 27.7 95% CI)
	Prevalence of moderate malnutrition (<-2 z-score and >=-3 z-score, no oedema)	(92) 20.2 % (17.1 - 23.8 95% CI)
	Prevalence of severe malnutrition (<-3 z-score and/or oedema)	(17) 3.7 % (2.5 - 5.5 95% CI)
WAZ- scores	Prevalence of underweight (<-2 z-score)	(126) 28.1 % (22.6 - 34.3 95% C.I.)
	Prevalence of moderate underweight (<-2 z-score and >=-3 z-score)	(94) 20.9 % (16.0 - 26.9 95% C.I.)
	Prevalence of severe underweight (<-3 z-score)	(32) 7.1 % (4.9 - 10.3 95% C.I.)
HAZ-scores	Prevalence of stunting (<-2 z-score)	(86) 19.8 % (15.6 - 24.8 95% C.I.)
	Prevalence of moderate stunting (<-2 z-score and >=-3 z-score)	(61) 14.1 % (11.0 - 17.9 95% C.I.)
	Prevalence of severe stunting (<-3 z-score)	(25) 5.8 % (3.9 - 8.5 95% C.I.)
MUAC	Prevalence of global malnutrition (< 125 mm and/or oedema)	(81) 17.7 % (13.7 - 22.6 95% CI)
	Prevalence of moderate malnutrition (< 125 mm and >= 110 mm, no oedema)	(72) 15.7 % (11.9 - 20.5 95% CI)
	Prevalence of severe malnutrition (< 115 mm and/or oedema)	(9) 2.0 % (1.1 - 3.5 95% CI)
Mortality, retrospectively	90 days recall period	
Mortality	CMR Deaths/10,000 people/day	(n= 11) 54 (0.31-0.95)
	U5 MR Deaths/10,000 children U5/day	(n= 2) 0.61 (0.15 -2.52)
Measles and BCG and vitamin A supplementation	Measles (N= 434) card + mother confirmation	(n= 271) 62.4% (57.7-67)
	BCG (N= 458)	(n= 290) 63.3% (58.7-67.7)
	Vitamin A (N+ 458)	(n= 218) 47.6% (43.0-52.3)
Reported illness		(n= 274) 60.3% (55.6-64.7)
Types of illness	Malaria/fever	(n= 99) 35.9% (30.2-41.8)
	Diarrhoea	(n= 105) 38% (32.2-44.1)
	Cough/difficulty of breathing	(n= 38) 13.8% (9.9-18.4)
	Skin infection	(n= 12) 4.3% (2.3-7.5)
	Eye infection	(n= 20) 7.2% (4.5-11.0)
Health seeking behaviour		
Treatment sought	None sought	(n= 29) 10.5% (7.2-14.7)
	Hospital	(n= 53 19.2% (14.5-24.4)
	PHCC/PHCU	(n= 192) 69.6% (63.8-74.9)
	Bought drugs from shop/market	(n= 1) 0.4% (0.0-2.0)
	Bought drugs from pharmacy	(n= 1) 0.4% (0.0-2.0)

1.0 Background

Maiwut is a county in Upper Nile State. The name 'Maiwut' is also being shared by the town of Maiwut; the administrative council of county. Located at the border between Ethiopia and South Sudan, which is in the eastern-most of South Sudan along Ethiopian border.

The area is the home of variety speakers of Nilo-Saharan languages such as the Nuer and Burun/Majangir as well as their Anyuak brothers/sisters on the side of Ethiopia. The Nuer who lives in Pagak County are eastern Jikany branch, consisting of Gaatjaak, Gaatguang and Gaatjiok. These clans are the majority of the Nuer who live in the Upper Nile region of South Sudan

Figure 1: Map of Upper Nile State



The county is characterized by deep, fertile clay plains and loamy soils. It is prone to seasonal flooding owing to the large swamps that cover much of the area. Livestock keeping and trade are far more prominent here. In addition to the traditional rain-fed farming, highly adaptive recessional agricultural farming is also practiced.

In a typical year, the dry season in Maiwut extends from November to April, followed by the start of heavy rains between May and June which extend through September and begin to dissipate October marking the end of rainy season.

In a typical year, cultivation starts at the onset of rain in May and continues through June and July. Sorghum and maize are the two varieties of crops grown and are planted at different times in order to spread risk and ensure cereal availability at different times during the year. Short-term varieties are planted in May and harvested August. Medium-term varieties are planted in June and harvested in October and/or November. Finally, long-term varieties are planted in June and/or July and harvested in November and/or December. The annual hunger gap typically extends from the point at which stocks from the November/December harvest are exhausted until August when short-term varieties are harvested.

The humanitarian situation in Maiwut remains perilous as a result of the protracted conflict that erupted in December 2013. Despite the signing of a peace agreement in August, there are still high levels of displacement and insecurity. An unusually dry rainy season and historically high food prices compound the negative impacts of the protracted conflict on food security. The area continues to suffer from the dual impact of high numbers of IDPs and a high IPC classification, with Level 3 (Crisis) projected for January-March. As Pagak, Maiwut County is one of the two most common entry points into Ethiopia, the area hosts both IDP settlements and IDPs seeking refugee status across the boarder – in one month of 2015, reaching an

average of 45 entries a day. The influx of people continues to stretch the capacity of existing infrastructure and services, including boreholes and health and nutrition facilities.

Performance against health indicators remains poor, as most primary health care facilities lack a functional cold chain. Cultural stigma surrounding modern child spacing, and strong preferences for home births continue to hinder gains in maternal and natal health. As with the rest of South Sudan, malaria, diarrhea, and acute respiratory illnesses are the three most common morbidities in children under five. Rampant open defecation (97.2% in June 2015 survey), coupled with poor handwashing practices (55% wash at three of five critical times, and 74% wash with water only), contributes to high rates of diahrrea. Furthermore, the heavy rains which turn much of the county into swamp land make health facilities inaccessible for some isolated communities – and also foster the rise of malaria-carrying mosquitos.

1.1 GOAL Programme Activities

Table 2: Summary of activities carried out by GOAL in Maiwut

Area	Activities
Health	✓ Curative and emergency care services in all health facilities ✓ Routine ANC, de-worming, basic EmOC in PHCCs and referral services in PHCUs ✓ Provision of home delivery kits to pregnant women visiting ANCs ✓ Trainings and refresher trainings for health-care staffs ✓ Training and mainstreaming of HIV TOTs to all GOAL programme staff ✓ Construction and rehabilitation of clinics and training facilities ✓ Training CHCs in basic health promotion strategies
Nutrition	✓ Promotion of breastfeeding in the county ✓ Improvement of complementary feeding through cookery demonstrations and nutrition education ✓ Establishment and strengthening of OTP sites in PHCCs, PHCUs and Outreaches ✓ Training CHPs, TBAs and clinic staff in running SFPs and OTPs ✓ Establishment of Nutritional Impact of Positive Practice (NIPP) Circles in the community
WASH	✓ Construction and rehabilitation of new water points, household latrines, public latrines, incinerators and rain water harvesting in collaboration with local authorities and communities ✓ Facilitate establishment, training and support for Water User Committees and hand pump caretakers ✓ Facilitate selection, support on, training, support and monitoring of water Super Technicians ✓ Technical and logistical support to the County Rural Water Department ✓ Promotion of optimal WASH practices in the county

1.2 Other Agencies currently working in Maiwut

. CARE: Working on food security and livelihood and peace building.

NPA (Norwegian people aid): General food distribution

ADRA (Adventist development relief project): they are supporting primary school including school feeding roof catchment or catching the rain water harvest used for household consumption.

Relief International (RI)
Working on food security and livelihood and distribution seeds and farm tools for the agro-pastoral communities working with farmer groups.

ICRC: Secondary health care and also managing the hospital.

2.0 General objectives

No SMART survey has been conducted in the county before, and thus GOAL has conducted full SMART survey in Maiwut to assess the current food security, health and nutrition situation of the population in order to better understand the existing situation of the population to inform programing and humanitarian response/need.

2.1 Specific objectives

- To assess the overall prevalence of malnutrition in the survey area;
- To estimate the immunization coverage of measles, BCG and vitamin A supplementation of children under five years of age
- To estimate retrospective under-five and crude mortality rates in the three months prior to the survey time;
- To assess the morbidity of children under five years during the two weeks prior to the survey time and treatment seeking practices;
- To assess infant and young child feeding practices among children less than 24 months of age;
- To assess household conditions of health, water and sanitation, and livelihood issues;
- To assess contextual factors associated with malnutrition
- To make recommendations to assist in present and future programme planning.

3.0 Methodology

Standardized Monitoring and Assessment of Relief and Transition (SMART) methodology was employed to undertake the nutrition and retrospective mortality survey in Maiwut County. The SMART methodology provides a basic integrated method for assessing nutritional status and mortality rate in emergency situations. It provides the basis for understanding the magnitude and severity of humanitarian crises. In this survey the Anthropometric measurements and Mortality assessments were undertaken simultaneously. In addition, food security & livelihoods and WASH, reproductive health and general health data were collected from households to give a glimpse of the underlying causes of malnutrition in the area.

3.1 Survey design

A two-stage cluster sampling approach based on a population sampling frame probability proportion to size (PPS) of all smallest rural villages was used as per SMART survey methodology.

3.1.1 Sample size calculation

Table 3: Sample size calculation for Anthropometry and Mortality

Parameters/values	Anthropometric survey	Mortality survey	Remark
Estimated prevalence	15.3%[1]	0.36[2]	Rapid SMART May 2015
± Desired precision	4.7	0.3	
Design effect	1.48	1.3	Rapid SMART May 2015
Recall period in days		90	
Percent of U5 children	16.8%		Rapid SMART May 2015
Average household size	7.1	7.1	Rapid SMART May 2015
Percent of non-responsive households	5%	5%	
Sample size	363 children and 356 HHs	2416 people 358 HHs	

3.1.2 Sample size for Anthropometry data

Sample size was calculated using ENA for SMART, July 2015, with an expected 15.3% prevalence of malnutrition. A standard 4.7% precision was used with a design effect of 1.48 was used to inflate sample size estimates and to compensate for possible bias resulting from cluster sampling. Other factors were used such as an average household size of 7.1 and under-five year old children were estimated at 16.8% of the population. Five present was then added for non-response households, giving a sample size of 363 children, estimated to be found through visiting 358 households.

[1] Point prevalence of Rapid SMART, GAM 15.3% (95% CI 11.4-20.2) May 2015 GOAL Ulang Upper Nile
[2] Point mortality rate, CMR 0.36 (95% CI 0.18-0.74), May 2015 GOAL, Ulang Upper Nile

3.1.3 Sample size for mortality data

Similarly, a two stage cluster sampling was also used to estimate mortality rates. The sample size for the mortality survey was calculated using the ENA for SMART, July 2015 version. Crude Mortality Rate (CMR) of 0.36 was estimated to reflect retrospectively the morality rate in the County with a precision of 0.3 and a design effect of 1.3. The average household size was entered as 7.1. On top of this 5% was used for potential non-response households.

The sample sizes of households determined for Anthropometry and Mortality were different. In Mortality 358 households were determined whereas in Anthropometry it was 356. Therefore, 358 households were considered for both the Anthropometry and Mortality data collection for consistency. Twelve households were visited per cluster for both anthropometry and mortality survey. At the end of the survey, 458 children were measured in 30 clustered villages through visiting 344 households. Sixteen households reported as absent.

Retrospective mortality rates were estimated using a recall period of 90 days. 10th December 2015 (two weeks before Christmas) was the start date of the recall period.

3.2 Cluster assignment /selection

A cross sectional, two-stage cluster survey was employed to collect nutritional and mortality data as well as contextual data. The Emergency Nutrition Assessment (ENA) for Standardized Monitoring of Relief and Transitions (SMART), July 2015 version was used to determine the sample size using the updated village-level population data of the County.

Clusters were assigned using ENA for SMART, July 2015 version. The villages included in the sample frame were entered into the software with their population numbers. The SMART software then randomly assigned clusters, with the chance of each village being chosen proportional to its population size (PPS). Using this technique allows every village to have the same probability of being selected. In order for a survey to be truly representative, every member of the population must have an equal chance of being chosen. Please refer the cluster assignment in Appendix 2:.

3.3 Second stage of sampling:

Household selection

Segmentation was used to randomly select households/sampling units in the field. Upon arrival at the randomly selected village, the village chief was found and introductions made and the purpose of the survey explained. Segmentation was used depending on the size of the village. The villages larger than 100 households were segmented and one segment was then selected randomly while the smaller villages were assessed completely.

The team then listed all the households residing in the village with the help of the village chief or representative. After drawing up the list of the households with the help of village leader, 12 households between 1 and the last number which correspond to the list of households were selected by using a Random Number Table using simple random sampling method. Then the teams would start with any convenient randomly selected household. If a household was not at home when the survey team passed, they noted the household name and number and returned later for revisiting. No substitution for absent and refusal households.

3.3.1 Selection of children

In every household visited the mother/caregiver was interviewed. If there was more than one wife in the household and they cook separately, they were considered as to be as independent households but if they eat from the same cooking pot, then they were considered as single household. If there were children between 0 - 59 months old in the household the child health and child feeding questionnaire was administered, as well as the other household indicator questions. All eligible children aged between 6 and 59 months in each visited household were included for the anthropometric questions. If a child was missing, the survey team returned to the household to check for the child later in the day. If the child is still away the team was considered as absent. No replacement of absent children.

3.4 Training

Five survey teams each consists of team leaders and 12 enumerators and 2 supervisors were trained and

subsequently participated in the data collection. Candidates with prior experience in nutrition survey were given preference.
Training was conducted for four days, including a field test, and training covered survey objectives, basic malnutrition, concept of sampling and SMART survey methodology followed by anthropometric measurements, recognition of the signs and symptoms of malnutrition including nutritional bi-lateral oedema and interview techniques.
As a means to verify anthropometric skills of enumerators and to detect differences among measurers a standardization test was given during the fourth day of the training. Ten children were measured once by the survey supervisor and then each of the 12 enumerators were allowed to measure the children's weight, height and MUAC twice with a time interval between individual measures. Finally, 10 enumerators were assigned as measurers and assistant measurers based on the results of their measurement evaluation, result and merit, commitment and performance shown during training. The remaining two enumerators were stand by for replacement if someone falls to sick or absent. The pilot survey was conducted in an area which was not selected for the survey. Observations of errors in the performance of each team with regards to undertaking measurements and completing the questionnaires were identified, discussed and corrected with all team members by the team supervisors and the Survey Manager.

Training was carried out by GOAL's Survey Manager and was conducted in English and the local language. five teams were formed, each consisting of an interviewer, two measurers and a supervisor who was responsible for ensuring the recording of all data collected as well as ensuring accuracy of measurements taken, methodology and any other technical issues raised while in the field.

3.5 Data collected

Four questionnaires were used to collect the data: a mortality questionnaire asked in all households, a anthropometric questionnaire asked for all children 6-59 months, a child health and feeding questionnaire for all children between 0-24 months; and a food security asked at all households containing children less than five years, which includes WASH and livelihoods.

The survey data was collected using five SMART phones in SurveyCTO. The digital data gathering device avoid errors and missing data that increases the quality of data. The data uploaded to the computer every night and feedback was given to the team at a daily basis in the morning.

3.5.1 Mortality data

The survey team collected data for the mortality questionnaire in every household visited regardless of whether there were children less than five years or not. Information collected included:

- Total number of people in the household
- Number of children under five years
- Number of people who left the household within the recall period (total and under five years)
- Number of people who joined the household within the recall period (total and under five years)
- Number of births in the household within the recall period
- Number of deaths in the household within the recall period (total and under five years)
- Cause of deaths

3.5.2. Individual information per survey child - Anthropometric data

- Sex
- Age (in months) determined using a local events calendar (Appendix 3)
- Weight (in kilograms) measured to a precision of 0.1 kg using electronics scale (SECA)
- Height (in centimetres) measured to the nearest 0.1 cm using length/height boards. Children <87 cm were measured lying down position.
- Presence of bilateral pitting oedema on both feet after three seconds of pressure
- MUAC, to the nearest millimetre

3.5.3 Individual information per survey child - Child Health and Feeding

- Vaccination status for measles and Pentavalent 3, based on documentation on the child's under-five card or verbal confirmation

- Vitamin A supplementation status in the past six months (children age 6-59 months only, by showing vitamin 'A' capsule)
- Child morbidity in the past two weeks before the survey and health seeking practices
- Child LLITN use the night before the survey
- Initiation of breast feeding
- If the child is currently breast feeding
- What did the child eat the day before the survey
- What did the child drink the day before the survey
- Feeding practices during illness
- Number of meals the child had the day before the survey.

3.5.4 Household information

Data for the household questionnaire was collected in every household visited with children less than five years. Information was collected on the following areas:

- Household demography
- Household livelihood and food security
- Income sources

3.6 Survey implementation

After completing four days training the field work was conducted from the 5st to 10th March 2016 for six consecutive days. Five teams were formed to carry out the survey each consisting of three people: One team leader, who was responsible for overseeing the team's activities, quality of the field work, survey methodology and completion of the data needed before leaving the field, including accurate capturing of the data on the questionnaires. Two anthropometric measurers who carried out weight, height and MUAC measurements and checked for the presence of oedema and one supervisor who was generally responsible providing support for the team especially during household selection, anthropometry measurement and other activities and two local porter/guide.

Interpreting the data

The SMART survey is a cross-sectional study that generates descriptive data such as the prevalence of malnutrition by taking a 'snapshot' at one point in time for one location. When prevalence's are presented, the denominator is also presented in this report as "N". Cross-sectional studies are helpful for looking at relationships among different variables (by using different statistical tests) for example the difference in the level of malnutrition in female versus male children. The statistical tests determine if the difference in figures amongst variables is far enough apart to really be a 'significant' difference where one can see a trend developing. Simply, this significant difference is shown throughout this report by the p-value, which if less than 0.05 means that there is a significant difference and 95% confidence intervals (CI) are used to judge the statistical precision of point estimates, whereby the more precise the estimate, the tighter the CI. Where means are presented throughout the report, a standard deviation (SD) will be presented which is the measure of spread around the mean.

Cross-sectional studies are also helpful by making generalizations about the characteristics of the population as a whole by collecting data from a random representative sample with a big enough sample size. To be able to generalize about the population in Maiwut, 95% CI's are also produced, which tell the reader the range in which the real value for Maiwut lies between 95 out of 100 times if one were to repeat the same survey 100 times. The actual prevalence that is presented is the value that the sample generated, which falls within the confidence interval, but the real population value is always unknown other than the range produced by the confidence interval.

Cross-sectional studies, however do not provide causal information or insight into temporal relationships, i.e. whether the exposure preceded or followed the outcome, as both are measured at the same time, such as if one were measuring wasting and illness, did the illness occur before the wasting started or after? These are the limitations of cross-sectional studies and so one should read the report with caution when looking at variables that are significantly associated and not assign causality.

3.7 Classifying malnutrition

Weight-for-height

Weight-for-height z-scores (WHZ) were calculated to give the prevalence of acute malnutrition or wasting. Wasting

can be assessed by comparing a child's weight with the weight that would be expected from a healthy child of the same height and sex.

Table 4: Wasting as defined by WHO

Global Acute Malnutrition (GAM) Moderate & severe wasting	<-2 z-scores weight-for-height (WFH) and/or oedema
Severe Acute Malnutrition (SAM) Severe wasting	<-3 z-scores weight-for-height (WFH) and/or oedema

Mid-upper arm circumference (MUAC)

MUAC is a simple and important tool as it is the best predictor of those cases most at risk of dying once the MUAC falls below 115 mm; however it is not a sensitive early predictor of malnutrition[3]. In recent years MUAC has been adopted for use on infants from six months. Any child aged between 6-59 months whose arm circumference is less than 125 mm may be acutely malnourished and less than 115 mm severely malnourished.

Height-for-age

Height-for-age z-scores were calculated to give the prevalence of chronic malnutrition or stunting. Stunting can be assessed by comparing a child's height with the height of a healthy child of the same age. Stunting is an index of long-term nutritional deprivation where growth is being compromised to conserve nutrients and energy for the maintenance of the body. It is also necessary to know the exact age of the child to accurately determine stunting which was a limitation of this survey therefore this data should be interpreted with caution. Even though an events calendar was used when estimating each child's age to the nearest month SMART rated the quality of the age data as unacceptable. As seen in the Table below, stunting is defined as <-2 z-scores, whereas severe stunting is defined as <-3 z-scores.

Table 5: Stunting as defined by WHO

Global Chronic Malnutrition Global Stunting	<-2 z-scores height-for-age (HFA)
Severe Chronic Malnutrition Severe Stunting	<-3 z-scores height-for-age (HFA)

Weight-for-age

Weight-for-age z-scores were calculated to give the prevalence of under nutrition or underweight. Underweight can be assessed by comparing a child's weight with the weight of a healthy child of the same age. It is also necessary to know the exact age of the child to accurately determine underweight which was a limitation of this survey; therefore this data should be interpreted with caution. Even though an events calendar was used when estimating each child's age to the nearest month SMART rated the quality of the age data as unacceptable. Underweight is defined as <-2 z-scores, whereas severe underweight is defined as <-3 z-scores.

Population cut-offs for malnutrition

The table below defines the population cut-offs for determining the severity of the malnutrition when the prevalence of acute and chronic malnutrition is known. These levels are internationally agreed upon and provide an objective basis for developing responses to increased levels of acute and chronic malnutrition[4]. To interpret proportions at a population level with meaning, absolute numbers are also necessary.

Table 6: WHO population cut-offs for chronic and acute malnutrition

Index	Normal/Low	Poor/Medium	Serious/High	Critical/Very high
Global Underweight	<10%	10-19.9%	20-29.9%	>30%
Global Chronic Malnutrition	<20%	20-29%	30-39%	≥40
Global Acute Malnutrition	<5%	5-9%	10-14%	≥15
(GAM) Mean weight for height z-score	>-0.40	-0.40 to –0.69	-0.70 to –0.99	≤-1.00

[3] WHO/UNICEF. WHO child growth standards and the identification of severe acute malnutrition in infants and children: A joint statement. 2009.

[4] Physical Status: The use and interpretation of Anthropometry. Report of a WHO expert committee, 1995. Chapter 5, p208 & 212

4.0 SURVEY RESULT

A total of 458 children (232 boys and 226 girls) were measured to estimate their nutritional status through anthropometric measurements from 344 households. Initially it was planned to measure 363 children however, at the end of the survey 458 children measured. From the total 30 sampled clusters three were replaced because of inaccessibility.

It was checked for outliers (values that lie +/-3 SD from the observed mean). Outliers were flagged by the SMART software as not being plausible values of either weight, height or age was incorrect. The SMART flags were excluded from the analysis but not from the data. Therefore, three were flagged records in weight-for-height hence a total of 455 children were analysed to estimate the Global Acute Malnutrition (GAM) of children 6-59 months. Weight-for-age for 449 children, and height-for-age 434 children were analysed.

4.1 Distribution by age and sex

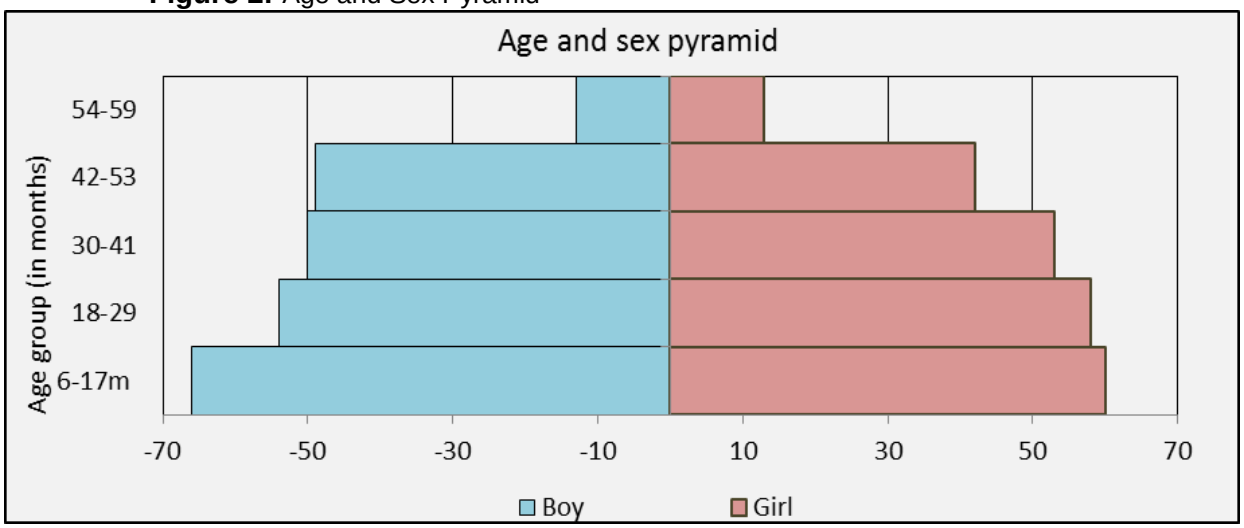
Table 7: Distribution of age and sex of sample

	Boys		Girls		Total		Ratio
Age groups	N	%	n	%	n	%	Boys: girls
6-17 months	66	52.4	60	47.6	126	27.5	1.1
18-29 months	54	48.2	58	51.8	112	24.5	0.9
30-41 months	50	48.5	53	51.5	103	22.5	0.9
42-53 months	49	53.8	42	46.2	91	19.9	1.2
54-59 months	13	50.0	13	50.0	26	5.7	1.0
Total	232	50.7	226	49.3	458	100.0	1.0

Overall sex ratio in the plausibility exhibited, P= 0.779 which means boys and girls were equally represented in the sample and age ratio of 6-29 months to 30-59 months was aroung 1.0, p-value= 0.010(significant difference). Overall age distribution for boys and girls showed 0.0.077 which can be defined as equally represented as expected.

The plausibility report generated by ENA for SMART, July 21st 2015 software revealed that the overall survey quality scored at 5% which indicates the quality of the data was excellent and could be taken as credible data to be taken for further analysis and programmatic decision.

Figure 2: Age and Sex Pyramid



4.2.1 Nutritional Anthropometry (Acute Malnutrition)

Prevalence of acute malnutrition by W/H z- score based on WHO standard

*Weight-for-Height (W/H**)** is the nutrition index that reflects short-term growth failure (acute malnutrition, wasting) and is defined by a child's weight (kg) and its height or length (cm) in relation to a standard or reference population of the same height/length. Acute malnutrition prevalence is estimated from the weight for height (W/H) index values combined with the presence of oedema. The WFH indices are expressed in Z-scores according to WHO standard.*

Global acute malnutrition is defined as <-2 z scores weight-for-height and/or oedema, severe acute malnutrition is defined as <-3 z scores weight-for-height and/or oedema). It is also used in the classification of global, moderate and severe acute malnutrition (GAM, MAM and SAM).

Table 8: Prevalence of acute malnutrition based on WH z-scores and/or oedema, by sex

	All n = 455	**Boys** n **=** 231	**Girls** n **=** 224
Prevalence of global malnutrition (<-2 z-score and/or oedema)	(109) 24.0 % (20.6 - 27.7 95% CI)	(59) 25.5 % (20.6 - 31.2 95% CI)	(50) 22.3 % (18.1 - 27.1 95% CI)
Prevalence of moderate malnutrition (<-2 z-score and >=-3 z-score, no oedema)	(92) 20.2 % (17.1 - 23.8 95% CI)	(49) 21.2 % (16.4 - 27.0 95% CI)	(43) 19.2 % (15.4 - 23.7 95% CI)
Prevalence of severe malnutrition (<-3 z-score and/or oedema)	(17) 3.7 % (2.5 - 5.5 95% CI)	(10) 4.3 % (2.4 - 7.6 95% CI)	(7) 3.1 % (1.6 - 6.1 95% CI)

The prevalence of oedema is 0.0%

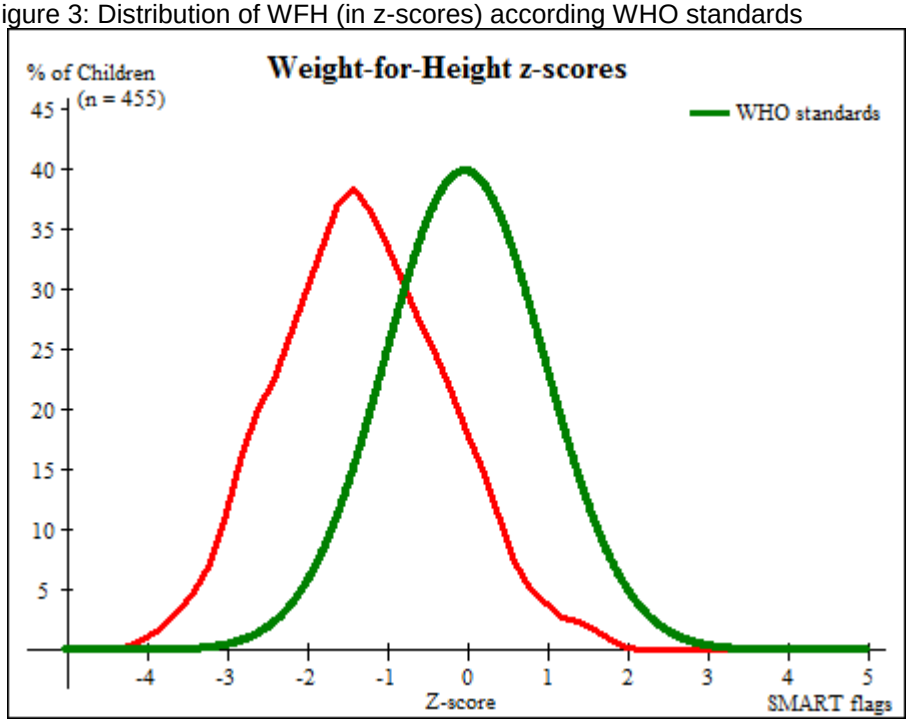
As indicated above the estimated prevalence of Global Acute Malnutrition (GAM) in Maiwut County was estimated at 24% (95% CI 20.6-27.2) and the prevalence of Severe Acute Malnutrition (SAM) was estimated at 3.7% (95% CI 2.5-5.5). There was no a child identified as nutritional bilateral oedema.

There is statistically no significant difference between girls and boys in the prevalence of GAM and SAM as p-value = 0.4211 and 0.4984 indicating that both boys and girls are at equal risk of malnutrition.

Table 9: Prevalence of acute malnutrition by age based on WH z-scores and/or oedema

		Severe wasting (<-3 z-score)		Moderate wasting (≥ -3 and <-2 z-score)		Normal (≥ -2 z-score)		Oedema	
Age (months)	Total	n	%	n	%	N	%	n	%
6-17	125	10	8.0	40	32.0	75	60.0	0	0.0
18-29	111	6	5.4	24	21.6	81	73.0	0	0.0
30-41	102	0	0.0	14	13.7	88	86.3	0	0.0
42-53	91	1	1.1	8	8.8	82	90.1	0	0.0
54-59	26	0	0.0	6	23.1	20	76.9	0	0.0
Total	455	17	3.7	92	20.2	346	76.0	0	0.0

Figure 3: Distribution of WFH (in z-scores) according WHO standards



The mean weight-for-height z- score was -1.29 indicates that the nutritional status of U5 population is poor as compared with WHO standard due to its deviation to the left side from the normal curve. The standard deviation (SD) of the z-scores is 1.03, which is below the cut-off point of 1.2 indicating that the quality of the data is acceptable.

The value for skewness and kurtosis rated as 0.18 and -0.22 and both the skewness and kurtosis lie within the acceptable range of ±1.0 that the distribution can be considered as normal.

The value of Index of Distribution (ID) in the plausibility result shows ID= 0.94 and P-value = 0.559. According to the ID and P value result, the malnutrition cases appear to be randomly distributed among the clusters indicating that the distribution is homogeneous as the P-value is between 0.05 and 0.95. Therefore, the plausibility check in ENA software revealed that the overall quality of the data was characterized as excellent (5%).

Table 10: Distribution of severe acute malnutrition and oedema based on W/H (in 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. 17 (3.7 %)	Not severely malnourished No. 441 (96.3 %)

Table 11: Prevalence of acute malnutrition based on MUAC cut off's (and/or oedema) and by sex

	All n = 458	**Boys** n = 232	**Girls** n = 226
Prevalence of global malnutrition (< 125 mm and/or oedema)	(81) 17.7 % (13.7 - 22.6 95% CI)	(32) 13.8 % (9.7 - 19.3 95% CI)	(49) 21.7 % (16.5 - 27.9 95% CI)
Prevalence of moderate malnutrition (< 125 mm and >= 115 mm, no oedema)	(72) 15.7 % (11.9 - 20.5 95% CI)	(31) 13.4 % (9.1 - 19.2 95% CI)	(41) 18.1 % (13.5 - 24.0 95% CI)
Prevalence of severe malnutrition (< 115 mm and/or oedema)	(9) 2.0 % (1.1 - 3.5 95% CI)	(1) 0.4 % (0.1 - 3.2 95% CI)	(8) 3.5 % (1.9 - 6.5 95% CI)

Children 6-59 months were the targeted groups for MUAC measurement. MUAC is a measurement of mid-upper circumference of a child which is good indicator of acute malnutrition and mortality. Their MUAC were taken accordingly to compliment with the other anthropometric findings. Of the 458 children assessed using MUAC 17.7% were prevalence of global malnutrition and 2.0% were severely malnourished.

Table 12: Prevalence of acute malnutrition by age, based on MUAC cut offs 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	126	4	3.2	41	32.5	81	64.3	0	0.0
18-29	112	3	2.7	19	17.0	90	80.4	0	0.0
30-41	103	1	1.0	9	8.7	93	90.3	0	0.0
42-53	91	1	1.1	2	2.2	88	96.7	0	0.0
54-59	26	0	0.0	1	3.8	25	96.2	0	0.0
Total	458	9	2.0	72	15.7	377	82.3	0	0.0

4.2.2 Underweight

Table 13: Prevalence of underweight among 6-59 months children based on WAZ and by sex

	All n = 449	**Boys** n = 229	**Girls** n = 220
Prevalence of underweight (<-2 z-score)	(126) 28.1 % (22.6 - 34.3 95% C.I.)	(61) 26.6 % (20.8 - 33.4 95% CI)	(65) 29.5 % (22.0 - 38.4 95% CI)
Prevalence of moderate underweight (<-2 z-score and >=-3 z-score)	(94) 20.9 % (16.0 - 26.9 95% C.I.)	(45) 19.7 % (14.3 - 26.4 95% CI)	(49) 22.3 % (15.8 - 30.4 95% CI)
Prevalence of severe underweight (<-3 z-score)	(32) 7.1 % (4.9 - 10.3 95% C.I.)	(16) 7.0 % (4.0 - 11.9 95% CI)	(16) 7.3 % (4.6 - 11.2 95% CI)

The overall prevalence of underweight was estimated at 28.1% while the severe underweight estimated at 7.1%.

Table 14: Prevalence of underweight among 6 to 59 months children based on WAZ

		Severe underweight (<-3 z-score)		Moderate underweight (≥ -3 and <-2 z-score)		Normal (≥ -2 z-score)		Oedema	
Age mths	Total	n	%	n	%	n	%	n	%
6-17	123	11	8.9	34	27.6	78	63.4	0	0.0
18-29	107	10	9.3	30	28.0	67	62.6	0	0.0
30-41	102	7	6.9	11	10.8	84	82.4	0	0.0
42-53	91	3	3.3	13	14.3	75	82.4	0	0.0
54-59	26	1	3.8	6	23.1	19	73.1	0	0.0
Total	449	32	7.1	94	20.9	323	71.9	0	0.0

4.2.3 Chronic malnutrition (stunting)

Table 15: Prevalence of stunting based on height-for-age z-scores and by sex

z-score	**All** n = 434	**Boys** n = 219	**Girls** n = 215
Prevalence of stunting (<-2 z-score)	(86) 19.8 % (15.6 - 24.8 95% C.I.)	(40) 18.3 % (14.2 - 23.2 95% C.I.)	(46) 21.4 % (15.0 - 29.5 95% C.I.)
Prevalence of moderate stunting (<-2 z-score and >=-3 z-score)	(61) 14.1 % (11.0 - 17.9 95% C.I.)	(25) 11.4 % (7.9 - 16.3 95% C.I.)	(36) 16.7 % (11.7 - 23.4 95% C.I.)
Prevalence of severe stunting (<-3 z-score)	(25) 5.8 % (3.9 - 8.5 95% C.I.)	(15) 6.8 % (4.5 - 10.3 95% C.I.)	(10) 4.7 % (2.4 - 8.7 95% C.I.)

Stunting is growth failure in a child that occurs over a slow cumulative process as a result of inadequate nutrition and/or repeated infections, measured by the height-for-age index. The findings the survey revealed that the overall global chronic malnutrition prevalence was estimated at 19.8% (15.6-24.8 95% C.I) and severe chronic malnutrition prevalence of 5.8% (3.9-8.5 95% C.I).

Stunting was higher among girls 21.4% (15.0-29.5 95% C.I.) than boys 18.3% (14.2-23.2 95% C.I.). However, the difference is statistically not significant as p-value = 0.4133. Therefore, both boys and girls are at equal risk of stunting.

Table 16: Prevalence of chronic malnutrition based on HAZ and by age

		Severe stunting (<-3 z-score)		Moderate stunting (≥ -3 and <-2 z-score)		Normal (≥ -2 z-score)	
Age mths	Total	n	%	n	%	n	%
6-17	120	6	5.0	10	8.3	104	86.7
18-29	107	11	10.3	25	23.4	71	66.4
30-41	93	3	3.2	6	6.5	84	90.3
42-53	88	3	3.4	13	14.8	72	81.8
54-59	26	2	7.7	7	26.9	17	65.4
Total	434	25	5.8	61	14.1	348	80.2

4.3 Mortality

Table 17: Mortality Demographic Information, (344 households interviewed, recall period of 90 days)

HOUSEHOLD INFORMATION			
Total population		Children 0-59 months	
Total number HH residents	2243.5	Number 0-5 years	365
Total number people joined HH in recall period	78	Number 0-5yrs joined HH during recall period	9
Total number people left HH in recall period	166	Number 0-5 years left HH during recall period	17
Total number births during recall period			16
Total number deaths during recall period	11	Number 0-5 years deaths during recall period	2
Crude mortality rate (deaths/10,*000*/day)	0.54 (0.31-0.95)	Under-5 mortality rate (deaths/10,000/day)	0.61 (0.54-2.52)
Design effect	1.00	Design effect	1.00

A proxy indication of mortality was taken retrospectively to provide some idea on the mortality situation of the population. The mortality assessment was done to all the targeted households with and with no under-five child.

Retrospective mortality rates were estimated using a recall period of 90 days. 10th December 2015 (two weeks before Christmas) was the start date of the recall period was used the recall period for collecting mortality information.

The information was collected from 12 randomly selected households per cluster, and the summary of the result as presented in table above, a total of 344 households and 2243.5 individuals were included in the 90 days retrospective mortality rates estimation. Crude Mortality Rate (CMR) was 0.54 deaths/10,000 people/day while the Under-five Mortality Rate (U5MR) was estimated 0.61 deaths/10,000 children/day. Both CMR and U5 mortality rates was below the emergency threshold of >=1.14 and >= 2.3 deaths for sub-Saharan African Countries respectively[5]. Hence, both Crude and U5 mortality rate can be classified as normal and did not indicate an emergency situation in the County. The survey finding revealed that from the total 11 deaths, half (45.5%) of the reason for death was unknown. The reminder reported to be injury/traumatic (9.1%), Fever/malaria (27.3%) and malnutrition 9.1%.

4.4 Other results

4.4.1 Child morbidity

Table 18: Prevalence of reported illness 2 weeks prior to the survey (N= 458)

6-59 months	n	%	95% C.I.
Prevalence of reported illness	276	60.3	55.6-64.7

276 children (60.3%) were reported to have been ill during the period two weeks prior to the survey date.

Table 19: Symptom breakdown in the children in the two weeks prior to interview (n= 276)

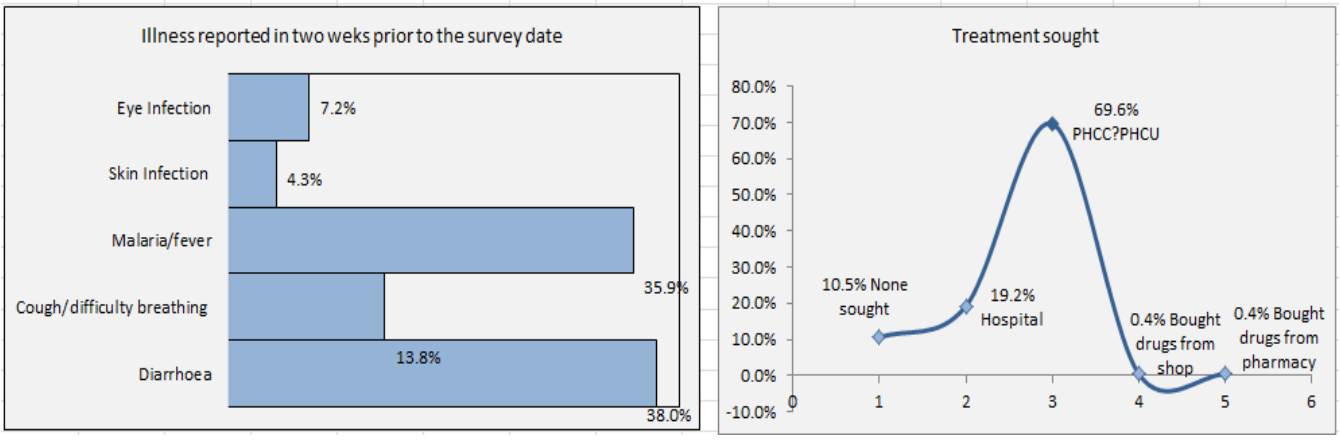
Illness/symptom breakdown	n	%
Diarrhoea	105	38% (32.3-44.1)
Cough/difficulty breathing	38	13.8% (9,9-18.4)
Fever/Malaria	99	35.9% (30.2-41.8)
Skin infection	12	4.3% (2.3-7.5)
Eye infection	20	7.2% (4.5-11.0)
Other	2	0.7% (0.1-2.6)
Total	276	100%

The common childhood illness was determined based on a fourteen days recall period. Mothers/caregivers were asked whether each of their child in the household had been sick in the two weeks prior to the survey date.

As per the interviewed mothers and caregivers, among the sample children 6 to 59 months, 60.3% (n= 276) children had been ill in the fourteen days period prior to the survey date. Diarrhoea followed by malaria/fever were the most common illnesses reported. Further, cough/difficulty of breathing, skin and eye infection were other common childhood illnesses reported.

[5] SMART Guidelines, 2008

Figure 4: Childhood illness reported by mother/care givers and treatment sought



Health seeking behaviour was also explored by asking what treatment the respondent sought when the child was ill. Of those sick children, more than three quarters of the children 89.4% (n= 247) were taken to health facility for treatment whereas, about 10.5% (n= 29) of sick children were not taken to health facility for treatment for their illnesses.

The association between acutely malnourished children with that of ill children in two weeks prior to the survey was statistically not significant as p-value = 0.45737.

Most importantly, the survey revealed that diarrheal disease is the most prominent cause of malnutrition as significantly associated with wasting in this survey. Around 38.0% of ill children had diarrhea in the two weeks prior to this survey, however, diarrhea was not statistically significant associated with acute malnutrition as P-value = 0.5996.

4.4.2. Measles Immunization and vitamin A supplementation

Table 20: Immunization and Vitamin 'A' supplementation

Vaccination	No	%	95% CI
Measles by card (9-59 months) N=434	72	16.6	13.3- 20.5
Measles by mother confirmation (9-59 months) N= 434	199	45.9%	41.1-50.7
Measles by card + mother confirmation (9-59 months) N=434	271	62.4	57.7- 67.0
BCG by scar (6-59 months) N= 458	290	63.3	58.7- 67.7
Vitamin A supplementation in the last 6 months (6-59 months) N= 458	218	47.6	43.0-52.3

During the assessment the survey team showed a vitamin 'A' capsule for mothers and caregivers to recall whether their children had received Vitamin 'A' or not in the past six months. Hence, the findings of the survey revealed that about 47.6% of the children reported as having received vitamin 'A' supplementation once in the last six months.

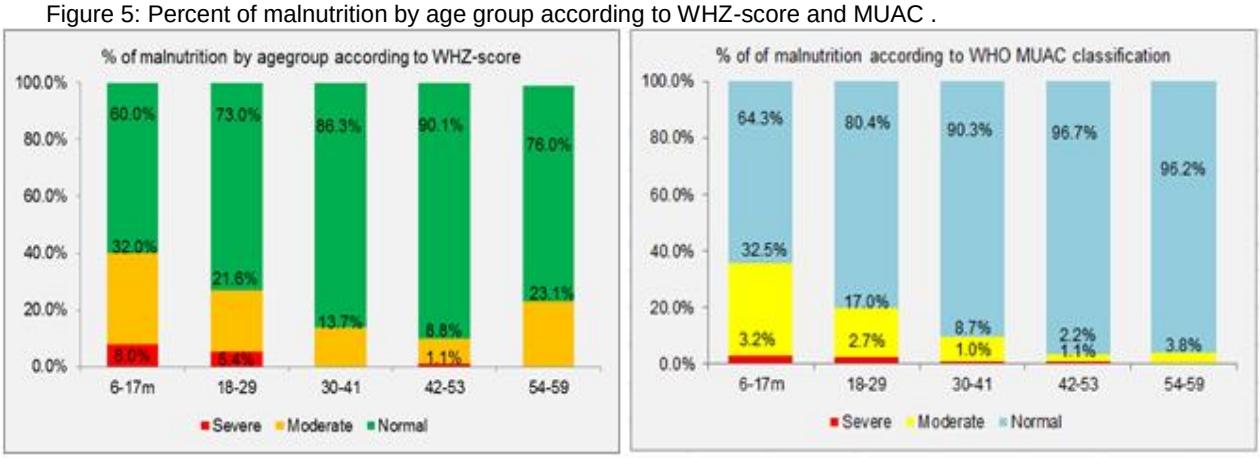
Measles vaccination was assessed through checking a vaccination card and recall by mothers of children 9-59 months of age. As the response, the mother of 16.6%, (n= 72) of children were able to show vaccination card. The reminder 45.9% (n= 199) of mothers confirmed that their children had been vaccinated for measles. As a result Measles immunization by card plus mothers' confirmation reached at 62.4% (n= 271).

5.0 Nutritional status

The prevalence of Global Acute Malnutrition (GAM) based on weight for height z-scores in WHO standard was estimated at 24.0% (95% CI 20.4-27.7) and Sever Acute Malnutrition (SAM) was estimated at 3.7% (95% CI 2.5-5.5). This level of Global Acute Malnutrition (GAM) which is 24.0% is above the emergency threshold (15%) and can be classified as **critical.**

The prevalence of severe acute malnutrition of 3.7% is high and should be viewed with caution since there are high numbers of moderately malnourished cases near to the severe cut off and that can easily fall into the severe category and push the prevalence of SAM to a higher level.

Figure 5: Percent of malnutrition by age group according to WHZ-score and MUAC .



As shown above, the younger children age 6-29 months are at higher risk of malnutrition than the older children. From the total 17 severe malnourished children 94.1% (n=16) children were found in the youngest age group between 6-29 months. Similarly, out of (N=92) moderately malnourished children (MAM) 69.5% (n=64) fall under the younger age group.

When comparing the prevalence of GAM in the two major age groups i.e. 6-29 months and 30-59 months of age, there is statistically significant difference in the prevalence of malnutrition (p-value= 0.00014, Chi^2= 26.3) between the two age groups. Therefore, the youngest age group 6-29 months was 1.3018 (95% CI 1.1785-1.4512) times more at risk of malnutrition than the oldest age group 30-59 months. This implies that the youngest age groups are more affected by malnutrition than older ones and hence require getting more attention in addressing causes of malnutrition specific to this age group.

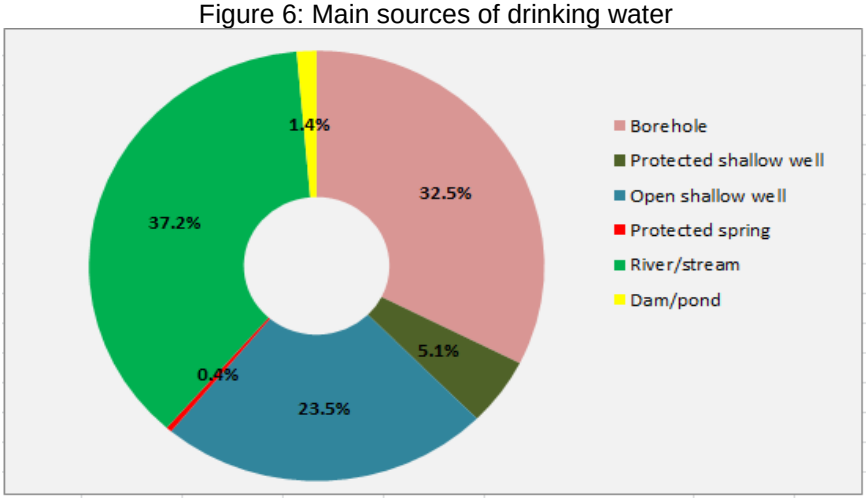
6.0 Water, sanitation and hygiene

6.1 Sources of drinking water

Safe drinking water is an important public health issue. Of particular concern is the risk of water-borne diseases from water contaminated with faecal and other pathogens. Individuals can easily affect if they are not able to access safe and equitable and sufficient quantity of water for drinking, cooking, personal and domestic hygiene.

When asked the main sources of drinking water, a response from the interviewed household indicated that different types of water sources were used for their water supply that falls into six general categories. As indicated in the figure below most of the household reportedly draw their main source of drinking water from river/stream (37.2%, 103), borehole (32.5%, 90) and open shallow well (23.5%, n= 65), protected shallow well (5.1%, n= 14), dam/pond 1.4%, n= 4) and protected spring (0.4%, n= 1). Therefore, the majority (62.1%, n= 172) of the households utilize unsafe water source.

Figure 6: Main sources of drinking water



6.1.1 Water Treatment

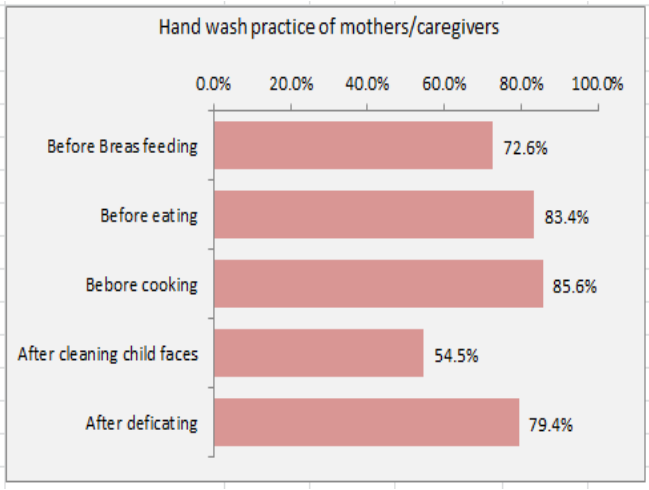
The impact of a poor hygiene and sanitation is reflected in the high incidence of diarrhoeal disease in the survey area, contributing to both mortality and childhood morbidity. Much can be done to turn this situation around by improving access to safe water, promotion of water treatment, improving sanitation and hygiene promotion as well as focusing on the home management of childhood illness. Young children are especially vulnerable to losing excessive weight very quickly due to successive bouts of diarrhoeal disease and subsequently becoming malnourished.

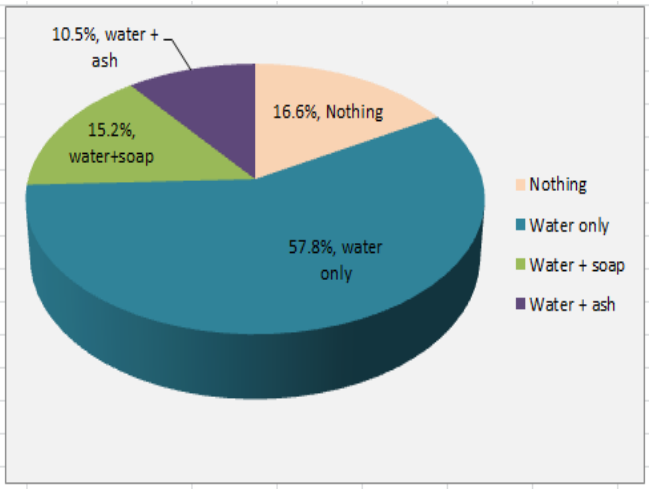
According to the survey finding the vast majority of mothers/care givers (88.1%, n= 244) do nothing to the water collected either from improved or unimproved sources at household level. This shows that water treatment practices in the community is very low/none, which seems to indicate the consumption of unsafe water is very common.

6.1.2 Hygiene and sanitation

A considerable proportion of the community use unimproved sanitary facilities. Most of the household have no access to toilet, majority of them going to undesignated area. The great proportion of the sample household 94.6% (n= 262) used bush/open field. Very few (4.0%, n= 11) households reported the possession of latrine for their families in their compound. All of the families that had a latrine at the time of the interview allowed the team to enter the latrine and complete the observation section of the questionnaire. On top of this, 1.1%, n= 3 and 0.4%, n=1) households used neighbour's latrine and designated open are respectively.

Figure 7: Hand wash practice and detergent used for hand washing





Response from the interviewed mother regarding hand washing behaviour, the majority, 85.6% (n= 237) wash their hands before cooking, 83.4% (n= 231) before eating and 79.4% (n= 220) after defecating. The rest of the interviewed mothers wash their hands before breast feeding and after cleaning child faces in order of importance.

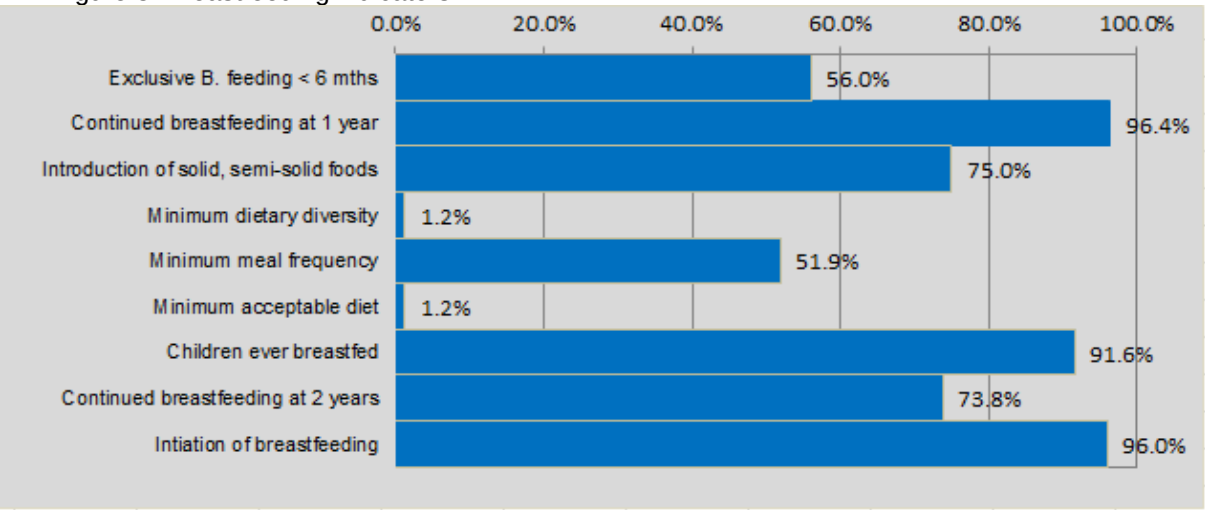
6.3 Infant and young child feeding (IYCF)

Infant and young child feeding practices directly affect the nutritional status of children under two years of age and, ultimately, impact child survival. Improving infant and young child feeding practices in children 0–23 months of age is therefore critical to improved nutrition, health and development of children. In this survey IYCF was one of the tools used to assess the infants and young children feeding practices aged 0-23 months. Therefore, mothers were interviewed about the infant and young child feeding practices of their children between the ages of 0-23 months in line with WHO guideline.

Table 21: Summary of breastfeeding practices

Infant and Young Children Feeding practices				
Core indicators	Age group	n	%	Comment
Early Initiation of breastfeeding (within I hour)	0-23 m	(218)	96.0% (92.6-98.2)	
Exclusive Breastfeeding	0.5 m	(28)	56.0% (41.3-70)	
Continues Breastfeeding at 1 year	12-15 m	(53)	96.4% (87.5-99.6)	
Introduction of solid, semi solids and soft foods	6-8 m	(18)	75% (53.3-90.2)	
Minimum dietary diversity	6-23 m	(2)	1.2% (0.1-4.4)	
Minimum meal frequency (Breast fed children)	6-23 m	(84)	51.9% (43.9-59.8)	
Minimum acceptable diet (breast fed children)	6-23 m	(2)	1.2% (0.1-4.4)	
Optional Indicators	Age group	n	%	
Child ever Breastfed	0-23 m	(208)	91.6% (87.2-94.9)	
Continued breast feeding at 2 years	20-23 m	(31)	73.8% (58-86.1)	

Figure 8: Breastfeeding indicators



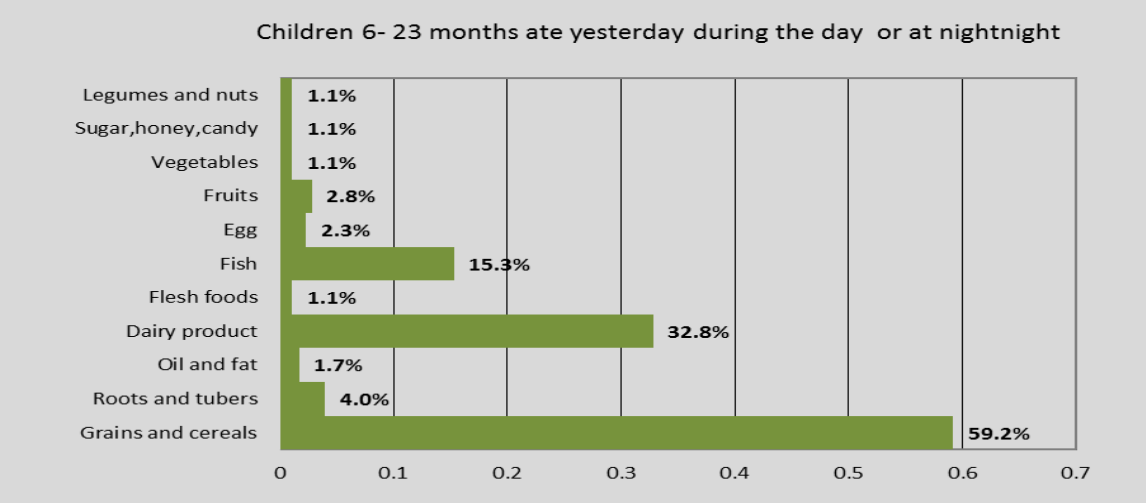
6.3.1 Timely initiation of breastfeeding

Respondents were asked whether their children were ever breastfed as a response 91.6% of children of 0- 23 months group were ever breastfed. Moreover, the majority of the children, 96% (n= 218) had reportedly been initiated to breastfeeding within immediately (1 hour) as per WHO recommended. The remainder 4.0% (n= 9) of the children initiated within 1 to 24 hours. Exclusive breastfeeding rates were analysed for infants below 6 months. The survey result indicated that more than half (56%, n= 28) children reportedly exclusively breastfed.

Complementary foods should be introduced at six months of age, when breast milk alone is no longer adequate for the child's growth. Young children need at least four meals per day, as they are not able to absorb larger quantities of nutrients in larger meals. On top of this Improved feeding of children under two years of age is particularly important because they experience rapid growth and development, and are vulnerable to illness.

According to the survey findings 75%, (n= 18) of the children were introduced solid, semi-solid and soft foods between 6-8 months of age and 96.4% of children between 12-15 months were continued breast feeding at 1 year. Continued breastfeeding beyond six months should be accompanied by consumption of nutritionally adequate, safe and appropriate complementary foods that help meet nutritional requirements when breast milk is no longer sufficient.

Figure 9: Children 6-23 months ate yesterday during the day or at night



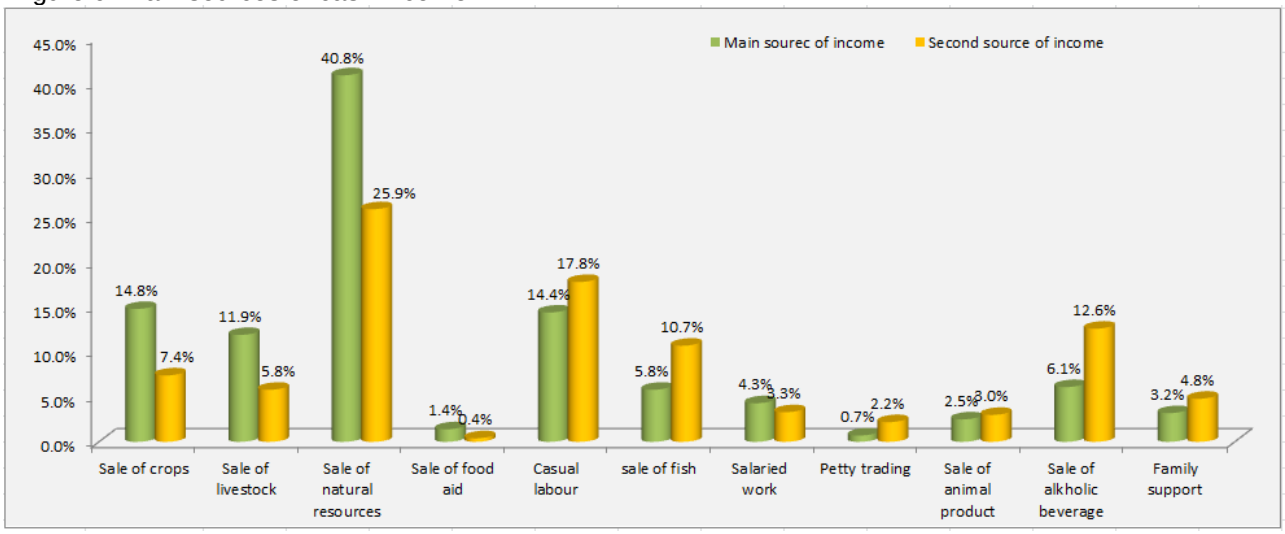
The dietary diversity indicator is based on the premise that the more diverse the diets are the more likely they are to provide adequate levels of a range of nutrients. Minimum dietary diversity was analysed for children 6-23 months of age. The findings showed that 1.2% of the children from the survey sites had minimum diversified diet while, the majority of the children were mainly fed cereal based diets with other foods as indicated in the figure above. As indicated the majority of the children, the meals did not have an adequate range of food groups and were thus likely to be limited in the diversity of nutrients received. Especially flesh foods, legumes and nut, vegetables, fruits and eggs are not common in the survey area. Minimum meal frequency for 6-23.9 months of breastfed children were 51.9% while the minimum acceptable diet was reported as to be 1.2%. As a whole, the complementary feeding practices OR diversity of food that the children consume across the survey areas were inadequate.

6.4 Food security

A food security questionnaire was administered in all targeted households in the survey. The data was collected from 277 households. Among the interviewed household 65.3%, n= 181 household owned livestock.

Asked about the current source of food, own production being the dominant source of food, accounting 39.7%, (n= 110), purchasing and fishing were the second main sources for 29.2%, (n= 81) households and the reminder of the households sourced from work for food (5.8%), wild food (5.1%) and food aid and borrowing.

Figure 9: Main sources of cash income



On average, households in the county acquired their income mainly from sale of natural resource (40.8%), casual labour (14.4%) and sale of alcoholic beverage (6.1%) to purchase food and other commodities.

Fish are an important seasonal source of food in the county, particularly for those living alongside the river. For some, it is also a regular source of food and income. However, poorer than normal catches have been reported from some upstream tributaries where water levels were low following the current dry season. Sale of livestock is also an important means of cash income in the county.

6.5 Conclusions

In conclusion the nutrition situation in Maiwut County is above the emergency threshold of serious level. Even though the key underlying factors affecting the nutritional status of the children i.e. morbidity, lack of safe drinking water and limited sanitation and hygiene facilities remain key risk factors, it is important to note that food insecurity is also currently a critical factor affecting the nutrition status of the population. Increased food prices (with majority of the households currently relying on purchase of food as their main source) and very poor diversity of food intake are contributing factors to the current poor nutrition status among the assessed population. The reduced food intake among the children and the household in general was blamed on high food prices in the market and the reduced milk and milk products in the area because of the dry season.

Overall the key underlying factors for acute malnutrition are morbidity, poor sanitation and lack of adequate safe drinking water and food insecurity at household level and in adequate milk availability. Integrated approaches should therefore be undertaken to reduce risk factors such as unsafe drinking water and limited sanitation and hygiene services. In spite of the current situation among the population in the County, it is very crucial to note the role of increased food prices and inadequate water and pasture which have affected the animal sales and production, hence directly affecting the income as well as the purchasing power of the households in the area which are certainly contributing to the inadequate food intake in the households.

7.1 Recommendations

Immediate interventions

- GOAL should Scale up targeting of acutely malnourished children through the ongoing nutrition intervention program in the County and improve active case finding until household food security is restored and critical public health issues are addressed.

- Expand coverage for nutrition and other health programs in all health facilities, especially for BCG and measles vaccination and vitamin A supplementation.

- Integration of nutrition with Integrated Community Case Management (ICCM) for effective management of SAM and treatment at community level of childhood diseases.

- There is a need to intensify health and nutrition education activities at the household level including diet diversification, and improvements in household hygiene and sanitation.

- There is a need to focus on programs that improve and sustain dietary diversity and consumption of micronutrient rich foods. Introduction of small gardens in agro-pastoral to promote production and consumption of vegetables and fruits may also enhance dietary diversity and increase the intake of vitamins and minerals.

- Address the issues of limited access to safe water, there is a need for rehabilitation/protection of water systems.

- Provision of sanitary facilities including construction of latrines and waste disposal pit at household level.

Appendix 1: Plausibility check

Overall data quality

Criteria	Flags*	Unit	Excel.	Good	Accept	Problematic	**Score**
Flagged data (% of out of range subjects)	Incl	%	0-2.5 0	>2.5-5.0 5	>5.0-7.5 10	>7.5 20	**0** (0.7 %)
Overall Sex ratio (Significant chi square) (p=0.779)	Incl	p	>0.1 0	>0.05 2	>0.001 4	<=0.001 10	**0**
Age ratio(6-29 vs 30-59) (Significant chi square) (p=0.010)	Incl	p	>0.1 0	>0.05 2	>0.001 4	<=0.001 10	**4**
Dig pref score - weight	Incl	#	0-7 0	8-12 2	13-20 4	> 20 10	**0** (5)
Dig pref score - height	Incl	#	0-7 0	8-12 2	13-20 4	> 20 10	**0** (4)
Dig pref score - MUAC	Incl	#	0-7 0	8-12 2	13-20 4	> 20 10	**0** (4)
Standard Dev WHZ	Excl	SD	<1.1 and	<1.15 and	<1.20 and	>=1.20 or	
.	Excl	SD	>0.9 0	>0.85 5	>0.80 10	<=0.80 20	**0** (1.03)
Skewness WHZ	Excl	#	<±0.2 0	<±0.4 1	<±0.6 3	>=±0.6 5	**0** (0.18)
Kurtosis WHZ	Excl	#	<±0.2 0	<±0.4 1	<±0.6 3	>=±0.6 5	**1** (-0.22)
Poisson dist WHZ-2 (p=0.559)	Excl	p	>0.05 0	>0.01 1	>0.001 3	<=0.001 5	**0**
OVERALL SCORE WHZ =			0-9	10-14	15-24	>25	**5** %

The overall score of this survey is 5 %, this is excellent.

Appendix 2: Cluster assignment

Village name	Population	CL
Pagak	460	
Jizera	200	
Newland	260	
Odier	300	1
Thinar	300	
Lerping	218	2
Kuerjonyang	200	
Kurthony	205	
Kuerdeng	120	3
Kuer Nyang	60	
Majiok	313	
Riangerup	100	
Kurmuk	242	
Kuerkiri	60	
Bimkur	50	4
Yuangding	411	
Waystation	114	
Chuey	418	
Pulkhota	100	
Merdiet	111	
Wich Lueni	302	5
Lothekot	200	RC
Nakdiar	50	
Miding	420	
Highland	256	
Gor	100	
Jizera	115	
Dualchuol	41	
Puldiar	29	
Matar	43	6
Mine	35	
Thowkhoat	12	
Wech bel	12	
Lolkuoth	51	7
Wech Thadieng	10	
Kemkhoat	41	
Kuerdiet	23	8
Kuorlochani	22	
Tiew	29	
Riangerup	22	9
Matar	23	
Kuermachhar	8	10
Kuuambor	21	
Wechtubor	23	
Pinyjol	26	
Pulpam	30	
Biethiwin	6	
Thakgok	24	
Latjor	30	
Niphip	20	
Pulkhotal	19	
Minychuol	36	
Thopiriemdu	28	
Chaga	12	11
Thakgok	20	
Matar	211	
Riangerup	103	
Kuomkew	30	
Gainen	104	
Payteth	105	
Kuerlaw	90	12
Kulong PHCC	106	
Kulong Police	110	
Palang	135	13
Wakare	100	
Bilethinak	115	
Kuerdeng	200	RC
Mana	150	
Pulguori	100	14
Duk	400	
Chuaydok	350	15
Gainen Nyamot	250	
Seven day	160	
Charjokow	158	16
Bilpam	80	
Malual	80	
PRDA	142	

Newsite	40	
Parish	50	17
Hat	56	
Nor	54	
Kuerlok	18	18
Orieng Two	170	
Malual	150	
Dit	22	
Lolieng	49	
Kuerlare	400	19
Palkach	350	
Kotngoi Rei	390	
Newland	40	20
Greenvillage	10	
Kuerthabor	12	
Maiwut two	9	
Wichluekin	15	
Kuergatchiek	15	21
Wech Nguot	15	
Wech Bil	13	
Kuergoakin	11	
Palang	133	
Wunbut	51	
Wuorwuot	48	
Tur	141	
Torbar	150	22
Buoy Bang	135	
Pilual Wiw	140	
Mat Gajaak	127	
Tang	218	
Kurek	137	
Kutoch	129	
DudjIok	121	
Chamkuartuar	148	
Mabor	134	RC
Machar	112	
Makuey	117	
Tutchar	103	
Nguekinley	128	
Yiew	140	
Dutjiok	115	
Nguer	200	

Duachthieng	237	
Wichluak yoa	147	
Ngaguer	31	
Nhiachbuok	70	
Kuerreath	146	
Padiet	230	
Jiongol	145	
Chanygech	51	
Manmot	55	
Riek	111	
Malual	64	
Malow	56	
Kuerlual	72	
Turu	215	23
Dhorgathuak	60	
Nyapman khot	50	
Chudier	73	
Yambura	82	
Tombor	245	
Makuey	178	
Khotkel	33	
Rotjiop	40	
Riangbear	118	
Panomdetek	113	
Taptujiok	120	
Wuolngok	100	
Lath	104	
Lolnyang	170	
Wech pal	218	
Wech christian	312	24
Kuerkong	134	
Khotreathluak	66	
GainenNyakuar	100	
Panayier	112	
Longkuey	174	
Kuolenyal	118	
Mabek	156	
Dime	60	25
Makuach	204	
Nyinegak	6	
Dhorgach	170	26
Payay	100	

Pagoradang	74	
Buol Nyalok	41	
Janguan	25	
Thuk	58	
Palel	21	
Lenyluak Buony	20	
Armia	61	
Chuadekuach	236	
Pajung	157	
Wechyiek	143	27
Matar	122	
Kuermok	164	
Pilual	59	
Ratoch	38	
Kuerkong	67	
Kuluy	50	
Manyebear	39	
Matarchiok	48	
Wichluekni	43	
Nyarweang	38	
Kukjil	67	28
Khoatdebil	62	
Thodiey	100	
LuakJang	112	29
Nyang	42	
Biltunyang	31	
Nyongo	17	
Guor	18	
Rotbul	11	
Luak Jang	7	
Kuermajak	6	RC
Rotbul	11	
Wechurieng	82	
Kuer Lam	216	
Kuer Nyayaka	45	
Chiekding	60	
Zarzar	218	30
Thoklola	154	
Jam	99	

Appendix 3: Seasonal and event calendar

Months	Season	2011	Age	2012	Age	20013	Age	20014	Age	2015	Age	2016	Age
January	Dry season: migration of livestock to river back.			Dry season: migration of livestock to river back.	50	Dry season: migration of livestock to river back.	38	Registration of IDPs in Pagak	26	Dry season: migration of livestock to river back.	14	Dry season: migration of livestock to river back.	2
February	Dry season: migration of livestock to river back.			Dry season: migration of livestock to river back.	49	Dry season: migration of livestock to river back.	37	Dry season: migration of livestock to river back	25	Dry season: migration of livestock to river back.	13	Dry season: migration of livestock to river back.	1
March	Dry season: migration of livestock to river back.		60	Dry season: migration of livestock to river back.	48	Dry season: migration of livestock to river back.	36	Dry season: migration of livestock to river back.	24	Dry season: migration of livestock to river back.	12	Dry season: migration of livestock to river back.	0
April	Rain began		59	Rain began	47		35	Rain began	23	Rain began	11	Rain began	
May	Rain season		58	Rain season	46		34	Rain season	22	Rain season	10	Rain season	
June	Rain season		57	Rain season	45		33	Rain season	21	Rain season	9	Rain season	
July	July 9 : Independence day		56		44		32		20		8		
August			55		43		31		19		7		
Sep	Harvesting time		54	Harvesting time	42		30	Harvesting time	18	Harvesting time	6	Harvesting time	
Oct			53		41		29		17		5		
Nov			52		40		28		16		4		
Dec	Christmas		51	Christmas	39	War broken out in Juba	27	Christmas	15	Christmas	3	10th December 2015 (Two weeks prior to Christmas)	

Appendix 4: Survey Questionnaires

ANTHROPOMETRIC & HEALTH QUESTIONNAIRE

To be conducted in EVERY SELECTED HH with children 6-59 months

Date (DD/MM/YY): …./……/…..... Cluster No:…… Team No…..… State:…….. County……..…….. Payam:……. Boma……..……..
Village:……...……

1	2	3	4	6	7			8	9	10	11	12		13	14	15	16	
Child No.	HH No.	Child Name	Sex 1 = Male 2= Female	Age in months	Weight in kg (eg 12.4)	Height in cm (eg 88.1)	MUAC in cm (eg 11.3)		Oedema 0= No 1= yes		Vitamin A in the last 6 mths Children 6-59 months --- 0 = No 1 = Yes, card 2= Yes, mother 3= DK	Measles Vaccine Children >= 9 months --- 0 = No 1 =Yes, card 2=Yes, mother 3= DK	Dewormed in the last 6 months Children 12-59 months --- 0 = No 1 =Yes, card 2= Yes, mother 3= DK	Has the child been ill in the last two weeks (14 days)? 0 = No 1 =Yes If no, go to 16	If yes, type of Illness 1 = Fever 2 = Diarrhoea 3 = Cough 4= Skin infection 5= Eye infection 6= Blood instool 7= Measles 8 = Other (specify)	Treatment ght: Not sought Hospital PHCC/U Mobile /outreach clinic CBD rivate clinic raditional practitioner harmacy/chemist ther (Specify)		Last night, did the child sleep under a mosquito net (LLITN) ? --- 0= No 1= Yes
1	1																	
2	2																	
3																		
4																		
5																		

DEMOGRAPHY AND MORTALITY QUESTIONNAIRE

Team Number [ ]	**Date**	**Cluster No. [ ]**
Area	**Village**	**HOUSEHOLD[6] NO. [ ]**

01	02	03	04	05	06	07	08	09	10
No.	Name	Sex (M/F)	Age (years)	Joined on or after:	Left on or after:	Born on or after:	Died on or after:	Cause of death (optional)	Location of death (optional)
				Start date of recall period 10th Dec 2015 – 8th March 2018 (two weeks before Christmas)					
				WRITE 'Y' for YES. Leave BLANK if NO.					
a) List all the household members that are **currently living** in this household.									
1									
2									
3									
4									
5									
6									
7									
12									
13									
14									
15									
b) List all the household members that have **left this household** (out migrants) **since the start** of the recall period.									
1					Y				
2					Y				
3					Y				
4					Y				
5					Y				
6					Y				
7					Y				
c) List all the household members who **died** since the start of the recall period.									
1							Y		
2							Y		
3							Y		
4							Y		
5							Y		

Causes of death

No.	Disease	No.	Disease	No.	Disease	No	Disease
1	Unknown	5	ARI/Pneumonia/Cough (difficulty of birthing)	9	Violence related	13	Meningitis
2	Injury/ Traumatic	6	Malnutrition	10	Neonatal Mortality	14	Old age
3	Diarrhoea	7	Measles	11	Acute Flaccid Paralysis (Polio)	15	Unknown
4	Fever (Malaria)	8	Accident	12	Maternal Mortality	16	Other (specify)

[6] Insert the household definition used in the survey in footnote here.

INFANT AND YOUNG CHILD FEEDING (0-23 Months)

11.4	11.5	11.6	11.8 Yesterday, during the day or at night, did [NAME] receive any of the following liquids?								11.8 Describe what did (NAME) eat yesterday during the day or night, whether at home or outside the home since (NAME) woke up yesterday until NAME went to sleep? a) Think about when (NAME) first woke up yesterday. Did (NAME) eat anything at that time? If yes: Please tell me everything (NAME) ate at that time. (Probe: Anything else? Until respondent says nothing else. If no, continue to Question b). What did (NAME) do after that? Did (NAME) eat anything at that time? If yes: Please tell me everything (NAME) ate at that time. Probe: Until respondent says nothing else. Repeat question b) above until respondent says the child went to sleep until the next day. Note whenever the child ate a food or drink from the food groups								
Has [NAME] ever been breastfed? (EverBF) 1= Yes 0 = No 2 =DK	How long after birth did you first put [NAME] to the breast? 1 = Less than one hour 2 = b/n 1 and 23 hours 3 =More than 24 hours	Is (Name) still breastfeeding now? 1= Yes 0 = No 2= DK	11.7	11.7.1	11.7.2	11.7.3	11.7.4	11.7.5	11.7.6	11.7.7	11.8	11.8.1	11.8.2	11.8.3	11.8.4	11.8.5	11.8.6	11.9	11.10
			Plain water 1= Yes 0 = No 2= DK	Infant formula 1= Yes 0 = No 2 = DK	Milk such as tinned, powdered, or fresh animal milk 1= Yes 0 = No 2= DK	Sour milk or Yoghurt 1= Yes 0 = No 2= DK	Juice or juice drinks 1= Yes 0 = No 2= DK	clear Broth 1= Yes 0 = No 2= DK	Thin Porridge 1= Yes 0 = No 2= DK	Other water base liquids 1= Yes 0 = No 2= DK	Cereals, flours, grains, roots and tubers 1= Yes 0 = No 2 = DK	legumes and nuts (Beans, Peas, Lentils, Nuts and Seeds) 1= Yes 0 = No 2= DK	dairy products (milk, yogurt, cheese) 1= Yes 0 = No 2 = Don't know	flesh foods (meat, fish, poultry and liver/organ meats) 1= Yes 0 = No 2= DK	eggs 1= Yes 0 = No 2 = DK	vitamin-A rich fruits and vegetables (carrot, red pepper, pumpkin, Ripe Mangoes, papaya 1= Yes 0 = No 2 = DK	other fruits and vegetables (Avocado, Banana, Appile, Grapes, Guava, Lemon, Pinappeal e, Cabbage, onions, tomatoes, etc 1= Yes 0 = No 2 = DK	How many times did [child's name] eat solid or semi-solid food other than liquids yesterday during the day or at night? (number of times)	Yesterday during the day/night, did [child's name] consume any food given by a health centre for the treatment of malnutrition (Plumpy'Nut, Plumpy' sup, Plumpy'Nut dose sprinkles/sachet etc) OR fortified food (porridge consisting of several meal mixed, CSB OR any food with added a micronutrient powder(MNP)? 1= Yes 0 = No 2 = Don't know

Food security and Livelihood OOD SECURITY AND LIVELIHOOD QUESTIONNAIRE

(continue questionning HH's where we've collected Anthro' & Health information)

Date (D/M/Y): ……./……./…..... Cluster No:…… Team No…..… State:…….. County……..…….. Payam:……. Boma……..……..
Village:……...……

	18	19	20	21	22	23	24	25	26	27	28
HH No*	HH size (No. of people living in HH)	Resident status of HH: --- 1: Permanent residents, 2: Returnees (returned within the last 12mths) 3: Nomads 4: IDPs (in last 12 months) 5: IDPs (1-5yrs) 6: IDPs (5yrs +) 7: Refugees (in last 12mths) 8: Refugees (1-5yrs) 9: Refugees (5yrs +) 10: DK	Is there any IDP or returnee currently livng in your household ? --- 0 = No 1 = Yes	Is the HH head male or female? --- 1 = Male 2 = Female	What was your HHs main source of income in the last 30 days? --- 1 = Sale of crops 2 = Sale of livestock 3 = Sale of animal product 4= Sale of alcoholic beverages 5 = Sale of fish 6 = Sale of natural resources (firewood; charcoal; grass) 7 = Sale of food aid 8 = Casual Labour 9 = Skilled labour 10 = Salaried work 11 = Petty trading 12 = Family support 13= Remitance 14=others (Specify)	What did your familly eat in the last 7 days? (include more than one if necessary) (Tom to Revise based on the standard) --- 1 = Cereals Roots and Tubers 2 = Legumes/nuts 3 = Meat /Poultry/Offals 5 = Fish & sea foods 6 = Milkl & Milk Products 7 = Vegetables 8 = Fruits 9 = Eggs 10 = Oil/ Fats 11 = Sugar & honey 12 = None	What was the main source of food in the past 7 days --- 1 =Own production 2 =Work for food 3 =Gifts from neighbours 4 =Market/shop purchase 5 =Borrowing/debts 6 =Food aid 7= Hunting 8 = Fishing 9 = Gathering 10= Others	Did you cultivate in the recent last season? --- 0 = No 1 = Yes	Does the HH own any livestock, heards or farm animals ? --- 0 = No 1 = Yes	Has your HH received any Humanitarian Assistance in the past 3 months? --- 0 = None 1 = GFD 2= School meals /feeding 3=TFP/SFP 4 = Seeds & tools 5=Fishing kits	What is the main shock currently faced by the HH --- 1 = Insecurity /violence 2 = Food too expensive /increased price 3 = Livestock diseases 4 = Floods 5 =Human sickness 7 =Returnee/IDP living with HH 8 =Late food distribution 9 = Social event 10 = Delay of rains 11 = Weeds/ Pest 12= Other(specify)

WATER AND SANITATION QUESTIONNAIRE

Date (D/M/Y): …./……./…..... Cluster No:…… Team No…..… State:…….. County……..…….. Payam:…… Boma……..….. Village:……...……

	26	27	28	29	30	31	32	33
HH Ref No.	What is the household's main drinking source of water ? --- 1=Borehole/hand pump 2= Protected Shallow well 3= Open shallow well 4= Protected spring 5= River /Stream 6= HH connection / Stand pipe /Tanker 7= Dam / Pond 8= Other (specify)	How long does it take to collect HH water (including travel to and from and waiting)? --- 1 = ≤30 min 2 = >30min to ≤1hr 3 = >1hr to ≤ 2hr 4 = more then 2 hr	How many jerricans of water did the HH use yesterday in total (excluding water for washing clothes and for animal)? (define how many litres in a jerrycan if the popn all use the same)	What is done to the water before households members drink it? --- 0 =Nothing 1 =Boiling 2 =Filtering with a cloth 3 =Letting it settle 4 =Water treatment chemicals 5 =Others(Specify)	When do you usually wash your hands (more than one if appropriate - do not prompt) --- 0 = Never 1 = After defecating 2 = Before cooking 3 = Before eating 4 = Before feeding the baby 5=Affter cleaning the baby 6=other (specify)	What do you use to wash hands? --- 0 = Nothing 1 = Water only 2 = Water + Soap 3 = Water + Ash 4 = other (specify)	Where does the household usually use the toilet (include more than one if necessary)? --- 1 = Undesignated open area 2 = Designated open area 3 = Hole 4 = Latrine 5 = Other (specify)	Do you have waste disposal pit in you compound? 0= No 1= Yes 3= DK