Post-Harvest Nutrition and Mortality Survey

Twic East County, Jonglei State, South Sudan

18th -21st December, 2017

I. Acknowledgements

Tearfund acknowledges the participation of the Nutrition Information Working Group (NIWG) in this process during planning, without their valuable feedback it would not be possible to conduct the survey. ECHO funded the personnel expenses, assessment vehicles and stationary related costs. Tearfund coordinated the entire process, gave technical assistance and provided anthropometric equipment. The contribution of the local authorities for the successful commencement of the survey at all levels is greatly appreciated.

We are grateful for the exceptional contribution and cooperation of the surveyed communities, especially the mothers and care givers who took time off their hectic schedule to respond to the interviewers. Their involvement is highly appreciated.

Tearfund also expresses their sincere appreciation to the entire survey team for the high level of commitment and diligence demonstrated during all stages of the assessment.

1 Table of Contents

I. Acknowledgements 2

I. List of Figures 5

II. List of tables 5

III. Acronyms 6

2 Executive Summary 7

3 Introduction 10

4 Survey Objectives 11

4.1 Overall objectives 11

4.2 Specific Objectives 11

5 Methodology 12

5.1 Questionnaire, Training and Supervision 14

5.1.1 Questionnaire 14

5.1.2 Training and Supervision 15

5.2 Data Analysis 16

6 Results 16

6.1 Demographic Characteristics of the Sample Population 16

7 Results ..... **Error! Bookmark not defined.**

7.1 Anthropometric results (based on WHO standards 2006): 18

7.1.1 Prevalence of acute malnutrition 18

7.1.2 Prevalence of underweight 21

7.1.3 Prevalence of chronic malnutrition 22

7.2 Nutritional Status of Women 23

7.3 Mortality results (retrospective over 3 months/90 days prior to interview) 23

7.4 Morbidity and health 25

7.5 Feeding practices during diarrhoea 26

7.6 Deworming, immunization coverage and vitamin A supplementation 27

7.7 Infant and Young Child Feeding practices (IYCF) 28

7.8 WASH 31

7.9 Food security and livelihood 34

7.9.1 Source of income 34
7.9.2 Access and availability of food from own production, livestock and food assistance 35
8 Discussion 36
8.1 Malnutrition 36
8.2 Mortality 39
8.3 Morbidity, measles and BCG coverage and vitamin A supplementation 40
8.4 IYCF 40
8.5 WASH 41
8.6 Food security and livelihood 41
9 Recommendation 43
Annex 1: List of selected clusters in Twic East 45
Annex 2: Survey tools 50
ANTHROPOMETRIC & HEALTH QUESTIONNAIRE 50
Food Security and Livelihood Questionnaire 50
WATER AND SANITATION QUESTIONNAIRE 51
IYCF Questionnaire 53
DEMOGRAPHY & MORTALITY QUESTIONNAIRE 53
Annex 3: Twic East Events Calendar 56
Annex 4: Standardization test results 57
Annex 5: Plausibility check for: SS_12172017TEARFUND_TWICEAST.as 61
Annex 6: Locations where malnutrition is more prevalent (areas with pockets of malnutrition) 62

I. List of Figures

Figure 1: Percent distribution of the household population 17
Figure 2: Age and sex distribution of the anthropometry survey 18
Figure 3: Plot of the standard and sample population weight-for-height z-scores frequency distribution 20
Figure 4: Feeding practices during diarrhoea 27
Figure 5: types of foods and liquids children under 2 years of age consumed during the day and night before the interview 31
Figure 6: Source of income for a month preceding the survey (n=460) 35
Figure 7: Main source of food during the 7 days preceding the survey (n=460) 36
Figure 8: WHO categorization of the public health significance of undernutrition (1995) 37
Figure 9: Acute malnutrition using WH z scores during 2012, 2014, 2016 and 2017-Twic East 38
Figure 10: Distribution of cases in clusters 38

II. List of tables

Table 2: Sample size calculation for mortality and nutrition components 12
Table 3: Baseline determination for number of households determination per cluster 13
Table 4: Table for age groups 16
Table 5: Classification of the situation based on weight-for-height (WHO) 19
Table 6: Prevalence of acute malnutrition based on weight-for-height z-scores (and/or oedema) and by sex 19
Table 7: Prevalence of acute malnutrition by age, based on weight-for-height z-scores and/or oedema 20
Table 8: Prevalence of acute malnutrition based on MUAC cut offs (and/or oedema) and by sex 21
Table 9: Prevalence of underweight based on weight-for-age z-scores by sex 22
Table 10: Prevalence of stunting based on height-for-age z-scores and by sex 22
Table 11: PLW nutritional status 23
Table 12: Demographic characteristics of survey population 24
Table 13: Mortality rates 24
Table 14: Age and sex specific mortality rates 25
Table 15: Causes and location of death 25
Table 16: Prevalence of reported illness in 6-59 months old children in the two weeks prior to interview (n=488) 26
Table 17: Symptom breakdown in the children in the two weeks prior to the survey (n=314) 26
Table 18: Among children (6-59 months) who had illness in the two weeks preceding the survey, the percentage of whom advice or treatment was sought from a health facility provider 26
Table 19: Deworming, BCG and measles vaccination and Vitamin A supplementation coverage 28
Table 20: Summary of IYCF indicators (n=217) 30
Table 21: Summary of findings for WASH indicators 33
Table 22: Access to humanitarian assistance in the past three months (n=460) 35

III. Acronyms

ARI	Acute Respiratory Infection
BCG	Bacillus Calmette-Guerin, Anti-tuberculosis vaccination
CI	Confidence Interval
CHD	County Health Department
CMR	Crude Mortality Rate
DRR	Disaster Risk reduction
ECHO	European Commission
ENA	Emergency Nutrition Assessment
EPI	Expanded Program on Immunization
FGD	Focus Group Discussion
FSL	Food Security and Livelihood
GAM	Global Acute Malnutrition
GFD	General Food Distribution
HH	Household
HAZ	Height for Age Z-score
INGO	International Non-Governmental Organization
IYCF	Infant and Young Child Feeding
LLITN	Long lasting Insecticides Treated Nets
MAM	Moderate Acute Malnutrition
MOH	Ministry of Health
MUAC	Mid Upper Arm Circumference
NCHS	National Centre for Health Statistic
OTP	Outpatient Therapeutic Program
PHCC	Primary Health Care Centre
PHCU	Primary Health Care Unit
PPS	Probability proportional to size
SAM	Severe Acute Malnutrition
SD	Standard Deviation
SFP	Supplementary Feeding Program
SMART	Standardized Monitoring and Assessment of Relief and Transitions
TFP	Therapeutic Feeding Progrm
U5MR	under Five Mortality Rate
UNICEF	United Nations Children's Fund
WASH	Water, Sanitation and Hygiene
WAZ	Weight for Age Z-score
WHZ	Weight for Height Z- score
WFP	World Food Program
WHO	World Health Organization

2 Executive Summary

The survey was conducted from December 18th, 2017, to December 21st, 2016, based on a county level representative sample that provides estimates at county levels. The survey target groups for nutrition survey were children age 6-59 month olds, for IYCF the target groups were 0-23.9 month old children, while for other contextual data and mortality the target groups were all households, including those without children less than five years old in randomly selected households across Twic East.

Detailed information was collected on background characteristics of the respondents, Infant and Young Feeding Practices (IYCF), nutritional status of women, food security and livelihood, Water and Sanitation (WASH), vaccination and supplementation information, feeding practices during diarrhoea episode and morbidity. This report presents comprehensive, detailed, final outcomes of the survey at county level.

Nutritional status and mortality rates are used as essential indicators to assess the degree of severity of the situation, to follow trends, and to guide decision making, which includes the allocation of funds.

The survey was a two stage cross-sectional survey using clusters/villages as primary sampling unit and simple random sampling as secondary sampling unit. Adequate sampling methodology and sample size are used to ensure the representativeness and accuracy of a survey as well as the precision of the results, respectively. The result of the survey were considered sufficiently precise as the sample size was large enough to allow the width of the 95% confidence interval to be within 30% of the estimated prevalence of acute malnutrition and within 50% of the estimated mortality rate.

A total of 3,048 individuals stayed overnight in the 476 interviewed households. About 50% of them (1,531) were female, and 50% (1,517) were male. Children under age 17 (49%) represent nearly half of the population, while 4% of Twic East's population are age 65 or older.

Ninety-seven percent respondents are permanent residents, while 3% are returnee in the last one year. Nonetheless, 18% of households found to have at least one returnee in the last one year as a household member.

Anthropometry data was analysed based on WHO standards 2006. Data was collected from 489 children aged 6-59 months in 476 households. Five anthropometry datasets were flagged by SMART software for wasting; the flagged datasets were excluded from WHZ analysis.

The prevalence of Global Acute Malnutrition (GAM) was 18.4 % (14.3 - 23.3 95% C.I.) and the prevalence of Severe Acute malnutrition (SAM) was 2.5 % (1.3 - 4.6 95% C.I.). No link was established between gender and global acute malnutrition. Severe wasting is highest in the youngest age group of children age 6-17 (3.3%) and lowest in older children age 54-59 (0%). According to the WHO categorization of the public health significance of undernutrition, the prevalence of GAM in Twic East, 18.4 % (14.3 - 23.3 95% C.I.), indicates a critical level.

Mortality rates were calculated retrospectively over a 90 day recall period. In terms of absolute number of deaths over a 90-day recall period there was a total of 19 deaths. The retrospective crude and U5

mortality rates) for the 90 days preceding the survey were 0.69 (0.36-1.32 95% CI) and was 0.63 (0.20-1.96 95% CI), respectively. The mortality rate based on gender shows men die more than women but the difference is not statistically significant. Male deaths are localized while female deaths are uniformly distributed across the county. The retrospective crude and under mortality rates (CMR and U5MR) were below the emergency threshold i.e. 1 death/10,000 persons/day for crude mortality rate and 2 death/10,000persons/day.

Age specific mortality rate indicated that the 65+ year olds were affected disproportionately with 4 deaths/per 10000 old persons per day followed by the 50-64 age group (1.53 deaths/10000persons/day).

Box 1: Summary of other key findings

Characteristic	Percent
Prevalence of underweight (<-2 z-score)	10.1 % (6.8 - 14.8 95% C.I.)
Prevalence of stunting (<-2 z-score)	6.3 % (3.7 - 10.3 95% C.I.)
Prevalence of reported illness	64.8% (56.1-73.5 95% C.I.)
Converge of Long lasting Insecticides Treated Nets	94.5%
BCG by scar (6-59 months) (n=485)	98.6% (96.8 – 100.0 95% C.I.)
Measles by card (9-59 months) (n=460)	79.3 (71.0 – 87.7 95% C.I.)
Measles by card **and** recall (9-59 months) (n=460)	98 (98.4 – 100.0 95% C.I.)
Vitamin A in last 6 months (6-59 months) (n=486)	89.7 (85.5 – 93.9 95% C.I.)
Deworming (12-59) (n=433)	76.9 (65.4 – 8.3 95% C.I.)
Early initiation of breastfeeding within an hour	97.8% (93.1-99.3 95% C.I.)
Continued breastfeeding at 1 year	95.5% (86.2-100.0 95% C.I.)
Continued breastfeeding at 2 year	86.8% (72.3-100.0 95% C.I.)
Children ever breastfeed	91.2% (84.5-98.0 95% C.I.)
Exclusive breastfeeding	90.9% (79.4-100.0 95% C.I.)
Colostrum	98.9% (97.4-100.0 95% C.I.)
Proportion of households using improved water sources	99.8% (99.4-100.0 95% C.I.)
Open defecation	52.3%
Proportion that harvested	60.0% (50.5-69.9 95% C.I.)
Proportion of livestock owners	74.5% (67.8-81.4 95% C.I.)
GFD coverage	85.9% (50.5-69.9 95% C.I.)

Recommendation

Recommendation

Immediate

- To continue 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 continue the access to a TSFP to cope with the high caseload of MAM children,

- Expand current admission criteria to include the MUAC 21-23 cm for malnourished PLW.
- To reinforce the IYCF activities with quality one-to-one counselling tailored to the individual, peer-led support groups, and implication/ capacity-building of health decision-makers at the community and family level for larger IYCF messaging and behaviour change.
- To continue the routine immunization, deworming and supplementation, to impact on morbidity and avoid disease outbreaks such as measles.
- To ensure adequate access to PHC and referral services to secondary care
- To maintain the General Food Distribution (GFD)
- Market interventions to protect pastoralist households from poor terms of trade (particularly given the high level of inflation in the country)

Medium term

- The humanitarian actors operational in the county should advocate for expansion of livelihood programmes in the county to address the underlying causes of food insecurity. Possible areas of intervention are on integrating an effective and responsive DRR scheme, skill training to households on crop production to increase culture of cultivation, increased assistance for households on marketing their livestock, increased veterinary services and including community managed veterinary drugstores.
- Develop or strengthen long term strategies which address the underlying causes of malnutrition. This includes a focus on health, child care education and the public health environment as well as improving access to a wider variety of foods through animal husbandry and off-farm income generating activities;
- Efforts should be made to strengthen to access of basic services like water, sanitation and hygiene programme (WASH). Improved water access is already achieved but further interventions on sanitation and hygiene are required. This is essential as the rates of current child hood illness caused by diarrheal diseases can largely be attributed to lack of safe water, sanitation and/or hygiene practices. Effective awareness raising and training campaign accompanying distribution of water treatment tabs etc. for enhancement of access to safe drinking water. Continued support for the development and maintenance of existing safe water sources is recommended.

3 Introduction

Twic East is located in Jonglei state, which is the largest state in South Sudan. The county is made up of five Payams namely: Pakeer, Ajuong, Nyuak, Lith and Kongor with an estimated population of 127,219 people. The population data for the County keeps on fluctuating due to population movement with IDP's settling within the County and new displacement. In 2016 (January to December) the RRC had recorded a total of 19,882 returnees from the neighboring Duk county and Minkaman IDP Camp. This number is projected to increase as more IDP's return to their original households.

Twic East borders Uror and Duk Counties on the south, though there was no direct fighting in the county during the crisis it was highly affected by the current political crisis mainly by having to bear the burden of hosting IDPs from Duk regions. There was widespread displacement from Duk County with majority of households settling in Twic East. Communities of Twic East were also displaced and moved to Bor, Minkaman, the Islands along river Nile and into Kenya and Uganda. Most of the IDP's displaced in Minkaman and other IDP camps are returning and the community is witnessing more returnees into the County.

This survey was conducted during the post-harvest period (December 2017).

Since the beginning of last year and the onset of the dry season in January 2017, many of the IDPs have returned back to their original homes. These returnees are anticipated to have a higher level of malnutrition than the host community, resulting in a need to conduct an up to date survey to assess the current situation.

Tearfund's operational response in Southern Sudan started in 1998, in response to the famine in the Bahr el Ghazal region. Tearfund has more than 16 years of experience implementing nutrition projects across South Sudan, and also have had programmes in household food security, primary health care, community health education, water and sanitation. These projects have targeted the most vulnerable members of the community including displaced persons, widows and children.

Tearfund is currently implementing an ECHO and OFDA funded Emergency nutrition program in Twic East County and a DFID funded WASH program. The nutrition intervention aims at identifying and treating acutely malnourished children under five and pregnant and lactating mothers as an immediate life saving measure while at the same time tackling barriers that cause poor utilization of health and nutrition services. The key components of the activities carried in these centres include : Screening and referral of all malnourished under-five children at the community, admissions and treatment of those identified as malnourished using anthropometric measurements, weekly follow-up of the children enrolled into the OTP program and Bi weekly follow-up in TSFP for both children under 5 years and PLW, deworming and provision of routine medication to the children in the program, defaulter tracing, nutrition hygiene and health promotion activities across all the project areas in Twic East County, individual and group counselling of caregivers/caretakers, pregnant and lactating mothers about infant and young child feeding practices as well provision of routine immunizations.

The nutrition interventions focus on providing therapeutic and supplementary feeding to severely and moderately malnourished children under the age of 5 years and pregnant and lactating women. This integrated (CMAM) project provides support to internally displaced people (IDPS) and host communities in underserved areas affected by the recent violence in Twic East County. The intervention will also target new arrivals fleeing recent insecurity in the neighboring Counties of Duk, Ayod, Canal, Pibor and the greater Akobo in Jonglei and Nasir, Pigi, Malakal in the Upper Nile state. The goal of the project is to contribute to the reduction in nutrition related mortality and morbidity, and improve access to high quality multisectoral lifesaving nutrition interventions for the most vulnerable populations notably U5 children and pregnant and lactating women. Interventions also focus on implementation on Infant and Young Child Feeding (IYCF) in emergencies targeting women, girls and boys. Twic East County is one of the worst affected areas. Malnutrition and food insecurity are among the highest in the country.

4 Survey Objectives

4.1 Overall objectives

The Overall objective of the SMART assessment is to Estimate the current prevalence of acute malnutrition among children 6-59 months of age as well as underlying risk factors contributing to malnutrition such as morbidity, Infant and Young Children feeding (IYCF) practices and estimate retrospective mortality rates of under five years and all persons who live in Twic East County, Jonglei State, South Sudan.

4.2 Specific Objectives

- Estimate the prevalence of acute malnutrition (Global and severe) amongst children aged 6-59 months in Twic East County, Jonglei State, South Sudan
- Estimate retrospective crude and under five mortality rates in the entire population of Twic East County, Jonglei State, South Sudan
- Estimate the prevalence of morbidity among children 6-59 months in the last two weeks prior to the survey date in Twic East, Jonglei State, South Sudan
- To estimate the vaccination coverage of measles and BCG and Vitamin A supplementation for children 9-59 months and 6-59 months respectively.
- Assess the current food security status in the community (post-harvest) following the last harvest for the purpose of monitoring the nutritional status of children under five and determining whether continued and or scaled up response is necessary in the area.
- To determine infant and young child feeding practices in relation to malnutrition and morbidity in children between 0-23.9 Months, identifying gaps in IYCF practices for the purpose programing.
- To determine the morbidity and health seeking behaviour among children 6- 59 months

- To assess hygiene and sanitation factors that may contribute to malnutrition in children and mothers.
- To draw appropriate recommendations for the improvement of the food security, nutritional and health status of the population in the counties.

5 Methodology

Survey Design: The survey was cross-sectional with two-stage cluster sampling using the Standardized Monitoring and Assessment of Relief and Transition (SMART) methodology.

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

Table 1: Sample size calculation for mortality and nutrition components

Anthropometry		Mortality	
Parameters for Anthropometry	**Value**	**Parameters for Mortality**	**Value**
Estimated Prevalence of GAM (%)	21%[1]	Estimated Death Rate /10,000/day	0.32[2]
± Desired precision	+/- 4.6%	± Desired precision /10,000/day	±0.31
Design Effect	1.5[3]	Design Effect	1.36[4]
% Children under-5	19.3%[5]	Recall period	90 days
Non-response	3%	Average HH Size	6.9
Average HH Size	6.9[6]	Non response	3%
Household to be included	423	Household to be included	472
Children to be included	492	Population to be included	3160

[1] Lowest confidence interval of the 2017 pre-harvest survey

[2] May 2016 SMART survey

[3] Following feedbacks of NIWG a more conservative design effect was used

[4] Based on the DEFF of the May, 2016 survey CMR

[5] May, 2017 survey finding

[6] May, 2017 survey finding

Geographic target area and population group: The nutrition survey was carried in Twic East County. The study population for nutrition component was children from the age of 6 to 59 months, while the entire population was the target population for mortality survey.

Survey period: Training and data collection was conducted from the 14th to 21st of December 2017 (four training days and four days for data collection).

Cluster selection: The data was collected from 34 clusters with 14 households per cluster. The list of selected clusters is shown on Annex 1.

The first stage of sampling was selection of clusters. Each village was considered as a smallest geographical unit (a cluster) and the clusters to be randomly sampled were selected using probability proportional to size (PPS) and ENA for SMART software (July, 2015 update).

A team was assigned to collect data from one cluster per day. A total of 476 Households were visited in 34 clusters where data on Anthropometry, Mortality, food security and WASH was collected. Data on IYCF was collected from 217 eligible children aged 0-23.9 months from all the sampled households. The survey data collection was carried out by 9 teams where each team collected data from one cluster per day for a total of 4 days.

The table below shows timing estimation which was taken into consideration to effectively collect data from 476 HH in 34 clusters. Teams managed to collect Anthropometry, Food security, mortality and WASH data from 476 households. Anthropometry measurements were taken from 489 children 6-59 months. The information on the table below was used to estimate the number of households to include in the assessment.

Table 2: Baseline determination for number of household determination per cluster

Activity	Timing	Total villages
Start and end time	7:00AM-6.00PM	11 hrs. X60min=660min
Time taken to travel from base to the cluster/village and back	60 minutes one way	60minX2=120 minutes
Time taken for introduction and meeting with the community leaders upon arrival at the village	30 minutes	30 minutes
Time taken to make list of households with the village leader and selecting the household to be surveyed	60minutes	60 minutes
One lunch break	20 minutes	20minutes
Available time for administering all the questionnaires	660min-230minutes	430 minutes
Time taken to administer one set of questionnaires in 1 HH	25 minutes	

Time taken between households	5 minutes	(5X14HH)=70 minutes
Number of households that can be visited in a day	430/30min	14 households (rounded down)
Total number of clusters based on the above inputs	472/14 households	34 clusters (rounded up)

Selection of households: The second stage of sampling was the selection of the households within the clusters (villages) selected for the survey using simple random sampling approach. In the selected households, all children 6-59 months fitting the inclusion criteria were taken their anthropometric measurements and data on WASH, Food Security and Mortality was collected. Additionally, in the sampled household without children 6-59 months, data on Mortality, Food Security and WASH was collected. IYCF questionnaire was administered in all sampled households with children between 0-23.9 months.

5.1 Questionnaire, Training and Supervision

5.1.1 Questionnaire

The questionnaire used is provided in annex 2. There were five set of questionnaires namely: Antropometry, WASH, FSL, IYCF and Mortality questionnaires.

The anthropometric questionnaire used was SMART standard questionnaire. 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 (annex 3). 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 . Children were weighed with a minimum of clothes.
- Height/Length: each child was measured to the nearest 1mm with a standard wooden anthropometric height-board. Children below 87 cm were measured lying down and those equal to or above 87 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.
- 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.

- 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: "0" for No, "1" for Yes.
- 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.
- Survey team assessed BCG vaccination by looking for a scar on the upper arm. The scar is normally on the right arm, but may be on the left, so teams checked both by observing the on child's arm.

Additionally, the anthropometry questionnaire asked questions on status of deworming, use of LLITNs the night before the survey, illness in the past two weeks, and health seeking behaviour.

IYCF, WASH and Food Security and Livelihoods (FSL) questionnaires used were those developed by the NIWG.

The mortality questionnaire used was the SMART standard form (individual questionnaire). The questionnaire has three major sections: Current household members, Household members that have left since the start of the recall period, and household members that have died since the start of the recall period. For each section, team listed information about the respondent, followed by spouse(s), parents, siblings, children and then other current household members.

5.1.2 Training and Supervision

A total of 30 people were trained. They attended 2 days of theoretical training on assessment methodology, measurement, questionnaires and other assessment tools (event calendar). Theory was completed by various practical exercises using SMART standard assessment training tools. In addition, 2 standardization tests took place in order to evaluate and guarantee the enumerators' accuracy and precision in taking measurements (see results in annex 4). The field team manager used post-training and standardization test results to determine optimal team composition.

The training was completed with a one-day field test on non-selected village 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.

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.

5.2 Data Analysis

Data entry was made simultaneously with data collection. Data collected were entered by one data entry officer and checked by survey manager using the latest version of ENA software (9th July 2015), 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, and EPINFO (version 3.5.4).

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 annex 5).

6 Results

6.1 Demographic Characteristics of the Sample Population

This section presents information on demographic and socioeconomic characteristics of the survey respondents.

Table 4 shows the percent distribution of women and men. A total of 3,048 individuals stayed overnight in the 476 interviewed households. About 50% of them (1,531) were female, and 50% (1,517) were male. Children under age 17 (49%) represent nearly half of the population, while 4% of Twic East's population are age 65 or older.

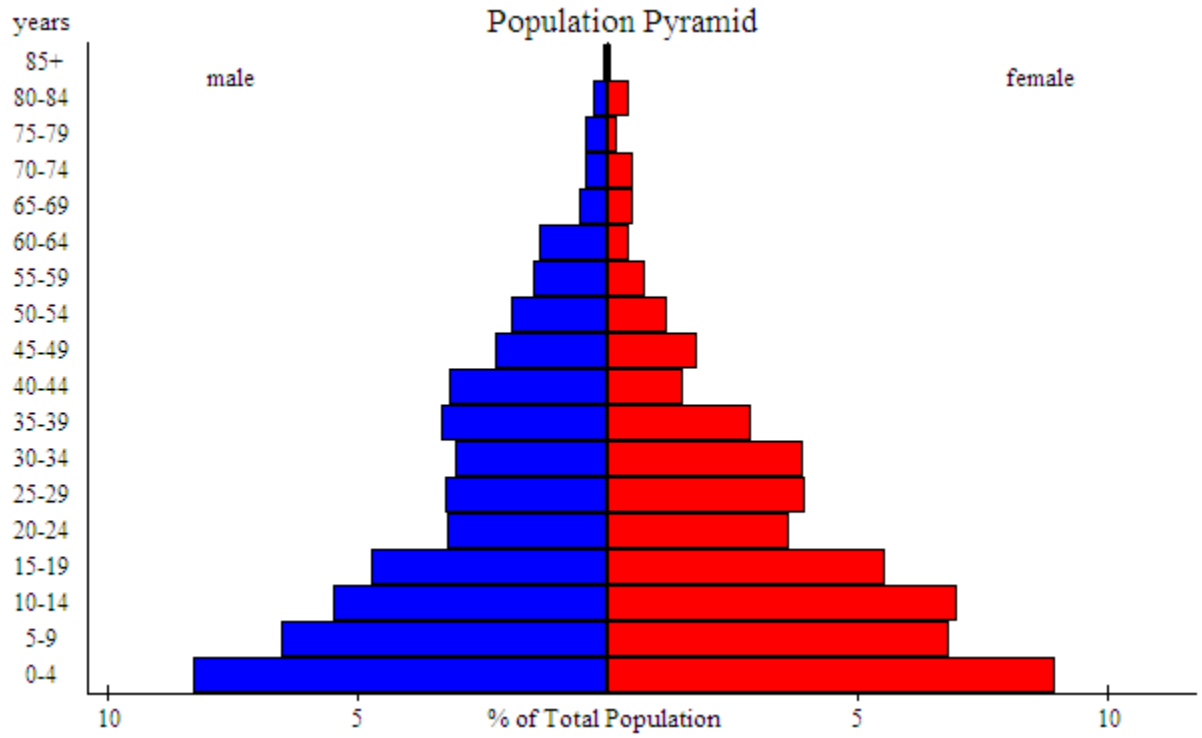
Table 3: Table for age groups

Year	Popul.	%	male	female
'0-4	525.5	17%	252.5	273
'5-11	555	18%	270	285
'12-17	431	14%	188.5	242.5
'18-49	1209	40%	605.5	603.5
'50-64	218	7%	145	73
'65-120	109.5	4%	55.5	54

Sum:	3048		1517	1531
Percent			50%	50%

The population pyramid in Figure 1 shows the population distribution by 5-year age groups, separately for males and females. The broad base of the pyramid indicates that the population is young, which is typical of countries with low life expectancies and high fertility rates.

Figure 1: Percent distribution of the household population



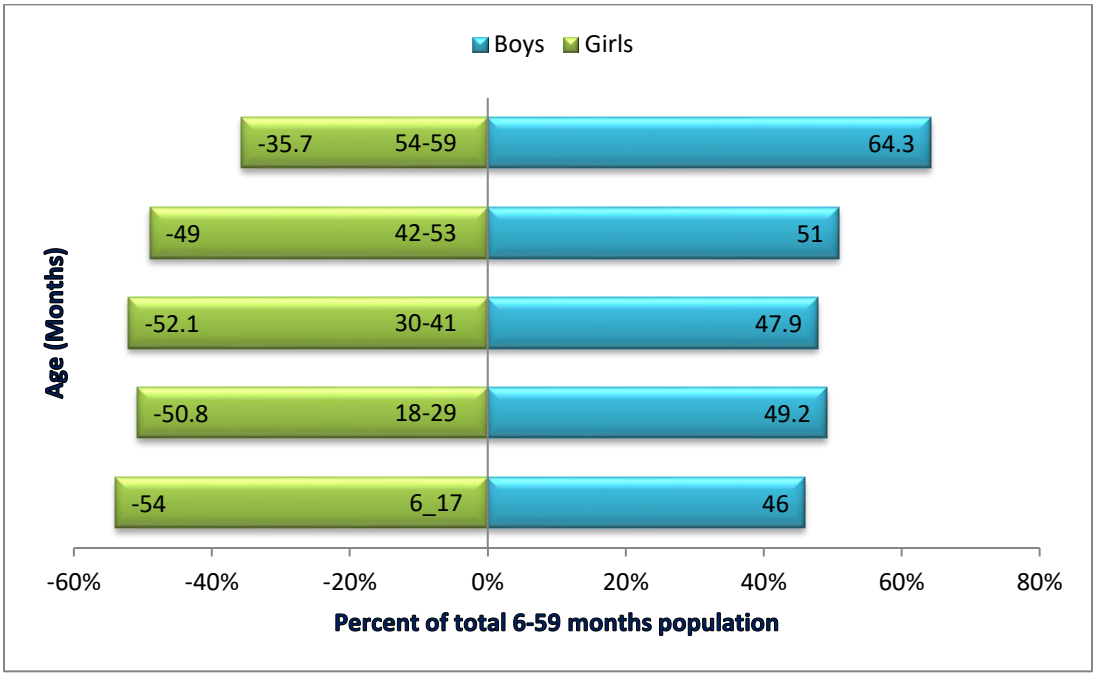
Ninety-seven percent respondents are permanent residents, while 3% are returnee in the last one year. Nonetheless, 18% of households found to have at least one returnee in the last one year as a household member. The average household size in Twic East is 6.4 persons. Men head the majority of households (67%), with only 1 in 3 households headed by women.

A distribution of the sample according to sex allows verifying that both sexes are equally distributed, and that no selection bias has occurred. The total ratio should be between 0.8 and 1.1 if there was no sex bias in the selection. An age–sex breakdown of the survey sample for the anthropometry survey population (children aged 6–59 months) shows a sex ratio within the range of 0.8-1.1 (ratio of boys/girls 0.97). Statistical test using chi-square statistics shows that boys and girls are equally represented (p-value = 0.752). This shows that there was no selection bias.

Age ratio of 6-29 months to 30-59 months was not as expected. Age ratio of 6-29 months to 30-59 months was 1.03 indicating a slight over-representation of the youngest age group (The value should be around 0.85). Similarly, overall age distribution for age groups 6–17 months, 18–29 months, 30–41

months, 42–53 and 54–59 months show a significant difference than what is normally expected (p-value = 0.004). Nonetheless, overall age distribution for the entire 0-59 months using test by two age categories (0-<2, 2-<5) shows an acceptable distribution (p-value = 0.358)

Figure 2: Age and sex distribution of the anthropometry survey



6.2 Anthropometric results (based on WHO standards 2006):

Anthropometry data was analysed based on WHO standards 2006. Data was collected from 489 children aged 6-59 months in 476 households. Five anthropometry datasets were flagged by SMART software for wasting; the flagged datasets were excluded from WHZ analysis.

6.2.1 Prevalence of acute malnutrition

6.2.1.1 Weight-for-Height z-scores and/or oedema

Acute malnutrition is classified at individual level as normal, moderate acute and severe acute malnutrition. At population level, the prevalence of malnutrition is expressed as severe acute malnutrition and global acute malnutrition. Global acute malnutrition expresses the sum of severe acute malnutrition and moderate acute malnutrition. This could be summarized:

- Global acute malnutrition prevalence: Proportion of children with WFH <–2 z-scores and/or oedema

- Moderate acute malnutrition prevalence: Proportion of children with WFH <–2 z-scores and WFH > = –3 z-scores
- Severe acute malnutrition prevalence: Proportion of children with WFH <–3 z-scores and/or oedema

Table 5 shows WHO's classification of public health significance or target for Weight-For-Height.

Table 4: Classification of the situation based on weight-for-height (WHO)

Cut-off point	Classification of the situation
GAM >15%	Critical (Very High)
GAM > 10%-14%	Serious (High)
GAM >5%-9%	Poor (medium)
GAM <5	Normal (low)

The prevalence of Global Acute Malnutrition (GAM) was 18.4 % (14.3 - 23.3 95% C.I.) and the prevalence of Severe Acute malnutrition (SAM) was 2.5 % (1.3 - 4.6 95% C.I.). No link was established between gender and global acute malnutrition.

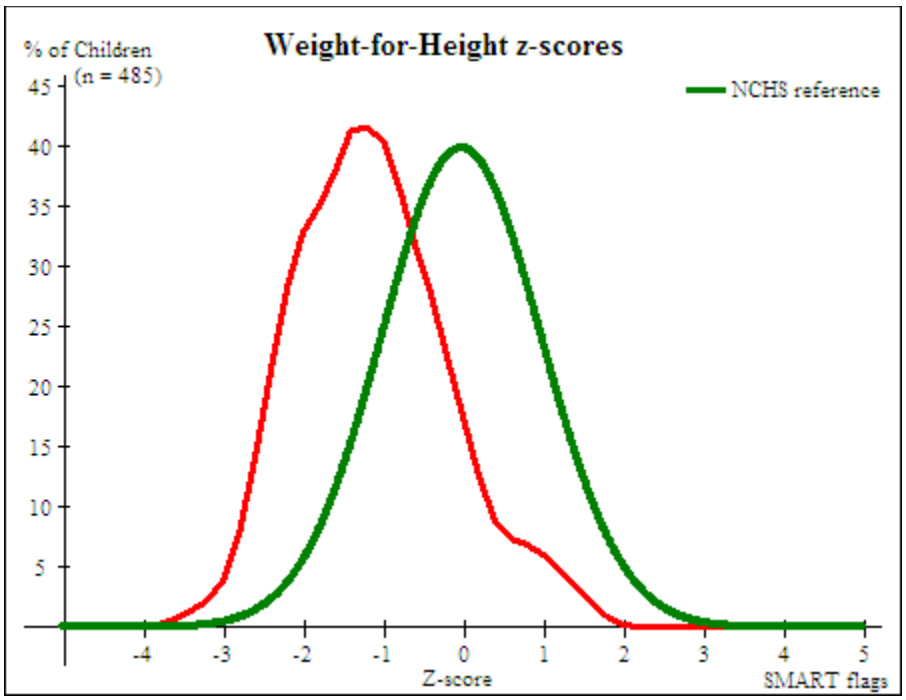
Table 5: Prevalence of acute malnutrition based on weight-for-height z-scores (and/or oedema) and by sex

	All n = 484	**Boys** n = 238	**Girls** n = 246
Prevalence of global malnutrition (<-2 z-score and/or oedema)	(89) 18.4 % (14.3 - 23.3 95% C.I.)	(46) 19.3 % (13.7 - 26.6 95% C.I.)	(43) 17.5 % (12.2 - 24.4 95% C.I.)
Prevalence of moderate malnutrition (<-2 z-score and >=-3 z-score, no oedema)	(77) 15.9 % (12.4 - 20.2 95% C.I.)	(40) 16.8 % (12.0 - 23.0 95% C.I.)	(37) 15.0 % (10.4 - 21.2 95% C.I.)
Prevalence of severe malnutrition (<-3 z-score and/or oedema)	(12) 2.5 % (1.3 - 4.6 95% C.I.)	(6) 2.5 % (1.1 - 5.9 95% C.I.)	(6) 2.4 % (1.1 - 5.3 95% C.I.)

The prevalence of oedema is 0.0 %

The distribution of WFH z-scores of the survey was plotted on a graph (red) and compared with the WHO standard population (green). Distribution curves of z-scores give a complete picture of the nutrition status of the whole population, which can be compared with that of the WHO standard population. Figure 3 shows that the sample population's WHZ distribution (red) is shifted to the left of the WHO standard population showing the population in Twic East are malnourished compared with the standard population.

Figure 3: Plot of the standard and sample population weight-for-height z-scores frequency distribution



6.2.1.1.1 Age-specific prevalence of acute malnutrition

Prevalence of malnutrition may be higher in one age group than another. Survey results are reported in Table 7 for age specific prevalence of malnutrition defined by WFH z-scores and/or oedema. The standard age groups are: 6–17 months, 18–29 months, 30–41 months, 42–53 months and 54–59 months. Severe wasting is highest in the youngest age group of children age 6-17 (3.3%) and lowest in older children age 54-59 (0%).

Table 6: 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	123	4	3.3	16	13.0	103	83.7	0	0.0
18-29	120	3	2.5	14	11.7	103	85.8	0	0.0
30-41	117	2	1.7	16	13.7	99	84.6	0	0.0
42-53	96	3	3.1	19	19.8	74	77.1	0	0.0
54-59	28	0	0.0	12	42.9	16	57.1	0	0.0
Total	484	12	2.5	77	15.9	395	81.6	0	0.0

6.2.1.2 Prevalence of acute malnutrition using MUAC cut-offs

MUAC is closely correlated with mortality and is a better indicator of mortality for severely malnourished children, than WFH. In addition, MUAC is not affected by oedema or heavy parasite loads. The main cut-off criterion for admission children in to selective feeding programs in survey areas is MUAC. The diagnostic criteria for SAM in children aged 6–59 months is MUAC <115 mm and for MAM is MUAC ≧115 mm and < 125 mm.

Table 8 shows prevalence of proxy global acute malnutrition using MUAC cut-offs was 8.8% with severe wasting of 0.6%.

Table 7: Prevalence of acute malnutrition based on MUAC cut offs (and/or oedema) and by sex

	All n = 489	**Boys** n = 241	**Girls** n = 248
Prevalence of global malnutrition (< 125 mm and/or oedema)	(43) 8.8 % (6.0 - 12.7 95% C.I.)	(20) 8.3 % (5.2 - 12.9 95% C.I.)	(23) 9.3 % (5.7 - 14.7 95% C.I.)
Prevalence of moderate malnutrition (< 125 mm and >= 115 mm, no oedema)	(40) 8.2 % (5.5 - 12.0 95% C.I.)	(20) 8.3 % (5.2 - 12.9 95% C.I.)	(20) 8.1 % (4.9 - 13.0 95% C.I.)
Prevalence of severe malnutrition (< 115 mm and/or oedema)	(3) 0.6 % (0.2 - 1.9 95% C.I.)	(0) 0.0 % (0.0 - 0.0 95% C.I.)	(3) 1.2 % (0.4 - 3.8 95% C.I.)

6.2.2 Prevalence of underweight

Weight-for-age is a composite index of height-for-age and weight-for-height. It takes into account both chronic and acute malnutrition. A child can be underweight for his/her age because he or she is stunted, wasted, or both. Weight-for-age is an overall indicator of a population's nutritional health. At individual level, children with weight-for-age below minus two standard deviations (−2 SD) are classified as underweight. Children with weight-for-age below minus three standard deviations (−3 SD) are considered severely underweight.

At population level, a global WFA ≧ 30% in a population is considered critical (very high), between 20%-29% high, between 10%-19% medium and less than 10% low (normal).

Table 9 shows that 10.1% of under-age five children are underweight (have low weight-for-age) in Twic East.

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

	All n = 485	Boys n = 238	Girls n = 247
Prevalence of underweight (<-2 z-score)	(49) 10.1 % (6.8 - 14.8 95% C.I.)	(30) 12.6 % (7.8 - 19.8 95% C.I.)	(19) 7.7 % (4.7 - 12.4 95% C.I.)
Prevalence of moderate underweight (<-2 z-score and >=-3 z-score)	(43) 8.9 % (6.2 - 12.6 95% C.I.)	(25) 10.5 % (6.9 - 15.8 95% C.I.)	(18) 7.3 % (4.5 - 11.5 95% C.I.)
Prevalence of severe underweight (<-3 z-score)	(6) 1.2 % (0.4 - 4.1 95% C.I.)	(5) 2.1 % (0.7 - 6.5 95% C.I.)	(1) 0.4 % (0.1 - 3.0 95% C.I.)

6.2.3 Prevalence of chronic malnutrition

Children whose height-for-age Z-score is below minus two standard deviations (−2 SD) from the median of the WHO reference population are considered short for their age (stunted), or chronically malnourished. Children who are below minus three standard deviations (−3 SD) are considered severely stunted. Stunting reflects failure to receive adequate nutrition over a long period of time and is affected by recurrent and chronic illness. Height-for-age, therefore, represents the long-term effects of malnutrition in a population and is not sensitive to recent, short-term changes in dietary intake.

WHO classifications for stunting at a population level are: ≧ 40% critical (very high), 30%-39% high, 20%-29% medium and < 20% low.

Table 10 shows the overall and gender prevalence of stunting. The survey result showed that 6.3% of the 6-59 months in Twic East are stunted.

Table 9: Prevalence of stunting based on height-for-age z-scores and by sex

	All n = 464	Boys n = 226	Girls n = 238
Prevalence of stunting (<-2 z-score)	(29) 6.3 % (3.7 - 10.3 95% C.I.)	(14) 6.2 % (3.6 - 10.3 95% C.I.)	(15) 6.3 % (3.0 - 12.9 95% C.I.)
Prevalence of moderate stunting (<-2 z-score and >=-3 z-score)	(29) 6.3 % (3.7 - 10.3 95% C.I.)	(14) 6.2 % (3.6 - 10.3 95% C.I.)	(15) 6.3 % (3.0 - 12.9 95% C.I.)
Prevalence of severe stunting (<-3 z-score)	(0) 0.0 % (0.0 - 0.0 95% C.I.)	(0) 0.0 % (0.0 - 0.0 95% C.I.)	(0) 0.0 % (0.0 - 0.0 95% C.I.)

6.3 Nutritional Status of Women

Women of reproductive age are especially vulnerable to chronic energy deficiency and malnutrition due to low dietary intake, inequitable distribution of food within the household, improper food storage and preparation, dietary taboos, infectious diseases, and inadequate care practices. Chronic undernutrition among women is a major risk factor for adverse birth outcomes.

The survey collected anthropometric data on MUAC for pregnant and lactating women. The survey has identified 710 women of which 216 are pregnant and lactating. The survey finds that 2.8% of the PLWs were with a MUAC less than 210mm, 21.3% with a MUAC between 210 and 230 and three fourth of the PLWs were with a MUAC over 230mm.

Table 10: PLW nutritional status

MUAC< 210MM	MUAC ≥210-≤230MM	MUAC >230MM
(6) 2.8 % (0.6 - 4.9 95% C.I.)	(46) 21.3 % (13.7 - 28.9 95% C.I.)	(46) 75.9 % (68.3 - 83.6 95% C.I.)

6.4 Mortality results (retrospective over 3 months/90 days prior to interview)

Crude and under-5 mortality rates are key indicators to evaluate the magnitude of a crisis, and **a doubling of non-crisis (baseline)** mortality is taken to define an emergency situation. Mortality is normally reported in two ways: crude mortality rate (CMR) and under-five mortality rate (U5MR). These rates are defined as:

- CMR: the rate of death in the entire population, including both sexes and all ages (total deaths/10,000 people/day
- U5MR: the rate of death among children below five years of age in the population 9deaths in children under five/10,000 children under five/day)

Baseline, non-crisis CMRs in most of Sub-Saharan Africa are in the range 0.3-0.6 per 10,000 per day, with a probable current average of 0.44. Based on this, in 1990 Toole and Waldman suggested an approximate doubling of Crude Mortality Rate (to 1 per 10,000 per day) as a useful threshold for formally declaring an emergency, from a health stand point. This simple threshold has since been adopted widely and incorporated into various humanitarian guidelines.

The survey planned to collect mortality data from 490 households and 3,160 persons. Table 11 shows mortality survey included 476 households and 3048 persons. The sample size was large enough to allow the width of the 95% confidence intervals to be within 52% of the estimated mortality rate.[7]

The average household size in the surveyed population is 6.4 persons per household while the 0-59 month old population accounted for 18% of the entire population. The birth rate was 0.95 births per 10,000 population per day while in migration rate and out migration rates were 4.92 and 6.27 persons from 10,000 in one day.

Table 11: Demographic characteristics of survey population

General Data:	
	Results:
Total number of HHs	476
Total number of HHs with children under five	345
Average household size	6.4
Mid Interval Population Size	3048
Number of Clusters	34
Percentage of children under five	18
Birth Rate	0.95
In-migration Rate (Joined)	4.92
Out-migration Rate (Left)	6.27

Mortality rates were calculated retrospectively over a 90 day recall period. In terms of absolute number of deaths over a 90-day recall period there were a total of 19 deaths. The retrospective crude and U5 mortality rates) for the 90 days preceding the survey were 0.69 (0.36-1.3295% CI) and was 0.63 (0.20-1.96 95% CI), respectively.

Table 12: Mortality rates

	Number of deaths	**Deaths/10,000/day**
CMR (total deaths/10,000 people / day):	19	0.69 (0.36-1.3295% CI)
U5MR (deaths in children under five/10,000 children under five / day):	3	0.63 (0.20-1.96 95% CI)

Table 14 shows gender specific and age specific mortality rates. The mortality rate based on gender shows men die more than women but the difference is not statistically significant. Male deaths are localized while female deaths are uniformly distributed across the county.

[7] A review of methodology and analysis of nutrition and mortality surveys conducted in humanitarian emergencies from October 1993 to April 2004 Claudine Prudhon and Paul B Spiegel

Age specific mortality rate indicated that the 65+ year olds were affected disproportionately with 4 deaths/per 10000 old persons per day followed by the 50-64 age group (1.53 deaths/10000persons/day).

Table 13: Age and sex specific mortality rates

Sex	Death Rate	Design Effect
Male	0.88 (0.42-1.83)	1.57
Female	0.51 (0.25-1.03)	1
Years		
0-4	0.63 (0.20-1.96)	1
5_11	0.20 (0.03-1.54)	1.01
12_17	0.26 (0.03-2.04)	1.05
18-49	0.64 (0.30-1.38)	1
50-64	1.53 (0.33-6.75)	1.67
65-120	4.06 (1.22-12.77)	1.36

Verbal autopsy of the cause of death indicated that 73.7% were illness related while 26.3% deaths occurred due to injury. The types of illness that were mentioned as cause of death are (n=14): issues related with during delivery (n=3), diarrhoea (n=5), and other causes related with old age (n=6).

Table 14: Causes and location of death

Cause of death	%
1] Unknown	0
2] Injury/Traumatic	26.3
3] Illness	73.7
Location of death	%
1] In current location	68.4
2] Hospital	15.8
3] In place of last residence	0

6.5 Morbidity and health

Interpretation of results of the anthropometry survey, need indicators on immediate causes of malnutrition. To this effect, in the anthropometric questionnaire mothers were asked whether any of their children under age five had illness at any time during the two-week period preceding the survey. The validity of these indicators is affected by the mother's perception of diarrhea/fever/cough/measles

as an illness and her capacity to recall the events. Thus, these variables should be interpreted with caution.

Table 16 shows that 64.8% of children under age five had illness at any time during the two weeks-period preceding the survey.

Table 15: Prevalence of reported illness in 6-59 months old children in the two weeks prior to interview (n=488)

	6-59 months
Prevalence of reported illness	64.8% (56.1-73.5 95% C.I.)

Those mothers who reported illness in the past 14 days were further asked to describe the symptoms at any time during the past 14 days. Fever was most common (59.6%), followed by Cough (20.4%) and diarrhoea (18.5%).

Table 16: Symptom breakdown in the children in the two weeks prior to the survey (n=314)

	number	6-59 months
Fever	187	59.6% (50.6-68.5 95% C.I.)
Cough	64	20.4% (13.7-27.0 95% C.I.)
Diarrhoea	58	18.5% (12.1-24.8 95% C.I.)
Other	5	1.6% (0.0-3.7 95% C.I.)

For children who had illness in the two weeks preceding the survey, mothers were asked what they did to treat the illness. Table 18 shows the percentage of children with illness who received specific treatments. Overall, an encouraging 93% percent of the children with illness were taken to a health care facility or provider.

Table 17: Among children (6-59 months) who had illness in the two weeks preceding the survey, the percentage of whom advice or treatment was sought from a health facility provider

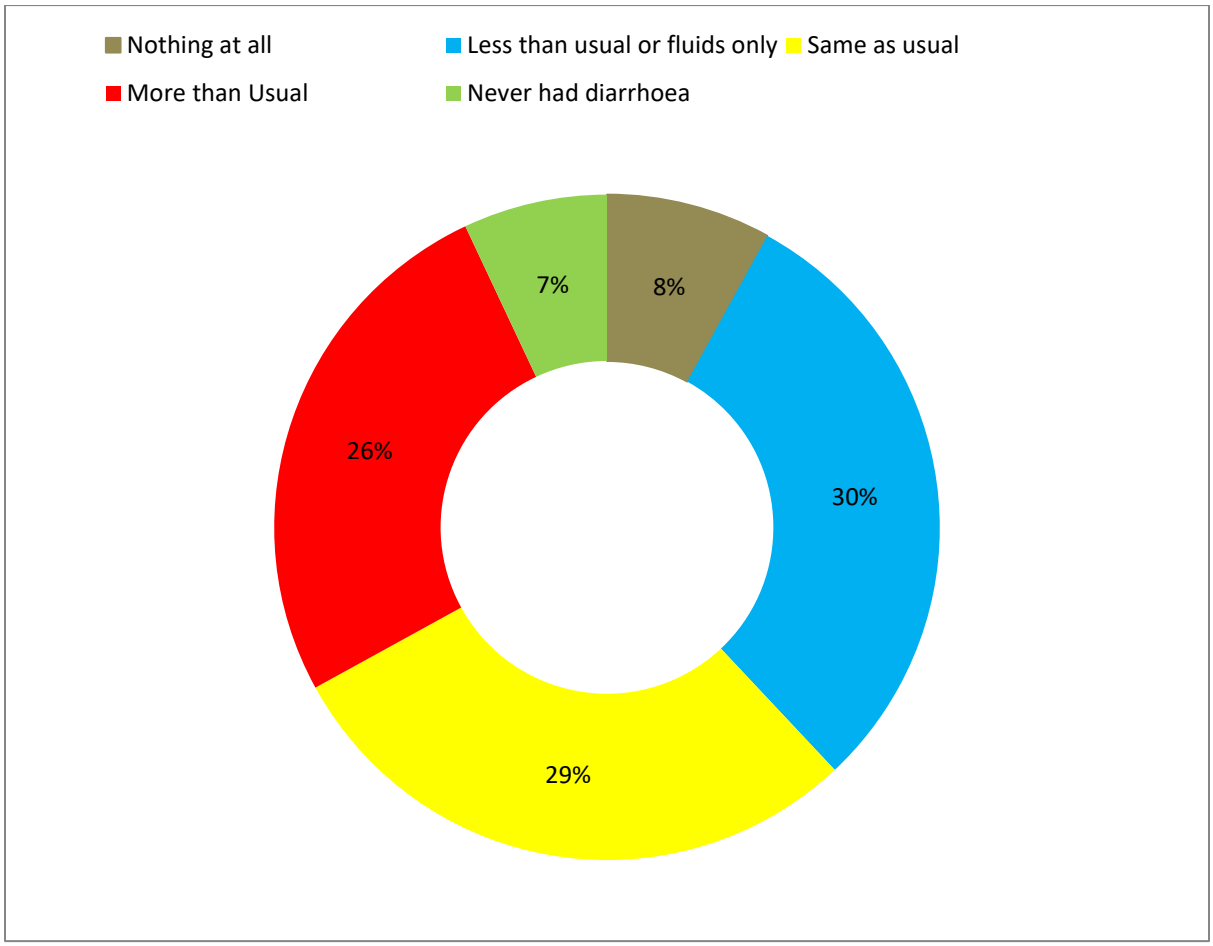
Treatment sought	Results
None	7.2%
Hospital	16.7%
PHCC	65.6%
Private	10.5%
Traditional	1%

The survey has also found that 94.5% of the surveyed 489 children did sleep under a mosquito net (LLITN) the previous night.

6.6 Feeding practices during diarrhoea

To reduce dehydration and minimise the effects of diarrhoea on nutritional status, mothers are encouraged to continue normal feeding of children with diarrhoea and to increase the amount of fluids. Mothers reported that 30% give less than usual or fluids only, 29% give the usual amount of liquids and food, and 26% of mothers reports that children received somewhat more amount of liquids and foods than usual during diarrhoea episode.

Figure 4: Feeding practices during diarrhoea



6.7 Deworming, immunization coverage and vitamin A supplementation

It is essential to measure measles vaccination coverage in humanitarian emergencies, as measles epidemics may lead to high numbers of deaths among children. WHO recommends that 90% of children aged from 9 to 59 months be vaccinated against measles, to ensure effective epidemic prevention.

Information on deworming, BCG and measles vaccinations and vitamin A supplementation coverage were collected during an anthropometric survey because of their relationship with mortality and malnutrition.

The survey collected information on vaccination and supplementation coverage in three ways: from vaccination cards shown to the interviewer, from mothers' verbal reports, and by checking BCG scars. For each of these children, mothers were asked to provide their health card. When interviewers could see these health cards, the data of vaccinations were copied from the card directly onto the questionnaire. The reference period for these indicators was the past six months. If the interviewer did not see the card/card not available or if a vaccine had not been recorded on the card as being administered, the mother was asked to recall the specific vaccines given to her child. The vaccination coverage is based on both the information copied from the health cards and the information obtained from the mothers' reports.

Table 19 shows deworming, BCG vaccination coverage and vitamin A supplementation in children aged 6-59 months, and measles immunization for 6-59 month, in the six months prior to the survey period. Optimal coverage levels were observed across the board.

Table 18: Deworming, BCG and measles vaccination and Vitamin A supplementation coverage

	%	95% CI
BCG by scar (6-59 months) (n=485)	**98.6**	96.8 – 100.0
Measles by card (9-59 months) (n=460)	**79.3**	71.0 – 87.7
Measles by card **and** recall (9-59 months) (n=460)	**98**	98.4 – 100.0
Vitamin A in last 6 months (6-59 months) (n=486)	**89.7**	85.5 – 93.9
Deworming (12-59) (n=433)	**76.9**	65.4 – 88.3

6.8 Infant and Young Child Feeding practices (IYCF)

Suboptimal infant and young child feeding practices increase vulnerability to under-nutrition, disease and death. The risks are heightened in disasters and the youngest are most vulnerable. Optimal feeding practices that maximize survival and reduce morbidity in children under-24 months are early initiation of exclusive breastfeeding, exclusive breastfeeding for 6 months, continued breastfeeding to 24 months or beyond, and introduction of adequate, appropriate and safe complementary foods at 6 months.

The IYCF indicators were collected from mothers or primary caretakers. Infant and young child feeding practices reported in this survey are

- Proportion of children born in the last 24 months who were put to the breast within one hour of birth
- Proportion of infants 0-5 months of age who are fed exclusively with breast-milk
- Proportion of children 12-15 months of age who are fed breast milk

- Proportion of children 6-23 months of age who receive foods from 4 or more food groups
- Proportion of children 6-23 months of age who receive a minimum acceptable diet (apart from breast milk)
- Meal frequency of children 6-23 months of age
- Proportion of children born in the last 24 months who were ever breastfed

The survey had used standard guideline of WHO to analyze infant and young feeding practices.[8]

Table 20 shows that 91.2% of children born in the 2 years before the survey were breastfed at some point. Almost 98% were breastfed within 1 hour of birth, and nearly all infants (100%) were breastfed within 1 day of birth. Overall, 90% of children under age 6 months are exclusively breastfed (Table 20). Contrary to the recommendation that children under the age of 6 months be exclusively breastfed, many infants are also fed with other liquids such as animal milk (3%), animal milk liquids and cereals (3%), and water (3%) before reaching age 6 months (0-5 months).

Continued breastfeeding is relatively long at 95.5% at age 1, while 86.8% continue breastfeeding until their second birthdays.

The first breast milk contains colostrum, which is highly nutritious and has antibodies that protect the newborn from diseases. Nearly all (98.9%) mothers reported feeding colostrum to their new born.

Dietary diversity is a proxy for adequate micronutrient density of foods. Minimum dietary diversity assesses food intake among children age 6-23 months from at least four food groups. The cut-off of four food groups is associated with better-quality diets for both breastfed and non-breastfed children.

Consumption of food from at least four food groups means that the child has a high likelihood of consuming at least one animal source of food and at least one fruit or vegetable in addition to a staple food (grains, roots, or tubers). [9] The four food groups should come from a list of seven food groups: grains, roots, and tubers; legumes and nuts; dairy products (milk yogurt, cheese); flesh foods (meat, fish, poultry, and liver/organ meat); eggs; vitamin A-rich fruits and vegetables; and other fruits and vegetables.

According to the survey results 5% of the children had an adequately diverse diet in which they had been given foods from the appropriate number of food groups. The survey finds that only 5% had minimum dietary diversity (eating from 4 groups). On the other side, 8.1% had been fed 3 food groups, 48% from 2 food groups and 38% from a single food group.

[8]Indicators for assessing infant and young child feeding practices, Part 2 Measurement, WHO, USAID, FANTA II, IFPRI, Unicef

[9] World Health Organization (WHO). 2008. Indicators for Assessing Infant and Young Child Feeding Practices. Geneva, Switzerland: WHO.

Minimum meal frequency, a proxy for a child's energy requirements, examines the number of times children received foods other than breastmilk. The minimum number is specific to the age and breastfeeding status of the child. Breastfed children are considered to be consuming minimum meal frequency if they receive solid, semi-solid, or soft foods at least twice a day for infants age 6-8 months and at least three times a day for children age 9-23 months. Non-breastfed children age 6-23 months are considered to be fed with a minimum meal frequency if they receive solid, semi-solid, or soft foods at least four times a day.

According to the survey results, the feeding practices of 93.8% of 6-8 months and 66.2% of 9-23 months meet the minimum standards with respect to number of times they were fed during the day or night before the survey.

Table 19: Summary of IYCF indicators (n=217)

Indicator	Age group	n	Value	
Early initiation of breastfeeding within an hour	0-23.9 months	217	97.8% (93.1-99.3 95% C.I.)	
	0-12 months	104	100.0% (100.0-100.0 95% C.I.)	
	12-24 months.	144	98.2% (94.7-98.5 95% C.I.)	
Continued breastfeeding	at 1 year	48[10]	95.5% (86.2-100.0 95% C.I.)	
	at 2 years	30[11]	86.8% (72.3-100.0 95% C.I.)	
Children ever breastfed	0-23.9 months	217	91.2% (84.5-98.0 95% C.I.)	
	0-12 months	104	100.0% (100.0-100.0 95% C.I.)	
	12-24 months.	144	89.3% (81.2-97.4 95% C.I.)	
Exclusive breastfeeding	0-5.9	36	90.9% (79.4-100.0 95% C.I.)	
Colostrum	0-23.9	217	98.9% (97.4-100.0 95% C.I.)	
Meal frequency	6-23.9	181	1 times	2.7%
		181	2 times	31.5%
		181	3 times	35.6% (mean)
		181	4 times	27.4%
		181	5 times	2%
Minimum meal frequency (MMF).	6-8	24	93.8%	
	9-23.9	157	66.2%	
Minimum dietary diversity (MDD)	6-23.9	217	5%	

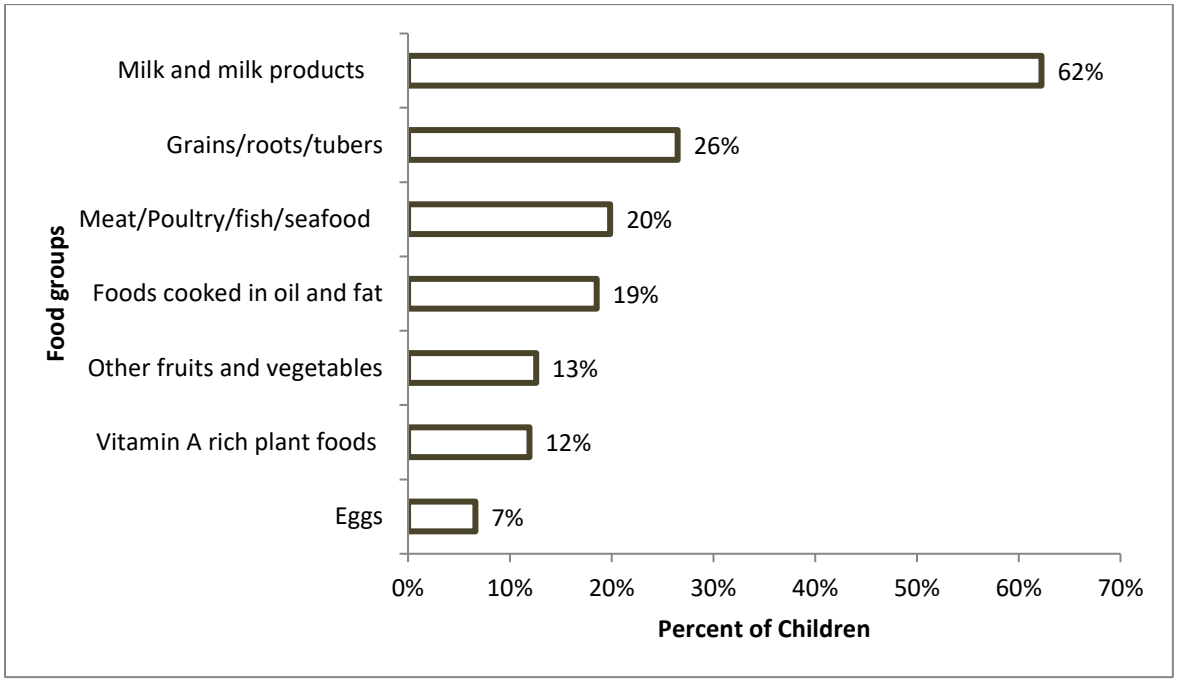
[10] children 12–15 months of age who received breast milk during the previous day over Children 12–15 months of age

[11] Children 20–23 months of age who received breast milk during the previous day over Children 20–23 months of age

Women who had at least one child living with them who was aged 6-23.9 were asked questions about the types of liquids and foods the child had consumed during the day or night before the interview.

Figure 5 indicates the types of foods and liquids children 6-23 months consumed during the day and night before the interview. Overall, the food items most commonly given to children were milk and milk products, followed by food made from grains, fish/meat, foods cooked in oil and fats, other fruits and vegetables, fruits and vegetables rich in vitamin A, eggs.

Figure 5: types of foods and liquids children under 2 years of age consumed during the day and night before the interview



6.9 WASH

Data from 476 households was collected.

In Twic East, 99.8% of households have access to an improved source of drinking water. Fetching drinking water is an additional chore that could be of great cost to household members, depending on the time spent to obtain it. More than a third of households travel 30 minutes or longer round trip to fetch drinking water.

Clean water is a basic need for human life; however, 1 in 4 households report that they do not treat their water prior to drinking. Overall, 59.2% of households are using an appropriate treatment method.

Appropriate treatment methods include boiling, adding bleach/chlorine, straining through a cloth, filtering, and letting it stand and settle.

Overall, 20% of households use improved toilet.

According to Sphere standards, on average a household of 6 members needs at least 90 liters of water to meet the minimum water requirement of 15 liters per person per day. Only 37.5% of the sampled Households were using more than 90 liters which is the minimum required amount of water needed for domestic use as per the SPHERE standard (15 liters/person per day).

When asked if they washed their hands, 96% of respondents answered yes. There appears to be some understanding of the fecal-oral cycle in that 73% of all surveyed households claimed that they wash their hands after defecating. However, only 61% of all households wash before eating. In addition, 74% of households washed prior to cooking. A significant lack of knowledge of the importance of washing after taking children to the toilet was noted in that only 17% are practicing this.

In terms of materials used for hand washing, 73% of all households either use soap (41%) or would use ash (8%). Twenty-three percent were only using water to wash their hands.

Table 21 presents information on the percentage of household by WASH indicators.

Table 20: Summary of findings for WASH indicators

Characteristics	%
Source of drinking water	
Borehole/hand pump	99.8% (99.4-100.0 95% C.I.)
Time to obtain drinking water(round trip)	
<30 min	63.3% (56.6-70.0 95% C.I.)
>30min to <1hr	30.2% (24.6-36.2 95% C.I.)
>1hr to < 2hr	5.3% (2.3-8.3 95% C.I.)
>2hr to < 4hr	0.8% (0.0-2.3 95% C.I.)
>4hr	0.2% (0.0-0.6 95% C.I.)
Water treatment prior to drinking	
Nothing	40.8%
Boiling	28.8%
Filtering with a cloth	10.7%
Letting it settle	15.3%
Water treatment chemicals	25.3%
Water consumption	
Proportion of households consuming >/= 15 Liters per person per day	37.5%
Percent distribution of households by type of toilet/latrine facility	
Undesignated open area	52.3%
Designated open area	27.8%
Hole	1.2%
Latrine	18.8%
Proportion of caregivers who wash their hands before certain crucial events	
Never	2%
After defecating	73%
Before cooking	74%
Before eating	61%
Before feeding the baby	35%
After cleaning the baby	17%
Three out of 5 critical times	5%
At all 5 critical times	1.5%
What do you use to wash hands	
Water only	23.4%
Water + Soap	41.4%
Water + Ash	8.9%

6.10 Food security and livelihood

Food security encompasses both the quantity and the quality of food accessed. The survey questionnaire of food security and livelihood focused on identifying the ways in which people accessed/will access food and income.

It aims to measure the following core indicators at the household level:

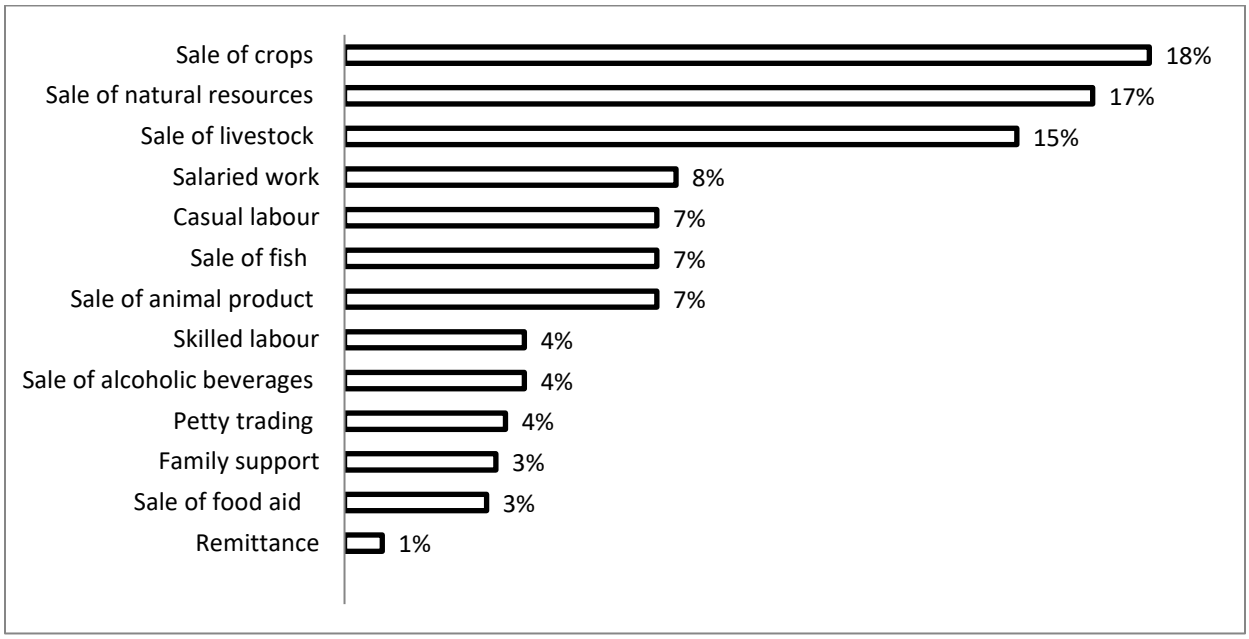
- Access to food assistance
- Food security condition in coming months

6.10.1 Source of income

Since the conflict, rural and urban populations face movement restrictions, and therefore have little access to cash, 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. All communities within the area have seen an increase in food prices.

Questions on source of income for the surveyed households in a month preceding the survey date revealed that 18% of households were dependent in sale of crops, 17% in production and sale of charcoal, 15% on sale of livestock, 8% from earnings of salaried work, 7% on earnings of casual labour, sale of alcohol, 8% on salary, 7% on casual labour, sale of fish and sale of animal products each, 4% on earnings from skilled labour and petty trading and sale of alcoholic. Overall, 64% of the households were mainly dependent on agriculture and production of primary activities.

Figure 6: Source of income for a month preceding the survey (n=460)



6.10.2 Access and availability of food from own production, livestock and food assistance

The survey finding revealed that 60.0% (50.5-69.9 95% C.I.) of households had harvested during the recent past main harvest season (Nov-Dec). Additionally, 74.5% (67.8-81.4 95% C.I.) of households reported having engaged in rearing of livestock.

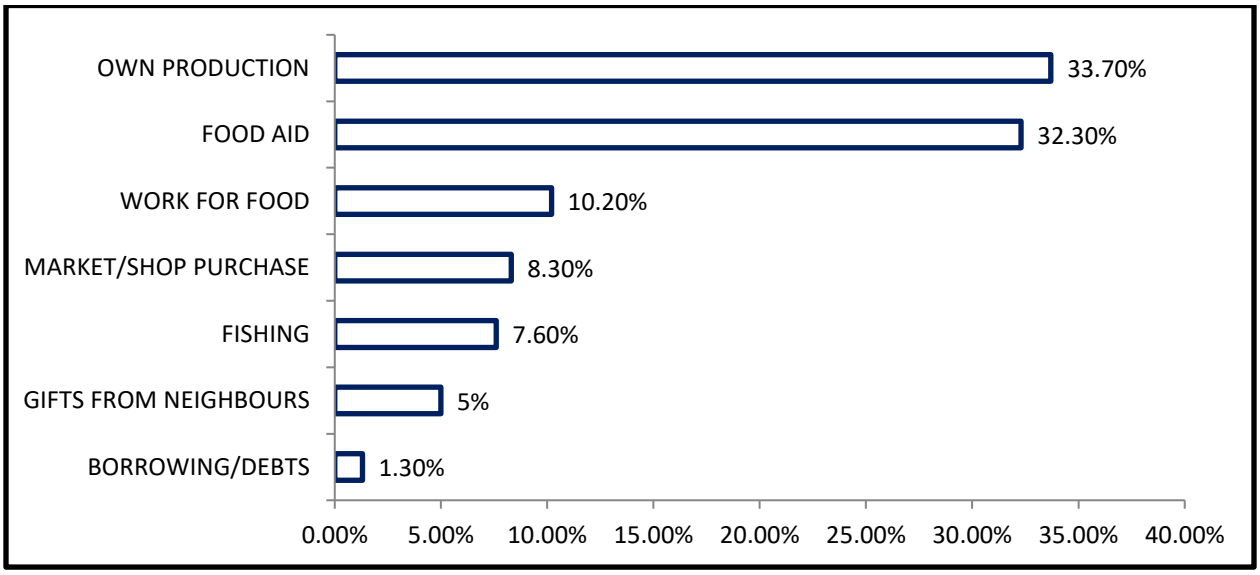
The survey findings revealed that 85.9% of the population received World Food Programme (WFP) food rations aka. Three percent of surveyed households have reported not to have any humanitarian assistance in past three months was just 1%.

Table 21: Access to humanitarian assistance in the past three months (n=460)

No humanitarian assistance	1.3% (0.1-2.5 95% C.I.)
GFD	85.9% (50.5-69.9 95% C.I.)
Seeds and tools	7.0% (0.7-13.2 95% C.I.)
Fishing kits	2.6% (0.0-6.3 95% C.I.)

Thirty-three percent of the households were using their own stock to access as main source of food during the week preceding the survey date. Food aid has come as the second most important food source during the week of the survey. Figure 7 lists other main source of foods.

Figure 7: Main source of food during the 7 days preceding the survey (n=460)



7 Discussion

The results of this SMART survey provide a snapshot of the situation; it tells us what is happening at the given moment. Extra information on the causes of malnutrition gives an added value by potentially telling us why it is happening and eventually improving programmatic decisions.

7.1 Malnutrition

The boy/girl ratio and other statistical criteria of quality were all as expected for a representative sample.

According to the WHO categorization of the public health significance of undernutrition, the prevalence of GAM in Twic East, 18.4 % (14.3 - 23.3 95% C.I.), indicates a **critical** level. Nonetheless, the calculated prevalence of stunting is very **low** at 6.3%. Regarding underweight the prevalence of 10.1 % (6.8 - 14.8 95% C.I.) indicates a **medium** level.

Figure 8: WHO categorization of the public health significance of undernutrition (1995)

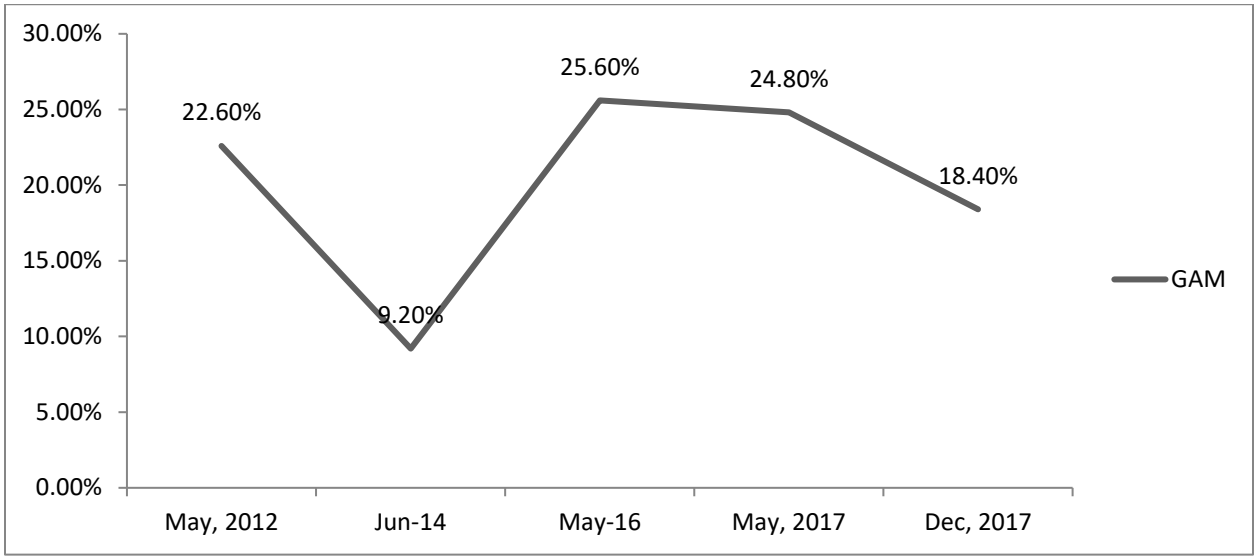
Indicator	Low	Medium	High	Very high
% Stunted	<20	20-29	30-39	≥40
% Underweight	<10	10-19	20-29	≥30
% Wasted	<5	5-9	10-14	≥15

For acute malnutrition further analysis was done by dividing the age groups in the range 6-29 months and 30-59 months in order to see differences in prevalence of acute malnutrition between the younger and the older age group as a whole. Results showed that wasting in 6-29 months old children was 14.9% (10.1-21.4 95% CI) and that of 30-59 months was 21.6% (16.3-28.0 95% CI). The two results of prevalence of acute malnutrition are not statistically significant (p-value=0.0982) indicating both age groups are equally affected by acute malnutrition.

Acute malnutrition expressed by MUAC is more than twice lower than the one expressed by z-score with a prevalence of 8.8% (6.0-12.7 95% CI) for MUAC <125 mm and a prevalence of 0.6% (0.2- 1.9 95% CI) for MUAC < 115 mm. No difference was shown between boys and girls. By age group, there appears to be a correlation between SAM and MAM in the youngest group 6-17 months (19.8% MAM and 2.4% SAM in the 6-17 months).

Nutrition surveys review in Twic East revealed critical levels of GAM in 2012, 2016 and 2017 pre-harvest seasons. So far this is the only post-harvest SMART survey in Twic East, hence direct season-season comparison was not possible. Nonetheless, when compared with pre-harvest survey of 2017 on January the current level of acute malnutrition has statistically different (p=0.0337). Statistical tests have also revealed that there is a 96.6% probability that the two surveys are different. Hence, following the harvest period acute malnutrition has declined in Twic East albeit it remains above the critical threshold level. It is important to note that the time of the year determines particularly the prevalence of wasting. The survey was done in December, which is typically the time of the post-harvest period where we expect a significant decline in prevalence levels.

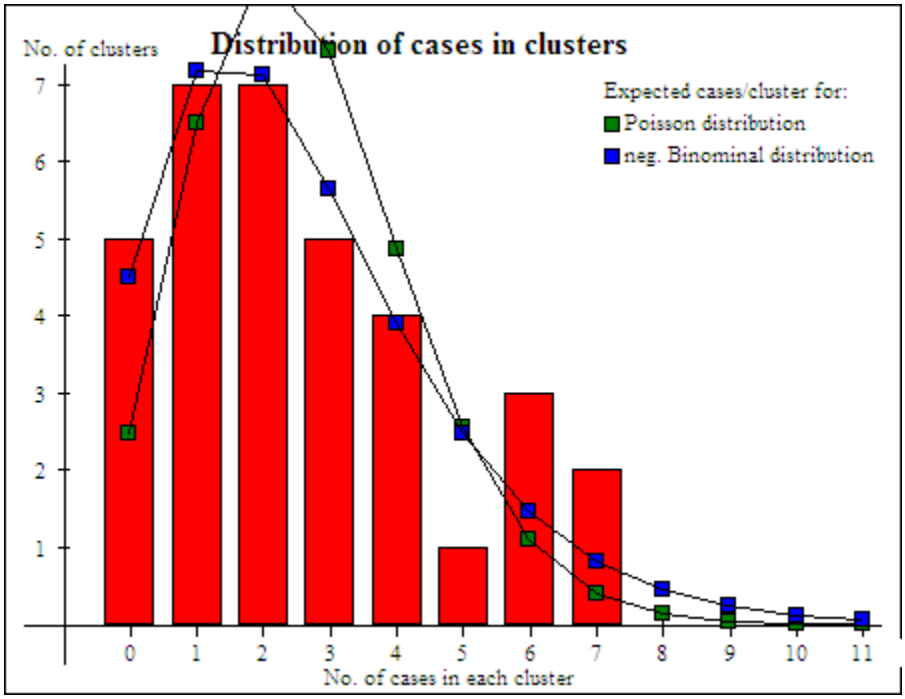
Figure 9: Acute malnutrition using WH z scores during 2012, 2014, 2016 and 2017-Twic East



In the plausibility report the survey has a 5 point as a penalty for poison distribution. This test examines the heterogeneity of the population. If the data conform to a Poisson distribution then we can say that the population is homogeneous (with respect to malnutrition), and we cannot use the data to pick out pockets of malnutrition. If on the other hand the distribution is not a Poisson distribution then we can say that the villages with large numbers of cases do indeed constitute pockets of malnutrition. Such heterogeneity will also cause an increase in the design effect. It helps program managers target more affected areas.

The index of dispersion (ID) for WHZ<-3 is ID=1.18 and the p>0.05. Therefore, we can assume that the distribution of the cases of **severe** wasting for this survey was **random**. However, for WHZ<-2 ID is 1.64 (p=0.011) indicating the cases are **aggregated** into certain cluster (there appear to be pockets of cases). Therefore, in Twic East parts of the county are severely affected and program targeting should take note of this difference in implementation of the CMAM program. The list of payams, Bomas and villages that are disproportionally affected by malnutrition are shared on annex 6. . In 2016 (January to December) the RRC had recorded a total of 19,882 returnees from the neighboring Duk county and Minkaman IDP Camp. These might cause heterogeneity in prevalence of malnutrition amongst the surveyed population, as the new arrivals might have a different livelihood endowment. Also, as discussed in following sections there are major discrepancies in crop production as well as rearing of livestock. These factors might play a role in creating pockets of malnutrition.

Figure 10: Distribution of cases in clusters



7.2 Mortality

The retrospective crude and under mortality rates (CMR and U5MR) were below the emergency threshold i.e. 1death/10,000 persons/day for crude mortality rate and 2 death/10,000persons/day. The retrospective crude and U5 mortality rates for the 90 days preceding the survey were 0.69 (0.36-1.3295% CI) and 0.63 (0.20-1.96 95% CI), respectively. Based on May, 2017 pre-harvest survey in Twic East CMR was 0.54 (0.27-1.09) and U5MR was 0.20 (0.03-1.48). The differences were not statistically significant. The mortality rate based on gender shows men die more than women but the difference is not statistically significant. Male deaths are localized while female deaths are uniformly distributed across the county. Age specific mortality rate indicated that the 65+ year olds were affected disproportionately with 4 deaths/per 10000 old persons per day followed by the 50-64 age group (1.53 deaths/10000persons/day).

Verbal autopsy of the cause of death indicated that 73.7% were illness related while 26.3% deaths occurred due to injury. The types of illness that were mentioned as cause of death are (n=14): issues related with during delivery (n=4), diarrhoea (n=5), and other causes related with old age (n=6).

7.3 Morbidity, measles and BCG coverage and vitamin A supplementation

The survey finds that 64.8% of children 6-59 month old had illness at any time during the two weeks-period preceding the survey. Without a baseline or a comparable data understanding and interpreting morbidity is difficult. Morbidity follows a typical seasonal pattern. Prevalence of morbidity typically reach picks during water shortage, lean periods, after rainy season in areas where malaria is widespread. May, 2017 pre-harvest survey founds a morbidity level of 46%, and that is counter intuitive as we might expect the post-harvest levels to be lower than their pre-harvest level. No explanation was found for this discrepancy.

Findings revealed measles vaccination coverage of 98% for 9-59 months old children. Vitamin A supplementation in the last six months had occurred in 89.7% of children. The current coverage is above the recommended optimum standards recommended by WHO (≥90%). Similarly, a high level of BCG vaccination was found (98.6%). Deworming levels were 76.9%.

7.4 IYCF

Food utilization is commonly understood as the way the body makes the various nutrients in the food to be active, healthy, energetic, and productive population in the society. It is not just food intake that affects nutrition, the way food is consumed, the care of children and above all the health of individuals can be equally important in food utilization. Sufficient energy and nutrient intake by individuals were the results of good care and feeding practices, food preparation, diversity of the diet, and intra-household distribution of food.

It was noticed that breastfeeding is common and widely practiced by all women, as it also indicates the 91.6% of children ever aged 6-23 months were breastfed. However, other practices fall below adequate standards and must be interpreted cautiously within the context.

The rate of exclusive breastfeeding until 6 months was 90.9% which is good according to the WHO rating.

In conclusion, although these two indicators may show positive rates, when they are contextualized they lose power too. Besides, the limitations of the sample should not be neglected, as for some of the indicators the denominator was small.

On the other side, the high rates of continued breastfeeding at 1 and 2 years are positive.

Ninety-four percent of children 6-8 months and 66 percent of children 9-23 months appear to have received a minimum acceptable number of meals. However, regarding the dietary diversity, this percentage represents only 5%. Milk and milk products were by far the most common food consumed

(62%), followed by grains, roots and tubers (26%), meat/poultary/fish (20%), foods cooked in oil and fat (19%), other vegetables and fruits (13%), vitamin A rich plant foods (12%) and eggs (7%).

7.5 WASH

There is a clear link between lack of clean drinking water, proper sanitation and hygiene practices and undernutrition, both in the form of wasting and stunting. The water and sanitation crisis can be considered a driver of the hunger and nutrition crisis. More specifically, the close relation between undernutrition and diarrhoea (a consequence of the lack of sanitation and clean drinking water) is well established: the undernourished are more likely to suffer higher incidences of and increased mortality rates from diarrhoea, while on the other hand those suffering from diarrhoea are more likely to suffer from wasting, as a child affected by diarrhoea will lose appetite, have difficulties eating and will pass water and nutrients in his stool, accelerating the malnutrition process.

The data shows that all households had access to a protected water source (99.8%). However, only 59.8% of households in the survey were treating their water with an effective and safe method (i.e. ceramic filtration, boiling or chlorination). The majority of the population (52%) is practicing open defecation, which is among the main contributing factors for the prevalence of diarrhoea cases in the area. Proper hygiene knowledge is poor in that while respondents seemed to understand the need for proper hand washing, only 61% of all households wash before eating and about 6 out of 10 households do not use soap. The practice of hand washing with soap has a strong evidence base as a key intervention capable of reducing diarrhoeal disease by 30-50% and respiratory infections by 16-23%.[12]

Tearfund runs a WASH project in all the Payams of Twic East County focusing on water supply, sanitation and hygiene (WASH) interventions implemented through the Capacity Building. The objective of the programme is to increase the capacity of Tearfund disaster management team operations, local partner projects and local government departments in conflict-affected and humanitarian contexts, to support improved access to potable water, sanitation and public health education (PHE), resulting in sustainable improved health, well-being and dignity for grassroots communities.

7.6 Food security and livelihood

Food security, which can be explained by the physical and economic access to the food needs of human beings, is often associated with food availability, accessibility and utilization. Previous sections have dealt with the utilization here the availability and accessibility are discussed.

[12] Cairncross S, Hunt C, Boisson S, Bostoen K, Curtis V, Fung I, et al. Water, sanitation and hygiene for the prevention of diarrhoea. Int J Epidemiol. 2010; 39(Sup 1):193-205. [doi:10.1371 /journal.pmed.1000058].

Overall, 64% of the households were mainly dependent on agriculture and production of primary activities for income for a month preceding the survey. These incomes are from sale of crop, sale of livestock, sale of animal products like milk, sale of fish and sale of natural resources. During this post-harvest season income earnings are mainly agricultural resources available to communities and the means by which households make a living are predominantly agricultural. Earnings from off-farm activity like earnings of salaries, casual labour, skilled labour, petty trading and sale of alcoholic beverages accounted for 36% of the surveyed household's income. As we go away from the agricultural season agriculture related incomes further dwindle. This shows the need of capacity building households on how to increase and diversify income generation activities, including business training etc.

Livelihoods resources are the stocks of capital households use to make a living. Overall, 60.0% (50.5-69.9 95% C.I.) of households had harvested during the recent past main harvest season (Nov-Dec). Additionally, 74.5% (67.8-81.4 95% C.I.) of households reported having engaged in rearing of livestock. In one hand the fact that 40% of households did not use to produce crops indicates to windows of opportunity towards a better food security. Capacity building of rural households on how to increase and diversify agriculture production should be considered to make the population more food secured. The proportion of households who have not harvested or do not have livestock indicates food shortage occur due to the fact that agriculture is practiced by part of the population this results in local decline in food availability to the level below the minimum necessary for survival.

Households that lack the basic assets/resources to engage in viable livelihood strategies live continually under the threat of food insecurity. Thirty-three percent of the households were using their own production (stock) to access food (as main source of food) during the week preceding the survey date. Food aid has come as a close second most important food source during the week of the survey (32.2%). The fact that almost a third of the population depends on food aid as main source of food during the week the survey was done reveals the ongoing vulnerability of the population even during the best of times like the period immediately after the harvest season. Fish constitutes as the important foods in the basket. Nearly 8% of the population was dependent on fishing as main source of income. Stress indicators like food for work (10%), gifts (5%) and borrowing (1%) collectively account for source of food for 16% of the population. It important to note that nearly half of the population, 32% food aid and other assistances 16%; depended on some form of external support to access their food. Given this is a time of plenty, the proportion of households in Twic East depending on support schemes is extremely high.

The problem of food insecurity is primarily a distributional issue, a matter of getting available food to people who need it, when they need it, and of ensuring their regular, appropriate and affordable access to food. The overwhelming majority of the population in Twic East (85.9%) had received World Food Programme (WFP) food rations (GFD) in the past three months. This indicates a very wide access to humanitarian access for the needs of the population addressing the food gap.

To conclude, more households will fall into vulnerability to food insecurity when they are unable to meet consumption requirements throughout the year as we go to the hunger gap (Feb-July) because of lack of off-farm income, dependence on food aid, having few or no livestock, and poor ownership of

assets. Nonetheless, the extents to which households face food insecurity and the level of vulnerability are not homogenous. Within the county, some households are chronically food insecure while others not because they have harvested during the current season.

8 Recommendation

The poor nutrition, health and food security situation in Twic East calls for continuation of interventions to address both immediate life-saving interventions in addition to developing longer term strategies to expand the supply of basic services, long term and sustainable strategies for livelihood support and social protection mechanisms. Specific recommendations include:

Recommendation

Immediate

- To continue 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 continue the access to a TSFP to cope with the high caseload of MAM children,
- Expand current admission criteria to include the MUAC 21-23 cm for malnourished PLW.
- To reinforce the IYCF activities with quality one-to-one counselling tailored to the individual, peer-led support groups, and implication/ capacity-building of health decision-makers at the community and family level for larger IYCF messaging and behaviour change.
- To continue the routine immunization, deworming and supplementation, to impact on morbidity and avoid disease outbreaks such as measles.
- To ensure adequate access to PHC and referral services to secondary care
- To maintain the General Food Distribution (GFD)
- Market interventions to protect pastoralist households from poor terms of trade (particularly given the high level of inflation in the country)

Medium term

- The humanitarian actors operational in the county should advocate for expansion of livelihood programmes in the county to address the underlying causes of food insecurity. Possible areas of intervention are on integrating an effective and responsive DRR scheme, skill training to households on crop production to increase culture of cultivation, increased assistance for

households on marketing their livestock, increased veterinary services and including community managed veterinary drugstores.

- Develop or strengthen long term strategies which address the underlying causes of malnutrition. This includes a focus on health, child care education and the public health environment as well as improving access to a wider variety of foods through animal husbandry and off-farm income generating activities;
- Efforts should be made to strengthen to access of basic services like water, sanitation and hygiene programme (WASH). Improved water access is already achieved but further interventions on sanitation and hygiene are required. This is essential as the rates of current child hood illness caused by diarrheal diseases can largely be attributed to lack of safe water, sanitation and/or hygiene practices. Effective awareness raising and training campaign accompanying distribution of water treatment tabs etc. for enhancement of access to safe drinking water. Continued support for the development and maintenance of existing safe water sources is recommended.

Annex 1: List of selected clusters in Twic East

Payam			From PA					
Pakeer Payam	**Boma**	**Village**	**Population**	**HH**	**Pop**	**Children < 5yrs**	**No of Volunteers**	Cluster
	Ikoy	Biokjok	2,575	429	2575	579	6	1
		Amoi-yok	1,498	250	1498	337	4	
		Tabau	1,602	267	1602	360	4	2
	Adulbaar	Nhomleau	2,022	337	2022	455	5	3
		Nyamchak	1,112	185	1112	250	3	
		Ruar	1,031	172	1031	232	3	RC
		Yiik	1,407	235	1407	317	3	
	Marial	Pareu	1,729	288	1729	389	4	4
		Pathol	2,001	334	2001	450	5	
		Morngok	2,291	382	2291	515	6	5
		Ajoh	331	55	331	74	2	
		Marial	2,452	394	2452	552	6	6
	Patiou	Ayiikdit	1,921	320	1921	432	5	7
		Lualdit	421	70	421	95	2	
		Pan Piol	579	97	579	130	2	
		Panhomkor	1,292	215	1292	291	3	RC
		Patiou	1,220	304	1220	275	3	
		Ruar	150	50	150	34	2	
	Nyang	Pajur	1,023	171	1023	230	3	8
		Acholroor	1,801	300	1801	405	4	RC
		Nyang	507	85	507	114	2	
Ajuong Payam	Makiir	Pagok	1,376	229	1376	310	3	

		Yar-ahome	530	88	530	119	2	
		Aluel	351	59	351	79	2	9
		Paliau	2,130	355	2130	479	5	
		Makiir	460	77	460	104	2	10
	Pawel	Mayom	1,648	275	1648	371	4	
		Wunkuen	1,456	243	1456	328	4	11
		Rual	450	75	450	101	2	
		Deng Reech	330	55	330	74	2	
		Kongdai	556	93	556	125	2	
		Panjongkot	404	67	404	91	2	
	Wunlir	Panjongkot	1,306	218	1306	294	3	12
		Ammum	550	92	550	124	2	
		Ayakjach Angui	430	72	430	97	2	
		Adubar	420	70	420	95	2	
		Wunlir	1,243	207	1243	280	3	13
		Nadai	450	75	450	101	2	
		Kondai	350	58	350	79	2	
	Ngawai	Parthet Kiir	408	68	408	92	2	
		Guer	430	72	430	97	2	14
		Ngawai	1,477	246	1477	332	4	
		Thiam Awan	396	66	396	89	2	
		Parrier	589	98	589	133	2	
		War Keech	246	41	246	55	2	15
Kongor payam	Garlei	Agekrot	637	91	637	143	2	
		Biol Bil	980	140	980	221	2	
		Duk Mabior	945	135	945	213	2	16
		Piom de Bioor	1,400	200	1400	315	3	

		Dung de Ngeer	1,120	160	1120	252	3	
	Pakuor	Pakuor	2,065	295	2065	465	5	17
		Piom Awan	1,540	220	1540	347	4	18
		Pabeic	1,540	220	1540	347	4	
		Wun Aguer	1,050	150	1050	236	3	19
		Powel	1,428	204	1428	321	3	
		Thananyier	595	85	595	134	2	20
		Pacol	494	70	494	111	2	
	Pamot	Pamoit Toich	1,365	195	1365	307	3	
		Agom	1,260	180	1260	284	3	21
		Pakeny	1,540	220	1540	347	4	
		Padangahol	1,246	178	1246	280	3	22
Nyuak Payam	Aliet	Aliet dit	2,100	300	2100	473	5	23
		Yith Manyok	1,050	150	1050	236	3	
		Ador	840	120	840	189	2	
		Longdooch	560	80	560	126	2	24
		Guengkeer	1,750	250	1750	394	4	
		Kongdaai	560	80	560	126	2	
	Wutkoro	Piom Ajangdit	1,400	200	1400	315	3	25
		Kanitha	840	120	840	189	2	
		panchuer	1,750	250	1750	394	4	26
		Panruen	630	90	630	142	2	
		Dungluol	1,820	260	1820	410	4	27
		Dungchut	840	120	840	189	2	
		Dungtheep	560	80	560	126	2	
		Panyereengit	840	120	840	189	2	28
		Panruel	560	80	560	126	2	

		Apiir	560	80	560	126	2	
	Pongborong	Thongping	840	120	840	189	2	
		Piom jar	840	120	840	189	2	29
		Piom bech	1,750	250	1750	394	4	
		Pongborong	1,750	250	1750	394	4	30
		Pathal	1,960	280	1960	441	5	31
			1,750	250	1750	394	4	
	Aluel	Padeloi	560	80	560	126	2	
		Lual ajok bil	560	80	560	126	2	
		Pawonydit	560	80	560	126	2	
		Piom pan agau	1,750	250	1750	394	4	RC
		Aluel	560	80	560	126	2	
		Peny dit	420	60	420	95	2	
	Pator	Patieng	840	120	840	189	2	32
		Thian wei	560	80	560	126	2	
	Kuachthor	kuach thor	560	80	560	126	2	
		Aliet pad de dabek	840	120	840	189	2	
		Bou Yaar	350	50	350	79	2	
Lith Payam	Dong	Dong dit	1,400	200	1400	315	4	33
		Dong wut	700	100	700	158	2	
		Dong Biong	350	50	350	79	2	
		Boma center	1,190	170	1190	268	3	34
			102,906		**102906**	**23154**	**284**	

Annex 2: Survey tools

ANTHROPOMETRIC & HEALTH QUESTIONNAIRE

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

Date (DD/MM/YY): ..…../……/……..... Team No…..… County:…….. …. Payam……..…….. …. Boma number……..……..

1	2	3	4	5	6	7	8	9	10
Child No.	HHNO	Sex **m** = Male **f** = Female	Age in months	Weght in Kg (eg 12.4)	Height in cm (eg 78.1)	**Oedema n = No y =Yes**	MUAC in cm	Vit. A in last 6 months -------- - **0** = No **1** =Yes	Measles Vac ---- **0** = No **1** =Yes with I card **2** =Yes recal **3** = Child <9r
1									
2									

Food Security and Livelihood Questionnaire

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

	18	19	20	21	22	23	24	25	26	

HH NO*	HH **size** (No. of people living in HH)	**Residence** status of HH: **1** = Resident **2** = Returnee (in the last 1yr) **3** = IDP/PoCs **4** = Refugees	Is there any IDP or returnee currently **living** 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 99=others (Specify)	Did you **cultivate and harvested** 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 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 **99**= Other, specify	**MUAC PLW (cm**

WATER AND SANITATION QUESTIONNAIRE

31	32	33	34	35	36	37	38

HHNO	What is the household's main **source** of drinking 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 **99**= Other (specify_____)	How **long** does it take the HH to collect water (including travel to and from and waiting)? ---------- **1** = ≤30 min **2** = >30min to ≤1hr **3** = >1hr to ≤ 2hr **4** = >2hr to ≤ 4hr **5** = >4hr	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 population all use the same)	Capacity of the jerrycan in litres (the jerry can mentioned in Q33)	What do you usually do to water to make it safer **before** household members drink it? -------- **0 =**Nothing **1 =**Boiling **2 =**Filtering with a cloth **3 =**Letting it settle **4 =**Water treatment chemicals **99 =**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 99=other (specify)	**What** do you use to **wash** hands? ..... **0** = Nothing **1** = Water only **2** = Water + Soap **3** = Water + Ash 99 = other (specify)	**Where** does the household usually defecate or relieve themselves (include more than one if necessary)? --------- **1** = Undesignated open area **2** = Designated open area **3** = Hole **4** = Latrine **99** = Other (specify)
1								
2								
3								
4								
5								
6								

IYCF Questionnaire

Child No.	HHNO	**Age** (in months)	Has this child ever been **breastfed**? --------- 0 = No 1 = Yes If no go to 47	**How long** after birth did you first put the child to the breast? **1** = Immediately **2** = In less than an hour **3** = In less than 24 hours 4= In more than one day	Did you feed your child with **colostrum** (local language = tiith) --------- 0 = No 1 = Yes	Is this child **still** breastfeeding now? --------- 0 = No 1 = Yes	**Exclusive** breast feeding: What other foods did you give the child before the age of 6 months (other than breast milk)_____ 0 =None other than breast milk 1 = Powder/animal milk/yogurt 2 = Cereals based diet 3 = Plain water 4 = Fruit Juice 5 = Sugar water 6 = Vegetables	What foods were given to the child **yesterday** during the day and night? --------- 1 =Grains/roots/tubers 2=Vitamin A rich plant foods 3 = Other fruits and vegetables 4 = Meat/Poultry/fish/seafood 5=Eggs 6 = Milk and milk products 7= Foods cooked in oil and fat	Since this time yesterday , how many times have you given the child **food** other than liquid? (put number)	How do you t child when h **diarrhoea**, d him **0** = Nothing a **1** = Less thar fluids only **2** = Same as **3** = More tha **4** = Never ha diarrhoea

DEMOGRAPHY & MORTALITY QUESTIONNAIRE

DATE OF INTERVIEW: [D][D]/[M][M]/ [Y][Y]

COUNTY:		**PAYAM:**			**NAME OF INTERVIEWER:**				
BOMA:		**VILLAGE:**							
CLUSTER NO. [ ][ ]		**TEAM NO.** [ ][ ]		HOUSEHOLD[1] NO. [ ][ ]					
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**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 1= illness 2=injury	Location of death 1=current location 2=during migration 3=in place of last residence 99=other, specify
				2-Sep					
a) List all the people that slept in this household last night.									
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									

17									
18									
b) List all the people that slept in this household on the **first night of the recall period (FILL IN DATE/EVENT)** but did **NOT sleep** in the **household last night**.									
1					Y				
2					Y				
3					Y				
4					Y				
5					Y				
6					Y				
c) List all the people that slept in this household on the **first night of the recall period but have since died**									
1							Y		
2							Y		
3							Y		
4							Y		

Was anyone in the household pregnant at the start of the recall period? No [ ] Yes [ ] If yes, how many? _____

[1] HH definition: Group of people living under same roof & sharing food from the same pot . In home with multiple wives, those living and eating in different houses are considered as separate HHs. Wives living in different houses and eating from same pot are considered as one HH.

Annex 3: Twic East Events Calendar

	2012		2013		2014		2015		2016		2017	
Jan	New year	70	New year	58	New year	46	New year	34	New year	22	New year	10
Feb		69		57		45		33		21		9
March		68		56		44		32		20		08
April	Ester	67	Ester	55	Ester	43	Ester	31	Ester	19	Ester	7
May		66		54		42		30		18		6
June		65		53		41		29		17		5
July	Independence day	64	Independence day	52	Independence day	40	Independence day	28	Independence day	16	Independence day	4
Aug	Main rains	63	Main rains	51	Main rains	39	Main rains	27	Main rains	15	Main rains	3
Sep	Main rains	62	Main rains	50	Main rains	38	Main rains	26	Main rains	14	Main rains	2

Oct		61		49		37		25		13		1
Nov		60		48		36		24		12		
Dec	Christmas	59	Christmas	47	Christmas	35	Christmas	23	Christmas	11		

Annex 4: Standardization test results

Standardisation test results

Precisio

Weight	subjects #	mean kg	SD kg	max kg
Supervisor	10	14.7	1.9	0.
Enumerator 1	10	14.7	1.8	0.
Enumerator 2	10	14.6	1.8	2.
Enumerator 3	10	14.7	1.8	0.
Enumerator 4	10	14.7	1.8	0.
Enumerator 5	10	14.7	1.8	0.
Enumerator 6	10	14.7	1.8	0.
Enumerator 7	10	14.7	1.8	0.
Enumerator 8	10	14.6	1.7	0.
Enumerator 9	10	14.7	1.8	0.
Enumerator 10	10	14.7	1.7	0.
Enumerator 11	10	14.6	1.8	0.

	Enumerator 12	10	14.7	1.9	0.4
	Enumerator 13	10	14.8	1.8	0.8
	Enumerator 14	10	14.7	1.8	0.1
	enum inter 1st	14x10	14.7	1.8	-
	enum inter 2nd	14x10	14.7	1.7	-
	inter enum + sup	15x10	14.7	1.8	-
	TOTAL intra+inter	14x10	-	-	-
	TOTAL+ sup	15x10	-	-	-

Height		subjects #	mean cm	SD cm	max cm
	Supervisor	10	102.9	6.8	0.2
	Enumerator 1	10	102.8	6.7	1.1
	Enumerator 2	10	103	6.8	3.1
	Enumerator 3	10	103.2	6.8	3.2
	Enumerator 4	10	102.3	6.8	1.7
	Enumerator 5	10	98.2	21.6	98
	Enumerator 6	10	102.9	6.6	1.7
	Enumerator 7	10	102.9	6.7	3.9

	Enumerator 8	10	105.9	14.8	6
	Enumerator 9	10	103.5	7.2	11.
	Enumerator 10	10	103.6	7.2	7.
	Enumerator 11	10	102.8	6.7	3.
	Enumerator 12	10	102.7	6.7	1.
	Enumerator 13	10	103	6.6	1.
	Enumerator 14	10	102.8	6.6	0.
	enum inter 1st	14x10	102.4	10.3	-
	enum inter 2nd	14x10	103.3	8.2	-
	inter enum + sup	15x10	102.8	9.2	-
	TOTAL intra+inter	14x10	-	-	-
	TOTAL+ sup	15x10	-	-	-

MUAC		subjects #	mean mm	SD mm	max mm
	Supervisor	10	14.4	0.8	0.
	Enumerator 1	10	14.3	0.6	
	Enumerator 2	10	14.6	0.8	1.
	Enumerator 3	10	14.3	0.6	0.
	Enumerator 4	10	14	0.6	0.
	Enumerator 5	10	14.3	0.7	0.

Enumerator 6	10	14.4	0.8	1.1
Enumerator 7	10	14.4	0.8	1.2
Enumerator 8	10	14.3	0.8	1.4
Enumerator 9	10	14.6	0.6	1.3
Enumerator 10	10	14.4	0.7	1.3
Enumerator 11	10	14.4	0.7	1.1
Enumerator 12	10	14.5	0.7	1.2
Enumerator 13	10	14.5	0.6	0.3
Enumerator 14	10	144.8	6.4	0
enum inter 1st	14x10	23.7	33.8	-
enum inter 2nd	14x10	23.7	33.8	-
inter enum + sup	15x10	23.1	32.6	-
TOTAL intra+inter	14x10	-	-	-
TOTAL+ sup	15x10	-	-	-

Suggested cut-off points for acceptability of measurements

Parameter		MUAC mm	Weight Kg	Height cm
individual	good	<2.0	<0.04	<0.4
TEM	acceptable	<2.7	<0.10	<0.6
(intra)	poor	<3.3	<0.21	<1.0
	reject	>3.3	>0.21	>1.0
Team TEM	good	<2.0	<0.10	<0.5
(intra+inter)	acceptable	<2.7	<0.21	<1.0
and Total	poor	<3.3	<0.24	<1.5

	reject	>3.3	>0.24	>1.5
R value	good	>99	>99	>99
	acceptable	>95	>95	>95
	poor	>90	>90	>90
	reject	<90	<90	<90
Bias	Good	<1	<0.04	<0.4
From sup if good outcome,	Acceptable	<2	<0.10	<0.6
otherwise	Poor	<3	<0.21	<1.4
from median	Reject	>3	>0.21	>1.4

Annex 5: Plausibility check for: SS_12172017TEARFUND_TWICEAST.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**
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** (1.0 %)
Overall Sex ratio (Significant chi square)	Incl	p	>0.1 0	>0.05 2	>0.001 4	<=0.001 10	**0** (p=0.752)
Age ratio(6-29 vs 30-59) (Significant chi square)	Incl	p	>0.1 0	>0.05 2	>0.001 4	<=0.001 10	**4** (p=0.034)

Dig pref score - weight	Incl	#	0-7	8-12	13-20	> 20	
			0	2	4	10	**0** (5)
Dig pref score - height	Incl	#	0-7	8-12	13-20	> 20	
			0	2	4	10	**0** (4)
Dig pref score - MUAC	Incl	#	0-7	8-12	13-20	> 20	
			0	2	4	10	**0** (5)
Standard Dev WHZ	Excl	SD	<1.1 and	<1.15 and	<1.20 and	>=1.20 or	
.							
.	Excl	SD	>0.9	>0.85	>0.80	<=0.80	
			0	5	10	20	**5** (1.10)
Skewness WHZ	Excl	#	<±0.2	<±0.4	<±0.6	>=±0.6	
			0	1	3	5	**1** (0.22)
Kurtosis WHZ	Excl	#	<±0.2	<±0.4	<±0.6	>=±0.6	
			0	1	3	5	**0** (-0.19)
Poisson dist WHZ-2	Excl	p	>0.05	>0.01	>0.001	<=0.001	
			0	1	3	5	**1** (p=0.011)
OVERALL SCORE WHZ =			0-9	10-14	15-24	>25	**11** %

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

Annex 6: Locations where malnutrition is more prevalent

(areas with pockets of malnutrition)

Payam	Boma	Village	Population size	Cluster	Number of MAM cases	Number of SAM cases	Number of all cases
Pakeer Payam		Village	Population size				
	Ikoy	Biokjok	2575	1	2	2	4
		Tabau	1602	2	0	0	0
	Adulbaar	Nhomleau	2022	3	2	0	2
		Ruar	1031	RC			
	Marial	Pareu	1729	4	2	0	2
		Morngok	2291	5	4	0	4
		Marial	2452	6	1	0	1
	Patiou	Ayiikdit	1921	7	1	0	1
		Panhomkor	1292	RC			
	Nyang	Pajur	1023	8	0	0	0
		Acholroor	1801	RC			
		Aluel	351	9	4	0	4
		Makiir	460	10	1	0	1
		Wunkuen	1456	11	1	0	1
	Wunlir	Panjongkot	1306	12	5	0	5
		Wunlir	1243	13	5	2	7
		Guer	430	14	2	0	2
		War Keech	246	15	3	0	3
		Duk Mabior	945	16	6	0	6
	Pakuor	Pakuor	2065	17	5	1	6
		Piom Awan	1540	18	1	1	2
		Wun Aguer	1050	19	1	1	2

		Thananyier	595	20	5	2	7
		Agom	1260	21	0	0	0
		Padangahol	1246	22	2	1	3
Nyuak Payam	Aliet	Aliet dit	2100	23	0	0	0
		Longdooch	560	24	1	1	2
	Wutkoro	Piom Ajangdit	1400	25	0	0	0
		panchuer	1750	26	3	0	3
		Dungluol	1820	27	1	0	1
		Panyereengit	840	28	3	1	4
		Piom jar	840	29	1	0	1
		Pongborong	1750	30	0	0	0
		Pathal	1960	31	1	0	1
			1750	32			
		Piom pan agau	1750	RC			
	Pator	Patieng	840	33	6	0	6
Lith Payam	Dong	Dong dit	1400	34	3	0	3
		Boma center	1190	35	1	0	1