



**INTEGRATED NUTRITIONAL
ANTHROPOMETRY AND MORTALITY
SURVEYS**

**AWEIL SOUTH COUNTY
NORTHERN BAHR EL GHAZAL STATE
REPUBLIC OF SOUTH SUDAN**

Final

April 2014

1.0 Acknowledgment

IRC would like also to express its heartfelt appreciation to the support and cooperation of the organizations and individuals who were involved in the planning and implementation of this survey

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- to UNOCHA Aweil south for provision of secondary data

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2.0 EXECUTIVE SUMMARY, AWEIL SOUTH COUNTY NUTRITION SURVEY

Introduction: Aweil South is a county situated in the Northern Bahr el Ghazal State of South Sudan. It was carved out of the southern portion of Aweil East and Aweil West counties in 1999. It borders Aweil East to the north, Gogrial County to the east, Wau County to the south and Aweil West County to the west. Aweil South is predominantly inhabited by the agro-pastoralist Dinka (100%)¹ Panthou is the main town of the county located 35 km from the Aweil town state capital, The County consists of eight administrative payams: Ayai, Gakrol, Nyieth, Nyoch-Awany, Panthou, Tarweng, Tiraliet and Wathmok. The population of the county is estimated to be 80,766 people with an average household size of 6.8 people.

In Aweil South, the March 2012 SMART pre-harvest Survey conducted by Action Against Hunger (ACF USA) found that GAM (18.4%) WHO WHZ and SAM rates was (2.7%).² Since the exit of ADRA in late 2012, the County has had a gap in Nutrition treatment programs until recently when IRC started 6 OTP sites to offer treatment of SAM covering 7 payams. WVSS was implementing TSFP in 2 Payams of the county. The community is currently experiencing a serious hunger gap due to the result of concurrent drought, floods, and last year's poor harvest as well as the current national conflict. An anthropometric and retrospective mortality survey integrated with food security, WASH and IYCF components was conducted from 21st -26th April 2014 by IRC in Aweil South.

Methodology: This Integrated nutrition and retrospective mortality survey utilized the Standardized Monitoring and assessment of Relief and Transitions (SMART) methodology and recommended nutrition survey key indicators. Both anthropometric and mortality data were collected during the survey. Food Security and WASH questionnaires were also applied in each selected household, as per the South Sudan Nutrition Cluster guidance. IYCF questionnaire was used for households with children of less than two years. A two-stage cluster sampling with probability proportional to size (PPS) design was employed for the integrated nutrition survey.

The sample size was determined on the basis of estimated global acute malnutrition (GAM) prevalence rate of 22.1%, based on the pre-harvest SMART survey conducted by ACF in March 2012. . The desired precision and design effect were calculated using the ENA delta software. The sampling frame included all the 8 payams of Aweil South County. A total of 13 households were covered in each of the 34 sampled clusters. All children

¹ County commissioner report 2014

² ACF 2012 pre harvest integrated mortality and nutrition survey report

*International Rescue Committee _Aweil south County Integrated SMART Nutritional Anthropometry and Mortality survey
Final report April 2014*

aged 6-59 months in every household visited were included in the anthropometric survey and 0-24 months were included in assessment of infant and young child feeding practices.

The second stage of sampling was the household selection within the clusters. On arrival at the village, the survey team introduced themselves and the objectives of the study to the village leader. By the help of the selected village leader, the team list out all the households residing in the village. Then, using random number table, 13 households between 1 and the last number corresponding to the listed households were randomly selected. The survey team started from any convenient randomly selected household to carry out anthropometric measurement and other questionnaires.

All eligible children aged between 6 and 59 months in each visited household were included. Anthropometric measurements conducted on each child from 6-59 months took the weight, height/length and MUAC. If a child's age is unknown, it was estimated using local calendar.

Anthropometry, mortality, Food security, WASH and IYCF questionnaires were administered to the selected households in the sampling frame. In total, the data of 471 children and 418 households were collected for anthropometrics and mortality, respectively.

Results: In total, the data of 471 children and 418 households were collected for anthropometrics and 418 HHs and 2853 people mortality, respectively. The main anthropometric (prevalence of global and severe acute malnutrition including Oedema at 95% confidence intervals) and selected IYCF, WASH and FSL results are presented in this report.

From the survey, both Global Acute Malnutrition (GAM) and Severe Acute Malnutrition (SAM) rates were at critical levels (3) (weight-for-height z-scores, WHO Standards 2006) of (N 471n=123) 26.1% (20.7-32.3 95% CI) and 5.9% (3.7- 9.3 95% CI) respectively (SD 1.13)⁴.

Global and severe acute malnutrition according to Mid-upper arm circumference (MUAC) (N=417) were 14.4% (10.4 – 19.8) and 4.0% (2.0 – 7.8) respectively. The mean MUAC of all children in the sample was 138 mm with a standard deviation of ±17.3 mm.

³ Above emergency threshold of GAM >15% (WHO, UNICEF and SPHERE 2011 standards)

⁴ The SD should be between 0.8 and 1.2

Crude and under five mortality rates of 0.72 (0.32-1.59) and 2.15 (0.95-4.81) respectively were obtained. The Crude death rate and under five mortality rate are at normal levels according to WHO classification of mortality thresholds.

Table 1: Anthropometric result, Aweil South April 2014

INDEX	INDICATOR		RESULTS (M=218,F=253)
WHO (2006) (n=471)	Z-scores	Global Acute Malnutrition <i>W/H < -2 z and/or oedema</i>	(123) 26.1% (20.7-32.3 95% CI)
WHO (2006) (n=471)	Z-scores	Severe Acute Malnutrition <i>W/H < -3 z and/or oedema</i>	5.9% (3.7- 9.3 95% CI)
NCHS (1977) (n=471)	Z-scores	Global Acute Malnutrition <i>W/H < -2 z and/or oedema</i>	(120) 25.5% (20.5-31.2 95% CI)
NCHS (1977) (n=471)	Z-scores	Severe Acute Malnutrition <i>W/H < -3 z and/or oedema</i>	3.4% (2.2- 5.3 95% CI)
Crude retrospective mortality¹ /10,000/day Alert level: 1/10,000 persons/day Emergency level: 2/10,000 persons/day			0.70(0.33-1.46)
Under five retrospective mortality /10,000/day Alert level: 2/10,000 persons/day Emergency level: 4/10,000 persons/day			2.04 (0.90-4.58)

- The reported coverage of measles immunization by card (27%), recall (2%) and vitamin A supplementation (11.88%) is low as compared with the national and international standards.
- The main livelihood of the community is subsistence crop farming followed by agro-pastoralist and smaller percent employment. The Main source of income for the surveyed households was sale natural resources which were mainly grass at 34.4%, followed by sale of local alcoholic beverages at 19.4%, casual labour accounting for 5.5% and sale of livestock that accounted for 5.7%.
- The main source of food in the household is Purchase from the market (Cash) at 39.2% followed by work for food 18.2% and gathering 10.5% finally own production (previous harvest) at 9.1% . In responding to whether they have cultivated in the previous season, 80.4% of the household reported cultivating. In addition to that ownership of livestock was at 34.9%, this implies a balance between subsistence farming and livestock keeping. In addition to this, most of the food consumed at household level was purchased (sale natural resources which were mainly grass), highlighting the vulnerability of the community to cope with

food shortages. This was creating an even greater dependence on increasing market prices – and greater adaptation difficulties for coping with food insecurity.

- Majority of the households are dependent on market purchase. They do not have reserve for the coming hunger months. Most farmers have sold their livestock to cope up with existing food shortage, the situation may not seem improved rather deteriorate; Hence it should be closely monitored and general ration should be provided to the most vulnerable community members of the county
- Most households experience shortages as there been times when they did not have enough food or money to buy food. This was reported by 83.5% of the respondents use coping mechanisms. Some of the coping mechanisms employed were Limit portion size of food (10.8%) borrow from kin man(11%) and sale of more animal than usual(5.5%)The main shocks households are currently facing is expensive food 56.9%(n=238)
- Majority of the household (protected shallow well 10% and borehole 83%) had access to protected water sources (used improved water source for drinking) much higher than sub-Saharan average which is 60%4. In the communities sampled, 52.9% percent of the population travels less than 30 minute to access water and 27.3% take half to one hour, from either source. Majority of the population (70.3%) do nothing to the water collected either from improved or unimproved sources at household level. Only 15.1% boil drinking water and 11.2% used water filtration by cloth method for water treatment.
- The morbidity rate is 49% (n=231), children (10.1%, n= 48) were affected with diarrhoea and this was indicative of poor sanitation conditions. Eye infection was also reported as another prevalent condition in the community due to poor hygiene practices.
- A considerable proportion of the community (92.1%) use unimproved sanitary facilities (designated and undesignated bush area). It is above the average for sub Saharan African countries, which is 63%. Most of the household have no access to toilet, most of them going to designated and undesignated bush. Use of improved latrine was only reported in 4.3% of the sampled households.
- In all the 0 - 23 months children surveyed 98.2% were ever breastfed. Among them, majority had reportedly been initiated to breastfeeding within the WHO recommended 1 hour of birth with 99.4% of children breast fed on colostrum

Recommendations:

Further to the above, the following short and medium term recommendations will serve to aid IRC/agencies willing to assist the county or work in the county over a long-term period, in order to ameliorate the nutritional and health status of the population.

Short Term

- General ration provision should be started to the vulnerable population of the county
- Strengthen and expand the existing management of severe acute malnutrition before the situation further deteriorates and claims the life of under five children using CMAM approach Strengthen and expand the existing TSFP/BSFP programmers to provide supplementary food on a monthly and bi monthly basis
- Expand the coverage of Outpatient therapeutic program (OTP) in the county
- Establish Stabilization center(SC) at reasonable distance
- Strengthen linkages and referrals between SC, OTP and TSFP programs enroll and refer SAM and MAM cases
- Strengthen the initiation started to use CBDs for screening and referral of malnourished children
- Low measles vaccination (29%)and Vitamin A coverage (11.9%)- strengthening of outreach services and integrating supplementation in all immunization campaigns (Measles campaign already started at the end of this survey by UNICEF together with CHD)

Medium to Long-Term

- Commence income-generating schemes for households via off-farm activities and other ways of introducing saving and credit opportunities.
- Improve availability and quality of potable water through rehabilitation of existing structures and increasing number of latrines in villages
- Address poor infant and young child feeding practices in the community for long-term prevention of malnutrition and other diseases
- Commence food security and livelihood programs (provision of improved seed , agriculture tools, provision of capacity building trainings, Fishery)

3.0 GLOSSARY OF ACRONYMS

Acronyms

ARI	Acute Respiratory Infection
CHP	Community Health Promoter
CI	Confidence Interval
CMR	Crude Mortality Rate
CSB	Corn Soya Blend
EPI	Extended Programme of Immunisation
GAM	Global Acute Malnutrition
GFD	General Food Distribution
HFA	Height for Age
ITN	Insecticide Treated Bed Nets
OTP	Out-patient Therapeutic Programme
PPS	Population Proportional Sampling
SAM	Severe Acute Malnutrition
SC	Stabilization Centre
SFP	Supplementary Feeding Programme
TSFP	Targeted Supplementary Feeding Programme
URTI	Upper Respiratory Tract Infection
U5MR	Under 5's Mortality Rate
WFH	Weight for Height
ACF	Action Contre la Faim
CMAM	Community Management of Acute Malnutrition
ENA	Emergency Nutrition Assessment
FFR	Food for Recovery
FCS	Food Consumption Score
FSL	Food Security and Livelihood
GFD	General Food Distribution
HH	Household
IDP	Internally Displaced People

INGO	International Non-Governmental Organization
IYCFP	Infant and Young Child Feeding Practice
MOH	Ministry of Health
N	Number
NCHS	National Centre for Health Statistic
PHCC	Primary Health Care Centre
PHCU	Primary Health Care Unit
SMART	Standardized Monitoring and Assessment of Relief and Transitions
SSRRC	Southern Sudan Relief and Rehabilitation Commission
UNICEF	United Nations Children’s Fund
WASH	Water Sanitation and Hygiene
WHO	World Health Organization
WVI	World Vision International
WVSS	World Vision South Sudan

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7.0 INTRODUCTION

7.1 Location and Demography

Aweil South is a county situated in the Northern Bahr el Ghazal State of South Sudan. It was carved out of the southern portion of Aweil East and Aweil West counties in 1999. It borders Aweil East to the north, Gogrial county to the east, Wau County to the south and Aweil West County to the west. Aweil South is predominantly inhabited by the agro pastoralist Dinka (100%). Panthou is the main town of the county located 35 km from the Aweil town state capital, The County consists of eight administrative Payams: Ayai, Gakrol, Nyieth, Nyoch-Awany, Panthou, Tarweng, Tiraliet and Wathmok. The population of the county is estimated to be 80,766 people with an average household size of 6.8 people.

The conditions of roads in county are generally poor. Only 60 km roads are dry weather roads but extremely rough. Road access is very critical specifically during the rainy season⁵. The people of Aweil South have limited access to social services, as in other parts of South Sudan. There is only one main road connecting some of the Payams to the capital of the county and the state. The majority of the Payams are completely inaccessible during and after the rainy season due to the stagnant water of the floods in the months of June to January. The poor road infrastructure and the long rainy season are significant and recurrent challenges to program implementation. Impassable road created delays in distributing foods and agricultural inputs to the intended program beneficiaries. They also hampered the program monitoring activities.

7.2 Livelihoods and Food Security

Aweil south comprises only one main agro-ecological zone: lowland. Livelihoods in all agro-ecologies are predominantly based on mixed-type subsistence farming - crop cultivation complimented by small livestock holdings. The major crops grown in the area are maize, sorghum, *sim sim*. At the time of this survey, crop farm cultivation was going on. Farmers use traditional way of land cultivation; do not have seeds for the next planting season due to weak purchasing power and unavailability of store seeds due to recurrent drought. Women and children were engaged in the cultivation of the land, the involvement of adult men were very low.

Generally, livestock condition has been good. There has not been any disease outbreak; the pasture remains also good. Both crop production and livestock production is highly dependent on rainfall. Any variation in the amount, distribution, onset and cessation of rainfall has a significant impact on crop and livestock production. Recent years have seen unfavorable changes in the rainfall pattern, hampering crop production and resulting in serious food shortages in the county.

⁵ County Commissioner report April 2014

7.3 Health

Health services are delivered by International Rescue Committee (IRC) and the county health department. The IRC is working in both the curative and prevention aspects of health services in six PHC's of seven Payams since the beginning of the year. There are eleven functional health facilities within the county including one PHCC, Ten PHCU. There are a total of 3 health professionals working in the health facilities and 460 trained CBDs working at community level throughout the county. ⁶The county population does not benefit from better health services due to low health facilities. Generally there are too few health facilities and they remain understaffed.

Both treatment and prevention activities are implemented through these health facilities, including regular EPI activities. The last measles vaccination and vitamin A supplementation campaign was carried out in February 2012 by UNICEF and CHD. At the end of this survey measles camping was started. The major diseases affecting the community include: malaria, upper respiratory tract infection (URTI), diarrhea, malnutrition and STI. See the following table) ⁷(See the bellow Table 2)

For U5s, the two major illnesses seen at the health facilities were malaria and malnutrition. While the aforementioned malaria treatment is available, there is no treatment available for severe acute malnutrition with complication. Severe acute malnutrition cases are referred to IRC's OTP without complication and to Aweil south SAM with complication, but it should be noted that money for transport, lodging and treatment in Aweil South County is a major constraint for any family from Aweil south seeking treatment for anything. According to the information obtained from MSF the SC in Aweil town is to be closed in near future, currently the service very minimal.

Table 2: Major diseases in Aweil South County, Aweil South County, April 2014 ⁸

No	Disease	This year		Last year	
		Under Five	Adult	Under Five	Adult
1	Malaria	546	2252	3120	18329
2	Cough/Cold/Pneumonia	0	476	62	2700
3	Diarrhea	756	295	3489	936
4	Marasmes	112	0	0	0
5	Measles	16	1	0	0
6	STI	0	80	0	322
7	TB	0	4	0	38

⁶ County Health Department April 2014

⁷ County Health Department April 2014

⁸ County Health Department April 2014

7.4 Nutrition Situation

The county has suffered years of flood and shortage of rain with cumulative effects that are increasing the vulnerability of the population. A supplementary ration (CSB, 18.5 Kg/person for 3 months) was distributed throughout 2 payams of the county by WVSS to malnourished children and pregnant and lactating mothers. ⁹

7.4.1 Water

Water availability is generally good in the county, with most people able to access water in less than one kilometer. The main sources of drinking water include: 250 Hand dug well 45 among the 250 not functional and river. Approximately eighty-five percent of the population has easy access to safe water in Aweil south. ¹⁰

7.5 Education¹¹

Type of school	No.	School Enrollment
Secondary	1	150
Primary	49	21653

UN and NGO Activities in Aweil south

UN agency or NGO	Activities
IRC	<ul style="list-style-type: none"> • CMAM program in County with 6 OTP sites and community outreach activity in 7 payams • CCM Program Community Case Management program for under five childhood illness through CBDs • An HIV/AIDS prevention program – education targeting behavior change communication. • Water and sanitation activities – creation of hand dug wells and latrine construction. • Health interventions - malaria prevention through provision of Insecticide Treated Bed Nets (ITN), reproductive health and training of community health workers in health promotion activities. ¹²
World Vision	<ul style="list-style-type: none"> • Provision of BCFP/TSFP emergency food aid for beneficiaries in 2 Payams of the county
UNICEF	<ul style="list-style-type: none"> • Work with CHD and the IRC
WFP	<ul style="list-style-type: none"> • Work with WVI

⁹ WVSS Aweil South Field office report April 2014

¹⁰ Aweil South County Water Bureau Report April 2014

¹¹ Aweil South County Education Bureau Report April 2014

¹² IRC_Aweil South Panthou Field office Report April 2014

8.0 OBJECTIVES

8.1 Overall goal of the survey

The overall goal of the survey was to determine the prevalence of acute malnutrition of children between 6-59 months of age and also to estimate crude and under five mortality rates of in all Aweil south county of northern bahr el ghazal state republic of south Sudan population.

8.2 Specific survey objectives

- To evaluate the nutritional status of the population targeting children 6-59 months
- To estimate both Crude and Under five mortality rates
- To determine the child morbidity and health seeking behaviors for children 6-59 months.
- To estimate Vitamin A supplementation rates and Measles immunization coverage
- To estimate some IYCF indicators proxy rates (Complementary feeding and initiation to breastfeeding)
- To collect information on possible underlying causes of malnutrition such as household food security, water, sanitation, and hygiene practices

9.0 METHODOLOGY

9.1 Geographic target area and population group

The County wide nutrition survey covered the whole of Aweil South County. The assessment targeted children aged 6-59 months for the anthropometric measurements and mothers of children below 5 years of age as primary respondents to the household questionnaires.

9.2 Type of survey

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

The SMART methodology draws from core elements of several existing methods and best practices. The anthropometric measurements and mortality assessments were undertaken simultaneously. In addition IYCF, food security & Livelihoods and Water Sanitation and hygiene data was collected from the households to give a glimpse of the underlying causes of malnutrition in the area. Structured household questionnaire on food security, water and sanitation and selected health practices including IYCF were standardized at the National Nutrition cluster level for all partners working in the Republic of South Sudan.

9.3 Sampling Methodology

A two stage cluster sampling with probability proportional to size (PPS) design was employed for the integrated nutritional survey as a listing of the households was not available and systematic or simple random sampling could not be used. The Emergency Nutrition Assessment (ENA) for Standardized Monitoring of Relief and Transitions (SMART) ENA for SMART Nov 16, 2013 was used to determine the sample size using village-level population data.

9.3.1 First stage sampling

The sample size for both integrated nutrition and retrospective mortality surveys were determined by using ENA delta, by entering all the required data in the planning screen of the ENA delta software. The data entered to the software included estimated prevalence of malnutrition and mortality rate, desired precision, recall period in days, design effect, average household size, percentage of under five children and 3% for non-response households. Prevalence of malnutrition and mortality was estimated at 22.1 and 1.31 respectively. The sample

size was determined on the basis of estimated global acute malnutrition (GAM) prevalence rate of 22.1%,¹³ based on the pre-harvest SMART survey conducted by ACF in March 2012.

To determine the sample size for anthropometry, appropriate statistical procedures using the ENA for SMART Nov 16, 2013. Relevant secondary information had been collected from county CHD and sector offices. Five parameters were taken into account to calculate sample size for anthropometry; anticipated malnutrition prevalence (21.1%) The design effect 1.5 and Precision (5%)

- ✓ **Under 5 population:** The total under five population of the county is 19% is of the total population (21,653) obtained from south Sudan nutrition cluster advice
- ✓ **Malnutrition prevalence:** Assuming that the current food security situation is worse as compared to march 2012 ACF survey malnutrition prevalence rate the upper limit of the confidence interval (22.1%) was taken for current prevalence estimation=(n=109) 18.6 % (15.6 - 22.0 95% C.I.)
- ✓ **The Design effect:** The population of the county is affected in equally the same way but malnutrition rate could have a slight differ from cluster to cluster. As cluster sampling is in use, 1.5 was decided upon as the design effect.
- ✓ **The precision:** Since the estimated malnutrition rate is 22.1% (ACF pre-harvest Survey March 2012) a precision of 5% is required to get the current estimated prevalence of malnutrition.
- ✓ None response rate is 3%
- ✓ Based on the above demographic figures total population 80,766 total under five 15346 household size 6. Therefore 432 children were expected to be obtained from a total of households the sample size for anthropometry, 13 households were visited per cluster, hence $436/13=33.54$ clusters, $13 \times 34=442$ households were interviewed. (See table 1)

Similarly, the sample size for mortality was calculated as follows

- ✓ Expected CMR = CMR (total deaths/10,000 people / day): 0.88 [0.58 - 1.13] 1.13 [From the previous ACF March 2012 ACF survey result the CMR was reported as 0.88. On top of this, as per the County report there is some change in mortality but not abnormal in the area. So the team decided to take the upper limit of the confidence interval 1.31 as expected CMR which is a bit higher than the survey result of ACF, Precision = 0.5 [Interim guidelines for NS in SS,]
- ✓ Design effect = 1.5 [Interim guidelines for NS in SS,]
- ✓ 90 days as recall period

¹³ ACF_ Pre-harvest March 2012 Integrated SMART nutritional Anthropometry and Mortality survey report
*International Rescue Committee_ Aweil south County Integrated SMART Nutritional Anthropometry and Mortality survey
Final report April 2014*

- ✓ Average household size 6
- ✓ Total population to be included 2536
- ✓ % of none response households= 3%
- ✓ Total number of households to be visited 436

NB: The sample size of households determined for Anthropometry and Mortality was different. In Mortality 436 households was determined whereas in Anthropometry it was 432. The number of household in the mortality was higher than anthropometric therefore, 436 households were considered in both Anthropometry and Mortality for consistency.

It was also assumed that each team would measure approximately 13 Households per day, per cluster. Dividing 436 by 13 HHs, which gave 33.54 clusters; It was therefore rounded up to 13*34=442 HHs to be surveyed

Table 3: Sample size determination, Aweil South County, April 2014

Anthropometry Sample	Anthropometry Sample	Mortality sample
Estimated prevalence ¹⁴	22.1%	
Estimated CMR		1.31
Precision	5%	0.5
Design effect	1.5	1.5
Average household size	6	6
% under five ¹⁵	19%	
% non response	3%	3%
Recall period		90 days
Population to be included	434 children	2536 total population
Households to be included	434	436

This Anthropometric and Retrospective Mortality survey utilized the Standardized Monitoring and assessment of Relief and Transitions (SMART) methodology and recommended nutrition survey key indicators. Both anthropometric and mortality data were collected during the survey. Food security and WASH questionnaires were also administered to every sampled household, as per the South Sudan Nutrition Cluster guidance. IYCF questionnaire was used for households with children of less than two years.

As a complete list of households in the sample frame was not available, a two-stage cluster sampling approach was used with villages/clusters as primary sampling units. Accordingly, in two stages, 34 clusters of 13 HHs * were used based on a population-sampling frame of all villages using ENA for SMART soft ware.

¹⁴ Prevalence based on ACF pre-harvest SMART 2012 Aweil south

¹⁵ As advised by the cluster

In the first stage, the smallest geographic units of the village, of which there are 185, was listed and 34 study clusters were selected using a systematic random sampling and PPS. This was generated in ENA for SMART Nov 16, 2013 software. These smallest administrative units were considered to be village lists with respective estimated population figures was obtained from ACF and verified by IRC office. The sampling includes all villages of Aweil South ,all areas of the county included in the sampling frame Once they were entered into ENA smart, then the software automatically assigned clusters to be visited using PPS. Once clusters/PSUs identified all Households in each cluster were enrolled as study subjects.

9.3.2 Second stage sampling

The second stage of sampling was the household selection within the clusters. On arrival at the village, the survey team introduced themselves and the objectives of the study to the village leader. By the help of the selected village leader, the team list out all the households residing in the village. Then, using random number table, 13 households between 1 and the last number corresponding to the listed households were randomly selected. The survey team started from a randomly selected household to carry out anthropometric measurement and other questionnaires.

All eligible children aged between 6 and 59 months in each visited household were included; all households without under 5 children were included for the mortality assessment. Anthropometric measurements conducted on each child from 6-59 months took the weight, height/length and MUAC. If a child's age is unknown, it was estimated using local calendar.

9.4 Data Collection Tools and Procedures

All eligible children aged 6 to 59 months were measured for anthropometric data and if a child's age was unknown, it was estimated using a seasonal/local calendar. Absent children were followed up during the survey day. The names and ages of eligible children who were away during the survey and couldn't be found after call back, and those children with physical limitations/abnormalities/ for anthropometrics measurements were recorded and noted with missing anthropometry data. Furthermore Household interview was made using structured questioner designated for both the mother and child at all HHs falling in the sample frame and selected information on the child (demographic, health related and socio-economic characteristics and food security collected.

9.5 Testing and Translation of Questioners

All designated questioners were translated to Dinka language and pre tested in the study area before deployment. Following the pre test the questioners were standardized and were used throughout the study period in the study area. During training pre-test on the tools were made to make sure consistency and ease of language among the various interviewers and HHs/mothers consecutively.

9.6 Training and Supervision

A total of twenty six enumerators were trained and twenty four of these enumerators were grouped in six teams of four members for data collection, while the other trained personnel worked in the survey data entry, supervision and logistics support. Prior to the actual fieldwork, five days training was given for all enumerators, interviewers and team leaders at IRC Pantua field hall on nutrition assessment techniques, nutrition data collection procedure, interview and measurement techniques, recognition of the signs and symptoms of malnutrition including nutritional edema, and on how to estimate age of children by using a local calendar. A practical training/exercise was undertaken on the third day particularly on the standardization of anthropometrics measurements. Ten children were measured twice by a supervisor and each of the enumerators orderly. The measurement values were entered into ENA Epi Info to check the accuracy and precision of each enumerator.

The survey coordinator was responsible for the overall supervision and coordination of the study activities. Half day practical demonstration particularly on survey methodology and one day pilot survey has also conducted within unselected cluster of the county. Discussions were conducted in each day after field work.

Quality of data was also ensured through Crosschecking of filled questionnaires on daily basis, daily review of performance of the data collection teams in addressing any difficulties encountered; daily based data cleaning was made during and after data entry. Data was also checked by ENA for SMART plausibility program before analysis

9.7 Operational definitions

Age: The age of children is needed to calculate nutrition indices as well as to know whether a child is between 6 and 59 months and should be included or not in a study. In case the age of the child cannot be estimated, children measuring between 65 and 110 cm should be included in the study. Children 6-59 months from the selected households are eligible for the survey and will be measured by estimating children age through birth certificate, immunization card, etc. if the child doesn't have these documents then the team used a local event, traditional calendar and seasonal calendar to remind the mothers or care givers. A height stick can also be used for selecting children taller than 65 cm and shorter than 110cm to determine their age and include them in the survey.

Weight: in kg- Salter scale was used to measure children.

Height: Similar to age, a height stick used for selecting children taller than 65 cm and shorter than 110cm, and for deciding whether the child should be measured standing up or lying down. Length measured for the children <87cm and the above 87cm was measured standing. When age is known, children less than 24 months will be measured lying down, and children greater than or equal to 24 months were measured in standing position. Where age can't be estimated a height board was used for children greater than or equal to 85.0cm and length was taken for children less than 87.0cm in a lying position.

MUAC: A mid-upper arm circumference measurement was made using a flexible and non-stretch tape. Only special MUAC tapes with appropriate graduation and colours were used. MUAC measurement was taken on the mid-point of the left upper arm. All children in the selected households aged 6-59 months were measured to the nearest 0.1 cm or 1.0 mm.

Oedema: To diagnose nutritional oedema, normal thumb pressure was applied to the tops of the feet for about three seconds (if counted “one thousand and one, one thousand and two, one thousand and three” in English, pronouncing the words carefully, this takes about three seconds). If there is oedema, an impression remains for some time (at least a few seconds) where the oedema fluid has been pressed out of the tissue.

Measles vaccination status: information was collected from the records on the immunization card and if there is no card mother/care giver recall was considered. Mothers/care givers was interviewed for their children between 9-59 months age. Finally both verbal [mother recall] and cards were computed separately.

Vitamin A supplementation: When asking a mother about vitamin A supplementations, the teams was brought a capsule and show the mother to check whether or not the child has taken vitamin ‘A’ in the past six months prior to the survey date.

Retrospective morbidity: Mothers were interviewed whether any type of disease had affected their children (6-59 months) in the last two weeks prior to the study.

Child Information and House Hold Data: Standard Child and Household questionnaires were developed and used to collect selected characteristics of both the child and household.

The household questionnaire was asked at every household fall in the sample. If no one was at home at a selected house, a neighbor was consulted concerning that head of that household where about of members of the *International Rescue Committee _Aweil south County Integrated SMART Nutritional Anthropometry and Mortality survey Final report April 2014*

household. If the members had departed permanently or where not expected to return before the survey days, the survey team re-visited the house before declaring “household missed”.

Household (HH): It is defined as any group of person occupying the same structure and sharing household resource, such as food and bedding. Members of a household are not necessarily relatives by blood or marriage.

Malnutrition is defined as having two standard deviations or more below the median weight-for-age (underweight) and/or height-for-age (stunting) and/or weight-for-height (wasting) of the NCHS/WHO international reference population.

9.8 Ethical Consideration

County commissioner, CHD, Payam administration village chiefs and village including the HHs involved were informed of the survey rationales and methods involved in data collection including their specific roles. Verbal consent was obtained from the survey subjects on the day of survey and they were requested to participate in the survey. Those who did not wish to participate in the survey were respected for their decisions. All the information collected was treated as strictly confidential. All children diagnosed as severely malnourished based on MUAC or with oedema were referred to a nearby health facility where they get treatment service/OTP. Each team was provided with referral sheets and made sure they have got the treatment service.

9.9 Survey Teams

Six data collection teams comprised of 4 staff members) were used to conduct the survey.

9.10 Survey Implementation

The survey was conducted from April 21st -26th. Throughout data collection the teams were closely monitored by 3 IRC supervisors.

9.11 Data Analysis

Data entry and analysis were done using, SMART November 16, 2013, Epi Info version 3.5.1 software and SPSS 20 respectively. The principal investigator alongside the study team was fully engage in data cleaning, editing, and analysis and in report writing as well as making recommendations.

The result was presented after exporting and analyzing through SPSS Version 20. Descriptive analysis was done for each variable using appropriate absolute numbers, frequencies, proportions, and cross tabulation.

9.12 Challenges

Age: Age determination was a major challenge as many mothers/caregivers did not know the birth dates of their children. Age was then estimated by the use of a local calendar of events developed for the County.

We used one reserve cluster due to inaccessibility (due to heavy rain prior to the day of data collection) of the selected cluster

9.13 Guidelines and Formulas Used

9.13.1 Acute Malnutrition

9.13.1.1 Weight for Height Index

Weight for height index was used to identify wasted children. It measures short term effect either from lack of food intake or illness, which reflects the recent past and current situation of the area. It is useful particularly when it becomes difficult to determine the exact age of the child as the case in most rural parts of developing countries.

Acute malnutrition rate is estimated using weight for height index and bilateral pitting oedema. Results are expressed both in z-score and percentage of median using NCHS reference and WHO standards. Besides to having true technical meaning; z-score express malnutrition rate more precisely and allow for cross study comparison. On the other hand, the percentage median estimate weight more accurately and commonly used in determining eligible children for targeted feeding programs. The prevalence of malnutrition using the Z-score cut-off tends to be higher than if percentage of the reference median is used (in other words, more children are identified as malnourished using Z-scores as compared with percentage of the median). This has an impact on program planning and estimating food needs. The following guidelines were thus used in expression of results in z-score and percentage of median

Thresholds for results expressed in Z-score

SAM is defined by WFH <-3SD and/or existing bilateral pitting oedema

MAM is defined by WFH <-2SD and \geq -3 SD and no oedema

GAM is defined by <-2 SD and/or existing of bilateral pitting oedema

Thresholds for results expressed in percentage of median

SAM is defined by WFH < 70% and/or existing bilateral oedema

MAM is defined by WFH > 70% and \geq 80% and no pitting oedema

GAM is defined by < 80% and/or existing of bilateral pitting oedema

9.13.2 Mid Upper Arm Circumference

It is not a good indicator to define the problem at population level. However, it is a good indicator of mortality in emergency situation

9.13.2.1 Definition of MUAC

- ❖ MUAC < 115mm and/or bilateral pitting oedema SAM with high risk of mortality
- ❖ MUAC ≥ 115mm and < 125mm MAM with risk of mortality
- ❖ MUAC ≥ 125mm and < 135mm Risk of malnutrition
- ❖ MUAC ≥ 135mm Adequate nutritional status

9.13.3 Retrospective Mortality

Ninety days recall period was used to collect mortality data. SMART methodology was utilized in data entry and calculation of crude and under five mortality rates. The result is expressed per 10,000 people per day. It is calculated using the following formula.

9.13.3.1 Crude Mortality Rate

$(CMR) = 10,000/a * f / (b + f/2 - e/2 + d/2 - c/2)$, where:

a = Number of recall days (100)

b = Number of current household residents

c = Number of people who joined household

d = Number of people who left household

e = Number of births during recall

f = Number of deaths during recall period

Thresholds are defined as follows

*Crude Mortality Rate (CMR):*¹⁶

Alert level: 1/10,000 persons/day

Emergency level: 2/10,000 persons/day

¹⁶ Health and nutrition information systems among refugee and displaced persons workshop report on refugee's nutrition ACC/SCN, November 2003

9.13.3.2 Under five Mortality Rate (U5MR)¹⁷

Alert level: 2/10,000 persons/day

Emergency level: 4/10,000 persons/day

¹⁷ Health and nutrition information systems among refugee and displaced persons workshop report on refugee's nutrition ACC/SCN, November 2003

10.0 RESULTS

10.1 Demographic Characteristics of the Respondents

In the survey community an average household size is 6.8 persons. The results further showed that 100% of the respondents were residents. The main residents of the County belong to the Dinka ethnic group who are traditionally agro-pastoralist. There is a mix of subsistence farming with animal husbandry as the main activity in most community members.

10.2 Description of Sample Population

A total of 471 under five children were visited from 418 HHs and valid height and weight measurements were obtained from 471 children.

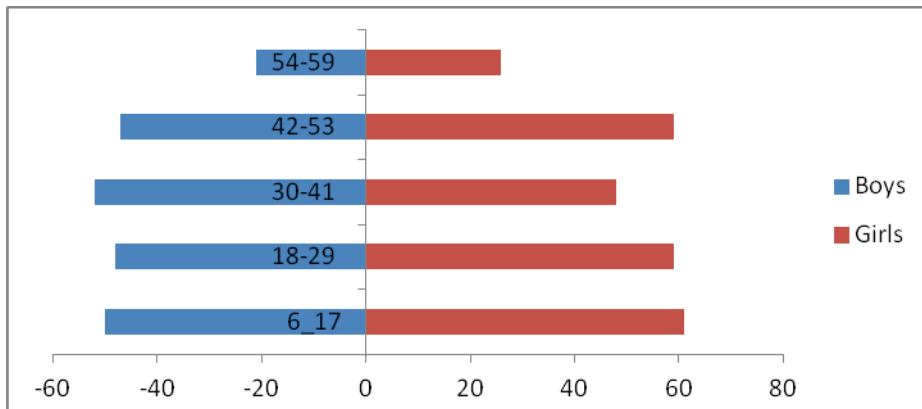
Two entries were missed height and age; There were n=18HHs (4%) absentees and o refusal , one cluster was inaccessible and replaced with reserve cluster .Overall, there are more females n= 253 (53.7.2%) than males n= 218 (49.8%) within the sample. However there are more boys noted in the age group 30-41 months wherein there are 4 more boys than girls. The ratio of boys to girls was equivalent to 0.9. , indicating that the sample was unbiased.

The age/sex distribution of the children indicates a difference in the size of the age groups (Figure 1). A smaller number of children in the 54-59 month age group are expected because of the smaller age range of this group compared to the others. It should be noted that age data is often inaccurate due to difficulties in establishing birth dates.

Table 4: Distribution of Age and Sex of sample, Aweil South County, April 2014

	Boys		Girls		Total		Ratio
AGE (mo)	no.	%	no.	%	no.	%	Boy:girl
6-17	50	45.0	61	55.0	111	23.6	0.8
18-29	48	44.9	59	55.1	107	22.7	0.8
30-41	52	52.0	48	48.0	100	21.2	1.1
42-53	47	44.3	59	55.7	106	22.5	0.8
54-59	21	44.7	26	55.3	47	10.0	0.8
Total	218	46.3	253	53.7	471	100.0	0.9

Figure 1: Sample population Age/Sex pyramid / Aweil South County, April 2014(N=471)



Mortality data was collected in 418 households containing 2853 people (436 under 5 years). The mean household size was 6.8 with an average of 1.13 children under 5 years of age. 16% of family members in the 418 households surveyed were under 5 years of age.

10.3 Acute Malnutrition (Wasting)

The distribution of W/H z-scores of the 471 sampled children is shifted to the left of that of the reference population (see Figure 2) with a mean W/H z-score below the reference mean (zero) at -1.2 (± 1.13 standard deviation). This indicates that the population of the sample frame is malnourished compared to the reference population.

Among the 471 children surveyed, prevalence of GAM by z-score was 26.1% (n=123) and prevalence of SAM was 5.9%. One case of oedematous malnutrition (Kwashiorkor) was found. Number of children found with malnutrition according to % median cut-offs are given in Table 1. Table 3.2 shows the breakdown of the type of malnutrition found in the survey population.

Prevalence did not differ significantly by sex, as judged by overlapping confidence intervals (WFH by z-score: males: 27.5% (20.7 - 35.5 95% C.I, females: 24.9% (18.6 - 32.5 95% C.I).

Table 5: Prevalence of acute malnutrition based on weight-for-height z-scores (and/or oedema) and by sex, Aweil South County, April 2014

	All n = 471	Boys n = 218	Girls n = 253
Prevalence of global malnutrition (<-2 z-score and/or oedema)	(123) 26.1 % (20.7 - 32.3 95% C.I.)	(60) 27.5 % (20.7 - 35.5 95% C.I.)	(63) 24.9 % (18.6 - 32.5 95% C.I.)
Prevalence of moderate malnutrition (<-2 z-score and >=-3 z-score, no oedema)	(95) 20.2 % (16.1 - 24.9 95% C.I.)	(46) 21.1 % (16.0 - 27.3 95% C.I.)	(49) 19.4 % (14.7 - 25.0 95% C.I.)
Prevalence of severe malnutrition (<-3 z-score and/or oedema)	(28) 5.9 % (3.7 - 9.3 95% C.I.)	(14) 6.4 % (3.3 - 12.0 95% C.I.)	(14) 5.5 % (2.9 - 10.2 95% C.I.)

The prevalence of oedema is 0.2 %

Table 6: Prevalence of acute Malnutrition by Age, based on weight-for-height z-scores and/or oedema, Aweil South County, 2014

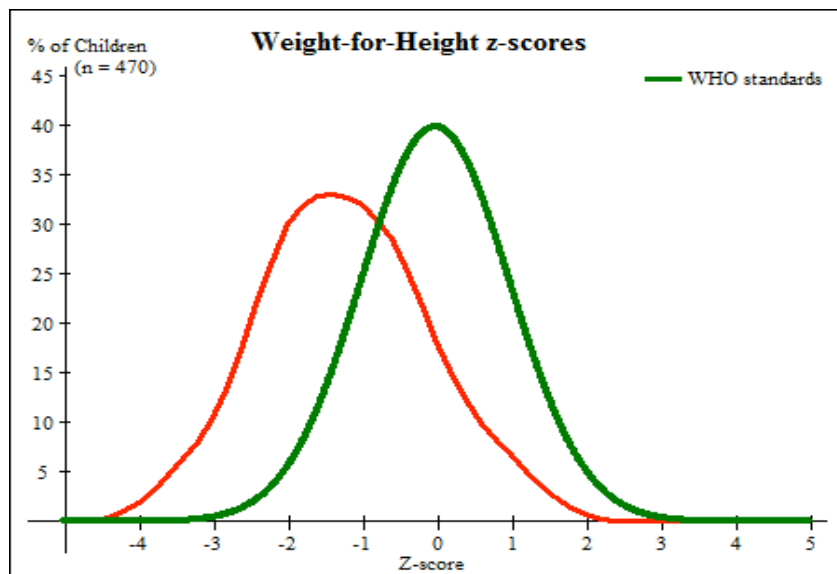
Age (mo)	Total no.	Severe wasting (<-3 z-score)		Moderate wasting (>= -3 and <-2 z-score)		Normal (>= -2 z score)		Oedema	
		No.	%	No.	%	No.	%	No.	%
6-17	111	11	9.9	17	15.3	82	73.9	1	0.9
18-29	107	5	4.7	24	22.4	78	72.9	0	0.0
30-41	100	2	2.0	20	20.0	78	78.0	0	0.0
42-53	106	5	4.7	27	25.5	74	69.8	0	0.0
54-59	47	4	8.5	7	14.9	36	76.6	0	0.0
Total	471	27	5.7	95	20.2	348	73.9	1	0.2

Among the 471 children sampled, none was excluded from analysis using SMART flag. There was one case of nutritional oedema (0.2%) and children who were found with SAM case during data collection were referred to OTP. The MAM cases were referred to the operational SFP program at the time if village was close to it.

Table 7: Distribution of acute malnutrition and oedema based on weight-for-height z-scores, Aweil South County, April 2014

	<-3 z-score	>=-3 z-score
Oedema present	Marasmic kwashiorkor No. 0 (0.0 %)	Kwashiorkor No. 1 (0.2 %)
Oedema absent	Marasmic No. 27 (5.7 %)	Not severely malnourished No. 443 (94.1 %)

Figure 2: Frequency Distribution of WFH Z-scores for Children 6-59 month's old-Aweil south county, April 21, 2014 (N=470)



10.3.1 Distribution of Middle Upper Arm Circumference

Table 8: Prevalence of acute malnutrition based on MUAC cut off's (and/or oedema) and by sex, Aweil South County, April 2014

	All n = 471	Boys n = 218	Girls n = 253
Prevalence of global malnutrition (< 125 mm and/or oedema)	(68) 14.4 % (10.4 - 19.8 95% C.I.)	(26) 11.9 % (7.5 - 18.4 95% C.I.)	(42) 16.6 % (11.4 - 23.5 95% C.I.)
Prevalence of moderate malnutrition (< 125 mm and >= 115 mm, no oedema)	(49) 10.4 % (7.3 - 14.6 95% C.I.)	(21) 9.6 % (6.1 - 14.8 95% C.I.)	(28) 11.1 % (6.8 - 17.4 95% C.I.)
Prevalence of severe malnutrition (< 115 mm and/or oedema)	(19) 4.0 % (2.0 - 7.8 95% C.I.)	(5) 2.3 % (0.8 - 6.3 95% C.I.)	(14) 5.5 % (3.0 - 10.1 95% C.I.)

10.4 Chronic Malnutrition (Stunting)

At 17.0% global stunting (HFA by z-score), indicates the low prevalence of chronic malnutrition (see Table 4). It is likely that this figure is even higher, considering South Sudan has more than 50% of its U5 population reported as stunted. The fact that age data are particularly difficult to determine and verify may account for the lower than national average figure presented in this survey.

Table 9: Prevalence of stunting based on height-for-age z-scores and by sex, Aweil South County, April 2014

	All n = 471	Boys n = 218	Girls n = 253
Prevalence of stunting (<-2 z-score)	(80) 17.0 % (13.5 - 21.2 95% C.I.)	(41) 18.8 % (13.7 - 25.3 95% C.I.)	(39) 15.4 % (11.2 - 20.8 95% C.I.)
Prevalence of moderate stunting (<-2 z-score and >=-3 z-score)	(61) 13.0 % (10.0 - 16.7 95% C.I.)	(30) 13.8 % (9.5 - 19.4 95% C.I.)	(31) 12.3 % (8.9 - 16.7 95% C.I.)
Prevalence of severe stunting (<-3 z-score)	(19) 4.0 % (2.4 - 6.7 95% C.I.)	(11) 5.0 % (2.7 - 9.2 95% C.I.)	(8) 3.2 % (1.4 - 6.8 95% C.I.)

Table 10: Mean z-scores, Design effect and excluded Subjects

Indicator	N	Mean z-scores ± SD	Design Effect (z-score < -2)	z-scores not available*	z-scores out of range
Weight-for-Height	470	-1.24±1.13	1.94	1	0
Weight-for-Age	470	-1.14±1.14	1.05	1	0
Height-for-Age	471	-0.51±1.46	1.21	0	13

* contains for WHZ and WAZ the children with oedema.

10.5 Feeding Program Coverage

OTP coverage was reported to be 72% with 2 out of 3 severely malnourished children participating in IRCs OTP program. The other severely malnourished child was referred to WVE's nearest TSFP site and IRC'S OTP to enrol in the program. An additional four MAM cases were enrolled in the TSFP program of WVSS; the coverage is 8.1%. (See table 8)

Table 11: Sampled children enrolled in nutrition feeding centers, Aweil South County, April 2014

Type of feeding centre	Finding	%
Targeted supplementary feeding program (TSFP)	N=49 n=4(MUAC)	8.1
Outpatient feeding program (OTP)	N=19 n= 26(MUAC)	73

10.6 Retrospective Mortality

Mortality data was collected in every household visited, Ninety days recall period was used to collect retrospective mortality data using the 15 January 1st of December (new year first month) as reference point. Data was collected from 13 households per cluster and summary of the result is presented in table. Crude and

under five mortality rates of 0.72(0.32-1.59) and 2.15(0.95-4.81) respectively were obtained. The Crude death rate and under five mortality rate is at serious levels according to WHO classification of mortality thresholds

Table 12: under five and CMR summary table, Aweil South County, April 2014

Demographic data	Number
Current resident at household	2853
Current resident under five in household	436
People who joined the household	9
Under five who joined the household	1
People who left the household during recall period	38
Under five children who left the household during recall period	6
Birth	23
Death	18
Under five death	8
Recall period in days 90	
CMR [Death/10,000 people/day] 0.88 [0.58 – 1.31 95% C.I]	0.72(0.32-1.59)
U5MR [death in under five children/10,000/day]	2.15(0.95-4.81)

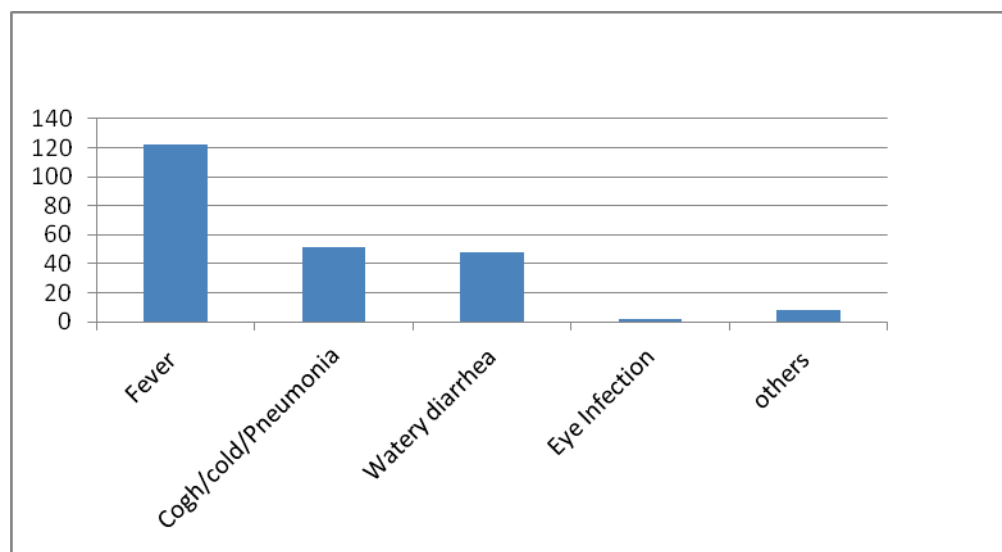
Causes cited for the included fever/malaria, (illness 11.1%) (11.1), injury and (5.6%) unknown. location of death 59% current location, 11.1% in the place of last residence and 5.6% others(unity state conflict areas.

10.7 Child Morbidity, Vaccination & Vitamin A Supplementation Status

10.7.1 Morbidity

Mothers/caretakers were questioned on the recent health status (2 weeks prior to the survey date) of their children. Among the sample children, mothers/carers of 49% (n=231) reported that they had been ill. Diarrhoea was the most prevalent disease in the surveyed area

Figure 3: Types of Illness reported, Aweil south county, April 2014 (N=471)



Mothers of sick children were asked whether they had taken their child to a health facility for treatment. Only 41 (34.2%) mothers said yes, while the remainder chose alternative therapy or did not seek treatment. Reasons cited informally included lack of funds and awareness.

Table 13: Treatment sought, Aweil South County, April 2014 (N=230)

Treatment sought	Number	%
None sought	52	22.6
Hospital	51	22.1
PHCC/PHCU	57	24.1
Mobile /outreach clinic	0	0
Village health care worker	37	16.1
Private physician	4	1.7
Relative/ friend	0	0
Shop	4	1.7
Traditional practitioner	18	7.8
Pharmacy	5	2.2
Other	3	1.7
Total	231	100

10.7.2 Measles & Vaccination and Vitamin A Supplementation

Amongst children 9-59 months measles vaccination coverage was slightly more than half at 29.0% (130/448). Vitamin A coverage was low at 12% (n=56/491) of children 6-59 months old. Coverage rates determined in this survey much higher than from SSHH survey 2010(6% Vat A &20% measles) reported coverage rates most likely because the national survey considered the whole counties of the country but this one only concentrated in one county. Both Vitamin A and vaccination coverage is lower than the SPHERE standard recommendation of at least 90%.

Table 14: Proportion of children 9-59 months immunized against Measles and VIT A supplementation coverage for six months (since November 2013), Aweil South County, April 2014

Indicator	Responses	N	%	
Measles Immunization coverage >=9 months N=448	Not given (Not immunized)	315(56.6-75.895%C.I)	56.5%	
	Yes EPI Card (immunized)	121(17.2-36.5 95%C.I)	27%	
	Mothers Recall (immunized)	9 (0.9-4.2 95% C.I)	2%	
	Don't Know	26 (4.1-7.5 95% C.I)	5.8	
Vitamin A coverage (471)	6-59 months	Given	56 (7.2-18.9 95%C.I)	11.88
		Not given at all	412(80.6-92.2 95% C.I)	87.4
		Don't know/remember	3 (0.1-2.9 95%C.I)	0.6
Mosquito net usage(471)	Yes	124	26.3	
	No	347	73.7	

10.8 Food Securities and Livelihood

The main livelihood of the community is subsistence crop farming followed by agro-pastoralist and smaller percent for employment. The Main source of income for the surveyed households was sale natural resources which were mainly grass at 34.4%, followed by sale of local alcoholic beverages at 19.4%, casual labour accounting for 5.5% and sale of livestock that accounted for 5.7%. 24.9% (n=104) of the 418 interviewed households were female-headed. Majority of the surveyed HHs spending more than 50% of their income e to food and food related expenses

Sources of food for the households seven days prior to the survey date were Purchasing from market (Cash) at 40.4% and followed by work for food 18.2% and Gathering wild nuts at 10.5%. The other sources were recording less than 10% of the respondents. The livelihood of the district was agro-pastoralist with 34.9% of the households owning livestock and 80.4% doing cultivation in the most recent planting season. Table 11-13 below presents summary findings.

Table 15: The main source of income for the community, Aweil South, County April 2014

Mine income	Number	Percent
Sale of natural resources (firewood; charcoal; grass)	144	34.4
Brewing	81	19.4
Sale of livestock	24	5.7
Casual labour	23	5.5
Sale of crop	11	2.6
Sale of fish	13	3.1
Salaried work	8	1.9
Sale of animal products	11	2.6
Sale of food aid	7	1.7
Skilled labour	13	3.1
Other petty trading	23	5.5
Family support	21	5.0
Others	36	8.6

Table 16: Sources of food in the household, Aweil South County, April 2014

Source of food in the last 7 days	Frequency	Percent
Market/ shop purchase	164	39.2
Own production	38	9.1
Work for food	76	18.2
Gifts	11	2.6
Gathering	44	10.5
Borrowing/ debt	20	4.8
Others	23	5.5
Fishing	13	3.1
Hunting	6	1.4
Total		100

Table 17: Income allocation to Food purchase, Aweil South County, April 2014

Percent Allocated to food purchase	Frequency	Percent
0 = 1-25%	169	40.4
1 = 1-25%	131	31.3
2 = 26-50%	63	15.1
3 = >65%	55	13.2

Most households experience shortages as there been times when they did not have enough food or money to buy food. This was reported by 84.4% of the respondents and the coping mechanisms employed are shown in table 19 below.

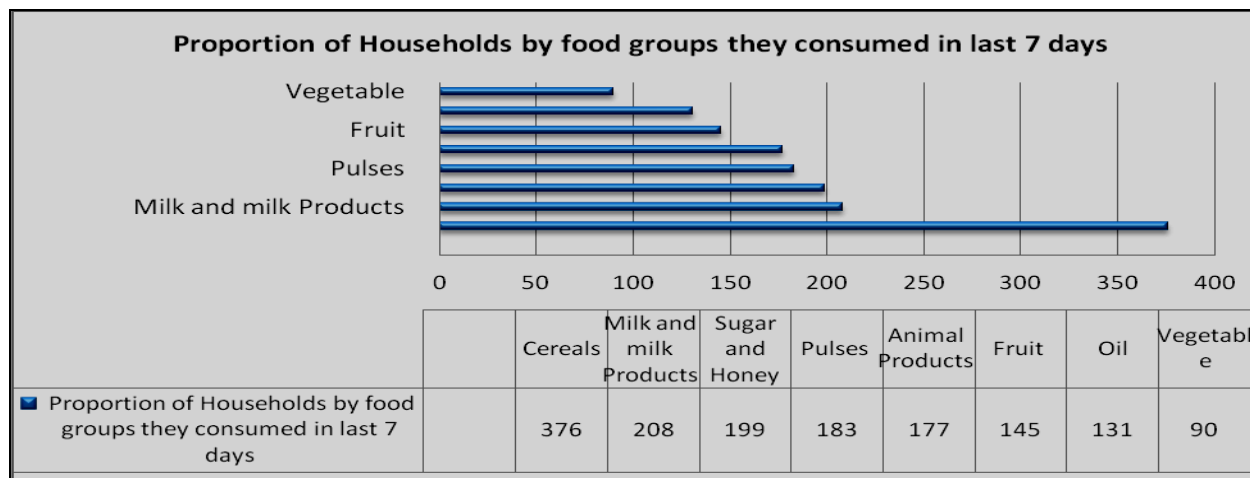
10.8.1 Household Food consumption patterns

A household food consumption pattern was derived from eight food groups consumed by the household in last 7 days preceding the survey. Cereals, cereal products and tubers were consumed by almost all households (90.8%), which averaged at 4 days consumption per 7 days. This was followed by Milk and milk products with 49.8% of households consuming which averaged at 4 days consuming per 7 days period. The least consumed were vegetables, oil , fruits and animal products with households consuming for last 7 days accounting being 21.5%, 31.3%, 34.7% and 42.3% respectively.

Table 18: Proportion of Households by food consumed in the last seven days, Aweil south County April 2014

Food groups	Proportion of Households by food groups they consumed in last 7 days							
	0	1	2	3	4	5	6	7
Cereals	42	51	93	82	54	34	22	40
Pulses	235	72	65	28	7	4	3	4
Vegetable	328	43	29	12	4	0	2	0
Fruit	273	74	37	22	5	3	2	2
Animal Products	241	73	48	32	16	5	2	0
Milk and milk Products	210	68	55	36	20	8	1	20
Sugar and Honey	219	84	45	21	18	6	3	22
Oil	287	67	31	13	13	3	1	2

Figure 4 : Proportion of Households by food groups they consumed in the last 7 days, Aweil south County, April, 2014



10.9 Coping Strategies

The sampled households indicated using different coping strategies including relying on less preferred food, limiting portion sizes, borrowing from kinsmen, restricting adult's consumption in favor of children and reduction in number of meals consumed. Ninety -three surveyed households (22.2%) reported ate less preferred /cheaper food,11.2% Borrowed money from kinship in order to get money to buy food,12.2% Limit portion size at meals and around 23 surveyed households had sold livestock in the month prior to the survey to purchase food (5.5%). (See the bellow table 14)

Table 19: No households had engaged in unusual migration in the three months prior to the survey, Aweil South County, April 2014

Coping Mechanisms	Frequency	Percent
on less preferred/ cheaper food	93	22.2
Borrowing/ kinship support	47	11.2
Limit portion size at meals	51	12.2
Restrict adults' consumption for children	19	4.5
Reduce number of daily meals	23	5.5
Sell more animals than usual	23	5.5
Consume seed stocks	26	6.2
Other	81	19.4

Table 20: Constraints faced by the Households, Aweil South County, April 2014

Household Constraints n=418	Frequency	Percent
No shocks	3	0.7
Insecurity	13	3.1
Expensive food	238	56.9
Limited access/ movt	8	1.9
Livestock diseases	2	0.5
Floods	57	13.6
Human sickness	31	7.4
Delay of rains	22	5.3
Pest/crop disease	5	1.2
Lack of water	22	5.3
Other	17	4.1

10.10 Infant and Young Child Care practices

10.10.1 Timely initiation of breastfeeding

Respondents were asked whether their children were ever breastfed. Majority of N= 163 (98%)of children 0 - 23 months were ever breastfed. Moreover N= 163 (95.7%) of the children had reportedly been initiated to breastfeeding within the WHO recommended 1 hour with 1.8% initiating within the day ,1.6% initiating after the first day and the remaining 1.8% initiated after 48hrs.

10.10.2 Other breastfeeding practices

Every child surveyed, the respondents overwhelmingly reported 99.4% having received colostrums and 92.0% of the children sampled were still being breastfed at 1 year.

10.10.3 Exclusive breastfeeding

Exclusive breastfeeding rates were analyzed for infants below 6 months. Although all children below 6 months of age were reportedly still breastfeeding, in the first three days of life, 4.9% were fed on other feeds other than breast milk and further than that n=71/163; 44.2% of them were already on other foods, having been weaned at an early age (1 - 5months), implying that only n=54;(33.1%) of the infants were exclusively breastfed as per the WHO recommendation.

Table 21: Exclusive breastfeeding and Meal frequency peratcice ,Aweil South County, April 2014

INDICATOR (N=163)	N	%
Exclusive breastfeeding rates (<6 months)	54	33.1
Early initiation of breastfeeding (All) (within an hour)	156	95.7
Proportion of children 0-23 months ever breast fed	160	98
Proportion of children 20-23 months still breastfeeding	13	53.8
Proportion of children 0-23 months breastfed on colostrum	162	99
Minimum meal frequency 6-23 months breastfed(at least 3 times a day)	150	32.7
Minimum meal frequency 6-23 months non breastfed (at least 4 times a day)	14	12.7
Minimum meal frequency 6-23 months (>4 times a day)	2	1.8
Minimum meal frequency 6-23 months (less than 3 times)	63	57.2
Minimum meal frequency 6-23 months ALL (at least 3 times a day)	110	67.5

10.10.4 Minimum dietary diversity of complementary foods

The dietary diversity indicator is based on the premise that the more diverse the diets are the more likely they are to provide adequate levels of a range of nutrients. There is considerable evidence for this idea.

Table 22: Dietary diversity for children aged 6-23 months, Aweil South County, April 2014

INDICATOR	N	%
Proportion of children who consumed solid, semi-solid or soft foods during previous day (6-8 months)	15	55.5
Minimum diversity (breast fed) (from ≥ 3 food groups during the previous day) 6-23 months	70	59.3
Minimum diet diversity (non- breast fed) (from ≥ 4 food groups during the previous day) 6-23 months	34	41.4
Minimum diet diversity (breast fed and non breast fed) (from ≥ 3 food groups during the previous day) 6-23 months	84	71

The survey further required to know the liquids given to children immediately after birth (first 3 days). The results in table 21 below reveal that most of the mothers are ignorant of what to feed an infant. This is because according to World Health Organization (WHO), different criteria for 'adequate feeding' are used depending on the age of the child. For infants aged 0-5 months, exclusive breastfeeding is considered adequate feeding. The results below shows that within the first three days majority (85.9%) of mothers practice exclusive breastfeeding this very good should encouraged and further strengthen through IYCF Program.

10.11 Management During diarrheal incidence

Diarrhoea is an important cause of under nutrition. This is because nutrient requirements are increased during diarrhoea, just like during other infectious diseases, because nutrient intake and absorption are usually decreased. Each episode of diarrhoea can cause weight loss and growth faltering. Moreover, if diarrhoea occurs frequently, there may be too little time to "catch up" on growth between episodes. In general, the impact of diarrhoea on nutrition status is proportional to the number of days a child spends with diarrhoea each year.

As discussed above, the feeding of children in these communities especially in the incidence of diarrhoea is below the recommended standard and contributes to increased cases of severe malnutrition and in some cases leads to death.

Chart 2 below presents the picture of how the situation is in the survey community. It is required that feeding during diarrhoea incidence should be more than normal to replace the loss of fluid leading to dehydration. Therefore a child is expected to be given child more fluids than usual to prevent dehydration and plenty of nutritious food, to prevent malnutrition. From the chart you may notice that only 11% were able to feed the children more than usual.

Figure 5 Amount of Liquid Given, Aweil South County, April 2014(n=230)

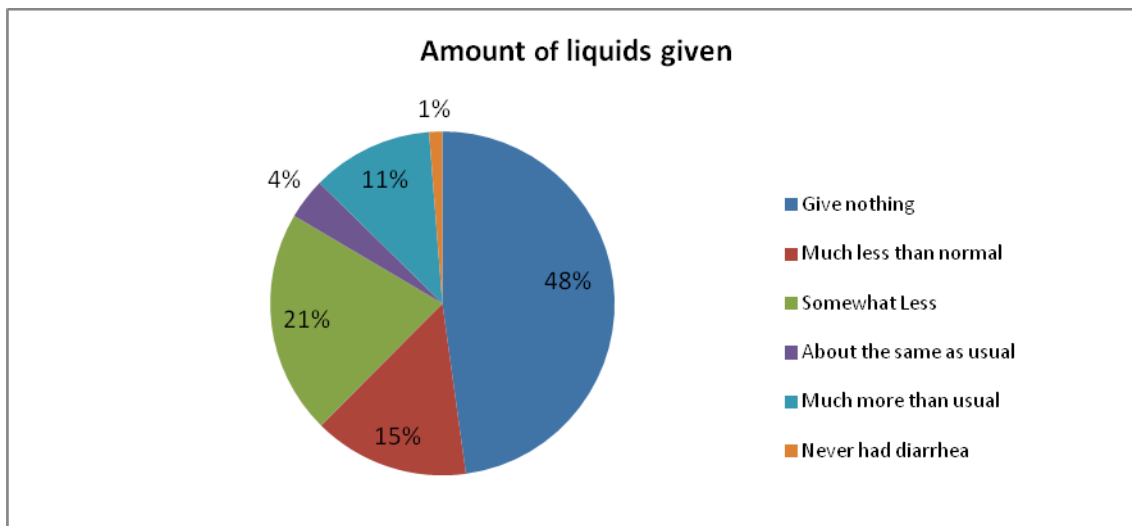
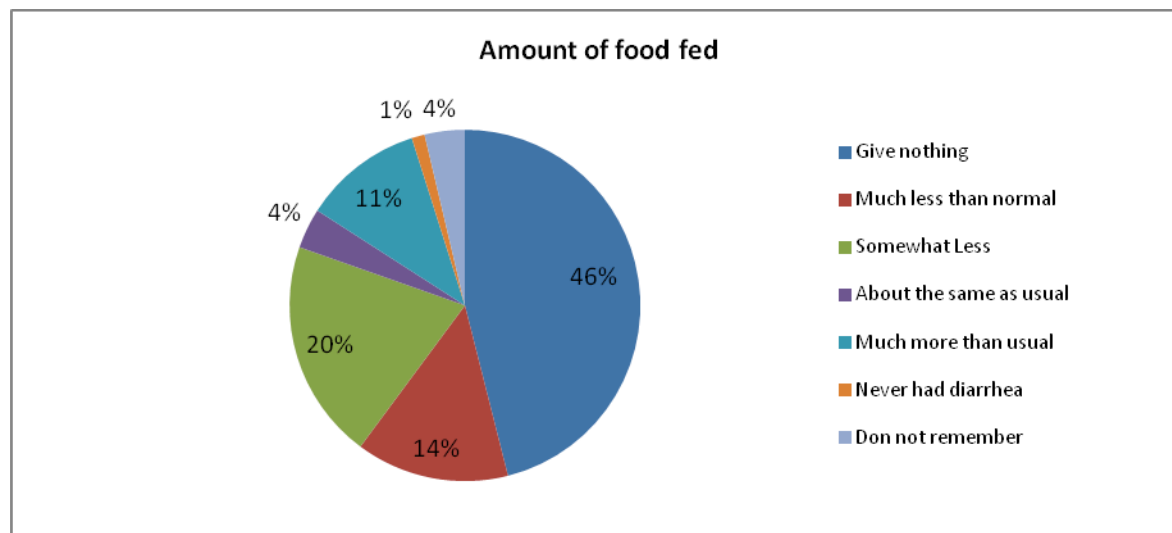


Figure 6: Amount of Food Fed, Aweil South county, April 2014 (N=230)



10.12 Water, sanitation and Hygiene

10.12.1 Access to Water

A good number of households (93%, n=139) reported using a protected water source: 10% collected water from a protected hand dug well and 83% from a bore hole, much higher than sub-Saharan average which is 60%4. However, the remaining proportion of households 7%, still collect water from an unsafe source. These water sources included unprotected rivers, lakes, ponds and hand dug wells.

In the communities sampled, 52.9% percent of the population travels less than 30 minute to access water and 27.3% take half to one hour, from either source. Majority of the population (70.3%) do nothing to the water collected either from improved or unimproved sources at household level. Only 15.1% boil drinking water and 11.2% used water filtration by cloth method for water treatment.

Table 23: Water sources and time taken to fetch it, Aweil South County, April 2014

HH water source	Frequency	Percent
Borehole	347	83.0
Protected Shallow well	10	2.4
Open shallow well	37	8.1
River /Stream	22	5.3
Dam/Pond	2	0.5
Total	418	100
Time taken to fetch water	Frequency	Percent
<30 minutes	221	52.9
>30min to <1hr	114	27.3
>1hr to < 2hr	54	12.9
>2hr to < 4hr 2	21	5.0
Total	418	100

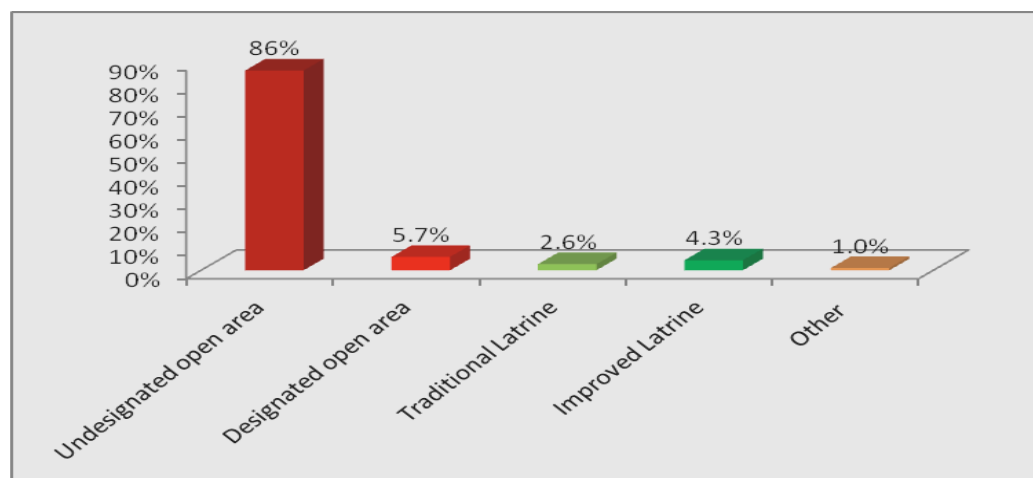
10.12.2 Water Treatments

Majority of the population (70.3%) do nothing to the water collected either from improved or unimproved sources at household level. This shows that water treatment practices at the household level are very low, which seems to indicate the consumption of unsafe water. Only 15% boil drinking water, and 11.2% used water filtration, 2.6% let the water settle and only 0.2% chlorination method for water treatment.

10.12.3 Sanitation and Hygiene

A considerable proportion of the community (86.4%) use unimproved sanitary facilities (designated and undesignated bush area). It is well above the average for sub Saharan African countries, which is 63%. Most of the household have no access to toilet, with most of them going to designated and undesignated bush. Use of traditional latrine 2.6%, improved latrine was only reported in 4.3% of the sampled households.(see the following figure)

Figure 7: Percentages of households by the human excreta disposal ways, Aweil South County, April 2014



Among the surveyed households, 33.0% wash their hands before cooking, before breast feeding 29.9%. 22.5% after defecation and 33.0% wash before eating. Only 41.1% of household reported using soap at home when washing their hands. This highlights unhealthy hygiene behaviors for most people.

Sanitation and hygiene are critical to health, survival, and development. Lack of basic sanitation facilities coupled with the poor hygiene practices and lack of access to improved drinking water sources makes the communities vulnerable to diseases.

Table 24: Material used for Hand washing, Aweil South County, April 2014

What is used in hand wash	Frequency	Percent
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Nothing	38	9.1
Water only	200	47.8
Water + soap	171	41.0
Water + ash	7	1.7
Total	418	100

11.0 DISCUSSION

11.1 Nutrition status

Prevalence of both Global Acute Malnutrition (GAM) and Severe Acute Malnutrition (SAM) rates were at critical levels¹⁸ of (123) 26.1% (20.7-32.3 95% CI) and 5.9% (3.7- 9.3 95% CI) respectively. Crude and under five mortality rates of 0.72(0.32-1.59) and 2.15(0.95-4.81) respectively were obtained. The Crude death rate and Under five mortality rate is at serious levels according to WHO classification of mortality thresholds. The GAM and SAM levels have increased since Marche 2012 ACF survey found a GAM of 18.6 % (15.6 - 22.0 95% C.I.), and SAM level is higher than ACF March 2012 2.6 % (1.3 - 5.0 95% C.I.). The reported coverage of measles immunization by card (27%), recall (2%) and vitamin A supplementation (11.88%) is low which was far below the recommended coverage of >80% by World Health Organization (WHO) both for vitamin a and measles.

The two surveys employed similar Methodologies and conducted in same season (pre- harvest). The possible reasons for the increment are the current national conflict, the recurrent flood occurrence in the county and high food price and low food supply in major markets of the county. In addition to this both surveys were conducted in the lean period. The situation is expected to worsen as the hunger bites between May - July till the first crop harvest expected around August.

This is further corroborated by the ANLA 2014 report which indicates that Preliminary IPC analysis of late January 2014 estimates about 6 million people are in stress, crisis and emergency phases, an increase of 2 million people relative to pre-conflict levels. Of this total, 3.2 million are in emergency or crisis phases. These numbers exclude the 740 000 IDPs within South Sudan.

Continuing insecurity is affecting trade routes from Uganda, through which food supplies are brought to other wider areas of South Sudan. The impact on markets of this restriction in food supplies is taking place as households exhaust their stocks and enter the period when dependency on markets for food supplies becomes greater. This will affect negatively the food security status of populations even in regions far from direct conflict like Aweil south. Further to the situation being worse, there is currently a gap in Nutrition treatment and prevention interventions which make the situation compounded and will thus require much attention from both State level partners to National level.

¹⁸ Above emergency threshold of GAM >15% (WHO, UNICEF and SPHERE 2011 standards)

The dietary diversity, dependency on market/shop purchases and food consumption pattern reported here vividly substantiate the trend of food insecurity in the survey area. Most of the households depend on cereal based diets.

The continuing prevalence of high levels of acute malnutrition in Aweil South might be due to the multifactorial Causes of malnutrition such as the prevailing chronic food insecurity, public health problems, the current conflict, and poor child care practices of the local communities.

11.2 Breastfeeding Practices

Breastfeeding is the cultural norm in South Sudan particularly giving colostrum and the duration of breastfeeding to one year. Exclusive breastfeeding on the other hand is very low and breastfeeding falls off to around 50% to two years which is sub-optimal. It is recommended that all children be breastfed for two years or longer because of the immense health benefits of breast milk. Most of the children were given colostrum which provides antibodies thus conferring immunity to the baby In contrast, optimal breastfeeding practices in terms of not giving of pre-lacteal feeds, and exclusive breastfeeding for 6 months were inadequate..

The exclusive breastfeeding rates of 33.1% are below the WHO recommended levels. While interpreting the prevalence of exclusive breastfeeding, it should be taken into account that the sample size is very low.

11.3 Complementary Feeding Practices

Complementary Food means age-appropriate foods which complement breast-milk when breast milk no longer can fully satisfy the nutritional requirements of the young child.

The complimentary feeding practices in Aweil South are below the acceptable standards. The results section clearly depicts inadequate feeding as most children are fed on cereal based diets and imply that for majority of the children, the meals did not have an adequate range of food groups and were thus likely to be limited in the diversity of nutrients received.

Low quality complementary foods combined with inappropriate feeding practices put under-twos in the county at high risk for under nutrition and its associated outcomes. Too often, solid, semi-solid and soft foods are introduced too soon or too late. The frequency and amount of food offered may be less than required for normal child growth, or their consistency or nutrient density may be inappropriate in relation to the child's needs. Too much of a poor complementary food could displace the more nutritive breast milk in the child's diet. As a whole, the complementary feeding practices in all the survey sites were inadequate.

11.4 Household Food Security

Food quality that is nutrient density, variety of foods and food safety to avoid infection, is a major determinant of nutritional status in children under 5 years. In the surveyed community food diversity is still a challenge since the community is strained by a number of confounding factors. The household income is low and not diversified, and thus gives limited options to adhere to the nutrition requirement of more than four meals in a day especially in children 6-23 months and food diversity is limited to largely available cereals.

The main income activities reported in the results section reflect the time of year the survey was conducted and is largely consistent with Aweil South as a whole. Crop sales (2.6%) lower than 2012 ACF survey (5.0%) is very low since most households have exhausted their stocks and since market prices are high, it is difficult to purchase from the market consistently. Livestock sales reported 5.7% and slightly lower than ACF's 2012 survey (7.8%) are generally low because the price of livestock is low. Animal products namely milk, is being used for household consumption; fishing is not done this time of year, so it limits diversity provided by fish protein; Alcoholic beverages are high because you can get a lot of alcohol from a little sorghum so it makes sense to brew and sell, as well since people are hungry, alcohol is cheap compared to a *malua* (5 litre jerry can) of sorghum; sale of bush materials (firewood, charcoal) and casual labour are the typical sources of income for households this time of year.

The number of times the family ate the previous day is true sense for the survey period. During the hunger gap families tend to eat once a day in the evening and perhaps have something small in the morning such as tea. Variety of food types eaten is very low, as is normal for this time of the year. The majority of the community's diet is sorghum, usually eaten in the form of *kisra*, or *ugali*, some okra is also typically consumed, with groundnut paste. It is also very likely that more households would have reported consuming ground nuts since some of their vegetables is made inform of a paste with ground nuts.

Cultivation in recent season was reported in **80.4%** of the sampled households and ownership of livestock Percentages reflects the Aweil South as a whole. Low percentage is due to the fact that households cannot afford them; people sell their cattle during the dry season when fodder is less available for cattle and money is needed to access food, seeds, and tools; and returnees typically came without cattle.

The households face a number of constraints; during the survey, market prices reported by 56.9% were high, a definite shock for households during the hunger gap. The price of most commodities raised and was attributed to the indirect impact of current conflict, insecurity, border closure, and the large number of returnees increasing demand.

Flooding was also experienced last year which was a constriction to some households; it wiped out the crops for many households. Water Sanitation and Hygiene Almost fifty per cent of the developing world's population – 2.5 billion people – lack improved sanitation facilities, and over 884 million people still use unsafe drinking water sources. Inadequate access to safe water and sanitation services, coupled with poor hygiene practices, kills and sickens thousands of children every day, and leads to impoverishment and diminished opportunities for thousands more.

Poor sanitation, water and hygiene have many other serious repercussions. Women are forced to spend large parts of their day fetching water. Poor farmers and wage earners are less productive due to illness, health systems are overwhelmed and national economies suffer. Without WASH (water, sanitation and hygiene), sustainable development is impossible.

The community of Aweil South suffers from a cocktail of causes that contribute to nutritional status in children and the community at large. Water, sanitation and hygiene have contributed to the suffering since the practices are a public health concern. Time taken to fetch water has a significant impact on the caretakers' opportunity to engage in additional economic activities and decreases the amount of time spent with young children. The safety of water is an average since at least 83% of the community has access to a borehole which is considered safe. The duration varies as 52.9% take 30 minutes and another 27.3% takes an hour and the remaining takes more than an hour, but most households are well about the SPHERE standards.

Unhygienic disposal of human feces is one of the key factors responsible for the incidence of diarrhoea in developing countries. Lack of safe sanitation facilities in more than 86.4% of the Aweil South County community is a public health and sanitation concern. Sensitization of communities on improved defecation practices, importance of the use of latrines and proper human waste disposal is critical to achieving a long term improvement in malnutrition. This must be coupled with intensive hygiene education aimed at improving hygiene practices.

12.0 CONCLUSIONS

12.1 Conclusions and recommendations

- Prevalence of both Global Acute Malnutrition (GAM) and Severe Acute Malnutrition (SAM) rates were at critical levels¹⁹ of (123) 26.1% (20.7-32.3 95% CI) and 5.9% (3.7- 9.3 95% CI) respectively. Crude and under five mortality rates of 0.72(0.32-1.59) and 2.15(0.95-4.81) respectively were obtained. The Crude death rate and Under five mortality rate is at normal levels according to WHO classification of mortality thresholds
- The main livelihood of the community is subsistence crop farming followed by agro-pastoralist and smaller percent employment. The Main source of income for the surveyed households was sale natural resources which were mainly grass at 34.4%, followed by sale of local alcoholic beverages at 19.4%, casual labour accounting for 5.5% and sale of livestock that accounted for 5.7%.
- The main source of food in the household is Purchase from the market (Cash) at 39.2% followed by work for food 18.2% and gathering 10.5% finally own production (previous harvest) at 9.1% . In responding to whether they have cultivated in the previous season, 80.4% of the household reported cultivating. In addition to that ownership of livestock was at 34.9%, this implies a balance between subsistence farming and livestock keeping. In addition to this, most of the food consumed at household level was purchased (sale natural resources which were mainly grass), highlighting the vulnerability of the community to cope with food shortages. This was creating an even greater dependence on increasing market prices – and greater adaptation difficulties for coping with food insecurity.
- Majority of the households are dependent on market purchase. They do not have reserve for the coming hunger months. Most farmers have sold their small animals to cope up with existing food shortage, the situation may not seem improved rather deteriorate; Hence it should be closely monitored and general ration should be provided to the most vulnerable community members of the county
- Most households experience shortages as there been times when they did not have enough food or money to buy food. This was reported by 83.5% of the respondents use coping mechanisms. Some of the coping mechanisms employed were Limit portion size of food (10.8%) borrow from kin man(11%) and sale of more animal than usual(5.5%)The main shocks households are currently facing is expensive food 56.9%(n=238)

¹⁹ Above emergency threshold of GAM >15% (WHO, UNICEF and SPHERE 2011 standards)

- Majority of the household (protected shallow well 10% and borehole 83%) had access to protected water sources (used improved water source for drinking) much higher than sub-Saharan average which is 60%⁴. In the communities sampled, 52.9% percent of the population travels less than 30 minute to access water and 27.3% take half to one hour, from either source. Majority of the population (70.3%) do nothing to the water collected either from improved or unimproved sources at household level. Only 15.1% boil drinking water and 11.2% used water filtration by cloth method for water treatment.
- The morbidity rate is 49% (n=231), children (10.1%, n= 48) were affected with diarrhoea and this was indicative of poor sanitation conditions. Eye infection was also reported as another prevalent condition in the community due to poor hygiene practices.
- A considerable proportion of the community (92.1%) use unimproved sanitary facilities (designated and undesignated bush area). It is well above the average for sub Saharan African countries, which is 63%. Most of the household have no access to toilet, most of them going to designated and designated bush. Use of improved latrine was only reported in 4.3% of the sampled households.
- Some of Childcare practices, as indicated by the survey results were particularly poor. As there is a close link between maternal education and child health, the low literacy rate indicates that it would be beneficial to increase female education and school enrolment rates in the county. In all the 0 – 23 months children surveyed 98.2% were breastfed. Among them, 95% of the children had reportedly been initiated to breastfeeding within the WHO recommended 1 hour with 99.4% of children breast fed on colostrums. 14% Proportion of children given liquids in their first 3 days of life.

12.2 Recommendations:

Further to the above, the following short and medium term recommendations will serve to aid IRC/agencies willing to assist the county or work in the county over a long-term period, in order to ameliorate the nutritional and health status of the population.

12.3 Short Term

- General ration provision should be started to the vulnerable population of the county
- Strengthen and expand the existing management of severe acute malnutrition before the situation further deteriorates and claims the life of under five children using CMAM approach Strengthen and expand the existing TSFP/BSFP programmers to provide supplementary food on a monthly and bi monthly basis

- Expand the coverage of Outpatient therapeutic program (OTP) in the county
- Establish Stabilization center(SC) at reasonable distance
- Strengthen linkages and referrals between SC, OTP and TSFP programs enroll and refer SAM and MAM cases
- Strengthen the initiation started to use CBDs for screening and referral of malnourished children
- Low measles vaccination (29%)and Vitamin A coverage (11.9%)- strengthening of outreach services and integrating supplementation in all immunization campaigns (Measles campaign already started at the end of this survey by UNICEF together with CHD)

12.4 Medium to Long-Term

- Commence income-generating schemes for households via off-farm activities and other ways of introducing saving and credit opportunities.
- Improve availability and quality of potable water through rehabilitation of existing structures and increasing number of latrines in villages
- Address infant and young child feeding practices in the community for long-term prevention of malnutrition and other diseases
- Commence food security and livelihood programs (provision of improved seed , agriculture tools, provision of capacity building trainings, Fishery)

13.0 Appendix

13.1 Appendix 1: Plausibility check for: (over all data quality)

Criteria score	Flags*	Unit	Excel.	Good	Accept	Problematic
Missing/Flagged data	Incl %	0-2.5	>2.5-5.0	>5.0-7.5	>7.5	
(% of in-range subjects)		0	5	10	20	0 (0.0 %)
Overall Sex ratio	Incl p	>0.1	>0.05	>0.001	<=0.001	
(Significant chi square)		0	2	4	10	0 (p=0.107)
Overall Age distrib	Incl p	>0.1	>0.05	>0.001	<=0.001	
(Significant chi square)		0	2	4	10	0 (p=0.970)
Dig pref score - weight	Incl #	0-7	8-12	13-20	> 20	
		0	2	4	10	0 (7)
Dig pref score - height	Incl #	0-7	8-12	13-20	> 20	
		0	2	4	10	2 (11)
Dig pref score - MUAC	Incl #	0-7	8-12	13-20	> 20	
		0	2	4	10	0 (7)
Standard Dev WHZ	Excl SD	<1.1	<1.15	<1.20	>=1.20	
.		and	and	and	or	
.	Excl SD	>0.9	>0.85	>0.80	<=0.80	
		0	2	6	20	2 (1.13)
Skweness WHZ	Excl #	<±0.2	<±0.4	<±0.6	>=±0.6	
		0	1	3	5	0 (0.13)
Kurtosis WHZ	Excl #	<±0.2	<±0.4	<±0.6	>=±0.6	
		0	1	3	5	1 (-0.27)
Poisson dist WHZ-2	Excl p	>0.05	>0.01	>0.001	<=0.001	
		0	1	3	5	3 (p=0.006)
		0	1	3	5	
OVERALL SCORE WHZ =		0-9	10-14	15-24	>25	8 %

13.2 Appendix 2: Result tables for NCHS growth reference 1977

Table 3.2: Prevalence of acute malnutrition based on weight-for-height z-scores (and/or oedema) and by sex, Aweil South County, April 2014

	All n = 471	Boys n = 218	Girls n = 253
Prevalence of global malnutrition (<-2 z-score and/or oedema)	(123) 26.1 % (20.7 - 32.3 95% C.I.)	(60) 27.5 % (20.7 - 35.5 95% C.I.)	(63) 24.9 % (18.6 - 32.5 95% C.I.)
Prevalence of moderate malnutrition (<-2 z-score and >=-3 z-score, no oedema)	(95) 20.2 % (16.1 - 24.9 95% C.I.)	(46) 21.1 % (16.0 - 27.3 95% C.I.)	(49) 19.4 % (14.7 - 25.0 95% C.I.)
Prevalence of severe malnutrition (<-3 z-score and/or oedema)	(28) 5.9 % (3.7 - 9.3 95% C.I.)	(14) 6.4 % (3.3 - 12.0 95% C.I.)	(14) 5.5 % (2.9 - 10.2 95% C.I.)

The prevalence of oedema is 0.2 % Table 3.3: Prevalence of acute malnutrition by age, based on weight-for-height z-scores and/or oedema, Aweil South County, April 2014

Age (mo)	Total no.	Severe wasting (<-3 z-score)		Moderate wasting (>= -3 and <-2 z-score)		Normal (> = -2 z score)		Oedema	
		No.	%	No.	%	No.	%	No.	%
6-17	111	11	9.9	17	15.3	82	73.9	1	0.9
18-29	107	5	4.7	24	22.4	78	72.9	0	0.0
30-41	100	2	2.0	20	20.0	78	78.0	0	0.0
42-53	106	5	4.7	27	25.5	74	69.8	0	0.0
54-59	47	4	8.5	7	14.9	36	76.6	0	0.0
Total	471	27	5.7	95	20.2	348	73.9	1	0.2

Table 3.4: Distribution of acute malnutrition and oedema based on weight-for-height z-scores, Aweil South County, April 2014

	<-3 z-score	>=-3 z-score
Oedema present	Marasmic kwashiorkor No. 0 (0.0 %)	Kwashiorkor No. 1 (0.2 %)
Oedema absent	Marasmic No. 27 (5.7 %)	Not severely malnourished No. 443 (94.1 %)

Table 3.5: Prevalence of acute malnutrition based on MUAC cut off's (and/or oedema) and by sex, Aweil South County, April 2014

	All n = 471	Boys n = 218	Girls n = 253
Prevalence of global malnutrition (< 125 mm and/or oedema)	(68) 14.4 % (10.4 - 19.8 95% C.I.)	(26) 11.9 % (7.5 - 18.4 95% C.I.)	(42) 16.6 % (11.4 - 23.5 95% C.I.)
Prevalence of moderate malnutrition (< 125 mm and >= 115 mm, no oedema)	(49) 10.4 % (7.3 - 14.6 95% C.I.)	(21) 9.6 % (6.1 - 14.8 95% C.I.)	(28) 11.1 % (6.8 - 17.4 95% C.I.)
Prevalence of severe malnutrition (< 115 mm and/or oedema)	(19) 4.0 % (2.0 - 7.8 95% C.I.)	(5) 2.3 % (0.8 - 6.3 95% C.I.)	(14) 5.5 % (3.0 - 10.1 95% C.I.)

Table 3.6: Prevalence of acute malnutrition by age, based on MUAC cut off's and/or oedema, Aweil South County, April 2014

Age (mo)	Total no.	Severe wasting (< 115 mm)		Moderate wasting (>= 115 mm and < 125 mm)		Normal (>= 125 mm)		Oedema	
		No.	%	No.	%	No.	%	No.	%
6-17	111	9	8.1	21	18.9	81	73.0	1	0.9
18-29	107	3	2.8	11	10.3	93	86.9	0	0.0
30-41	100	3	3.0	6	6.0	91	91.0	0	0.0
42-53	106	1	0.9	9	8.5	96	90.6	0	0.0
54-59	47	2	4.3	2	4.3	43	91.5	0	0.0
Total	471	18	3.8	49	10.4	404	85.8	1	0.2

Table 3.7: Prevalence of underweight based on weight-for-age z-scores by sex, Aweil South County, April 2014

	All n = 470	Boys n = 218	Girls n = 252
Prevalence of underweight (<-2 z-score)	(111) 23.6 % (19.8 - 27.9 95% C.I.)	(61) 28.0 % (22.0 - 34.9 95% C.I.)	(50) 19.8 % (15.5 - 25.0 95% C.I.)
Prevalence of moderate underweight (<-2 z-score and >=-3 z-score)	(88) 18.7 % (15.0 - 23.1 95% C.I.)	(49) 22.5 % (17.0 - 29.2 95% C.I.)	(39) 15.5 % (11.4 - 20.6 95% C.I.)
Prevalence of severe underweight (<-3 z-score)	(23) 4.9 % (2.9 - 8.1 95% C.I.)	(12) 5.5 % (2.8 - 10.5 95% C.I.)	(11) 4.4 % (2.3 - 8.1 95% C.I.)

Table 3.8: Prevalence of underweight by age, based on weight-for-age z-scores, Aweil South County, April 2014

Age (mo)	Total no.	Severe underweight (<-3 z-score)		Moderate underweight (>= -3 and <-2 z-score)		Normal (>= -2 z score)		Oedema	
		No.	%	No.	%	No.	%	No.	%
6-17	110	5	4.5	17	15.5	88	80.0	1	0.9
18-29	107	5	4.7	23	21.5	79	73.8	0	0.0
30-41	100	6	6.0	16	16.0	78	78.0	0	0.0
42-53	106	6	5.7	21	19.8	79	74.5	0	0.0
54-59	47	1	2.1	11	23.4	35	74.5	0	0.0
Total	470	23	4.9	88	18.7	359	76.4	1	0.2

Table 3.9: Prevalence of stunting based on height-for-age z-scores and by sex, Aweil South County, April 2014

	All n = 471	Boys n = 218	Girls n = 253
Prevalence of stunting (<-2 z-score)	(80) 17.0 % (13.5 - 21.2 95% C.I.)	(41) 18.8 % (13.7 - 25.3 95% C.I.)	(39) 15.4 % (11.2 - 20.8 95% C.I.)

Prevalence of moderate stunting (<-2 z-score and ≥-3 z-score)	(61) 13.0 % (10.0 - 16.7 95% C.I.)	(30) 13.8 % (9.5 - 19.4 95% C.I.)	(31) 12.3 % (8.9 - 16.7 95% C.I.)
Prevalence of severe stunting (<-3 z-score)	(19) 4.0 % (2.4 - 6.7 95% C.I.)	(11) 5.0 % (2.7 - 9.2 95% C.I.)	(8) 3.2 % (1.4 - 6.8 95% C.I.)

Table 3.10: Prevalence of stunting by age based on height-for-age z-scores, Aweil South County, April 2014

Age (mo)	Total no.	Severe stunting (<-3 z-score)		Moderate stunting (≥-3 and <-2 z-score)		Normal (≥-2 z score)	
		No.	%	No.	%	No.	%
6-17	111	2	1.8	6	5.4	103	92.8
18-29	107	6	5.6	15	14.0	86	80.4
30-41	100	6	6.0	18	18.0	76	76.0
42-53	106	4	3.8	14	13.2	88	83.0
54-59	47	1	2.1	8	17.0	38	80.9
Total	471	19	4.0	61	13.0	391	83.0

Table 3.11: Prevalence of overweight based on weight for height cut off's and by sex (no oedema), Aweil South County, April 2014

	All n = 471	Boys n = 218	Girls n = 253
Prevalence of overweight (WHZ > 2)	(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.)
Prevalence of severe overweight (WHZ > 3)	(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.)

Table 3.12: Prevalence of overweight by age, based on weight for height (no oedema), Aweil South County, April 2014

Age (mo)	Total no.	Overweight (WHZ > 2)		Severe Overweight (WHZ > 3)	
		No.	%	No.	%
6-17	111	0	0.0	0	0.0
18-29	107	0	0.0	0	0.0
30-41	100	0	0.0	0	0.0
42-53	106	0	0.0	0	0.0
54-59	47	0	0.0	0	0.0
Total	471	0	0.0	0	0.0

13.3 Appendix 1: Assigned cluster, Aweil South County 2014

Payam	Boma	village	Pou	HH	cluster #
Ayai	Lach	Lachdit	620	124	16
Ayai	Ajiith	Arieu	295	59	17
Ayai	Panthony	Panthony	550	110	18
Gakrol	Pagai	Leek	215	43	19
Gakrol	Pagai	Duel	410	82	20
Gakrol	Rum-aluel	Maker	270	54	21
Nyoch-Awany	Hong-wekdit	Malek alel	1970	394	10
Nyoch-Awany	Hong-wekdit	Riang mawel	755	151	11
Nyoch-Awany	Mayom Lac	Mayom lac	1200	240	12
Nyoch-Awany	Mayom Lac	Akac	575	115	13
Nyoch-Awany	Mabior-Aduet	Mabior	570	114	14
Nyoch-Awany	Mabior-Aduet	Yupduk	275	55	15
Tarweng	Makuel alel	Marik	315	63	25
Tarweng	Majok-abyei	Wuncuei	475	95	26
Tarweng	Majok-abyei	Muong-atiek	665	133	27
Tarweng	Akuoc	Malek-bul	650	130	28
Tiaraliet	Malek-akol	Ajat gai	290	58	33
Tiaraliet	Mangar lual	Majokwet ajal	485	97	34
Wathmok	Majak Goi	Muocdit	1800	360	1
Wathmok	Majak Goi	Mathiel	795	159	2
Wathmok	Achuan	Achuan	1875	375	3
Wathmok	Achuan	Wun-kiir	530	106	4
Wathmok	Achuan	Thur-agokdit	495	99	5
Wathmok	Nyoc-anoon	Marol	1245	249	6
Wathmok*	Nyoc-anoon	Warajak	375	75	7*
Wathmok	Makuac-amiir	Pan adhot	440	88	8
Wathmok	Pan-ngap	Pan-adhot	1295	259	9
Panthou	Riang aker	Mayom ajowak	795	159	22
Panthou	Riang aker	Maker	175	35	23
Panthou	Mading chan	Panthou	1165	233	24
Nyieth	Riang mankuek	Panthony	495	99	29

Nyieth	Pan-kuech	Pan rual	655	131	30
Nyieth	Malook	Keragany	270	54	31
Nyieth	Wurpac	Liil-nhom	320	64	32
Panthou	Mangar gier	Mangargier	540	108	RC

Due to the heavy rain the team was unable to conduct the survey in this cluster; hence we used the reserve cluster

13.4 Appendix 2: Household Mortality form

Household Enumeration Data Collection Form of a Death Rate Calculation Survey

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

No	Name <i>(optional)</i>	Sex M / F	Age in Years *exact for U5 <i>(approx ok for adult)</i>	Joined During Recall Period (Yes or No)	Left During Recall Period (Yes or No)	Born During Recall Period (Yes or No)	Died During Recall Period (Yes or No)	Cause of Death (enter no. code)	Location of Death (enter no. code)
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									

Codes of Cause of Death		Codes for Location of Death	
1 Diarrhoea	5 Malnutrition	1 In current location	
2 Fever	6 Violence/ conflict related	2 During migration	
3 Measles	7 Other (please specify)	3 In place of last residence	
4 Cough & Difficulty Breathing		4 Other (please specify)	