Final Report
Anthropometric and Retrospective Mortality SMART survey
Jur River County, Western Bahr El Ghazal State

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Submitted by: REACH
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Prepared by: REACH Emergency Prioritization Unit, Juba

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Finally, we would like to thank all survey participants, including supervisors, team leaders and enumerators, for their endurance, dedication, and amazing team spirit, which enabled us to obtain high quality data in such hard-to-reach areas, some of which even required going on foot for more than an hour.

Summary

This SMART survey was conducted in Jur River county from November 24th-December 2nd, 2022. A total of 581 children aged 6-59 months from across 413 households in 32 clustered villages in Jur River County were surveyed for anthropometric data to assess their nutritional status. The final sample surpassed the planned sample size of 409 children and there was no need to activate reserve clusters.

Table 1. Summary of survey findings

Anthropometry - Children 6-59 months based on WHO 2006 standard		
Index	WHZ - scores	**(%)**
WHZ - score	Prevalence of global malnutrition (<-2 z-score and/or oedema)	(53) 9.4 % (7.1-12.2 95% CI)
	Prevalence of moderate malnutrition (<-2 z-score and >=-3 z-score, no oedema)	(44) 7.8 % (5.9-10.2 95% CI)
	Prevalence of severe malnutrition (<-3 z-score and/or oedema)	(9) 1.6 % (0.8-3.2 95% CI)
WAZ - scores		
WAZ - score	Prevalence of underweight (<-2 z-score)	(98) 17.2 % (13.9-21.1 95% CI)
	Prevalence of moderate underweight (<-2 z-score and >=-3 z-score)	(74) 13 % (10.2-16.3 95% CI)
	Prevalence of severe underweight (<-3 z-score)	(24) 4.2 % (2.8-6.2 95% CI)
HAZ – scores		
HAZ - score	Prevalence of stunting (<-2 z-score)	(128) 24.2 % (1.36% adjusted to SD =1) (20.4-28.3 95% CI)
	Prevalence of moderate stunting (<-2 z-score and >=-3 z-score)	(84) 15.8% (12.7-19.7 95% CI)
	Prevalence of severe stunting (<-3 z-score)	(44) 8.3 % (6.3-10.8 95% CI)
MUAC		
MUAC	Prevalence of global malnutrition (< 125 mm and/or oedema)	(24) 4.1 % (2.4-7.0 95% CI)
	Prevalence of moderate malnutrition (< 125 mm and >= 115 mm, no oedema)	(20) 3.4% (2.0-5.9 95% CI)
	Prevalence of severe malnutrition (< 115 mm and/or oedema)	(4) 0.7 % (0.3-1.9 95% CI)
Mortality, retrospectively	90 days recall period	
Mortality rate	CMR Deaths/10,000 people/day	(n=18) 0.68 (0.35-1.32)
	U5 MR Deaths/10,000 children U5/day	(n=5) 0.68 (0.21-2.22)
Measles, Deworming and vitamin A supplementation	Measles card + mother confirmation (children 9-59 months, n=550)	(n=449) 81.6% (78.4-84.7)
	De-worming (children12-59 months, n=65)	(n=38) 58.5% (46.2-70.8)
	Vitamin A (children 6-59 months, n=561)	(n=354) 63.1% (59.0-67.2)

Morbidity in the last 14 days (two weeks), (n= 490) 67.4% (64.0-70.8)			
Types of illness	Fever	(n= 116) (75.4-88.0)	81.7%
	Diarrhea	(n= 39) (20.4-35.2)	27.5%
	Cough/difficulty of breathing	(n= 52) (28.2-45.1)	36.6%
	Ear Infection	(n=1) (0.0-2.1)	0.7%
	Rash	(n= 4) (0.7-5.6)	2.8%

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List of Acronyms

AMN	Acute Malnutrition
BHA	Bureau of Humanitarian Assistance
CHD	County Health Department
CI	Confidence Interval
CMR	Crude Mortality Rate
EBF	Exclusive Breast Feeding
FCDO	Foreign Commonwealth & Development Office
FCS	Food Consumption Score
FSL	Food Security and Livelihood
GAM	Global Acute Malnutrition
HAZ	Height for Age Z-score
HH	Household
HHS	Household Hunger Scale
IDP	Internally Displaced Person
IPC	Integrated Food Security Phase Classification
ISSS	Introduction of Solid, Semi-solid or soft foods 6-8 months
IYCF	Infant and Young Children Feeding Practice
LBW	Low Birth Weight
LCS	Livelihood Coping Strategy
MAD	Minimum Acceptable Diet
MAM	Moderate Acute Malnutrition
MDD	Minimum Dietary Diversity
MOH	Ministry Of Health
MUAC	Mid Upper Arm Circumference
NIWG	Nutrition Information Working Group
ODK	Open Data Kit
PLW	Pregnant and Lactating Women
PPS	Probability Proportional to Size
RRC	Relief and Rehabilitation Commission
SAM	Severe Acute Malnutrition
SD	Standard Deviation
SMART	Standardized Monitoring and Assessment of Relief and Transitions
TSFP	Targeted Supplementary Feeding Program
U5	Under Five
U5MR	Under 5 Mortality Rate
WASH	Water, Sanitation and Hygiene
WAZ	Weight for Age Z-score
WFP	World Food Program
WHO	World Health Organization
WHZ	Weight-for-Height Z-score

Geographical Classifications

State Highest form of governance below the national level. It is formed from a collection of counties.
County The second highest governance below state. It is a collection of Payams.
Payam The third highest governance below County. It is formed from a collection of Bomas.
Boma A Boma is the second lowest administrative area. It is comprised of villages.
Village It is the lowest administrative division in the country. It is where the actual data collection done.

List of Figures, Tables and Maps

INTRODUCTION

Background

South Sudan, the world's youngest country after having gained independence from Sudan in 2011, has faced internal conflict since 2013, causing widespread displacement, disrupted livelihoods, and chronically high levels of acute food insecurity and malnutrition in many parts of the country. A peace deal was signed in September 2018, which resulted in improved security and increased access to affected populations for humanitarian assistance, and an increase in refugee and internally displaced persons (IDP) returnees to their communities.[1] However, as of July 2021, an estimated 2.26 million refugees from South Sudan remain in neighbouring countries (Uganda, Sudan, Ethiopia, Kenya, Democratic Republic of Congo) and 1.87 million remain internally displaced.[2] The consolidated findings from the Integrated Food Security Phase Classification (IPC) Technical Working Group and External Reviews show that 6.6 million people needed humanitarian food assistance (Phase 3 and above) in October-November 2022, of which 2.2 million were reportedly facing Emergency (IPC Phase 4) levels of acute food insecurity during this period. According to the analysis projection, between April and July 2023, an estimated 7.8 million people in South Sudan are likely to be experiencing high levels of acute food insecurity (IPC Phase 3 or above).[3] In addition, an estimated 1.34 million children under the age of five in South Sudan will likely suffer from acute malnutrition over the course of 2022. This figure includes about 87,000 who were classified in IPC Phase 5 (Catastrophe), the highest number in the previous year, and an estimated 55,000 people who were already classified in Catastrophe (IPC Phase 5) in Fangak, Canal Pigi, and Uror counties in Jonglei State; Pibor County in Greater Pibor Administrative Area; Tambura County in Western Equatoria State; and Leer and Jur River counties in Unity State.[4]

Jur River County is located in Western Bahr El-Ghazal State. The County borders Wau County to the west, Northern Bahr El-Ghazal State to the northwest, Warrap State to the east and Western Equatoria State to the south. The County headquarters is currently located in Wau Bai Payam. As a water source, the Jur River attracts livestock during the dry season. Jur River County has 6 Payams; Wau Bai (County Headquarters), Kangi, Kuarjena, Marial Bai, Rocrocdong, and Udici. The 2022 population projection was 283,228 compared to 273,118 in 2020 and 127,771 in the 2008 census[5]. The main ethnic group living in Jur River County are the Balanda Bor and Luo (Jur Chol). During the most recent IPC Acute Malnutrition (AMN) Analysis (October 2022), Jur River County was classified as Alert (Phase 2) for the current period (November-December). However, analysists projected the county to slide into Serious (Phase 3) levels for the projection period (December-March), partly driven by a likely deterioration of food consumption due to the depletion of available livestock from the population's own production, leaving the population to depend on other sources to sustain food consumption.[6] In line with this, in the Acute Food Insecurity (AFI) analysis, while Jur river was classified in Phase 3 (Crisis) for the current period (December-March) and the projection period (April-July), more people were projected to slide into Phase 4 (Emergency) in the county during the projection period.[7]

Agriculture is the primary economic activity in Jur River County, but the majority agro-pastoral population also practices livestock rearing, especially cattle. In addition, Jur River County is located alongside the Jur River and fishing also serves as a livelihood for some communities.

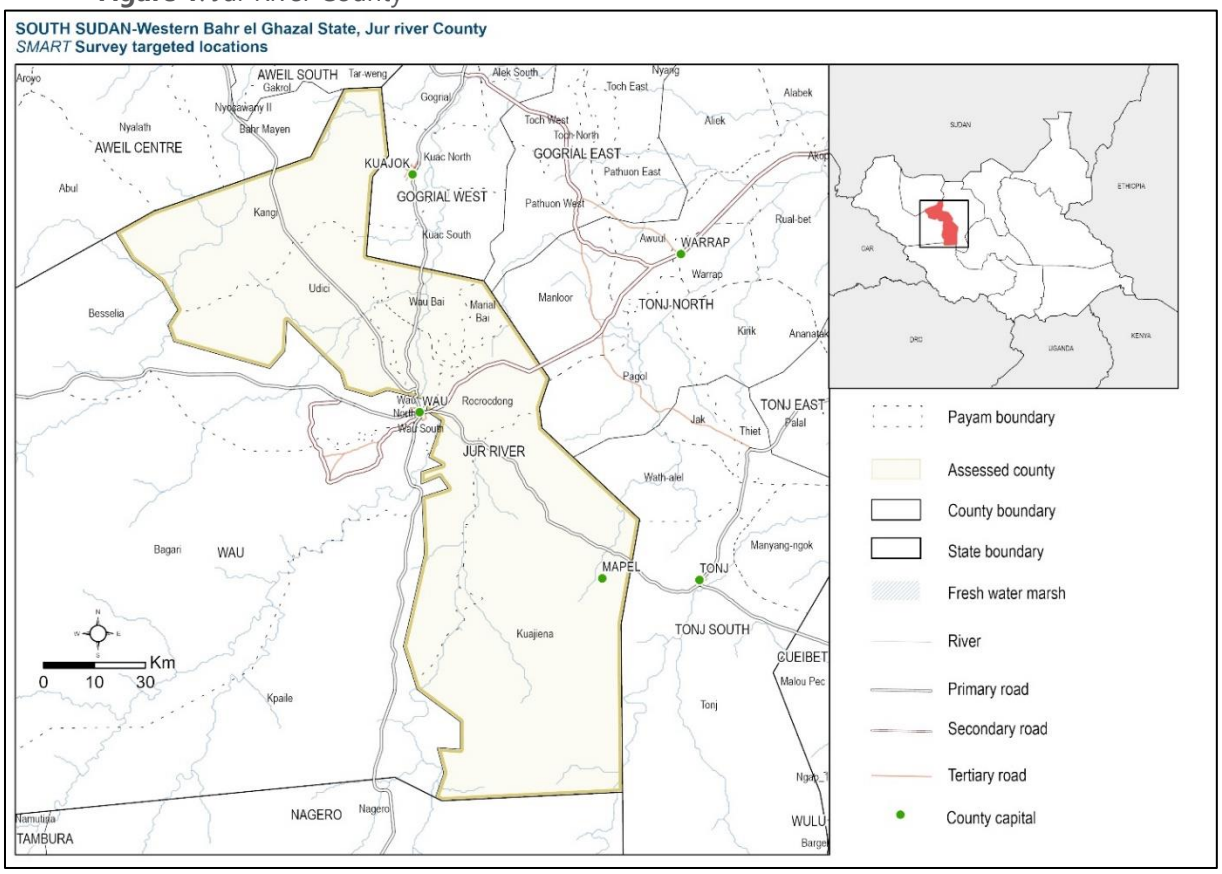
[1] World Bank (October 2022). South Sudan Overview.
[2] UNHCR (2020): South Sudan and Uganda refugee crisis
[3] IPC Info (October 2022): South Sudan acute food insecurity situation
[4] Ibid.
[5] Conflict Sensitivity Resource Facility (CSRF) - South Sudan
[6] IPC Info (October 2022): South Sudan acute food insecurity situation
[7] Ibid.

Johanniter International Assistance, the leading Nutrition partner in the area, provides preventive and curative malnutrition services and implements food security and livelihoods (FSL), water, sanitation, and hygiene (WASH) and protection activities. ACTED also provides FSL, Nutrition, Protection and Social cohesion activities. In addition, Johanniter International Assistance, Cordaid, and CARE all implement WASH and health projects within all six Payams of Jur River County.

REACH Initiative has worked in South Sudan since 2012, conducting needs assessments and providing evidence-based information to inform the humanitarian response. Since 2019, REACH has engaged with the Nutrition Information Working Group (NIWG), participated in IPC Acute Malnutrition (AMN) analysis workshops, and provided technical support to nutrition partners for SMART survey implementation in the country.

The nutrition situation in Jur River County remains an information gap for implementing partners as well as for the IPC AMN analysis. A previous SMART survey, which was conducted in December 2017, shows the prevalence of global acute malnutrition (GAM) in the survey area based on the weight-for-height and/or oedema, which was 10.1 % % (7.2 - 13.9 95% CI), which is classified as "serious" according to the World Health Organization (WHO) classification. To provide updated information on the nutrition situation in the county, ACTED, Johanniter International Assistance, and REACH Initiative implemented a SMART survey from November 11th to December 5th. As part of this assessment, REACH collected anthropometric and mortality data, as well as key multi-sectoral indicators (across the domains of FSL, WASH, and Health) to better understand the malnutrition situation in Jur River County as well as its key drivers.

Figure 1. Jur River County



Survey Objectives

General Objectives

The general objective of this SMART survey was to assess the nutrition situation and retrospective mortality rates amongst the population in Jur River County and to analyse the possible factors contributing to acute malnutrition among the community in Jur River County, Western Bahr-El-Ghazal, South Sudan.

In particular, the following are the specific objectives of the assessment:

Specific Objectives

1. To estimate the prevalence of acute malnutrition, stunting, and underweight among children (boys and girls) aged 6-59 months (about 5 years) in Jur River County.
2. To estimate retrospective Crude Mortality Rate (CMR) and Under 5 Mortality Rate (U5MR) in Jur River County.
3. To estimate the proxy coverage of acutely malnourished children 6-59 months (about 5 years) in any nutrition programme in Jur River County.
4. To estimate the proxy coverage of pregnant and lactating women (PLW) in targeted supplementary feeding programmes (TSFP) and estimate prevalence of acute malnutrition among PLW in Jur River County.
5. To estimate the coverage of various immunizations in Jur River County including:
    - Vitamin A supplementation (for children 6-59 months)
    - Deworming (for children 12-59 months)
    - Measles vaccination coverage (among children 9-59 months).
6. To assess childhood morbidity and health seeking behaviors among children aged 6-59 months (about 5 years) in Jur River County.
7. To assess the WASH situation in Jur River County (main water source, distance/time to water source, water treatment status, access to latrine)
8. To assess FSL situation in Jur River County [Food Consumption Scores (FCS), Household Hunger Scale (HHS), main livelihoods, and Livelihood Coping Strategies (LCS)]
9. To estimate the % of HHs that have received food assistance in the 3 months prior to data collection in Jur River County.
10. To formulate practical interventions and recommendations for both emergency and long-term programmes for stakeholders operating in Jur River County.

METHODOLOGY

The Standardized Monitoring and Assessment of Relief and Transition (SMART) methodology was employed to undertake the nutrition and retrospective mortality survey in Jur River County. The survey was designed using SMART methodology with probability proportional to size (PPS) at the first stage of sampling. The SMART methodology provides a basic integrated method for assessing nutritional status and mortality rate in emergency situations and provide understanding of the magnitude and severity of humanitarian crises.

Anthropometric measurements and Mortality assessments were undertaken simultaneously for this survey. In addition, indicators on child morbidity, FSL, WASH, infant & young child feeding (IYCF) practice were collected from households to provide a snapshot of underlying causes of malnutrition in the area.

Geographical scope

The SMART survey was implemented in Western Bahr El-Ghazal State Jur River County, which covers Wau Bai (County Headquarters), Kangi, Kuarjena, Marial Bai, Rocrocdong, and Udici Payams. In those Payams, 32 randomly selected villages/clusters were assessed for this survey.

Sampling strategy

SURVEY DESIGN

The survey applied a two-stage cluster sampling using the SMART methodology with the clusters being selected using the probability proportional to population size (PPS). Stage one sampling process involved the sampling of the clusters to be included in the survey, while the second stage included the selection of the households from within the sampled clusters

STUDY POPULATION

The target population for this survey were children aged 6-59 months for the anthropometric and child health seeking behaviour components, and the general population for the mortality, FSL and WASH components.

SAMPLE SIZE ESTIMATION

Sample size calculations for the survey were based on the expected prevalence of Global Acute Malnutrition (GAM) and Mortality Rate in the survey areas. The parameters used were extracted from the previous SMART survey conducted in Jur River County in December 2017. Anthropometric and Mortality Sample sizes were calculated using Emergency Nutrition Assessment (ENA) software (January 11th, 2020 version) following SMART methodology.

ANTHROPOMETRIC SAMPLE SIZE

Table 2. Anthropometry sample size calculation

Parameter	Jur River County	Justification
Estimated Prevalence (%)	10.1	The value of 10.1%, (7.2-13.9, 95% CI) was taken from the previous SMART Survey conducted in Jur River in December 2017 by the Johanniter International Assistance. As the most recent IPC AMN classification (Phase 3) and the time of the year are similar, it was assumed the situation has remained comparable.
Desired Precision	3.5	Based on the most recent SMART survey guide

Design Effect	1.32	From the December 2017 Jur River SMART Survey Johanniter International Assistance.
Children to be Included	409	
Average Household Size	7.2	From the December 2017 Jur River SMART Survey Johanniter International Assistance
% Children Under-Five	20.5%	From the December 2017 Jur River SMART Survey Johanniter International Assistance
% Non-Respondents	3%	From the December 2017 Jur River SMART Survey Johanniter International Assistance.
Households to be Included	**318**	

Table 3. Mortality sample size calculation

Parameter	Jur River County	Justification
Estimated death rate per 10,000/day	0.55	The estimated death rate (0.55 (0.28-1.07 95% CI)) was taken from the previous SMART Survey conducted in Jur River in December 2017 by the Johanniter International Assistance. The situation is assumed to have remained comparable.
Desired Precision	0.35	As per the SMART guidance
Design Effect	1.41	From the December 2017 Jur River SMART Survey Johanniter International Assistance.
Recall Period	116 days	This is taken as per the SMART guidance as a recall period of 3 months (116 days)
Population to be Included	**2847**	
Average Household Size	7.2	From the December 2017 Jur River SMART Survey Johanniter International Assistance.
% Non-Respondents	3%	From the December 2017 Jur River SMART Survey Johanniter International Assistance.
Households to be Included	**408**	

As per the SMART guideline, the maximum sample size yield either from Anthropometry or Mortality calculations is to be considered. Accordingly, the maximum sample size is returned by the anthropometric sample size calculation, and this has been considered the final sample size; **408** households, which meant that **32** clusters were included in the survey.

SELECTION OF CLUSTERS

A two-stage cluster sampling design was used to sample the survey clusters and households. In the first stage, clusters were assigned using probability proportional to size (PPS). The sampling frame for the first stage of the sampling process was the list of villages with the population estimates in each of the surveyed areas. The list of villages was then entered into ENA for SMART software (version Jan 2020) and clusters were assigned through PPS.

SELECTION OF HOUSEHOLDS AND CHILDREN

Definition of household for the survey: A household is defined as a group of people living together, that cook and eat from the same cooking pot. Polygamous families were defined based on the same parameters; if each wife has her own pot, even if living in the same compound, these were treated as different households.

Household selection techniques: Upon arrival in the selected clusters, the team leader met with the village elders. The team introduced themselves and explained the survey objectives and their expectations from the elder. Then, the team shared the above standard definition of the household to develop the

household list within the cluster together with the village elder. Thirteen (13) households were then randomly selected from the complete list of households using the random number generator in smart phones. The listed households were visited by the survey team. The village guide and community leaders supported the teams in updating the list of households.

For clusters with more than 150 households, segmentation was used to select one portion of the cluster that represents the cluster. Selection of segments was done using either PPS or simple random sampling, dependent on the population sizes of the specific segments. In the selected segment, the process of household selection followed the same process done in each cluster for selection of the 13 households.

In selected households, all eligible children (aged 6-59 months) were measured, and the household questionnaire was administered. For households without eligible children, only household-level information was collected. When a selected household was not present, and/or when eligible children were absent at the time of the visit, households were re-visited, and information of the outcome recorded on the cluster control form. This form was also used to record information on empty and non-responding households.

Data collection methods

SURVEY TEAMS, TRAINING, DATA COLLECTION AND MANAGEMENT

- Survey Teams: Six teams with four members (1 team leader, 1 measurer, 1 assistant, 1 person to handle the tablet) in each team were involved in the execution of the survey. At each cluster, a local guide was employed to facilitate data collection at the household level. The survey teams were recruited by REACH with the involvement of the local officials at Jur River County level. As much as possible, the team members were a mix of both men and women, ideally recruited from the local communities. Supervisors consisted of a mix of Johanniter International, the County Health Department (CHD) and REACH staff.
- Training: The survey teams were trained for five days from 18th November 2022. The training covered various components, including taking anthropometric measurements, sampling of households, data collection tools, digital data collection, data quality checks, and standardization exercises, among other themes. The training of the enumerators was facilitated by SMART certified staff and staff with experience conducting SMART surveys.
- Supervision: The overall management of the survey was done by REACH, with support from the Relieve and Rehabilitation Commission (RRC), CHD and Johanniter International. Maximum supervision of the survey teams was ensured to facilitate quality data.
- Data Entry and Management: Data was collected and entered the ODK platform installed on REACH tablets. The data collection tools were programmed and uploaded to the tablets which were then by the survey teams. The teams uploaded the collected data to a central server daily to allow the Survey Manager to review and clean the data collected on a daily basis, allowing the Survey Manager to give the feedback to the teams each morning.

DATA QUALITY

In order to ensure optimal and high data quality, several measures were put in place, including:

a) The survey was done in accordance with the submitted protocol, and the following steps were ensured:
    - Ensure that training of survey teams is done using standardized material as recommended by SMART Methodology
    - Undertake standardization test as part of the training; taking appropriate steps thereafter based on performance of the survey teams
    - Appropriate calibration of survey equipment, during the training and on every morning before proceeding to the field for data collection
    - Plausibility checks were conducted on daily basis and inform the daily debriefing sessions which has been conducted every day

b) Data was collected through digital platform, and control checks and skip patterns were programmed to improve the data quality

Analysis

- Anthropometry data was auto analyzed using ENA software anthropometry section. The same software was also used to analyze mortality data.
- Other IYCF data was analyzed using software such as R and/or SPSS. The findings are presented through appropriate visuals throughout the report.

Classifying malnutrition

WEIGHT-FOR-HEIGHT

Weight-for-height z-scores (WHZ) were calculated to indicate the prevalence of acute malnutrition or wasting. Wasting can be assessed by comparing a child's weight with the height that would be expected from a healthy child of the same Age and sex.

Table 4. Wasting as defined by WHO

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

MID-UPPER ARM CIRCUMFERENCE (MUAC)

MUAC is a simple and important tool as it is the best predictor of those cases most at risk of dying once the MUAC falls below 115 mm; however, it is not a sensitive early predictor of malnutrition.[8.] Any child aged between 6-59 months whose arm circumference is less than 125 mm may be acutely malnourished and less than 115 mm severely malnourished.

HEIGHT-FOR-AGE

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

Table 5. Stunting as defined by WHO

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

[8] WHO (2009): child growth standards and the identification of severe acute malnutrition in infants and children.

WEIGHT-FOR-AGE

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

POPULATION CUT-OFFS FOR MALNUTRITION

The table below defines the population cut-offs for determining the severity of the malnutrition when the prevalence of acute and chronic malnutrition is known. These levels are internationally agreed upon and provide an objective basis for developing responses to increased levels of acute and chronic malnutrition.[9] To interpret proportions at a population level with meaning, absolute numbers are also necessary.

Table 6: Classification for Severity of Malnutrition by Prevalence among Children 6-59 moths[10]

LEVELS	PREVALENCE OF THRESHOLDS %		
	WASTING	OVERWEIGHT	STUNTING
Very low	<2.5	<2.5	<2.5
Low	2.5- <5	2.5- <5	2.5- <10
Medium	5- <10	5- <10	10- <20
High	10- <15	10- <15	20- <30
Very high	>=15	>=15	>=30

[9] Physical status: the use of and interpretation of anthropometry, report of a WHO expert committee, 1995. Chapter 5, p208 & 212

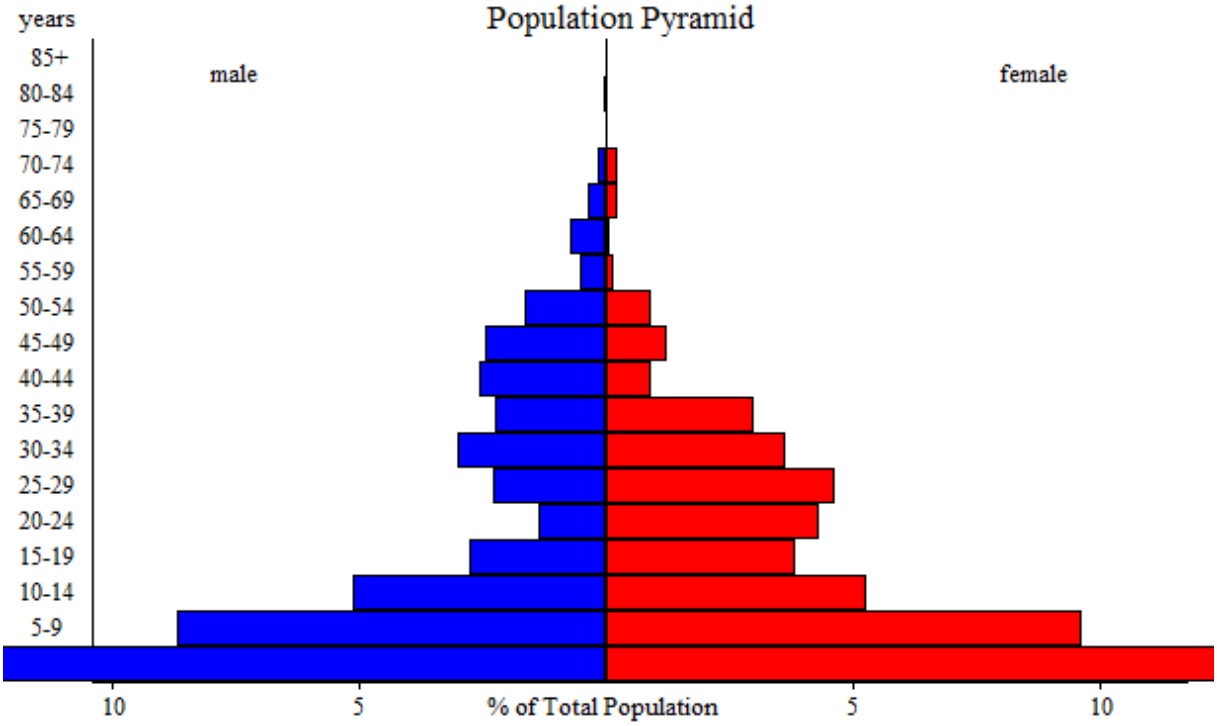
[10] UNHCR: Acute malnutrition threshold for emergencies

FINDINGS

Demographic characteristics of sampled households

A total of **413 households** and **2270 individuals** were included in the survey. The average household size was 5.5 individuals per household. Of the 96% households, 29.2% of the children aged 6-59 months accounted and the total number of children included in the survey was 581. Most households were female-headed (53.77%).

Figure 2. General population pyramid



Anthropometric results (based on WHO standards 2006):

From 32 villages in Jur River County, a total of 581 children aged 6-59 months (254 boys and 327 girls) were measured to assess acute malnutrition status. In this survey, all 32 clusters were surveyed with 413 households and 566 children measured for anthropometry.

With respect to outliers, the data has been checked with +/-3 from the observed mean and those identified as outliers were flagged by SMART software as not being plausible either for height, weight, or age. The SMART flags were excluded from the analysis but not from the data. **In total, 15 data points were flagged for the weight-for-height z-score, hence, 566 children were analysed. Additionally, 570 children were analysed for weight-for-age, and 530 for heigh-for-age.**

Table 7. Distribution of age and sex of sample

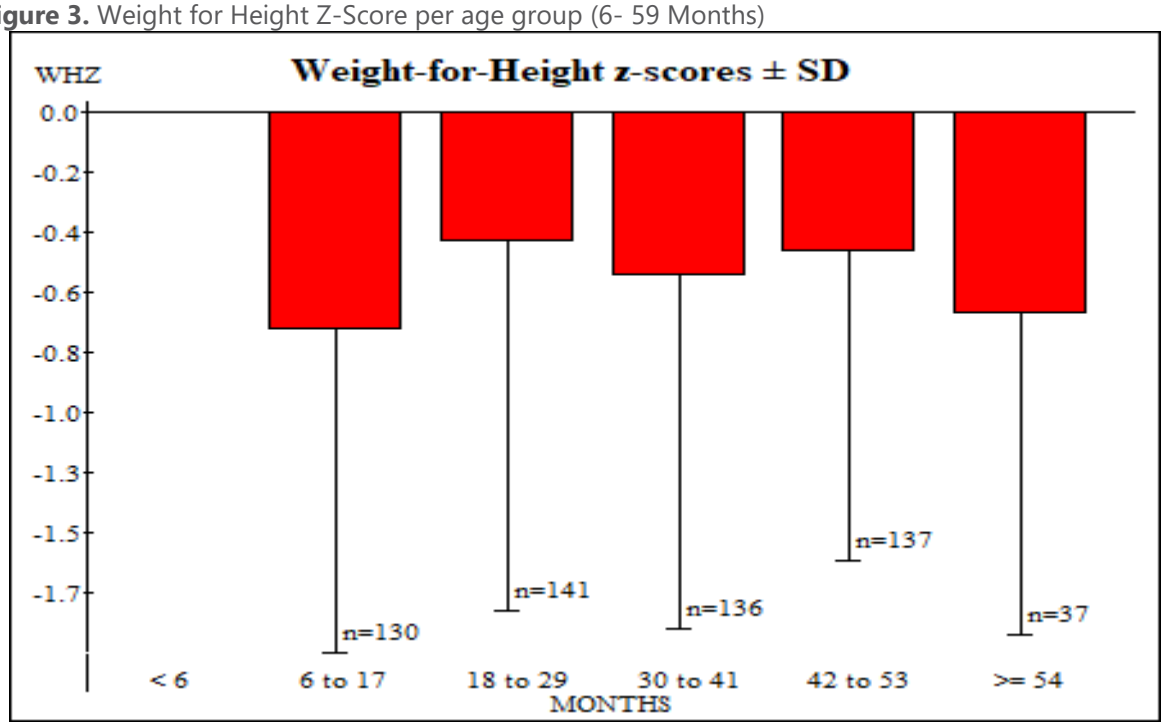
	Boys		Girls		Total		Ratio
AGE (months)	**no.**	**%**	**no.**	**%**	**no.**	**%**	**Boy:girl**
6-17	65	50.0	65	50.0	130	22.4	1.0
18-29	47	33.3	94	66.7	141	24.3	0.5
30-41	60	44.1	76	55.9	136	23.4	0.8
42-53	65	47.4	72	52.6	137	23.6	0.9
54-59	17	45.9	20	54.1	37	6.4	0.9

Total	254	43.7	327	56.3	581	100.0	0.8

The age ratio of 6-29 months to 30-59 months was around 0.87, with a p-value of 0.736 (as expected). The overall age distribution for boys has a p-value of 0.081 (as expected), while overall age distribution for girls has a p-value of 0.007 (significant difference). Digit preference of all weight, height and MUAC was rated as "excellent". In general, the overall score of the survey was 9%, putting the survey at an excellent quality that is reliable for further analysis to support programmatic decision-making.

A total of 581 children aged 6-59 months (254 boys and 327 girls) were measured to assess acute malnutrition from 413 households. In the original survey protocol, it was planned to measure 409 children for this study. This could be associated with the relatively higher percentage of children under-five compared to what was expected (29.2% vs. 20.5%), and because, as per cluster calculation, clusters were rounded up; there were 32 clusters, which then gives about 416 households (13 households per cluster).

Figure 3. Weight for Height Z-Score per age group (6- 59 Months)



Prevalence of Acute malnutrition:

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

Global acute malnutrition is defined as <-2 z scores WFH and/or oedema, severe acute malnutrition is defined as <-3 z scores WFH and/or oedema). It is also used in the classification of global, moderate, and severe acute malnutrition (GAM, MAM and SAM). Exclusion of z-scores from observed mean SMART flags: WHZ -3 to 3; HAZ -3 to 3; WAZ -3 to 3

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

	All n = 566	**Boys** n = 251	**Girls** n = 315
Prevalence of global malnutrition (<-2 z-score and/or oedema)	(53) 9.4 % (7.1 - 12.2 95% CI)	(27) 10.8 % (7.4 - 15.3 95% CI)	(26) 8.3 % (5.6 - 12.0 95% CI)
Prevalence of moderate malnutrition (<-2 z-score and >=-3 z-score, no oedema)	(44) 7.8 % (5.9 - 10.2 95% CI)	(22) 8.8 % (6.1 - 12.5 95% CI)	(22) 7.0 % (4.7 - 10.3 95% CI)
Prevalence of severe malnutrition (<-3 z-score and/or oedema)	(9) 1.6 % (0.8 - 3.2 95% CI)	(5) 2.0 % (0.7 - 5.7 95% CI)	(4) 1.3 % (0.5 - 3.3 95% CI)

The prevalence of oedema is 0.0 %

The prevalence of GAM defined as WHZ (WHZ<-2 and/or oedema) among children 6-59 months was estimated at 9.4% (7.1 – 12.2 95% CI) (see table 8) and was categorized as "Alert" level as per IPC AMN classification.[11] As per the IPC guidelines, a GAM rate falling in the Alert phase require a strengthening of response capacity and resilience, as well as monitoring, to prevent a deterioration of the situation.[12] The prevalence of SAM per WHZ among children 6-59 months is 1.6% (0.8 – 3.2 95% CI). No nutritional bilateral oedema case was observed during the assessment.

In the December 2017 SMART Survey conducted in Jur River County by Johanniter International, GAM was estimated at 10.1% (7.2-13.9 95% CI). The current survey carried out the same (harvest) season (Nov-Dec 2022) found a GAM rate of 9.4% (7.1-12.2 95% CI). When comparing the current survey result with that of December 2017, the confidence intervals of the two surveys overlap with each other, indicating that the change is not significant. However, statistical tests are necessary to prove whether the difference really is statistically significant or not. Change is not statistically significant (p-value (0.7447) when analysed using CDC statistical calculator. Therefore, we can say that the nutritional status of the under-five population in Jur River County has shown a decreasing trend as compared with December 2017, but the change is not statistically significant.

When disaggregated by age group, the highest GAM rate prevalence was found in the younger age group of children 6-29 months of age, with almost twice the prevalence of their elder counterparts (30-59 months), as presented in Figure 3 and table 9 below. According to this disaggregation, the prevalence of GAM among children 6-29 months is higher than found among older groups (30-59 months), which could be due to young children generally being particularly susceptible to malnutrition if complementary foods are of low nutrient density and have low bioavailability of micronutrients, as per the 2013 WHO guideline.[13]

[11] IPC Technical Manual Version 3.1
[12] IPC Technical Manual 3.1
[13] WHO (2013): Guideline, Updates on the management of severe acute malnutrition in infants and children

Figure 4. Prevalence of GAM disaggregated by age group

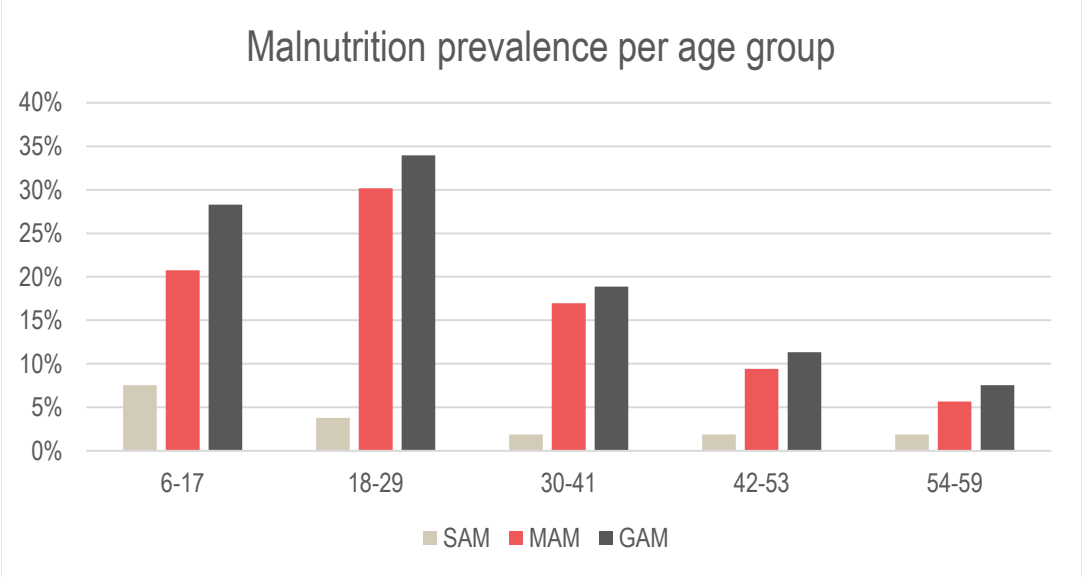
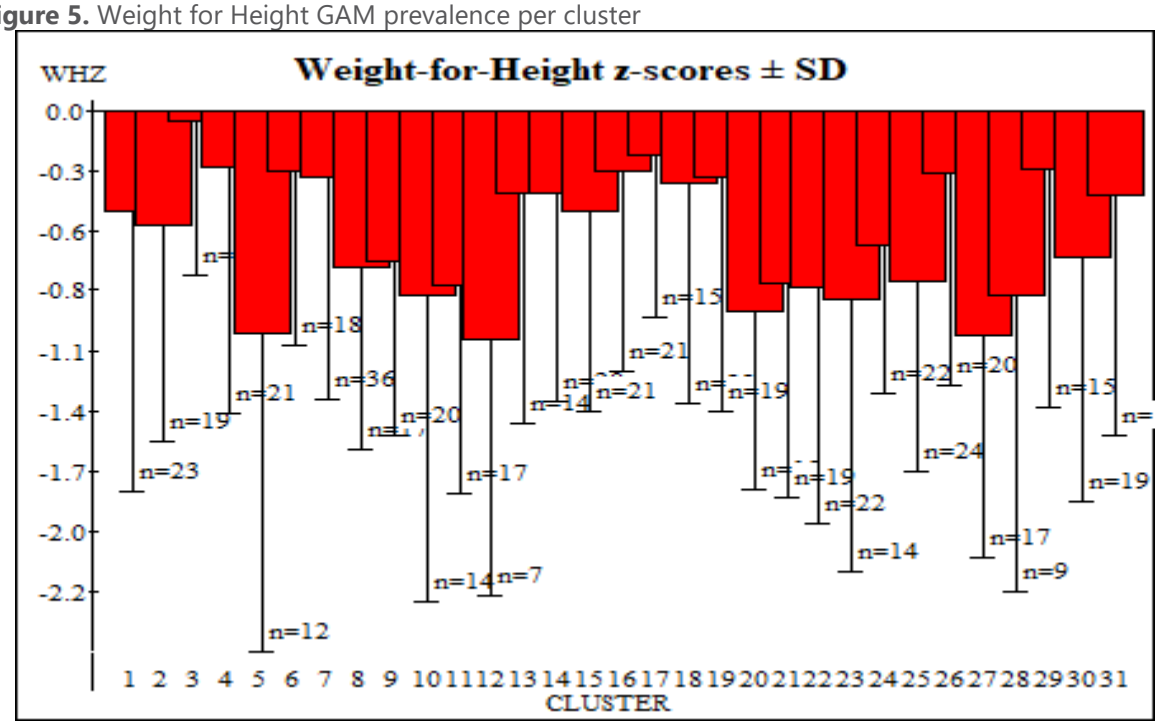


Table 9. Prevalence of acute malnutrition by age, based on weight-for-height z-scores and/or oedema

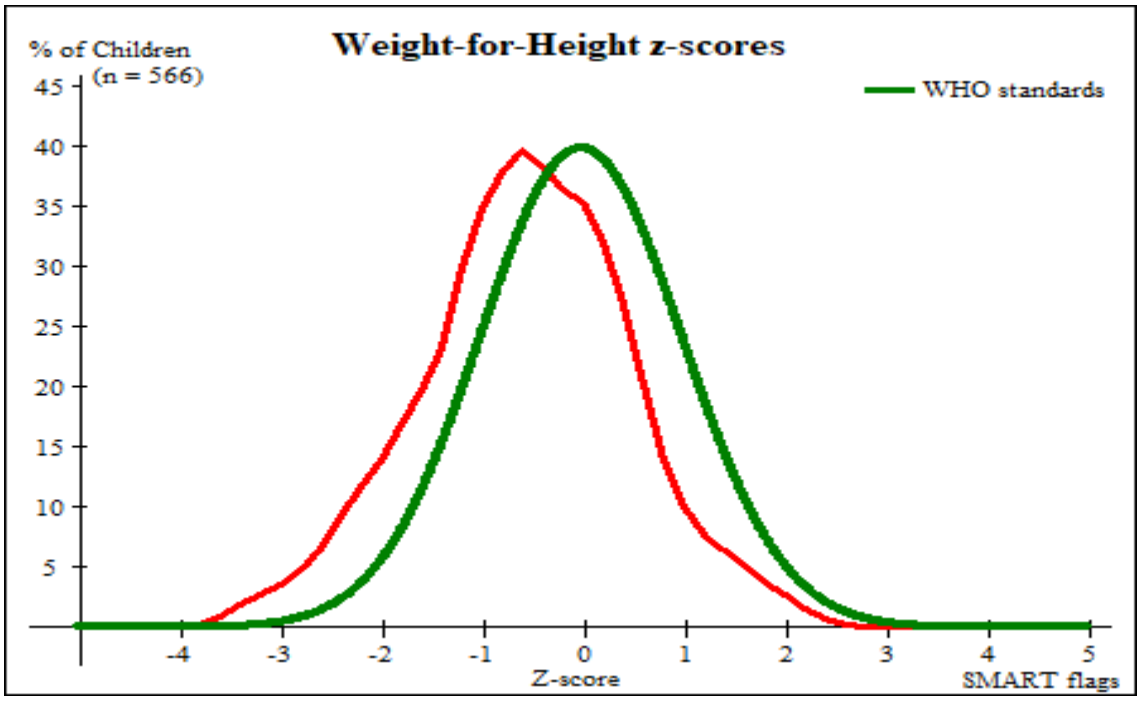
Age (mo)	Total no.	Severe wasting (<-3 z-score)		Moderate wasting (>= -3 and <-2 z-score)		Normal (> = -2 z score)		Oedema	
		No.	%	No.	%	No.	%	No.	%
6-17	128	4	3.1	11	8.6	113	88.3	0	0.0
18-29	136	2	1.5	16	11.8	118	86.8	0	0.0
30-41	131	1	0.8	9	6.9	121	92.4	0	0.0
42-53	135	1	0.7	5	3.7	129	95.6	0	0.0
54-59	36	1	2.8	3	8.3	32	88.9	0	0.0
Total	566	9	1.6	44	7.8	513	90.6	0	0.0

Figure 5. Weight for Height GAM prevalence per cluster



According to this survey's findings and plausibility check report, the distribution across clusters does not have a significant difference. There was no pocket of malnutrition among the surveyed clusters.

Figure 6. Distribution of WFH (in z-scores) according to WHO standards



The mean WHZ was -1.03 indicates that the nutritional status of U5 population is poor as compared with WHO 2006 standard as the curve shifted to the left side from the normal curve. The standard deviation (SD) of the z-scores is 1.03, which is between the acceptable range of 0.8-1-2 indicating that the quality of the data is acceptable. The value for skewness and kurtosis rated as -0.10 and 0.05 and both the skewness and kurtosis lie within the excellent range of ±0.2 that the distribution can be considered as normal.

Table 10. Distribution of acute malnutrition and oedema based on weight-for-height z-scores

	<-3 z-score	**>=-3 z-score**
Oedema present	Marasmic kwashiorkor. 0 (0.0 %)	Kwashiorkor. 0 (0.0 %)
Oedema absent	Marasmic No. 17 (2.9 %)	Not severely malnourished. 564 (97.1 %)

Table 11. Prevalence of acute malnutrition based on MUAC cut offs (and/or oedema) and by sex

	All n = 581	**Boys** n = 254	**Girls** n = 327
Prevalence of global malnutrition (< 125 mm and/or oedema)	(24) 4.1 % (2.4 - 7.0 95% CI)	(7) 2.8 % (1.2 - 6.2 95% CI)	(17) 5.2 % (3.0 - 8.9 95% CI)
Prevalence of moderate malnutrition	(20) 3.4 % (2.0 - 5.9 95% CI)	(7) 2.8 % (1.2 - 6.2 95% CI)	(13) 4.0 % (2.2 - 7.0 95% CI)

(< 125 mm and >= 115 mm, no oedema)			
Prevalence of severe malnutrition (< 115 mm and/or oedema)	(4) 0.7 % (0.3 - 1.9 95% CI)	(0) 0.0 % (0.0 - 0.0 95% CI)	(4) 1.2 % (0.4 - 3.3 95% CI)

MUAC is a measurement of mid-upper arm circumference of a child, which is considered as a good indicator of acute malnutrition and mortality. Prevalence of GAM based on MUAC (<125mm) and/or oedema among children 6-59 months was found to be 4.1% (2.4-7.0 95% C.I) and severe acute malnutrition MUAC (<115mm) and/or oedema was 0.7 (0.3-1.9 95% CI) (see Table 12).

Table 12. Prevalence of acute malnutrition by age, based on MUAC cut offs and/or oedema

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	130	3	2.3	10	7.7	117	90.0	0	0.0
18-29	141	1	0.7	7	5.0	133	94.3	0	0.0
30-41	136	0	0.0	2	1.5	134	98.5	0	0.0
42-53	137	0	0.0	1	0.7	136	99.3	0	0.0
54-59	37	0	0.0	0	0.0	37	100.0	0	0.0
Total	**581**	**4**	**0.7**	**20**	**3.4**	**557**	**95.9**	**0**	**0.0**

Table 13. Prevalence of combined GAM and SAM based on WHZ and MUAC cut offs (and/or oedema) and by sex

	All n = 581	Boys n = 254	Girls n = 327
Prevalence of combined GAM (WHZ <-2 and/or MUAC < 125 mm and/or oedema)	(66) 11.4 % (8.5 - 15.0 95% CI)	(31) 12.2 % (8.4 - 17.4 95% CI)	(35) 10.7 % (7.4 - 15.2 95% CI)
Prevalence of combined SAM (WHZ < -3 and/or MUAC < 115 mm and/or oedema	(12) 2.1 % (1.1 - 3.9 95% CI)	(5) 2.0 % (0.7 - 5.6 95% CI)	(7) 2.1 % (1.1 - 4.3 95% CI)

* For SMART and WHO flags, a missing MUAC/WHZ or WHZ value that is flagged "not plausible" is substitute by the other value (MUAC or WHZ) if the other value is available.

Table 14. Detailed numbers for combined GAM and SAM

	GAM		**SAM**	
	no.	**%**	**no.**	**%**
MUAC	13	2.2	3	0.5
WHZ	42	7.2	8	1.4
Both	11	1.9	1	0.2
Oedema	0	0.0	0	0.0
Total	**66**	**11.4**	**12**	**2.1**

Total Population: 581

Underweight (WAZ):

Table 15. Prevalence of underweight based on weight-for-age z-scores by sex

	All n = 570	**Boys** n = 251	**Girls** n = 319
Prevalence of underweight (<-2 z-score)	(98) 17.2% (13.9 - 21.1 95% CI)	(45) 17.9% (13.4 - 23.6 95% CI)	(53) 16.6% (12.6 - 21.6 95% CI)
Prevalence of moderate underweight (<-2 z-score and >=-3 z-score)	(74) 13.0% (10.2 - 16.3 95% CI)	(34) 13.5% (9.7 - 18.5 95% CI)	(40) 12.5% (8.9 - 17.4 95% CI)
Prevalence of severe underweight (<-3 z-score)	(24) 4.2% (2.8 - 6.2 95% CI)	(11) 4.4% (2.5 - 7.6 95% CI)	(13) 4.1% (2.4 - 6.9 95% CI)

Table 16. Prevalence of underweight by age, based on weight-for-age z-scores

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	128	4	3.1	18	14.1	106	82.8	0	0.0
18-29	138	12	8.7	19	13.8	107	77.5	0	0.0
30-41	131	6	4.6	21	16.0	104	79.4	0	0.0
42-53	136	2	1.5	10	7.4	124	91.2	0	0.0
54-59	37	0	0.0	6	16.2	31	83.8	0	0.0
Total	570	24	4.2	74	13.0	472	82.8	0	0.0

Prevalence of chronic malnutrition/stunting (HAZ)

Table 17. Prevalence of stunting based on height-for-age z-scores and by sex

	All n = 530	**Boys n =**	**Girls n =**
Prevalence of stunting (<-2 z-score)	(128) 13.6 % (SD =1)	Calculated at SD of 1	Calculated at SD of 1
Prevalence of moderate stunting (<-2 z-score and >=-3 z-score)	Calculated at SD of 1	Calculated at SD of 1	Calculated at SD of 1
Prevalence of severe stunting (<-3 z-score)	Calculated at SD of 1	Calculated at SD of 1	Calculated at SD of 1

The stunting indicator measures the number of children whose linear growth has been impaired by chronic malnutrition over a prolonged period of time (during pregnancy and/or their first years of life). It assesses to what degree (Z-score) a child's height for age deviates from the height of a child of the same age and sex as specified in the 2006 WHO Growth Standards. However, as the stunting SD is 1.42 and the SMART guideline recommends to adjust the finding if SD > 1.2, hence, the final reported stunting rate is 13.6% which is normal as per WHO threshold of 20%.[14]

[14] WHO (2019): child growth standards and the identification of severe acute malnutrition in infants and children

Table 18. Prevalence of stunting by age based on height-for-age z-scores

		Severe stunting (<-3 z-score)		Moderate stunting (>= -3 and <-2 z-score)		Normal (> = -2 z score)	
Age (mo)	**Total**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	126	8	6.3	17	13.5	101	80.2
18-29	123	13	10.6	26	21.1	84	68.3
30-41	116	12	10.3	17	14.7	87	75.0
42-53	128	8	6.3	18	14.1	102	79.7
54-59	37	3	8.1	6	16.2	28	75.7
Total	530	44	8.3	84	15.8	402	75.8

Table 19. Mean z-scores, Design Effects and excluded subjects

Indicator	n	Mean z-scores ± SD	Design Effect (z-score < -2)	z-scores not available*	z-scores out of range
Weight-for-Height	566	-0.57±1.03	1.01	0	15
Weight-for-Age	570	-0.87±1.16	1.24	0	11
Height-for-Age	530	-0.90±1.1.00	1.07	0	51

* Contains for WHZ and WAZ the children with oedema.

Women's Nutritional Status by MUAC

A total of 114 pregnant and lactating women (PLW) were measured using MUAC to identify PLW nutritional status. PLW's nutritional status is important, because malnourished PLW cannot provide the required nutritional intake for infants, especially for those under 6 months. From the total PLW, about 72% were lactating while the remaining 28% were pregnant women. Accordingly, it seems PLW nutritional status for both pregnant and lactating women was good as only 7.9% (n=9, 95%CI 3.5-14.0) fell below the 230 mm MUAC measurement. Overall, only 0.9% (n=1, 95 CI, 0.0-2.6) of pregnant women fell below this measure, while the remaining 7% (n=8, 95 CI, 2.6-11.4) were lactating women.

Mortality

Table 20. Mortality Demographic Information, (413 households interviewed, recall period of 116 days)

HOUSEHOLD INFORMATION			
Total population		**Children 0-59 months**	
Total number of household members assessed	2270	Number 0-5 years	633
Total number individuals who joined the household in the recall period	13	Number 0-5 years joined HH during recall period	12
Total number of individuals who left the household in recall the period	64	Number 0-5 years left HH during recall period	4
Total number of births during recall period			37
Total number of deaths during the recall period	18	Number 0-5 years deaths during recall period	5

Crude mortality rate (CMR) (deaths/10,*000*/day)	0.68 (0.35-1.32)	Under-5 mortality rate (U5MR) (deaths/10,000/day)	0.68 (0.21-2.22)
Design effect	1.91	Design effect	1.72

For a broad understanding on the health situation of children under the age of 5 (U5) and older groups, a proxy indicator of mortality is taken for this survey. The mortality survey was conducted alongside the nutrition survey, in which a SMART methodology with two stage cluster sampling methodology was used. Unlike the nutrition assessment, in the mortality study, all households with or without U5 children during the survey period were included in the study.

As it is required to have a specific timeframe to study the retrospective mortality assessment, a recall period of 116 days was used, by taking Martyr Day, which was 30th July 2022, to the date of data collection start day of 24th November 2022. This specific benchmark was taken since most of the residents are assumed to recall this special Remembrance Day and can easily remember it.

The information on mortality was collected from 13 randomly selected households across 32 clusters/villages. A total of 413 households and 2270 individuals were included in the 116 days retrospective mortality rates estimation (see table 22). The crude mortality (CMR) rate was estimated at 0.68 deaths/10,000 people/day and similarly U5 mortality rate (U5MR) was estimated at 0.68 deaths/10,000 children/day. Hence, the CRM lies below the emergency threshold of the WHO guideline (<1), implying that there was no emergency situation in Jur County during the recall period.

Table 21. % of total reported deaths (n=18) per broad causes and location of deaths

Causes of death	**%**	**Location of death**	**%**
Unknown (n=2)	11.1%	In current location (n=17)	94.4%
Injury/traumatic (n=2)	11.1%	During migration (n=1)	5.6%
Illness (n=14)	77.8%	In place last residence	0.0%
		Other (not in either of those)	0.0%

Child Morbidity

In order to assess the prevalence of main disease in children 6-59 months, a retrospective morbidity data was collected in those children with a two-week recall period. Accordingly, the survey result showed that about a quarter, 24.3% (21.1-27.7 95% CI) of children, had suffered at least one episode of illness in the 2 weeks prior to data collection. Fever, cough, and diarrhea were the most reported illnesses, accounting for 78%, 35.3%, and 28% of surveyed children (6-59 months) respectively. The most severe threat posed by diarrhoea is dehydration. During an episode of diarrhoea, water and electrolytes including sodium, chloride, potassium, and bicarbonate are lost through liquid stools, vomit, sweat, urine and breathing. A person with diarrhoea becomes dehydrated when these losses are not replaced. In addition, diarrhoea is a major cause of malnutrition, making the person more susceptible to future bouts of diarrhoea and to other diseases.[15]

Table 22. Prevalence of reported illness in children in the two weeks prior to interview (n= 584)

	6-59 months
Prevalence of reported illness	24.3% (21.1 – 27.7 95% CI)

[15] WHO (2023): health topics, Diarrhoea

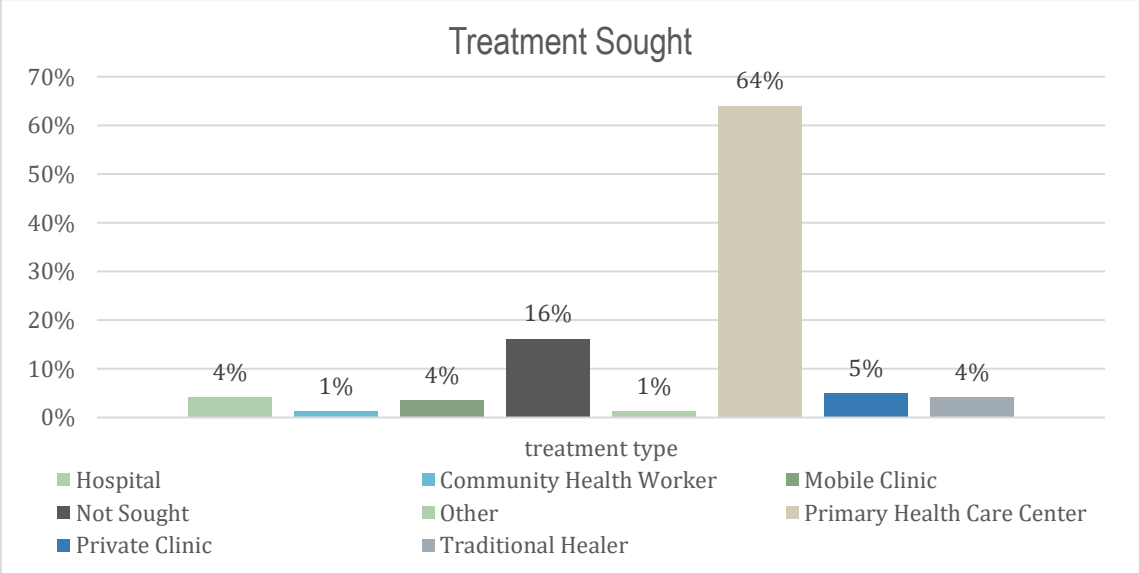
Table 23. Symptom breakdown reported for surveyed children in the two weeks prior to interview (n= 142)

	6-59 months
Diarrhoea	27.5% (20.4 - 35.2, 95% CI)
Cough	36.6% (28.2 - 45.1,95% CI)
Fever	81.7% (75.4 - 88.0, 95% CI)
Pneumonia	0.7% (0.0 - 2.1, 95% CI)
Skin infection	2.1% (0.0 - 4.9, 95% CI)
Ear infection	0.7% (0.0 - 2.1, 95% CI)
Rash	2.8% (0.7 – 5.6, 95% CI)
Other illness	8.5% (4.2 – 13.4, 95% CI)

Children 6-59 months who had been sick in the two weeks prior to data collection are more likely to be malnourished than their counterparts who had not been ill. Generally, ill children are more at risk of malnutrition than the healthy children.

The majority (78.2%) of children (6-59 months) who had reportedly been ill in the 2 weeks prior to data collection (n=111) had reportedly been brought to a health facility for treatment, with the reported types of facilities differing depending on the distance and accessibility. An almost similar amount received their treatment either in public/private clinic, mobile clinics, or hospitals. Amongst the children who had reportedly been ill, 16.2% had not sought for treatment at all, while very few (5.6%) sought treatment from traditional healers or other places as can be seen in the figure below.

Figure 7. Treatment sought; % of children (6-59 months) that had reportedly been ill in the 2 weeks prior to data collection (n=142), per type of facility where care was sought for these children.

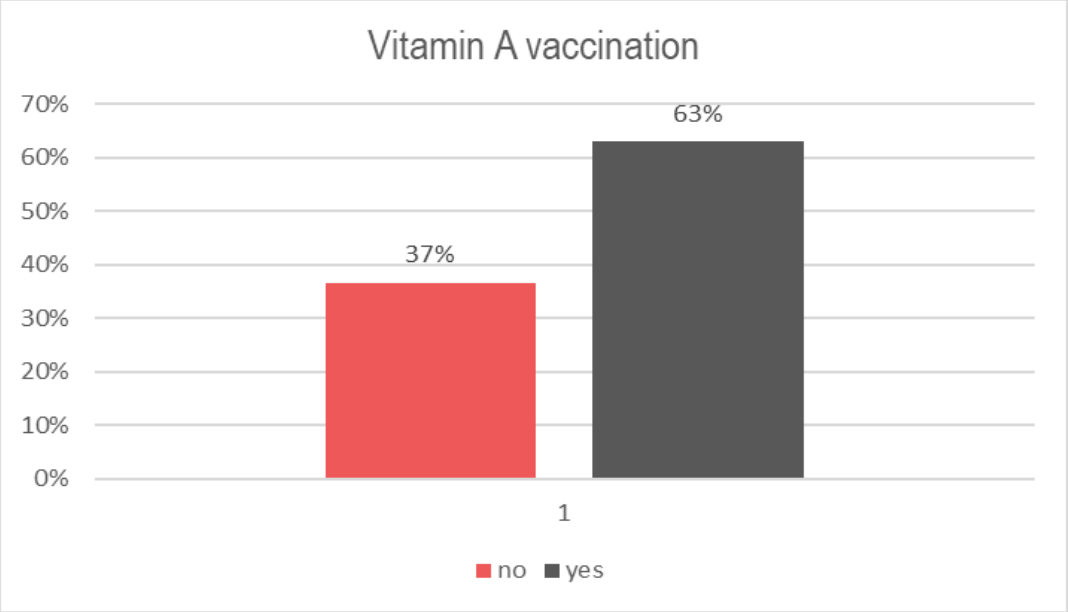


Vaccination Results

Table 24. Vaccination coverage: % of children having received vitamin A (6-59 months), deworming (12-59 months), and measles vaccinations (9-59 months)

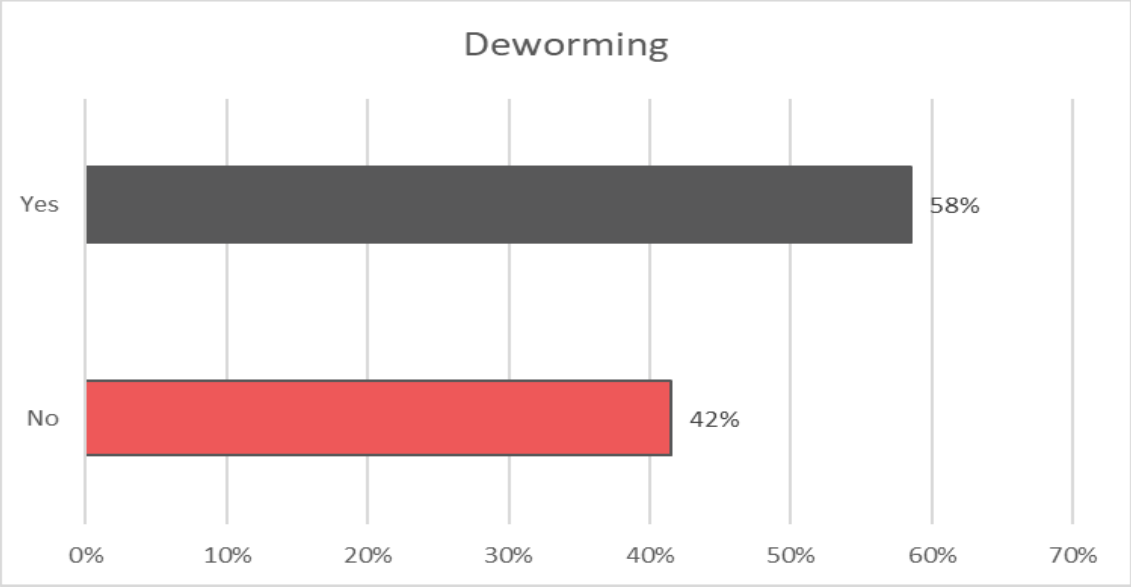
	Vitamin A Supplementation n=561	Deworming n=65	Measles (with card) n=550	Measles (card + recall) n=550
YES	(No. 354) 63.1% (59.0 – 67.2 95% CI)	(No. 38) 58.5% (46.2 – 70.8 95% CI)	(No. 110) 20% (16.5 – 23.1 95% CI)	(No. 449) 81.6% (78.4 – 84.7 95% CI)

Figure 8. Vitamin A coverage: % of children (6-59 months) reportedly having received Vitamin A vaccination in the 6 months prior to data collection



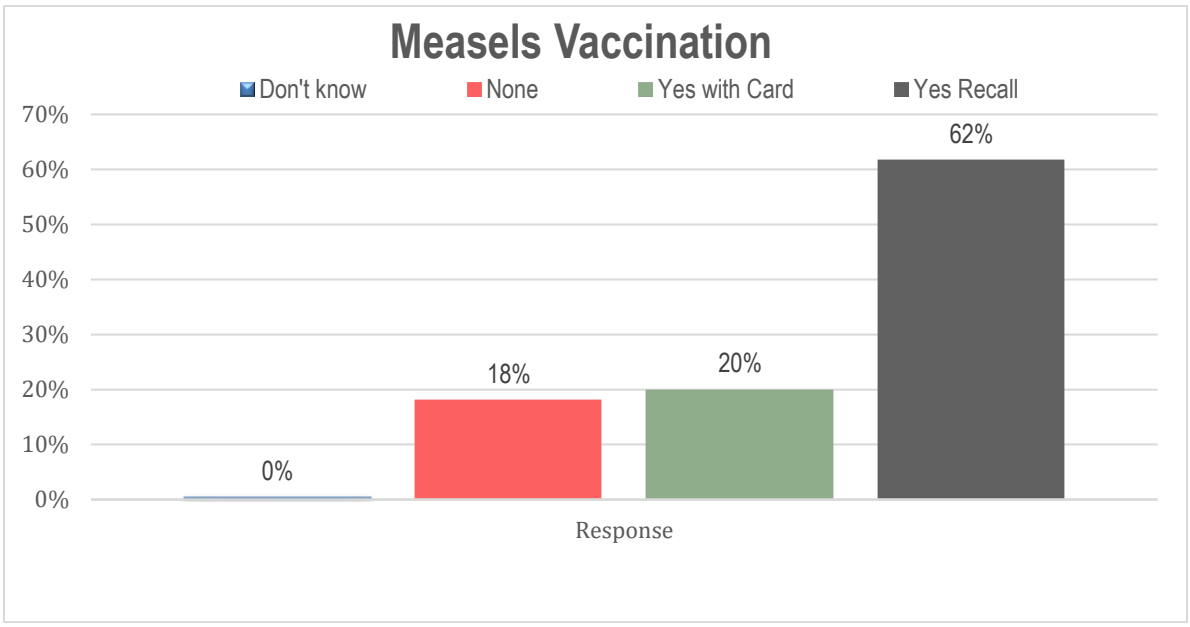
During the assessment, the survey team showed a picture of vitamin A capsules and deworming tablets for mothers and caregivers to recall if their children had received them in the past 6 months prior to data collection. As presented in table 26 above, among children 6-59 months, 63.1%, (n=354, 95% CI 59.0 – 67.2) had reportedly received vitamin A supplementation and around 58.5% (n=38, 95% CI 46.2 – 70.8) of children aged 12-59 months had received deworming capsules at least once in the 6 months prior to data collection. During the assessment, a vitamin A vaccination campaign was ongoing, which might have influenced vitamin A vaccination coverage findings. No other vaccination campaigns were ongoing at the time of data collection.

Figure 9. % Of children (12-59 months) who had reportedly received deworming capsules in the 6 months prior to data collection.



Measles vaccination was assessed through checking a vaccination card and recall by mothers and/or caregivers of children 9-59 months of age. For 20% of children (n=110, 16.5-23.1 CI 95%), mothers/caretakers were able to show physical measles vaccination cards and mothers/caretakers of 61.6% (n= 339, 57.6 – 65.5 CI 95%) confirmed verbally that their child(ren) had been vaccinated in the six months prior to data collection.

Figure 10. % Of children (9-59 months) who had reportedly received Measles vaccination in the 6 months prior to data collection.



Infant and Young Child Feeding Practice (IYCF)

Infant and young child feeding (IYCF) practices directly affect the health, development, and nutritional status of children less than two years of age and, ultimately, impact child survival. Improving IYCF practices in children 0–23 months of age is therefore critical to improved nutrition, health, and development.

Information regarding child feeding practices was collected for all children aged 0-23 months and analysed as described below. The sample sizes obtained in this type of survey for IYCF practices are small and the results should therefore only be interpreted as an indication; they should not be taken as representative of the population's knowledge and practices.

In this survey, mother/caretakers of 172 children aged 0-23 months were interviewed. The mothers/caretakers were interviewed about the IYCF practices of their children between the ages of 0-23 months in line with the revised indicators for assessing IYCF practices by WHO & UNICEF (2021).[16] The findings of the survey are presented in the following tables, graphs, and discussions.

Ever Breastfed

When mothers were asked whether their children were ever breastfed, 95.3% (n=172, 95% CI, 91.19-98.3) of children 0-23 months had reportedly been breastfed at some point in their lifetime. Out of those ever-breastfed children, 94.8% (n=172, 95% CI, 91.3-97.7 had reportedly been initiated to breastfeeding immediately within one hour of birth, as per WHO recommendation.

Table 25. IYCF: Child ever breastfed and early initiation of breastfeeding

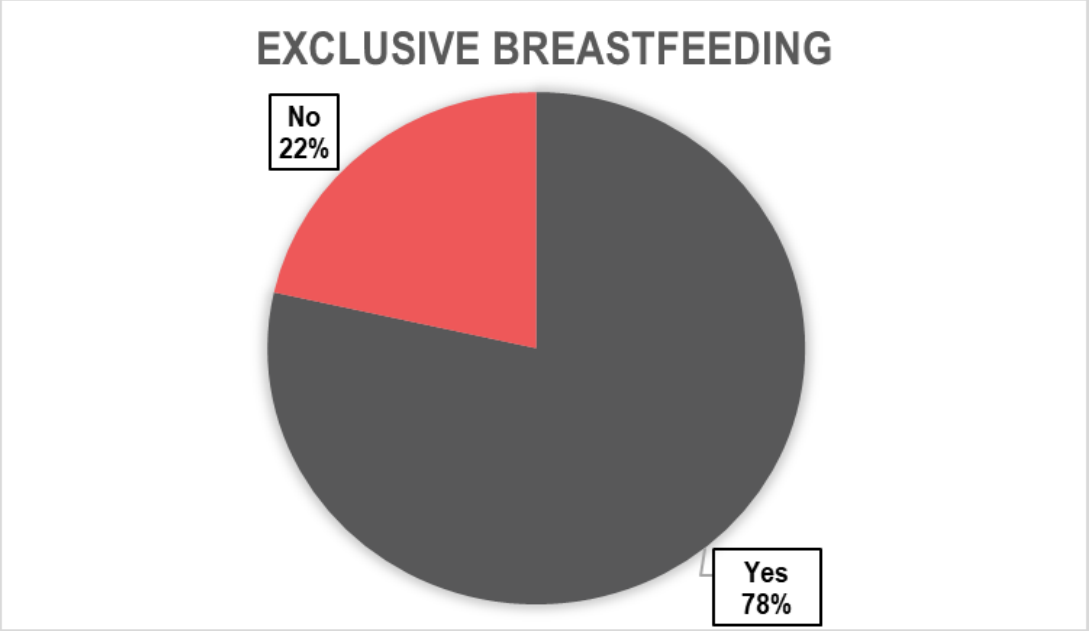
IYCF (Ever Breastfed & early Initiation)				
Indicator Name	Age group	n	%	95% CI
Child ever breastfed	0-23 months	164	95.3	91.19-98.3
Breastfeeding initiation	0-23 months	163	94.8	91.3-97.7

Exclusive breastfeeding (EBF)

The WHO Global Strategy for IYCF recommends that infants be exclusively breastfed until they turn six months of age. Exclusive breastfeeding is the safest and healthiest option for children everywhere, guaranteeing infants a food source that is uniquely adapted to their needs while also being safe, clean, healthy, and accessible. Evidence suggests that infants in low- and middle-income countries who received mixed feeding (foods and liquids in addition to breast milk) before six months were nearly three times more likely to die than those who were exclusively breastfed.[17] Exclusive breastfeeding protects against diarrhoea, lower respiratory infections, acute otitis media and childhood overweight and obesity.[18] Accordingly, 78.5% (n=135, 95% CI, 72.1-84.3) of children 0-5 months had reportedly been exclusively breasted, exceeding UNHCR's standards[19], according to which the proportion of exclusively breastfed infants (0-5 months) in emergency context should be >= 70%.

[16] Indicators for assessing infant and young child feeding practices (WHO 2021)
[17] Guidelines on optimal feeding of low birth-weight infants in low- and middle-income countries (who.int)
[18] ibid.
[19] Infant and young child feeding threshold - UNHCR Emergency Handbook

Figure 11. % of surveyed children 0-5 months who had reportedly been excursively breastfed



Continued breastfeeding

Children should continue breastfeeding for two years or beyond as per the global WHO IYCF recommendations.[20] Children who are still breastfed after one year of age can meet a substantial portion of their energy needs with breast milk in their diet. Continued breastfeeding is also vital during illness: while sick children often have little appetite for solid food, continued breastfeeding can help prevent dehydration while also providing the nutrients required for recovery.

Continued breastfeeding could prevent half of all deaths caused by infectious diseases between 6 and 23 months of age. Continued breastfeeding is consistently associated with higher performance in intelligence tests among children and adolescents, with children breastfed longer than 12 months benefiting the most. Longer periods of breastfeeding may reduce a child's risk of becoming overweight or obese. Continued breastfeeding is also important for mothers, reducing the risk of breast cancer and potentially reducing their risk of ovarian cancer and type 2 diabetes.

Accordingly, children aged 12-23 months were assessed based on the recall period of the previous 24 hours and the finding suggested that 91.1% of children have received continued breastfeeding as illustrated in the table below.

Table 26. Continued breastfeeding of 12-23 months of children

Continued breastfeeding practice (12-23 months)				
Indicator Name	Age group	n	%	95% CI
Continued breastfeeding	12-23 months	102	91.1	85.7 – 96.4

Introduction of Solid, Semi-solid or Soft foods 6-8 months (ISSS)

Solid, semi-solid and soft foods can be introduced at six months of age. Guiding principles for complementary feeding of the breastfed child similarly state: "introduce complementary foods at six

20WHO & UNICEF (2003). Global Strategy for Infant and Young Child Feeding

months of age (180 days) while continuing to breastfeed".[21] After the first six months of life, infants' nutrient demands start to exceed what breast milk alone can provide and this leaves them vulnerable to malnutrition unless solids are introduced. Moreover, an analysis of 14 countries found that children aged 6–8 months who ate solid or semi-solid foods had a lower risk of being stunted or underweight.[22]

Accordingly, Jur River SMART survey findings revealed that, 64.7% (n=22, 95% CI, 50-79.4) of children surveyed aged 6-8 months had been introduced to solid, semi-solid, or soft foods.

Minimum Dietary Diversity

WHO guiding principles recommend that children aged 6-23 months be fed a variety of foods to ensure that nutrient needs are met.[23] Food group diversity is associated with improved linear growth in young children. A diet lacking in diversity can increase the risk of micronutrient deficiencies, which may have a damaging effect on children's physical and cognitive development. One study found that little or no consumption of nutrient-dense foods such as eggs, dairy products, fruits and vegetables between 6 months and 23 months was associated with stunting[24].

On this regard, the survey findings show that only a third (30.2%) of surveyed breastfed & non-breastfed children (6-59 months) received food from at least 5 of 8 food groups (including breast milk) as per IYCF guideline recommendation. Findings thus suggest that meals were likely not adequately diverse for most of the children aged 6-23 months, indicating a limited diversity in terms of nutrients received.

Minimum Acceptable Diet

Among both breastfed and non-breastfed children, "meat, poultry, fish, or eggs should be eaten daily, or as often as possible" as per WHO guiding principles.[25] There is evidence that children who consume eggs and flesh foods have higher intakes of various nutrients important for optimal linear growth. Consuming eggs is associated with increased intakes of energy, protein, essential fatty acids, vitamin B_{12}, vitamin D, phosphorus, and selenium, and with higher recumbent length. Introduction of meat as an early complementary food for breastfed infants is also associated with improved protein and zinc intake[26].

In Jur River County, as per the survey result, only 10.5% (n=18, 95% CI, 6.4-15.1) of surveyed children aged 6-23 months had received a minimum acceptable diet in the in the 24 hours prior to data collection.

Household Level Indicators

Water, Sanitation, and Hygiene (WASH)

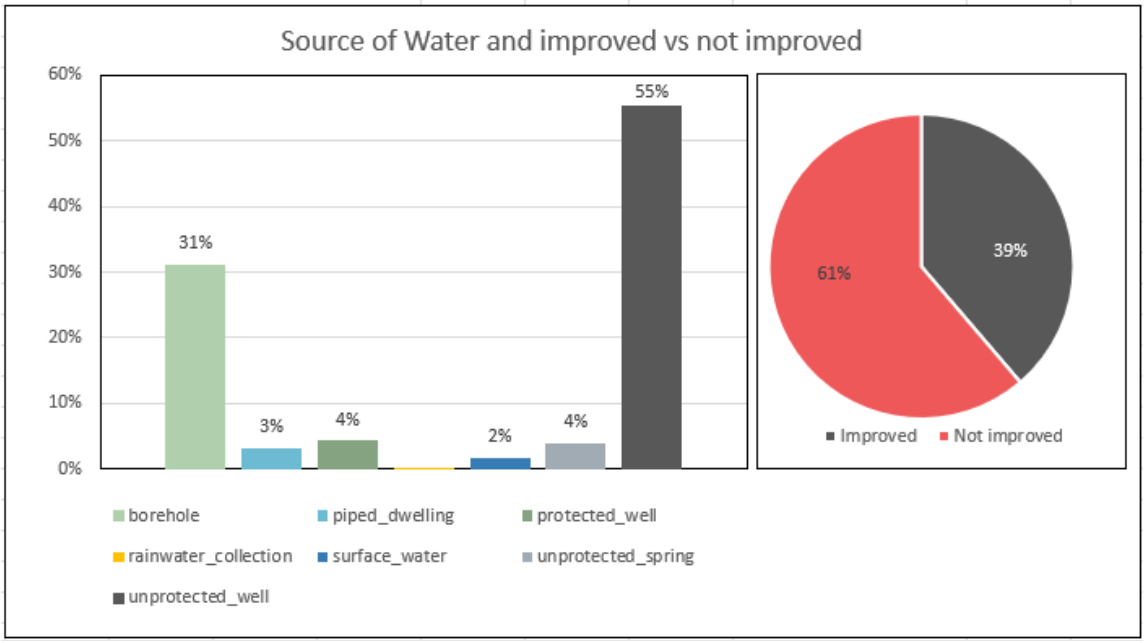
Source of Drinking Water

Consumption and use of unsafe water can cause diarrhea, which can prevent children from getting the nutrients they need to survive, ultimately leading to malnutrition. Malnourished children are also more vulnerable to waterborne diseases like Cholera. Inadequate access to minimum water, hygiene, and

[21] WHO & UNICEF (2021). Indicators for assessing infant and young child feeding practices: definitions and measurement methods, pp 8
[22] WHO & UNICEF (2021). Indicators for assessing infant and young child feeding practices: definitions and measurement methods
[23] WHO (2005): Guiding principles for feeding non-breastfed children 6-24 months of age
[24] WHO & UNICEF (2021). Indicators for assessing infant and young child feeding practices: definitions and measurements, p 8
[25] WHO & UNICEF (2021). Indicators for assessing infant and young child feeding practices: definitions and measurement methods
[26] Guiding principles for feeding non-breastfed children 6-24 months of age.pdf

sanitation is estimated to account for around 50 per cent of global malnutrition.[27] During the assessment, a set of systematically grouped close ended questions were asked to respondents, which were then automatically coded as an improved or unimproved source of water in the database. Almost two-third of survey respondents (61.3%, 95% CI, 56.4-65.6) reported fetching their water from unimproved water sources. Figure 12 below shows the main reported sources of water used by respondents.

Figure 12. % Of respondents per main source of water reportedly used for household consumption

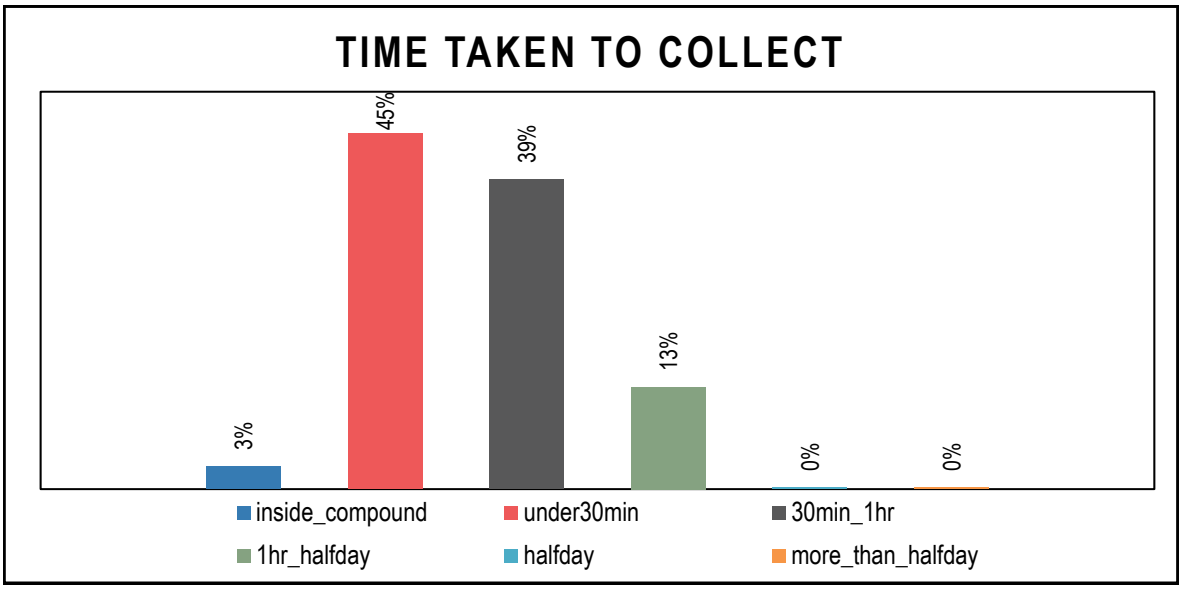


Time to collect water

The other important indicator assessed in relation to the above indicator is the time it took the households to collect water, keeping in mind queuing time and variation between villages with respect to distance are not included or taken into consideration during the analysis. Nearly half of respondents (44.8%) could reportedly access their main household water source within less than 30 minutes, followed by those households who reported being able to access the source of water between 30 minutes and 1 hour (39%). However, 13% of households reported traveling more than an hour to fetch water from their main source.

[27] 4 things you need to know about water and famine (UNICEF 2022)

Figure 13: % Of households per reported time it takes them to collect water from their main water source



Water treatment used

Unsafe water is among the main sources of life-threatening, waterborne diseases. This indicator therefore assesses the prevalence of households using effective methods for treating drinking water, which is particularly relevant as one of the main child morbidity issues in the assessed area was incidence of diarrhoeal disease, amongst other factors. Diarrhoea can be addressed by improving access to safe water, promotion of water treatment, improving sanitation and hygiene promotion as well as focusing on the home management of childhood illness.

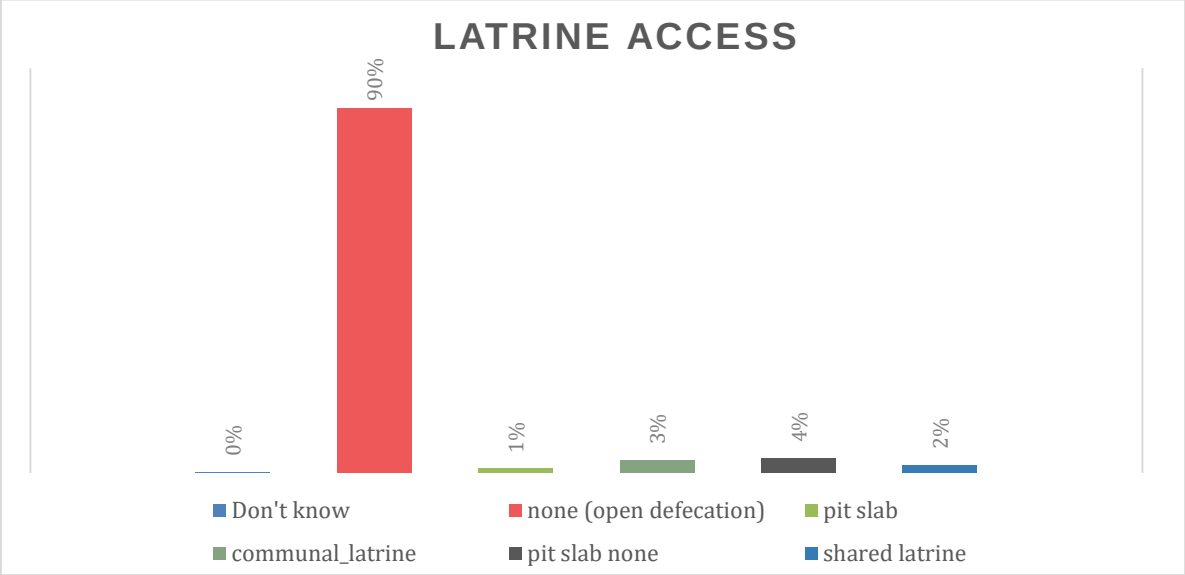
The majority of interviewed households (86.4%, n= 357) reported doing nothing to the water prior to consumption collected either from improved or unimproved sources at household level. Very few households reported use of chlorine (4.1%, n=17) and boiling water (0.2%, n=1) as a water treatment method. The remaining 9.0% (n=37) reported using clothes to filter water.

Hygiene and sanitation

This combined indicator measures the affected population's access to a sufficient number of safely located latrines with functioning handwashing facilities, which is a crucial precondition for ensuring a sanitary environment and preventing diseases. Lack of access to safe latrines in the household is key contributing factor to morbidity, which can in turn lead to elevated malnutrition and mortality rates. When the households were asked if they have access to safe excreta disposal in their households, most households (90.1%) (n=372, 95 CI, 86.9 – 92.7) responded not having access to such sanitation facilities and using open defecation instead. Only 3.6% (n=15, 95 CI, 1.7 – 5.6) of households reported having access to pit latrines without a slab or platform, 1.9% (n=8, 95 CI, 0.7-3.4) used shared latrines (between neighboring households), and 3.1% (n=13, 95 CI, 1.7-5.1) used communal latrines.

A complementary indicator for the above is access to soap for handwashing; washing hands with soap is one of the most effective way of preventing life-threatening diarrheal diseases. The indicator therefore assesses the proportion of households having soap available for their use. Accordingly, only 3.1% (n=13, 95 CI, 1.7-5.1) of households reported having access to soap (not confirmed by enumerators) and 10.2% (n=42, 95 CI, 7.3 -13.1) reported having access to soap (confirmed by enumerators), while most households (86.7% (n=358, 95 CI, 83.3-90.1)) reported not having access to soap.

Figure 14. % Of households per type of latrine they reported having access to



Food Security and Livelihoods (FSL)

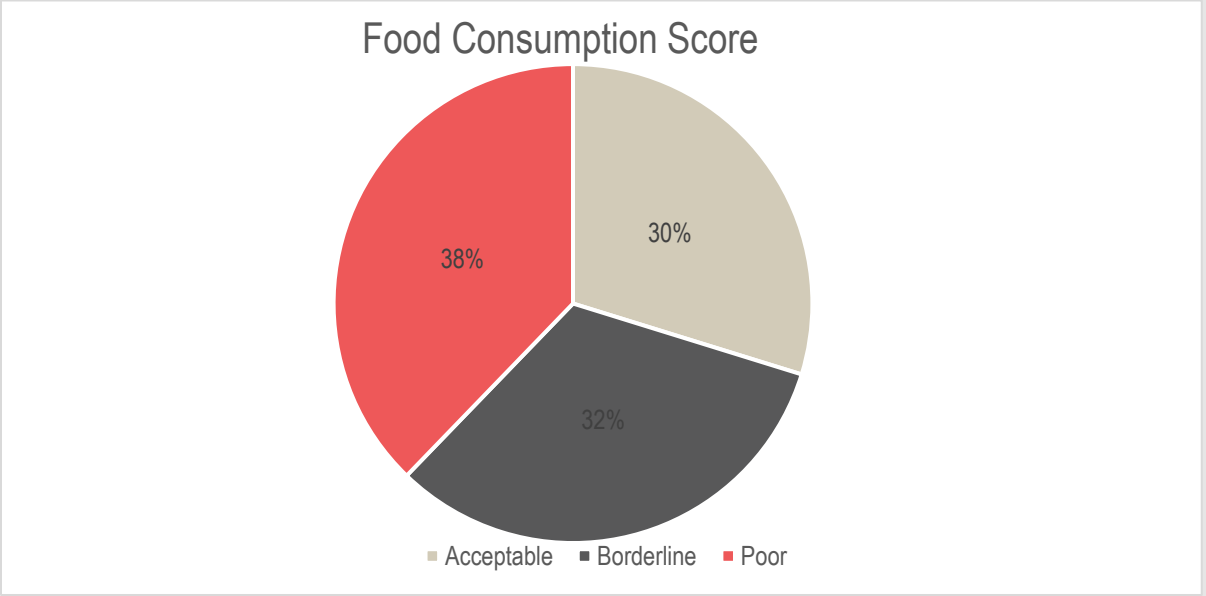
Food Consumption Score

The Food Consumption Score (FCS) is an index that was developed by the World Food Programme (WFP) in 1996. The FCS aggregates household-level data on the diversity and frequency of food groups consumed over the previous seven days, which is then weighted according to the relative nutritional value of the consumed food groups. For instance, food groups containing nutritionally dense foods, such as animal products, are given greater weight than those containing less nutritionally dense foods, such as tubers. Based on this score, a household's food consumption can be further classified into one of three categories: poor, borderline, or acceptable. The FCS is a proxy indicator of household caloric availability. As per WFP guidance,[28] households are classified with a "poor" FCS if they score 0-21, "borderline" with a 21.5-35 score, and "acceptable" with a score higher than 35.5.

Households in Jur River were most found to be in the "poor" category; 37.8% (n=156, 95 CI, 33.2 – 42.4) of households were categorized with a poor FCS, followed by 32.4% (n=134, 95 CI, 28.1 – 36.8) with a borderline FCS, and 29.8% (n=123, 95 CI, 25.2 – 34.4) with an acceptable FCS, as depicted Figure 15 below.

[28] WFP VAM (2008). Food consumption analysis: Calculation and use of food consumption score in food security analysis

Figure 15. Proportion of households per FCS

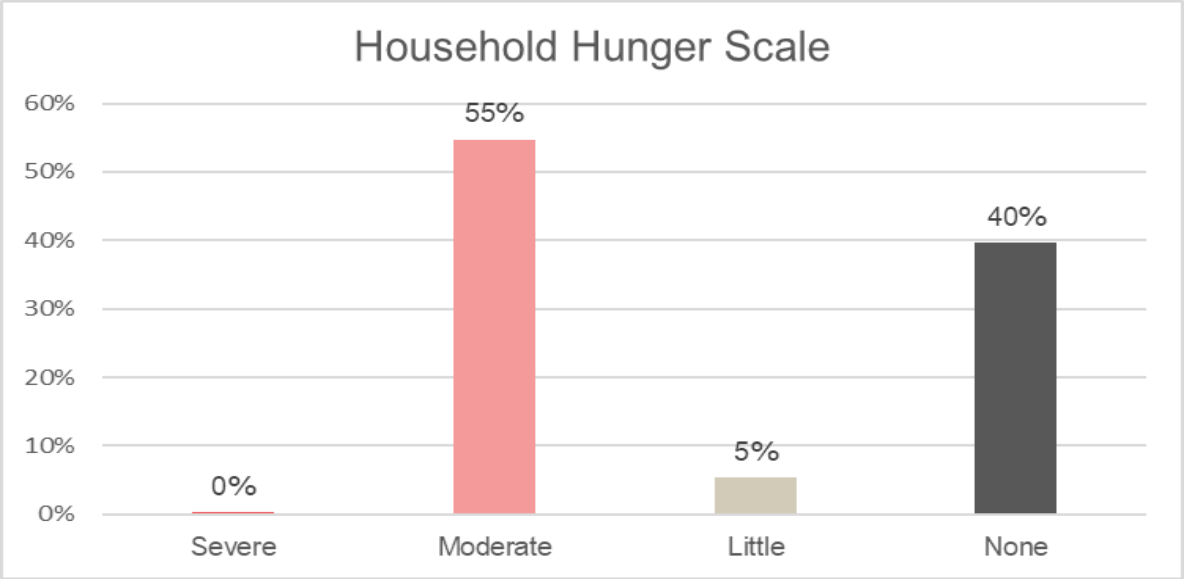


Household Hunger Scale (HHS)

The Household Hunger Scale (HHS) measures households' experienced food deprivation in the 30 days prior to data collection. It is based on an idea that the experience of household food deprivation causes predictable reactions that can be captured through a survey and summarized on a scale. It focuses on the food quantity dimension of food access and does not measure dietary quality.

The HHS is a simple indicator used to measure household hunger in food insecure areas. Using this composite indicator, a respondent can score between 0 and 6 depending on their answers. Individuals scoring from 0-1 are assumed to have experienced the lowest levels of hunger and respondents scoring 6 experienced the highest levels of hunger. The HHS findings suggest that roughly half of the interviewed households (54.7% (n=226, 95 CI, 49.6-59.6)) had faced moderate hunger, followed by 5.3% (n=22, 95 CI, 3.1-7.5) facing little hunger, while only one household was found to have experienced severe hunger in the 30 days prior to data collection. The remaining 39.7% (n=164, 95 CI, 34.9-44.6) of households had not faced hunger in their households during the recall period of 30 days. Figure 16 below shows the details of the findings.

Figure 16. Proportion of households per HHS category



Household Income Source

This indicator is a proxy indication of where a household earns its income and can be used as an indicator of livelihoods diversity. Broadly speaking, income is composed of earnings from productive activities and transfers. It is customary to distinguish four main components in the measurement of income, i.e., wage income from labour services, rental income from the supply of land, capital, or other assets; self-employment income; and current transfers from government or non-government agencies, or other households.

Accordingly, the most reported main sources of income were selling of own-produced agricultural products, such as grain, honey, sesame/seeds, vegetables, fruits (68% of households), followed by selling firewood (17%), with some households selling wild foods or charcoal or engaging in daily labour as their main source of income.

CONCLUSION

Responding to an information gap on the nutrition situation in Jur River County, ACTED, Johanniter International Assistance, and REACH implemented a SMART Survey in the county from November 11th to December 5th, 2022, to provide updated information to support humanitarian programming.

Findings revealed a GAM rate of 9.4%, which corresponds to the IPC AMN "Alert" category (as it falls between 4-9.9%). The mortality rate of 0.68% can be considered normal, as it falls below the WHO Emergency Threshold of <1. The most recent previous SMART Survey conducted in Jur River during the same period of the year in 2017 found a GAM rate of 10.1% and a CDR of 0.55. Hence, acute malnutrition apperas a bit lower than in 2017, while the CDR appears slightly higher. However, the difference was found to be not statistically significant. Though the GAM rate was found to be at Alert level, there seems to be no direct correlation with mortality levels. Both the under-five and crude mortality rates were within acceptable levels.

Findings suggest a generally limited access to improved water and sanitation, and knowledge and practice of key infant and young child feeding practices seems poor. Inadequate access to preventative health services indicated by the findings might also have a direct effect on acute malnutrition and mortality and all the while, vaccination and supplementation coverage in Jur River County appears limited.

During the recall period, diarrhoea, along with suspected malaria and suspected pneumonia, remained major causes of sickness, with almost one-third of surveyed children aged 0-59 months reportedly having been sick in the 2 weeks prior to data collection. These findings seem to be triangulated by the WHO County Cooperation Strategy brief, which highlights malaria, diarroea, and pneumonia as major health concerns, constituting about 77% of the total Outpatient Department (OPD) diagnoses for children under five in the country.[29]

To survive, families may be forced to drink dirty water, putting them at risk of waterborne diseases such as Cholera and diarrhoea, which remain the leading causes of death among children in South Sudan. Access to safe drinking water and sanitation materials such as soap have a paramount importance on combating this problem. However, assessment findings indicate that the majority of the population in Jur River rely on unimproved water sources, while reported use of acceptable water treatment mechanisms was low. Similarly, more than 90% of households reported using open defecation for excreta disposal, reflecting country-wide figures from a 2021 UNICEF WASH briefing note,[30] with only about a tenth of households surveyed in Jur River County reportedly having access to soap for handwashing purposes.

Measles is a highly contagious, serious disease caused by a virus. Globally, more than 140,000 people died from Measles in 2018 – mostly children under the age of 5 years, despite the availability of a safe and effective vaccine worldwide.[31] Accelerated immunization activities have had a major impact on reducing measles deaths.[32] However, survey results revealed that about a fifth of surveyed children (6-59 months of age) in Jur River county were not vaccinated against measles. Similarly, while Vitamin A helps boost immunity and protects children under five from preventable diseases, one-third surveyed children (6-59 months) had reportedly not received Vitamin A supplementation. In addition, almost half of surveyed children (12-59 months), had not received deworming, which helps to protect them against worms that consume essential micro-nutrients from the child's food intake.

[29] WHO, CCS South Sudan Brief, May 2018
[30] UNICEF, WASH South Sudan Briefing Note, Dec 2021
[31] Measles - WHO 2019
[32] Ibid.

Recommendations and priorities

- Increase therapeutic feeding programme coverage to reach all malnourished children by nutrition actors like Johanniter International operating in the County with a special focus on hard-to-reach areas such as Udici and Kuajenea bomas, where access is challenging, through community mobilization, MUAC massive screening campaigns, and active case finding. Children (6-29 months) are more affected by low coverage of those programmes which need immediate response as they will be more at risk of dying due to infectious disease and malnutrition.
    - The proxy coverage of malnourished children in Jur River County seems very low as it shows only 19% (n=8, 95%CI, 9.5-31) of these children were enrolled in the programme.
- Nutrition actors in the county need to also give due attention to availing nutrition products by liaising with donors/agencies such as UNICEF, as some MAM children enrolled in the programme were found that had not received the supplies for a couple of months, based on their caretakers' response as reported by data collection teams.
- In addition, it is better to consider the context in Jur River County and act on it now while it is under alert phase rather than waiting until a certain threshold such as emergency has been reached, by which it could be too late to implement an effective response.
- Prioritise interventions to reduce stunting including promotion of optimal IYCF, micronutrient-rich foods and appropriate supplementation and improving maternal health and nutrition.
- Conduct behaviour change campaigns that addresses IYCF practices and appropriate complementary feeding after six months.
    - The survey finding revealed that only 11% of children 6-59 months had received a minimum acceptable diet in the 24-hour recall period
- Improve the water and sanitation situation of the communities through promotion of hygiene practices and provision of safe water supply. Limited use of safe water sources appeared to not merely be associated with accessibility, as instances were observed during data collection in some places with people using unimproved sources while functional hand pumps were nearby. When prompted why they were not using the available pumps instead, people indicated they did not like the taste of the water. Hence, WASH actors are recommended to conduct community consultation on this regard to support consumption from safe sources. In addition, it is recommended that (mass) campaigns are conducted, in collaboration with CHD, to improve hygiene practices, such as safe excreta disposal, increased soap usage, and use of safe drinking water sources.
    - SMART findings revealed that about 39% of households were using unimproved sources of water. More than 80% of surveyed households were found to not treat water prior to consumption, and more than 90% of them used open defecation, while less than 4% had access to soap.
- The CHD, in collaboration with relevant actors like UNICEF and other nutrition actors operating in the county, should increase the vaccination coverage of Vitamin A, Measles and Deworming through mass mobilisation campaigns.
    - Findings from the current survey, show that vitamin A coverage is 63%, measles coverage is 84% and deworming coverage is 58%.

ANNEXES

Annex 1: Plausibility Report

Plausibility check for: SSD2206_ Jur_River_SMART_ENA File__Nov_2022.as

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

Overall data quality

Criteria	Flags*	Unit	Excel.	Good	Accept	Problematic	**Score**
Flagged data	Incl	%	0-2.5	>2.5-5.0	>5.0-7.5	>7.5	
(% of out of range subjects)			0	5	10	20	**5** (2.6 %)
Overall Sex ratio	Incl	p	>0.1	>0.05	>0.001	<=0.001	
(Significant chi square)			0	2	4	10	**4** (p=0.002)
Age ratio(6-29 vs 30-59)	Incl	p	>0.1	>0.05	>0.001	<=0.001	
(Significant chi square)			0	2	4	10	**0** (p=0.736)
Dig pref score - weight	Incl	#	0-7	8-12	13-20	> 20	
			0	2	4	10	**0** (5)
Dig pref score - height	Incl	#	0-7	8-12	13-20	> 20	
			0	2	4	10	**0** (5)
Dig pref score - MUAC	Incl	#	0-7	8-12	13-20	> 20	
			0	2	4	10	**0** (5)
Standard Dev WHZ	Excl	SD	<1.1	<1.15	<1.20	>=1.20	
.			and	and	and	or	
.	Excl	SD	>0.9	>0.85	>0.80	<=0.80	
			0	5	10	20	**0** (1.03)
Skewness WHZ	Excl	#	<±0.2	<±0.4	<±0.6	>=±0.6	
			0	1	3	5	**0** (-0.10)
Kurtosis WHZ	Excl	#	<±0.2	<±0.4	<±0.6	>=±0.6	
			0	1	3	5	**0** (0.05)
Poisson dist WHZ-2	Excl	p	>0.05	>0.01	>0.001	<=0.001	
			0	1	3	5	**0** (p=0.616)
OVERALL SCORE WHZ =			0-9	10-14	15-24	>25	**9** %

The overall score of this survey is 9 %, this is excellent.

Annex 2: Cluster assignment

SN	Geo Unit	Pop Size	CL		SN	Geo Unit	Pop Size	CL		SN	Geo Unit	Pop Size	CL
1	Baryar	1788	1		138	Alelthony	395			275	Uciirdit	204	
2	Baryar	965			139	Alelthony	510			276	Uciirdit	265	26
3	Baryar	449			140	Ayom	351			277	Sumut	295	
4	Abeyijadid	374			141	Aonyleny	412			278	Aldro	298	
5	Udici	1889			142	Malek	432			279	Adro	369	
6	Thur aluel	1916			143	Angarjur	422			280	Wingo	229	
7	Thur aluel	602			144	Machar	419			281	Wingo	237	
8	Thur aluel	771			145	WarTung	575			282	Wingo	244	
9	Thur aluel	510	2		146	Mabil	567			283	Adro	235	
10	Thur aluel	719			147	Warrac	420			284	Wingo	192	
11	Barurud	2069			148	Bar Athur	403			285	Hal didit	264	
12	Bamdiir	1381			149	BarAthur	351	13		286	Hai jaidit	340	
13	Barurud	2092			150	Nyauoino	384			287	Nyakat	460	
14	Barurud	1388			151	BarAyauo	389			288	Mangar	360	
15	Bamdiir	701			152	Apuo	203			289	Thiem Akuel	290	
16	Barurud	485			153	Cilek	227			290	Kuanya	237	
17	Bamdiir	451	3		154	AcholGuot	412			291	Achot centr	384	
18	Barurud	599			155	KangB	422			292	Hai jaidit	346	
19	Bamdiir	452			156	Pangu	567			293	Eastern Bank	338	
20	Barakol	1782			157	Maduldo	565			294	Akiema	240	
21	Barakol	605			158	Warnyiel	564			295	Remakier	275	
22	Barakol	542			159	Manuth	438			296	Minchiir	177	
23	Barakol	862			160	Majai	405			297	Nyaliel	357	
24	Barakol	1090			161	Mabil	569			298	Akeima	292	
25	Barakol	758			162	Mapump	420			299	Akana	619	
26	Akuyo	1721			163	Pangu	566			300	Abero	516	
27	Akuyo	619	4		164	Barwiir	2426			301	Aturo	526	
28	Akuyo	567			165	Guok	1459	14		302	Wathelel	469	
29	Akuyo	645			166	Madil	1700			303	Wingo	314	27
30	Bar Achol	1592			167	KuaJal	2011			304	Uber	575	
31	Bar Achol	979			168	Hoo	2200			305	War Achok	866	
32	Bar Achol	711			169	Mbili	2102	15		306	Nyan alel	601	
33	Bar Achol	936			170	Nyiwara	2923			307	war ameth	682	
34	BarAchoL	1005			171	BarWol	2746			308	Panhom Akoon	419	
35	Barachol	998			172	Achana	2087			309	Akonbet	524	
36	Gette	1594	5		173	Aya	2397	16		310	Dhonykou	524	
37	Abou	698			174	Bolla	1846			311	Nyinakok	248	
38	Gette	1416			175	Rongguo	2376			312	Wunkuot	792	
39	Uthol	481			176	Barra	2268			313	Malual Ayom	655	
40	Gette	761			177	Agua	2354	17		314	Chum Chok	607	
41	Atido Amiiry	1830			178	Gua	2404			315	Rocroc wau	894	
42	Amary	474			179	Nyikama	1964			316	Marail Awac	621	
43	Amary	933			180	PaweadDeng	2046			317	Thur agok	748	
44	ATido Amiiry	1580			181	Tingbabur	2112	18		318	Mariek	409	28
45	Atido Amiiry	805	6		182	Maruno	2117			319	Mabior Abun	736	
46	Amary	700			183	Mathintinyo	2412			320	Thur anguei	791	
47	Madoru	1653			184	Abull	1478			321	Chor kok	873	
48	ugara	832			185	Bar uthon	1968	19		322	Maboi Anyuon	588	
49	Madoru	741			186	KuaJual	2296			323	Thar kueng east	802	
50	Madoru	760			187	Pawadukel	2404			324	Leth poul	584	
51	Madoru	846			188	Agua	2276			325	Amath nyang	708	
52	Madoru	678			189	Achana	2457	20		326	Kollol	866	
53	Abou	1780			190	Achana	2094			327	Wun Awan	698	
54	Abou	801	RC		191	Achana	2624			328	Akoch chok	657	
55	Barakol	2117			192	Achana	2411			329	lol thou	799	

56	Gette	690			193	Ukono	2166	21		330	Adhoth	897	29
57	Abou	510			194	Kuajinea	1891			331	Roor aguar	612	
58	Abou	498			195	Chono	476			332	Path angol	605	
59	Ugalia	2088			196	Kuajinea	2165			333	Lak awet	494	
60	Ugalia	1962			197	School	2184			334	Thur anguei	612	
61	Ugalia	481			198	Aruom	2245	22		335	Agolon	840	
62	Ugalia	566	7		199	AdutAthaing	2402			336	Warcuei	333	
63	Ugalia	836			200	Kolou	1928			337	War Atem	764	
64	Ugara	857			201	Kolrar	1899			338	Mangar	564	
65	Kayango	2118			202	tieubonga	2006	RC		339	Kolloldit	479	
66	Akuel	854			203	Baraganga	1439			340	Thur anguei	458	
67	Kayango c	859			204	Reb ganya	1418			341	Mony chor	742	
68	Makum	1068			205	Akonyo	305			342	Liec	747	
69	Apham	937			206	Damagia	2123			343	Mabior Abie	501	
70	Baryar	2439	8		207	Maranya	1798			344	Maboir nhom	750	RC
71	Baryar	911			208	Pigiir	556			345	Tit agok	626	
72	Baryar	706			209	Tidel	615			346	Rieny Awach	453	
73	Baryar	808			210	Getong	404	23		347	Taragan	444	
74	Baryar	992			211	Irenco	486			348	War cuei	485	
75	Baryar	922			212	Winyjiir	409			349	Kuelek	572	
76	Udici	2575			213	Puticum	512			350	Gieric	759	
77	Udici	1381	9		214	Kujieno	487			351	Kueng nhom	437	
78	Udici	643			215	Ajini	611			352	Chor kok	679	
79	Udici	494			216	Malek	376			353	Taragan	391	
80	Udici	483			217	Arum2	637			354	Adetdit	607	
81	Apoch	834			218	Dangong	610			355	Mayac	752	
82	Warrieth	557			219	Manyang	570			356	Thillic	603	
83	Aken -Aken	742			220	Tikido	430			357	Rom	752	
84	PauPer	575			221	Chewel	457			358	Malual	915	
85	Agolo	403			222	Ugbeer	688			359	Marail ajieth	298	
86	TinWiir	403			223	madhony	525			360	Nyan alel	404	30
87	Hongkayby	435			224	Magebo	547			361	KurChok	762	
88	Dhikou	581			225	Kuajinea	437			362	Madhuk	886	
89	Areda	564			226	Lui	391			363	War hok	552	
90	Warr tung	556			227	Dagkeer	294			364	Mathaing Ayak	819	
91	WarCum	567			228	Gargar	409	24		365	ngot bul	999	
92	BarAyii	677	10		229	Alur	520			366	Deric	316	
93	Athuai	567			230	Agur	410			367	Adol	366	
94	Alelthony	554			231	Tiget	361			368	Rainy Awac	387	
95	Alelthony	357			232	Adicin	457			369	Maliith Giir	253	
96	Alelthony	742			233	Amou	546			370	Marail ajieth	1198	
97	Alelthony	358			234	Magollo	478			371	TitChok	386	
98	Alelthony	936			235	Agur2	421			372	Tiernhom	258	
99	Ayokdhok	453			236	Alur	396			373	Rainy Lac	244	
100	Gumel	460			237	War akot	482			374	Amethdic	372	
101	Wingo	631			238	Payie	404			375	Tiernhom	488	
102	Warmiir	365			239	Gargar	418			376	Lityic	1572	31
103	Warmiir	347			240	Amogot	647			377	Kuolkoth	319	
104	Athor	435			241	Derwol	770			378	Nyin arol	327	
105	War nyiel	435			242	Gargar	408			379	Bar agap	1288	
106	Nyikanyany	646			243	Kapana	464			380	Warn hok	304	
107	Manyang	575			244	Akim	395			381	Madhol	717	
108	Nyakanyiny	403			245	Gargar	310			382	Thulo	1452	
109	Barkaka	329	11		246	Gagar	428			383	Nyanaluel	367	
110	Alingjak	511			247	Alur	394			384	Manyang	861	
111	Pandak	892			248	Warmarial	628	25		385	Anuk	1423	
112	Warrieth	217			249	Magiloi	490			386	Panameth	412	
113	Ajookbil	202			250	Donymiir	680			387	RoorMangar	597	RC
114	Mathiang	543			251	MayenAmeth	562			388	Rakbak	614	
115	Adol	353			252	Nyiwala	642			389	Agoor	247	
116	Pankuel	696			253	BerJook	641			390	AleLchok B	446	

117	Marjang	534			254	Uciirdit	145			391	Kueny ajok	298	
118	Pancum	725			255	Rocrocdong	225			392	Akacyic	223	
119	Nyulual	422			256	Hajidi	141			393	Majuoc	1036	
120	Mangar	541			257	Akorok	168			394	Majuoc	684	
121	Akol Manga	218			258	Akorok	208			395	Raing Alek	726	
122	Ajugo	387			259	Agor	191			396	Akuom Agok	1035	
123	Barkuel	367			260	Akorok	159			397	Mour cuei	1187	
124	Bartio	387			261	Haai paintok	286			398	Mayen Atortor	407	
125	Theyido	357			262	Sumut	362			399	Wun Apam	384	
126	Garmango	558			263	Wathelel	134			400	Bar amiyok	1028	
127	BarAchat	430			264	Market	340			401	War gaal	563	32
128	NyiChiena	432	12		265	Paintok	323			402	Path Akoch	901	
129	Gielo	373			266	Nyikij0	232			403	Ameth nhom	490	
130	Nyakanda	379			267	Wathelel	175			404	War tit	837	
131	Mankuany	417			268	Khorjamus	286			405	WarRieth	216	
132	Ajugo	431			269	Uciirdit	251			406	Aluelweng	1213	
133	Aela	430			270	Douny miir	186			407	War hok	1439	
134	Maboir	384			271	Nyinalel	282			408	lach	471	
135	Alelthony	249			272	Upuom	218			409	Kuollich	210	
136	Alelthony	415			273	Hai Warrap	317			410	War hok	1540	
137	Alelthony	645			274	Piellenk	387			411	Adol	933	

Annex 3: Evaluation of Enumerators

Standardisation test results					Precision				Accuracy		OUTCOME			
Weight		subjects	mean	SD	max	Technical	TEM/mea	Coef of re	Bias from	Bias from median			From	From
		#	kg	kg	kg	TEM (kg)	TEM (%)	R (%)	Bias (kg)	Bias (kg)			Supervisc	Median
	Supervisc	10	11.7	2.9	0.9	0.28	2.4	99.1	0	0.12	TEM rejec	R value gc	Bias good	Bias poor
	Enumerat	10	11.6	3	0.6	0.19	1.7	99.6	0.13	0.1	TEM poor	R value gc	Bias poor	Bias poor
	Enumerat	10	11.6	2.9	0.6	0.25	2.2	99.3	0.21	0.12	TEM rejec	R value gc	Bias poor	Bias poor
	Enumerat	10	11.7	3	0.6	0.25	2.1	99.3	0.22	0.15	TEM rejec	R value gc	Bias rejec	Bias poor
	Enumerat	10	11.6	2.9	1	0.27	2.4	99.1	0.18	0.13	TEM rejec	R value gc	Bias poor	Bias poor
	Enumerat	10	11.8	2.6	5.5	1.44	12.2	70.3	0.51	0.5	TEM rejec	R value re	Bias rejec	Bias reject
	Enumerat	10	11.6	2.7	2.5	0.71	6.1	93.1	0.44	0.37	TEM rejec	R value pc	Bias rejec	Bias reject
	Enumerat	10	11.4	2.8	2.6	0.7	6.1	93.6	0.4	0.3	TEM rejec	R value pc	Bias rejec	Bias reject
	Enumerat	10	11.6	3	0.7	0.26	2.2	99.3	0.24	0.15	TEM rejec	R value gc	Bias rejec	Bias poor
	Enumerat	10	11.6	3	0.6	0.15	1.3	99.7	0.12	0.07	TEM poor	R value gc	Bias poor	Bias acceptable
	enum inte	9x10	11.6	2.8	-	0.65	5.6	94.8	-	-	TEM rejec	R value poor		
	enum inte	9x10	11.6	2.8	-	0.51	4.4	96.7	-	-	TEM rejec	R value acceptable		
	inter enur	10x10	11.6	2.8	-	0.56	4.8	96.1	-	-	TEM rejec	R value acceptable		
	TOTAL inti	9x10	-	-	-	0.85	7.3	90.9	-	-	TEM rejec	R value poor		
	TOTAL+ su	10x10	-	-	-	0.81	7	91.7	-	-	TEM rejec	R value poor		
Height		subjects	mean	SD	max	Technical	TEM/mea	Coef of re	Bias from	Bias from median			From	From
		#	cm	cm	cm	TEM (cm)	TEM (%)	R (%)	Bias (cm)	Bias (cm)			Supervisc	Median
	Supervisc	10	89.2	12.4	0.6	0.24	0.3	100	0	0.63	TEM good	R value gc	Bias good	Bias acceptable
	Enumerat	10	89.3	11.7	2.2	0.7	0.8	99.6	0.98	0.71	TEM poor	R value gc	Bias poor	Bias acceptable
	Enumerat	10	89.1	12.3	3.6	1.09	1.2	99.2	0.61	0.57	TEM rejec	R value gc	Bias accep	Bias acceptable
	Enumerat	10	91.8	15.5	30.6	7.88	8.6	74.1	3.16	2.96	TEM rejec	R value re	Bias rejec	Bias reject
	Enumerat	10	89.8	12.4	7.3	1.95	2.2	97.5	1.38	0.99	TEM rejec	R value ac	Bias poor	Bias poor
	Enumerat	10	89.3	12.1	1.4	0.52	0.6	99.8	0.69	0.33	TEM accep	R value gc	Bias accep	Bias good
	Enumerat	10	89.6	12.2	6.4	1.59	1.8	98.3	0.88	0.74	TEM rejec	R value ac	Bias poor	Bias acceptable
	Enumerat	10	90.8	10.8	18.5	4.17	4.6	85.1	1.97	1.5	TEM rejec	R value re	Bias rejec	Bias reject
	Enumerat	10	90.2	12.1	4	1.55	1.7	98.4	1.31	0.93	TEM rejec	R value ac	Bias poor	Bias poor
	Enumerat	10	89.6	11.9	1.8	0.69	0.8	99.7	1.03	0.52	TEM poor	R value gc	Bias poor	Bias acceptable
	enum inte	9x10	90.2	12.8	-	4.02	4.5	90.1	-	-	TEM rejec	R value poor		
	enum inte	9x10	89.7	11.5	-	2.34	2.6	95.9	-	-	TEM rejec	R value acceptable		
	inter enur	10x10	89.9	12.1	-	3.03	3.4	93.6	-	-	TEM rejec	R value poor		
	TOTAL inti	9x10	-	-	-	4.57	5.1	85.8	-	-	TEM rejec	R value reject		
	TOTAL+ su	10x10	-	-	-	4.34	4.8	87.2	-	-	TEM rejec	R value reject		

MUAC		subjects	mean	SD	max	Technical	TEM/mea	Coef of re	Bias from	Bias from median			From	From
		#	mm	mm	mm	TEM (mm)	TEM (%)	R (%)	Bias (mm)	Bias (mm)			Supervisc	Median
	Supervisc	10	14.4	1.2	0.5	0.2	1.4	97.4	0	0.13	TEM good	R value ac	Bias good	Bias good
	Enumerat	10	13.9	1.1	0.8	0.31	2.3	91.1	0.49	0.41	TEM good	R value pc	Bias good	Bias good
	Enumerat	10	14.9	1.4	1.3	0.34	2.3	93.8	0.57	0.64	TEM good	R value pc	Bias good	Bias good
	Enumerat	10	13.6	1	1	0.3	2.2	90.8	0.85	0.77	TEM good	R value pc	Bias good	Bias good
	Enumerat	10	13.9	1.1	0.8	0.34	2.4	90.3	0.51	0.42	TEM good	R value pc	Bias good	Bias good
	Enumerat	10	14.2	2	5.8	1.33	9.3	53.6	0.62	0.61	TEM good	R value re	Bias good	Bias good
	Enumerat	10	14.3	1.3	0.7	0.27	1.9	95.9	0.27	0.3	TEM good	R value ac	Bias good	Bias good
	Enumerat	10	14.4	1.2	0.8	0.36	2.5	91.7	0.37	0.3	TEM good	R value pc	Bias good	Bias good
	Enumerat	10	14.8	1.1	1	0.37	2.5	87.9	0.54	0.54	TEM good	R value re	Bias good	Bias good
	Enumerat	10	14.6	1.2	2.7	0.77	5.3	56.4	0.44	0.4	TEM good	R value re	Bias good	Bias good
	enum inte	9x10	14.3	1.4	-	0.79	5.5	70.3	-	-	TEM good	R value reject		
	enum inte	9x10	14.3	1.2	-	0.59	4.1	74.7	-	-	TEM good	R value reject		
	inter enur	10x10	14.3	1.3	-	0.66	4.6	74.5	-	-	TEM good	R value reject		
	TOTAL inti	9x10	-	-	-	0.91	6.4	51.8	-	-	TEM good	R value reject		
	TOTAL+ su	10x10	-	-	-	0.87	6.1	54.9	-	-	TEM good	R value reject		

Suggested cut-off points for acceptability of measurements

Parameter		MUAC mm	Weight Kg	Height cm
individual	good	<2.0	<0.04	<0.4
TEM	acceptabl	<2.7	<0.10	<0.6
(intra)	poor	<3.3	<0.21	<1.0
	reject	>3.3	>0.21	>1.0
Team TEM	good	<2.0	<0.10	<0.5
(intra+inte	acceptabl	<2.7	<0.21	<1.0
and Total	poor	<3.3	<0.24	<1.5
	reject	>3.3	>0.24	>1.5
R value	good	>99	>99	>99
	acceptabl	>95	>95	>95
	poor	>90	>90	>90
	reject	<90	<90	<90
Bias	good	<1	<0.04	<0.4
	acceptabl	<2	<0.10	<0.8
	poor	<3	<0.21	<1.4
	reject	>3	>0.21	>1.4

Annex 4: Jur River County local events calendar

Month		Annual Events / Season	2017	2018	2019	2020	2021	2022
1	Jan	New Year Celebrations Sesame and Sorghum harvesting Cattle Movement		58 New Year 9th January CPA Celebration	46 Displacement of people to Wau PoC	34	22	10 The governor's visit
2	Feb			57	45	33	21	9
3	Mar	Land Preparations		56	44 President Visit to WeBG Fighting of IO and the IG	32	20	8
4	Apr	Easter celebration		55 Easter celebration	43 Easter celebration	31 Total Lock Down for Cov 19	19	7 Appointment of Jur River commissioner
5	May	SPLA Day Collection of lulu fruit		54 SPLA Day Collection of lulu fruit Measles outbreak in Jur river	42 SPLA Day Collection of lulu fruit Conflict between cattle keepers	30 SPLA Day Collection of lulu fruit	18 SPLA Day Collection of lulu fruit	6 SPLA Day Collection of lulu fruit
6	Jun	Marial-Bai Agreement		53 Marial-Bai Agreement	41 Marial-Bai Agreement	29 Marial-Bai Agreement	17 Marial-Bai Agreement	5 Marial-Bai Agreement
7	Jul	South Sudan Independence/ Martyrs Day Hunger breakout		52 SSD Indep/ Martyrs Day Hunger breakout	40 SSD Indep/ Martyrs Day Hunger breakout	28 SSD Indep/ Martyrs Day Hunger breakout	16 SSD Indep/ Martyrs Day Hunger breakout	4 SSD Indep/ Martyrs Day Hunger breakout Flooding in Jur river
8	Aug	World Breast Feeding Week		51 World Breast Feeding Week	39 World Breast Feeding Week	27 World Breast Feeding Week	15 World Breast Feeding Week	3 World Breast Feeding Week Review of Luo Customary marriage
9	Sep	Massive Flooding		50	38	26	14	2
10	Oct	Daniel Comboni Day		49 Daniel Comboni Day	37 Daniel Comboni Day	25 Daniel Comboni Day	13 Daniel Comboni Day	1 Daniel Comboni Day
11	Nov	Grand Parents Day. Initiation of ceremony for young people to become adults.		48 Grand Parents Day. Initiation of ceremony for young people to become adults.	36 Grand Parents Day. Initiation of ceremony for young people to become adults.	24 Grand Parents Day. Initiation of ceremony for young people to become adults.	12 Grand Parents Day. Initiation of ceremony for young people to become adults.	0 Grand Parents Day. Initiation of ceremony for young people to become adults.
12	Dec	Christ mass. Cutting of grass for building	59 Cutting of grass for construction	47 Christ mass. Cutting of grass for building	35 Christ mass. Cutting of grass for building	23 Christ mass. Cutting of grass for building	11 Christ mass. Cutting of grass for building	