Report of Nutrition and Mortality in Panyikang County, Upper Nile State, South Sudan

Data Collection: October 26th – November 5th 2021
Report: December 2021

Acknowledgements

We would like to involve all parties involved who supported the implementation of the first ever Panyikang SMART Survey. Firstly we would like to appreciate the Bureau for Humanitarian Assistance (BHA) and the Foreign Commonwealth & Development Office (FCDO), whose financial support through the CARB Consortium made this survey possible. Additionally we would like extend our heartfelt thanks to the Upper Nile State Ministry of Health, particularly the Minister of Health Honorable Dr. Byinj Ernest Apuktong, whose coordination support along with the State Relief and Rehabilitation Commission (RRC) was invaluable to ensure the implementation of the survey. We would also like to thank the Panyikang County Health Department (CHD), whose support in supervision and implementation of the survey led by Mr. Joseph Oyath, was instrumental for the survey's completion. Lastly, we would like to thank the enumerators who worked difficult hours in hot and difficult weather to accomplish the task at hand.

Executive Summary

Panyikang County has been experiencing a protracted flooding situation since early January 2021[1], which at the time caused displacement, destruction of property and crops. The situation has continued thorugh the 2021 rainy season up till now, where populations remain in their displaced locations since that time. Due to the flooding situation, and the fact that a SMART survey has never been conducted in Panyikang County before, REACH Initiative in collaboration with World Vision and with support from the Upper Nile State Ministry of Health and Panyikang County Health Department implemented a SMART survey between October 26th and November 5th in order to better understand the current nutrition and mortality situation and inform partners on multi-sectoral drivers of malnutrition in the area.

As a result of the flooding, the nutrition situation has likely deteriorated compared to historical post-harvest severity classifications from the same season. Where typically Panyikang has only been classified as IPC AMN Phase 3 'Serious' during the post-harvest in 2019 and 2020, the current estimate of global acute malnutrition is 17.1% [12.7 – 22.5 95% CI] and severe acute malnutrition of 2.1% [0.9 – 4.5 95% CI], is indicative of a Phase 4 IPC AMN 'Emergency' classification. The crude mortality rate was 0.63 [0.36 – 1.14 95% CI] deaths per 10,000 per day, and the under-5 mortality rate at 1.31[0.38 – 4.40 95% CI] under-5 deaths per 10,000 under-5 children per day. The key drivers for this situation was a high reliance on rivers for drinking water (51%), low levels of latrine access (21%), challenges for some caregivers to access primary health care services (19.7% not seeking treatment for childhood illness), and low overall nutrition program coverage for malnourished children, regardless of admittance criteria.

Two main challenges effected the survey result and should be noted: Firstly, the demographic shift that has happened over time due to the flooding, with women and children heading to camps in Sudan as a coping mechanism. This resulted in a smaller average household size and % of children under-5 in the population, which negatively affected our ability to reach the target sample size given our assumptions were based on FSNMS data from before the flooding. Secondly, was our inability to access five clusters in what is known as Nakdiar Payam. Nakdiar is officially reported to be in Panyikang County at national levels of government, however there are local disputes at the state and county level where communities are not agreed to whether Nakdiar is a part of Baliet County or Panyikang County. The dispute was such that even after coordination with the Upper Nile State Relief and Rehabilitation Commission (RRC), Upper Nile State Ministry of Health, UNICEF, County Health Departments and payam local authorities, we were unable to guarantee safe access for our survey teams. Allowing access would have been seen as a recognition that the area belonged to Panyikang County, and as a humanitarian organization REACH and World Vision seek only to inform and provide services, not take sides in any political conflicts. Therefore it was agreed that these areas would not be included in the survey, and that results are only represetnative of the other 5 payams of Panyikang County (Tonga, Dhotim, Panyikang, Pakang, and Pinyduay).

The results suggest the current nutriton situation is deteriorated in Panyikang County, despite the migration of many women and children to Sudanese camps to the north as a coping mechanism to access food and services. Implementing partners should continue to monitor the risk of a continuation of the flooding situation into the next lean/rainy season in 2022, as well as the possibility of returnees from Sudan, as both factors would have a major impact on the nutrition situation and operational planning for partners. Immediate priorities to address acute malnutrition include improving access to improved drinking water, increasing access to primary health care services in hard to reach areas, and both scaling up of nutrition services and identification of malnourished cases in the community. As World Vision opened OTP services only a few years ago, it may be time to implement a SQUEAC coverage survey to inform program coverage issues. Additionally, it is recommended that the next SMART survey in Panyikang County be held in the lean season around May/June to better inform caseload estimates and multi-sectoral programming.

[1] IRNA Report: Panyikang Upper Nile State. 19-22 January 2021.

Background

Introduction

South Sudan, the world's youngest country having gained independence from Sudan in 2011, has faced internal conflict since 2013, causing widespread displacements, 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 IDP returnees to their communities. However as of July 2021, there remains an estimated 2.26 million refugees from South Sudan residing in neighboring countries (Uganda, Sudan, Ethiopia, Kenya, DRC)[2]. While technical consensus was not reached in the last IPC for South Sudan, the consolidated findings from the IPC Technical Working Group and External Reviews had published that as many as 6.3 million people were in need of humanitarian food assistance (Phase 3 and above) in October 2020[3], with an estimated 5.7 million people continuing in need from December 2020 to March 2021, and nearly 7.2 million people projected for the April to July 2021 period. These figures are now updated and there has not been an IPC update since that time, but given the various climate and conflict related shocks in the country it is likely the situation remains severe in some areas.

Panyikang County is located in Upper Nile State, and is bordered by Sudan to the north, Pariang County to the west, Fangak and Canal/Pigi Counties to the south, and Malakal and Baliet Counties to the East (see Map 1). Further, Panyikang is comprised of 6 payams including Tonga, Panyikang, Dahthem, Pakang, Pinyiduay, and Nakdiar. Located in the Northern Sorghum and Livestock Livelihood Zone, residents of this county traditionally rely on crop production and livestock, as well as fishing and casual labor migration to nearby markets. Since the start of conflict much of the population of Panyikang has moved back and forth across between Panyikang and camps in Malakal or Sudan, with during the conflict as much as half the population at one point being estimate to have left[4]. The current estimated projection for the Panyikang population is 65,294 people[5], as per OCHA Sub-National Population estimates for 2020. Panyikang likely continues to face elevated levels of food insecurity and malnutrition, having been classified as 'Emergency' Phase 4 in the IPC Acute Food Insecurity workshop back in October 2020, and being further expected to face 'Crisis' Phase 3 through both projection periods up through July 2021.

World Vision International (WVI) has been present in Panyikang county since 2018. WVI currently provides nutrition services in Panyikang County, with 3 OTP/TSFP sites located at Dheteim payam (Oweci PHCC), Panykang payam (Nyiluak PHCC) and Tonga payam (Tonga PHCC). Additionally, WVI is running programs on WASH , food assistance and FSL in Panyikang. The southern part of Panyikang (Nakdiar Payam) between Canal/Pigi and Baliet counties has nutrition services covered by Health Link South Sudan. International Medical Corps (IMC) is currently providing health services including OPD, IPD, SGBV, MNCH, and EPI services. REACH Initiative has worked in South Sudan since 2012 providing conducting needs assessments and providing information products for the joint humanitarian community. Since 2019, REACH has engaged with the Nutrition Information Working Group (NIWG), participated in IPC Acute Malnutrition analysis workshops, and provided technical support to nutrition partners for SMART survey implementation.

The nutrition situation in Panyikang is a recurrent information gap for the IPC AMN and nutrition implementing partners, as there has never been a SMART survey implemented there. In order to fill this information gap on the current nutrition situation, WVI and REACH Initiative plan to implement a SMART survey from approximately October 16th to October 23rd, collecting anthropometric and mortality data, as well as key multi-sectoral indicators (FSL,

[2] https://data2.unhcr.org/en/situations/southsudan. Accessed 15 September 2021.
[3] http://www.ipcinfo.org/fileadmin/user_upload/ipcinfo/docs/South_Sudan_Combined_IPC_Results_2020Oct_2021July.pdf
[4] https://fews.net/sites/default/files/documents/reports/Livelihoods%20Zone%20Map%20and%20Descriptions%20for%20South%20Sudan.pdf
[5] https://data.humdata.org/dataset/south-sudan-administrative-levels-0-2-2020-population-estimates

WASH, Health) to better understand key drivers of acute malnutrition.

Survey Objectives

General Objectives

To assess the nutrition situation and retrospective mortality rates amongst the population in Panyikang County. 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 in Panyikang County.
2. To estimate retrospective Crude Mortality Rate (CMR) and Under 5 Mortality Rate (U5MR) in Panyikang County
3. To estimate the proxy prevalence of acute malnutrition by MUAC in pregnant, lactating and women of reproductive age (15-49 years) in Panyikang County
4. To estimate the coverage of various immunizations in Panyikang County including:
    - Vitamin A supplementation (for children 6-59 months)
    - Deworming (for children 12 to 59 months)
    - Measles vaccination coverage among children 9-59 months.
5. To assess childhood morbidity and health seeking behaviors among children aged 6-59 months in Panyikang County
6. To assess the WASH situation in Panyikang County (Main water source, distance/time to water source, water treatment status, access to latrine)
7. To assess food security and livelihoods situation in Panyikang County [Food Consumption Scores (FCS), Household Hunger Scale (HHS), main livelihoods, and Livelihood Coping Strategies (LCS)]
8. To formulate practical interventions and recommendations for both emergency and long term programmes of WVI in Panyikang County.

Survey Areas

The SMART survey will be implemented in all areas/payams of Panyikang County.

Methodology

Survey Design

The survey will apply two stage cluster sampling using the SMART methodology with the clusters being selected using the probability proportional to population size (PPS). Stage one sampling will involve the sampling of the clusters to be included in the survey while the second stage sampling will involve the selection of the households from the sampled clusters.

Study Population

The target population for this survey will be the children aged 6 – 59 months for the anthropometric and child health seeking behaviors components, and the general population for the mortality, FSL and WASH components.

Sample Size Estimation

Sample size calculation for the survey will be based on the expected prevalence of Global Acute Malnutrition (GAM) and Mortality Rate in the survey areas. The parameters used have been extracted from the previous survey reports conducted in January 2019. Anthropometric and Mortality Sample sizes have been calculated using ENA software (January 11th, 2020) following SMART methodology.

Sample Size Calculations

Anthropometric Sample Size Calculation

Table 1: Sample Size (Anthropometric)

Parameter	Panyikang County	Justification
Estimated Prevalence (%)	15	There are no previous SMART survey data for this county, and the previous FSNMS Round 25 (same time period) which covered Panyikang yielded 19.4% GAM however with high SD (1.25). Panyikang at that time was classified with a domain GAM of 11.8% including Fashoda and Malakal, however confidence intervals are possibly not reliable for this analysis. Given the recent flooding, COVID and other shocks, likely the situation in Panyikang may have deteriorated compared to when FSNMS 25 was collected. To be conservative, we estimate a GAM of 15%.
Desired Precision	±4	As per in country guidance on precision for SSD SMART surveys.
Design Effect	1.5	Using a default of 1.5, given lack of previous survey data.
Children to be Included	**500**	
Average Household Size	7.3	Per FSNMS 26 – 7.3 people per household
% children Under-Five	20.7	Per FSNMS 26 – 20.7% under5
% Non-Respondents	5%	Using value slightly above 3% in case of COVID refusal
Households to be Included	**387**	

Mortality Sample Size Calculation

Table 2: Sample Size (Mortality)

Parameter	Panyikang County	Justification
Estimated death rate per 10,000/day	1	No previous data. We want to be fairly certain there is a CDR below 1.
Desired Precision	0.45	If estimating a CDR of 1, using precision of 0.45 to be reasonably sure we are below a CDR of 1.
Design Effect	1.5	Default value in absence of previous survey data.
Recall Period	93	Default until recall event is defined.
Population to be Included	**3331**	
Average Household Size	7.3	Per FSNMS 26 – 7.3 people per household
% Non-Respondents	5%	Using value slightly above 3% in case of COVID refusal
Households to be Included	**480**	

The maximum sample size is returned by the mortality sample size calculation and this will be considered the final sample size, with 480 households.

Number of Clusters

To determine the number of clusters required, the number of households that a team can comfortably survey in a day was estimated using the parameters found in the Table 3 below:

Table 3: Number of Households a Team can Sample in a Day

Activity	Estimated Time
Departure from Office	**8:00 AM**
a. Daily morning Briefings	*15min*
b. Travel to clusters	*60 min*
c. Introduction and HH list development	*30 min*

d. Lunch break	*30 min*
e. Total Time from one HH to another	*5 min*
f. Travel back to base	*60 min*
Total time for HH listing, travelling and breaks (a + b + c + d + f)	195
Arrival back to Base	**6:00 PM**
time in a day	10hrs (600 minutes)
Available time for work	600 - 195 minutes= 405 minutes
Time taken to complete one questionnaire	*25 minutes*
Total time per household + e	*30 minutes*

Note: The above are only estimates based on past experience, but will be updated after the pilot survey has been conducted and thus, slight changes may be expected.

Given the above, the number of households that a team can comfortably visit in a day is calculated as follows:

405 (min) / 30 (min) =13.5 **HH/per day ~ 13 HH**

Given the above, the number of clusters per survey area is presented in the table below:

Table 4: Number of Clusters

	Panyikang
Total number of HH based on sample size calculation	480
Total number of HH to be assessed per day per team	13
Clusters Needed	36.9
Rounded UP	**37**

Sampling Procedure: Selection of Clusters

A two-stage cluster sampling design will be used to sample the survey clusters and households. In the first stage, clusters will be assigned using probability proportional to size (PPS). The sampling frame for the 1st stage sampling will be the list of villages with the population estimates in each of the survey area. The list of villages will then be entered into ENA for SMART software (version Jan 2020) and clusters assigned using probability proportional to size (PPS) as per calculation.

Sampling Procedure: Selection of Households and Children

Definition of household for the survey: A household will be defined as a group of people living together, cook and eat from the same cooking pot. Polygamous families will be defined based on the same, if each wife has her own pot, even if living in the same compound, this will be treated as different households. On arrival in the selected clusters, the team leader will meet with the village elders. The team will introduce themselves, explaining the survey objectives as well as expectations from the elder.

Household selection techniques: The standard definition of a HH will be shared to aide in developing the HH listing within the cluster. One of two methods will be used for household listing; (1) a verbal listing from one or more community leaders, and if not possible then (2) a manual house to house listing. Thirteen households will then be randomly selected from the complete list of HHs using the random number generator in Smart phones. These are the HHs that will be visited by the survey team. The village guide and community leaders will support the teams in updating the list of households.

For clusters with more than 150HHs, segmentation will be used to select one portion of the cluster that will represent the cluster. Selection of segments will be done using either PPS or simple random sampling dependent on the

population sizes of the specific segments[6]. In the selected segment the process of HH selection will follow the same process done in each cluster for selection of the 13 HH.

In selected households, all eligible children (aged 6-59 months) will be measured and the household questionnaire applied. Empty households and households with absent children will be re-visited and information of the outcome recorded on the cluster control form. This form will also be used to record information on empty and non-responding households.

Survey Teams, Training, Data Collection and Data Management

Survey Teams: Six teams with four members (1 Team Leader, 1 measurer, 1 assistant, 1 tablet) in each team will be involved in the execution of the survey. At each cluster, a local guide will be employed to facilitate data collection at the household level. The survey teams will be recruited by WVI with the involvement of the appropriate local authorities from Tonga . As possible, the team members will be a mix of both males and females and will be recruited from the local communities. Supervisors will consist of a mix of WVI and REACH staff.

Training: The survey teams will be trained for five days with the training planned to start on 18th October, 2021. The training will cover various components including: taking anthropometric measurements, sampling of households, data collection tools, digital data collection, data quality checks, standardization exercise among other themes. The training of the enumerators will be facilitated by REACH Initiative.

Supervision: The overall management of the survey will be done by REACH Initiative. REACH will be supported in field supervision by WVI staff. Maximum supervision of the survey teams will be ensured to facilitate quality data.

Data Entry and Management: Data will be collected through REACH tablets through ODK. The data collection tools will be programmed and uploaded in the tablets which will be used by the survey teams. The teams will be uploading the collected data to a central server on daily basis to allow the Survey Manager to review the data collected

Data Quality

In order to ensure optimal and high data quality, a number of measures will be put in place which includes:

a) The survey will be done in accordance with the submitted protocol, and that the following will be ensured:
    a. Ensure that training of survey teams are done using standardised material as recommended by SMART Methodology
    - Undertake standardisation 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 will be conducted on daily basis and inform the daily debriefing sessions which will be conducted every day
b) Data will be collected through digital platform, and control checks and skip patterns will be programmed to improve the data quality
c) Anthropometry data will be auto analysed using ENA software anthropometry section. The same software will be used to analyse the mortality data.

[6] As per the SMART Guidelines, if the Segments will have almost equal population sizes, then, SRS will be used; but if the population sizes will be different, then PPS method will be use

Questionnaire

The survey will adopt the data collection tools which have been developed by the Global SMART Team for both anthropometric and mortality surveys. Other indicators will be collected using the modules in line with current FSNMS questionnaires as much as possible.

Indicators Collected

1. **Anthropometry**
   - Age: Will be determined using birth/health cards/ records if available and local calendar of events which will be jointly developed by local leaders and survey enumerators.
   - Sex: Male or female
   - Weight: Children's weights will be taken without clothes using mother and child digital weighing scales (SECA scales with precision of 100gm).
   - Height/length: Children will be measured using the wooden UNICEF measuring boards (precision of 0.1cm). Children less than 2 years of age will be measured lying down, while those greater than or equal to 2 years of age will be measured standing up.
   - Mid-upper arm circumference: MUAC measurements will be taken at the mid-point of the left upper arm using both the child and adult MUAC tapes (precision of 0.1cm) for children 6-59 months and for adult women 15-49 years of age.
   - Bilateral pitting oedema: Will be assessed by the application of normal thumb pressure on both feet for 3 seconds.
   - Referral: All children with acute malnutrition and not already enrolled in treatment will be referred using referral forms to existing TSFP and OTP programs in the county.

2. **Demographics and Mortality:** The following information will be collected for all current household members : age in years, sex, whether they were born, or had joined the household during the recall period. For household members that left during the recall period, will collect the age in years, sex, and whether they had joined or born into the household during the recall period. For persons who have died during the recall period, will collect age in years, sex, whether born or joined the household during the recall period, as well as estimated cause and location of death.

3. **Health Interventions Data:** Vitamin A supplementation, Deworming and Measles immunization data will be collected through health cards or recall.

4. **Morbidity**: Two-week retrospective morbidity data will be collected from mothers/caregivers of all children (6-59 months) included in the anthropometric survey. Mothers/caregivers will be asked about health seeking behaviours for their children who were ill in the previous two weeks.

5. **Food Security Indicators**:
   a. **Food Consumption Scores (FCS):** is an indicator of the general quantity and quality of foods being consumed in a household, based on how many days any household members have consumed 9 distinct food groups within a 7 day recall period. Households are categorized into categories of severity based on their responses. FCS is often used as a proxy for quality of food consumed. Standard FCS thresholds are <21 for 'poor', 21-<=35 for 'borderline' and 35+ for 'acceptable'.
   b. **Household Hunger Scale (HHS):** measures the perceived hunger by asking the frequency a household has experienced three common experiences associated with hunger in the past 30 days (no food in the house, slept hungry, gone whole day and night without food). HHS is often used as a proxy for quantity of food consumed. Thresholds and categories used for analysis are those used for IPC AFI in South Sudan.

c. **Livelihood Coping Strategies (LCS)** – measures what behaviours or actions that household are taking to cope with not having enough food or resources to get food. Ten coping strategies are asked about which are categorized as Emergency, Crisis, or Stress strategies.

6. **WASH** - indicators on main water source, access to latrines, distance/time to water source, and water treatment will be asked.
    a. **Improved Water –** asks respondents on their main water source, with each type of water source being categorized as improved or not improved.
    b. **Time to Collect Water –** asks respondents how long in minutes it takes for them to go to their water source, queue, and return with water.
    c. **Latrine Access** – asks respondents on whether they have latrine access
    d. **Water Treatment** – asks respondents what, if any, treatments methods are used to clean their drinking water
    e. **Soap Access –** asks respondents if there is soap in the household, and if yes, asks if the enumerator can see the soap.

Data Analysis

The anthropometric and mortality data will be analysed using ENA for SMART (Jan 2020 version). The other additional data (immunization, maternal nutrition, morbidity etc.) will be analysed using R. Various statistics will be used to summarize the data including percentages, means, and median among others. The analysed data will be presented in both tabular and graphical presentations. The preliminary datasets will be available within 7 days after the last day of data collection, and the preliminary report within 14 days. The preliminary report will get feedback from WVI and REACH, before submission to the Nutrition Information Working Group (NIWG) for validation.

Ethical Considerations

Informed consent – All households will be asked for informed consent prior to the survey. If a household does not wish to participate, they will be counted as non-response and the team will move to the next sampled household.

Referral – children identified as having acute malnutrition (either by MUAC, weight for height, or oedema) will be appropriately referred to health/nutrition services by the team supervisor/leader.

COVID-19 Precautions – Per recommendations in-country and global recommendations, the following will be done during the survey to mitigate COVID-19 risk.

- Participants will be informed of the risks of COVID-19 during the consent statement, before agreeing to participation in the survey.
- Face masks will be provided to survey teams. Each team member will be provided with 3 disposable face masks per day.
- Face masks will be offered to all household members, survey participants and children over 2 years of age during the survey.
- Temperature screenings will be conducted for survey team members at the beginning and end of each day during training and data collection.
- Team members will use hand sanitizer before entering each household.
- Social distancing will be kept during household interviews, with interviewer and respondent staying 2 meters apart at all times, unless measurements are being taken.
- Temperature screenings will be implemented for household members of selected households. If any persons have a temperature >= 38 degree Celsius, the household will be excluded from data collection.
- Weighting scales, height boards and MUAC tapes will be continuously disinfected between households.

Results

Data Collection

While a minimum of 90% of the initial target households and clusters were acheived, only approximately 70.2% of the target children were acheived, even with the addition of four reserve clusters. This shortfall was due to two main issues: (1) the first being a demographic shift in the population that has occured since the last FSNMS data collection, which was used to inform the sampling assumptions, and (2) secondly the loss of five clusters initially sampled in Nakdiar payam.

The shift is a result of the flooding in Panyikang which began in late 2020/early 2021, and reportedly has resulted in women and children moving from Panyikang County into the refugee camps in Sudan in order to meet their basic needs. The average household according to the October 2020 FNSMS was 7.3 people per household, however it was observed as 5.5 people per household in this survey. Additionally, there was a slight decrease in the % of children under-5 years of age from 20.7% to 19.4%, which with the reduced household size yielded significantly fewer children in the county than expected.

The five clusters in Nakdiar Payam were considered inaccessible during the survey as the teams were not able to acquire permissions from local authorities to access the survey locations. This stemmed from a state level dispute between authorities on which county the payam actually belonged to, Baliet or Panyikang County. After several weeks of following up and even after consultations with the RRC, SMoH, CHD, NIWG, local partners, and local authorities, the survey team was unable to find a way forward.

Table 3.0 Target and Acheived Samples

	Target	Acheived	Acheived (%)
Clusters	37	36	100%
Households	480*	433	90.2%
Children	500	351	70.2%

**After adjusting for the new recall period, this household sample size for mortality dropped to 399 households.*

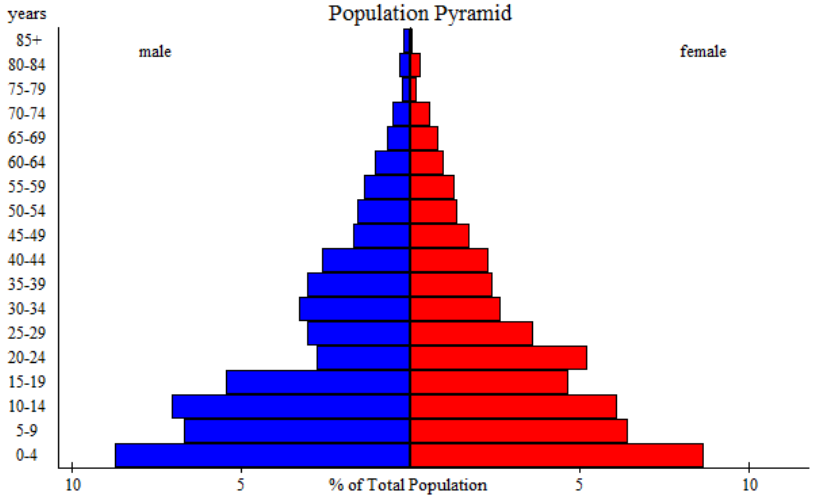
Anthropometric Results

Overall, 351 children were analysed in the dataset for anthropometric indicators, with the age distribution (p=0.808) and sex distribution (p=0.631) both appearing as expected (Table 3.1). The population pyramid showed a gap in men ages 20-24 years of age, however this is typical of the context as they have likely migrated for work in Sudan or other urban centers like Renk. The overall plausibility score for the survey was 18 (Acceptable), with the main quality triggers being flagged data (2.6%) and standard devitation (1.10).

Table 3.1: Distribution of age and sex of sample

	Boys		Girls		Total		Ratio
AGE (mo)	no.	%	no.	%	no.	%	Boy:girl
6-17	28	41.2	40	58.8	68	19.4	0.7
18-29	49	53.8	42	46.2	91	25.9	1.2
30-41	50	57.5	37	42.5	87	24.8	1.4
42-53	29	43.9	37	56.1	66	18.8	0.8
54-59	15	38.5	24	61.5	39	11.1	0.6
Total	171	48.7	180	51.3	351	100.0	0.9

Figure 3.1: Population age and sex pyramid



Global acute malnutrition by weight-for-height z-score was 17.1% [12.7 – 22.5], and severe acute malnutrition was at 2.1% [0.9 – 4.5], however due to the reduced sample size discussed above the results had a lower precision than targeted. While the result appears to be above the 15% WHO emergency threshold, it is not significantly different (p=0.12)[7]. Acute malnutrition by weight-for-height was not significantly different by age (p=0.529)[8]. Cases of malnutrition appeared mostly evenly distributed across ages. Only one case of oedema was found and confirmed by the team supervisor, one of World Vision's Nutriiton Officers.

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

	All n = 340	Boys n = 166	Girls n = 174
Prevalence of global malnutrition (<-2 z-score and/or oedema)	(58) 17.1 % (12.7 - 22.5 95% C.I.)	(31) 18.7 % (13.9 - 24.6 95% C.I.)	(27) 15.5 % (9.9 - 23.6 95% C.I.)
Prevalence of moderate malnutrition (<-2 z-score and >=-3 z-score, no oedema)	(51) 15.0 % (11.0 - 20.1 95% C.I.)	(27) 16.3 % (12.1 - 21.4 95% C.I.)	(24) 13.8 % (8.6 - 21.4 95% C.I.)
Prevalence of severe malnutrition (<-3 z-score and/or oedema)	(7) 2.1 % (0.9 - 4.5 95% C.I.)	(4) 2.4 % (1.0 - 5.8 95% C.I.)	(3) 1.7 % (0.4 - 7.2 95% C.I.)

The prevalence of oedema is 0.3 %

Table 3.3: Prevalence of acute malnutrition by age, based on weight-for-height z-scores and/or oedema

		Severe wasting (<-3 z-score)		Moderate wasting (>= -3 and <-2 z-score)		Normal (> = -2 z score)		Oedema	
Age (mo)	Total no.	No.	%	No.	%	No.	%	No.	%
6-17	66	2	3.0	12	18.2	51	77.3	1	1.5
18-29	87	2	2.3	11	12.6	74	85.1	0	0.0
30-41	86	1	1.2	7	8.1	78	90.7	0	0.0
42-53	64	0	0.0	12	18.8	52	81.3	0	0.0
54-59	37	1	2.7	9	24.3	27	73.0	0	0.0
Total	340	6	1.8	51	15.0	282	82.9	1	0.3

Figure 3.2 Nutritional Status by WHZ by Age group

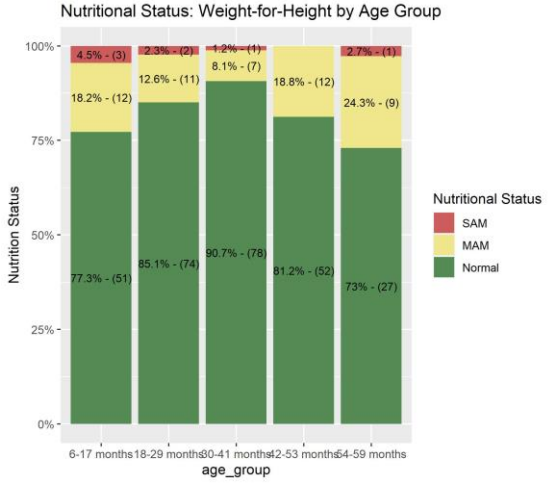


Table 3.4: Distribution of acute malnutrition and oedema based on weight-for-height z-scores

	<-3 z-score	>=-3 z-score
Oedema present	Marasmic kwashiorkor. 1 (0.3 %)	Kwashiorkor. 0 (0.0 %)
Oedema absent	Marasmic No. 10 (2.9 %)	Not severely malnourished. 338 (96.8 %)

[7] CDC One Survey Calculator

[8] Pearson's Chi-squared test in R (chisq.test)

Global acute malnutrition by MUAC was at 6.0% [3.9 – 9.1], with severe acute malnutrition at 0.6% [0.1 – 2.3]. There was no signficiant difference by sex (p=0.307). While cases for MUAC alone were more frequently observed in younger children, the distribtion of malnourished children by MUAC-for-age z-scores was more evenly distributed across ages.

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

	All n = 351	Boys n = 171	Girls n = 180
Prevalence of global malnutrition (< 125 mm and/or oedema)	(21) 6.0 % (3.9 - 9.1 95% C.I.)	(13) 7.6 % (4.4 - 12.8 95% C.I.)	(8) 4.4 % (2.0 - 9.6 95% C.I.)
Prevalence of moderate malnutrition (< 125 mm and >= 115 mm, no oedema)	(19) 5.4 % (3.5 - 8.4 95% C.I.)	(12) 7.0 % (3.9 - 12.2 95% C.I.)	(7) 3.9 % (1.8 - 8.3 95% C.I.)
Prevalence of severe malnutrition (< 115 mm and/or oedema)	(2) 0.6 % (0.1 - 2.3 95% C.I.)	(1) 0.6 % (0.1 - 4.4 95% C.I.)	(1) 0.6 % (0.1 - 4.1 95% C.I.)

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

		Severe wasting (< 115 mm)		Moderate wasting (>= 115 mm and < 125 mm)		Normal (> = 125 mm)		Oedema	
Age (mo)	Total no.	No.	%	No.	%	No.	%	No.	%
6-17	68	2	2.9	8	11.8	58	85.3	1	1.5
18-29	91	0	0.0	6	6.6	85	93.4	0	0.0
30-41	87	0	0.0	3	3.4	84	96.6	0	0.0
42-53	66	0	0.0	2	3.0	64	97.0	0	0.0
54-59	39	0	0.0	0	0.0	39	100.0	0	0.0
Total	351	2	0.6	19	5.4	330	94.0	1	0.3

Figure 3.3 Nutritional Status by MUAC by Age group

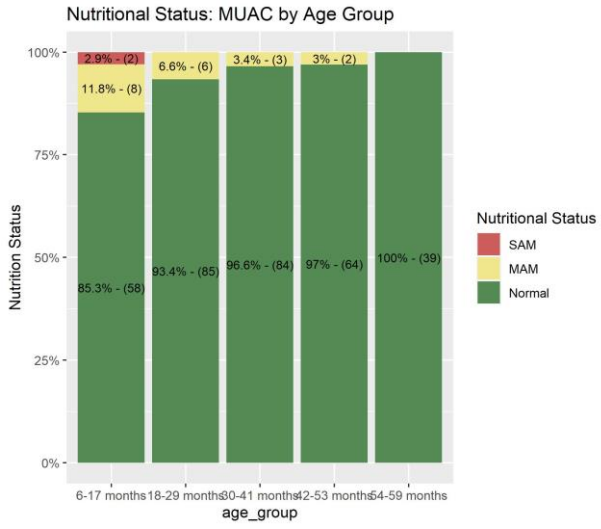
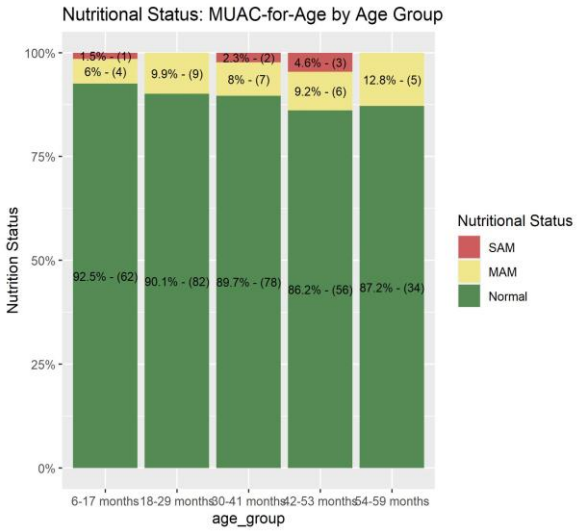


Figure 3.4 Nutritional Status by MFAZ by Age group



Combined GAM by WHZ and MUAC was 19.7% [15.8-24.2] and combined SAM was 2.3% [1.1-4.6]. The majority of these cases were malnourished by WHZ alone (48), followed by MUAC alone (11), both measures (9) and oedema alone (1). There was minimal overlap of WHZ and MUAC criteria with only 13% of cases meeting both criteria. There was no signficant difference by sex (p=0.755), however combined GAM cases appeared distributed slightly more in younger children than older ones with 27.2% of children 6-17 months being malnourished by WHZ and/or MUAC.

Table 3.7: Prevalence of combined GAM and SAM based on WHZ and MUAC cut off's (and/or oedema) and by sex*

	All n = 351	Boys n = 171	Girls n = 180
Prevalence of combined GAM (WHZ <-2 and/or MUAC < 125 mm and/or oedema)	(69) 19.7 % (15.8 - 24.2 95% C.I.)	(39) 22.8 % (18.6 - 27.6 95% C.I.)	(30) 16.7 % (11.0 - 24.5 95% C.I.)
Prevalence of combined SAM (WHZ < -3 and/or MUAC < 115 mm and/or oedema	(8) 2.3 % (1.1 - 4.6 95% C.I.)	(5) 2.9 % (1.3 - 6.4 95% C.I.)	(3) 1.7 % (0.4 - 7.0 95% C.I.)

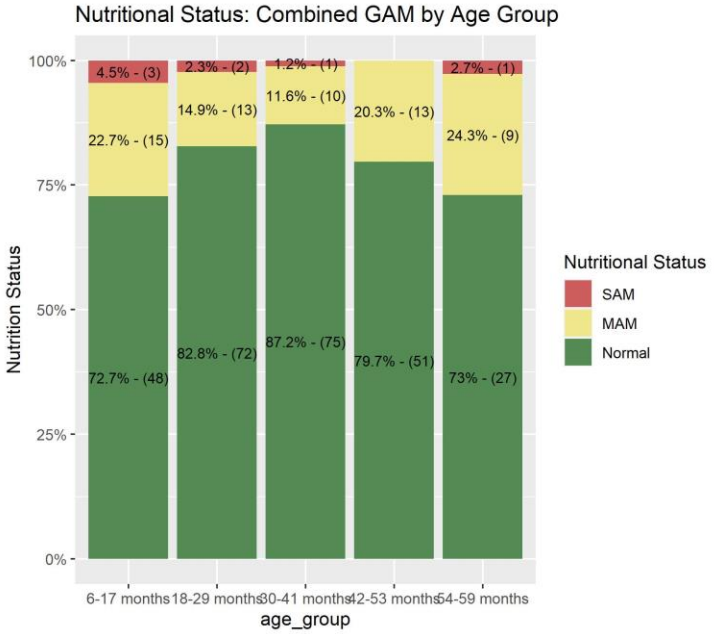
*With SMART or WHO flags a missing MUAC/WHZ or not plausible WHZ value is considered as normal when the other value is available

3.8: Detailed numbers for combined GAM and SAM

	GAM		SAM	
	no.	%	no.	%
MUAC	11	3.1	1	0.3
WHZ	48	13.7	6	1.7
Both	9	2.6	0	0.0
Edema	1	0.3	1	0.3
Total	69	19.7	8	2.3

Total population: 351

Figure 3.5 Nutritional Status by Combined GAM by Age group



Global underweight was 14.1% [11.0-17.9] and severe underweight was 3.3% [1.7-6.2]. There was no significant difference by sex (p=0.727), and cases were evenly distributed across age groups.

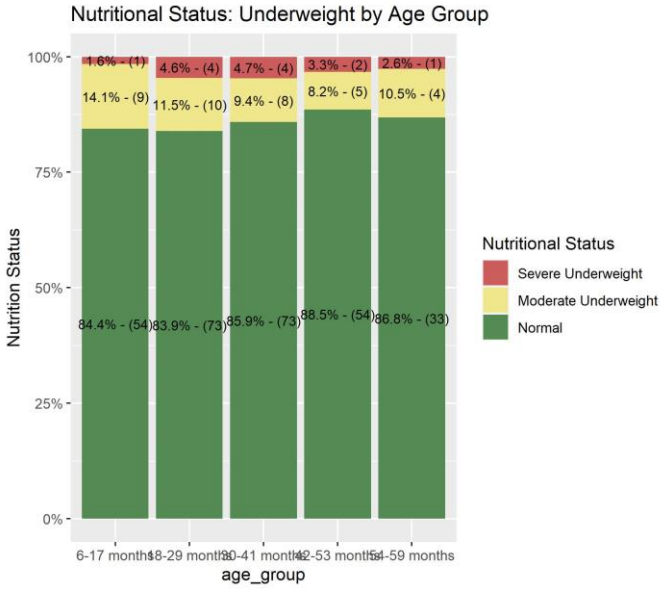
Table 3.9: Prevalence of underweight based on weight-for-age z-scores by sex

	All n = 334	Boys n = 164	Girls n = 170
Prevalence of underweight (<-2 z-score)	(47) 14.1 % (11.0 - 17.9 95% C.I.)	(25) 15.2 % (10.3 - 21.9 95% C.I.)	(22) 12.9 % (8.7 - 18.8 95% C.I.)
Prevalence of moderate underweight (<-2 z-score and >=-3 z-score)	(36) 10.8 % (7.9 - 14.6 95% C.I.)	(20) 12.2 % (7.8 - 18.5 95% C.I.)	(16) 9.4 % (5.9 - 14.7 95% C.I.)
Prevalence of severe underweight (<-3 z-score)	(11) 3.3 % (1.7 - 6.2 95% C.I.)	(5) 3.0 % (1.1 - 8.0 95% C.I.)	(6) 3.5 % (1.5 - 8.3 95% C.I.)

Table 3.10: Prevalence of underweight by age, based on weight-for-age z-scores

		Severe underweight (<-3 z-score)		Moderate underweight (>= -3 and <-2 z-score)		Normal (> = -2 z score)		Oedema	
Age (mo)	Total no.	No.	%	No.	%	No.	%	No.	%
6-17	63	0	0.0	9	14.3	54	85.7	1	1.6
18-29	87	4	4.6	10	11.5	73	83.9	0	0.0
30-41	85	4	4.7	8	9.4	73	85.9	0	0.0
42-53	61	2	3.3	5	8.2	54	88.5	0	0.0
54-59	38	1	2.6	4	10.5	33	86.8	0	0.0
Total	334	11	3.3	36	10.8	287	85.9	1	0.3

Figure 3.6 Nutritional Status by Underweight by Age group



The observed prevalence of stunting was 10.3% [7.4-14.3], however due to the high standard deviation height-for-age z-scores (1.34) it is recommended to report also stunting with an SD = 1, which is 4.0%.

Table 3.11: Prevalence of stunting based on height-for-age z-scores and by sex

	All n = 310	Boys n = 153	Girls n = 157
Prevalence of stunting (<-2 z-score)	(32) 10.3 % (7.4 - 14.3 95% C.I.)	(20) 13.1 % (8.4 - 19.7 95% C.I.)	(12) 7.6 % (3.9 - 14.5 95% C.I.)
Prevalence of moderate stunting (<-2 z-score and >=-3 z-score)	(27) 8.7 % (6.1 - 12.2 95% C.I.)	(17) 11.1 % (7.3 - 16.5 95% C.I.)	(10) 6.4 % (3.2 - 12.5 95% C.I.)
Prevalence of severe stunting (<-3 z-score)	(5) 1.6 % (0.7 - 3.8 95% C.I.)	(3) 2.0 % (0.6 - 6.1 95% C.I.)	(2) 1.3 % (0.3 - 4.9 95% C.I.)

Table 3.12: Prevalence of stunting by age based on height-for-age z-scores

		Severe stunting (<-3 z-score)		Moderate stunting (>= -3 and <-2 z-score)		Normal (> = -2 z score)	
Age (mo)	Total no.	No.	%	No.	%	No.	%
6-17	61	0	0.0	1	1.6	60	98.4
18-29	83	2	2.4	11	13.3	70	84.3
30-41	76	3	3.9	10	13.2	63	82.9
42-53	55	0	0.0	3	5.5	52	94.5
54-59	35	0	0.0	2	5.7	33	94.3
Total	310	5	1.6	27	8.7	278	89.7

Table 3.13: Mean z-scores, Design Effects and excluded subjects

Indicator	n	Mean z-scores ± SD	Design Effect (z-score < -2)	z-scores not available*	z-scores out of range
Weight-for-Height	339	-0.88±1.10	1.35	3	9
Weight-for-Age	334	-0.75±1.10	1.00	1	16
Height-for-Age	310	-0.24±1.34	1.00	1	40

* contains for WHZ and WAZ the children with edema.

Mortality results (retrospective over x months/days prior to interview)

The crude mortality rate was measured at 0.64 deaths per 10,000 per day, and the under-5 mortality rate was 1.31 under-5 deaths per 10,000 under-5 children per day. The majority of deaths were related to illness, and occured in the current location. Recent re-occurences of flooding earlier in the recall period and localized displacements may account for some of the deaths being reported during migration or in place of last residence. The average household size was smaller (5.5) than reported in the last round of FSNMS in October 2020 (7.3), likely due to the flooding situation that started in late 2020 and has displaced some households, women and children specifically, to Sudan, Malakal, or elsewhere. It was observed in several clusters a pattern of single male households as well, where the women and children had gone to Sudan but the men remained for fishing or other livelihoods related activities.

Table 3.14: Mortality rates

Indicator	Value
Mortaliy Rates	
Crude Mortality Rate (deaths/10,000 people per day)	0.64 (0.36 – 1.14 95% CI)
Under-5 Mortality Rate (deaths in under-5 children/10,000 children under-5/per day)	1.31 (0.38 – 4.40 95% CI)
Design Effect CMR	1.44
Total Deaths Reported	17
Total Under-5 Deaths Reported	6
Cause of Death	
Illness	70.6%
Trauma/Injury	23.5%
Unknown/Other	11.8%
Location of Death	
Current Location	47.1%
During Migration	29.4%
Place of Last Residence	23.5%
Other	5.9%
Demographics	
Total Households	
Mid-interval poplation observed	2355
Average Household Size	5.5
% of children-under 5 years of age	19.4%

Children's morbidity

Approximately one-third of children 6-59 months of age were reportedly ill in the two weeks prior to interview (35.9%), with the most common symptom reported being cough (22.3%), followed by diarrhoea (9.8%), fever (5.5%), and skin infection (5.5%). Of children that were ill (156), the majority of caregivers had sought any treatment (80.6%), with the Primary Health Care Center (PHCC) being the most frequent location for care (71.6%).

Table 3.15: Prevalence of reported illness in children 6-59 in the two weeks prior to interview (n=442)

Indicator Name	% [CI]
ill_yn	35.2 [28.2-42.3]
fever	5.2 [1.6-8.9]
diarrhoea	9.8 [6.1-13.4]
skin_infection	5.5 [2.7-8.2]
eye_infection	1.6 [0.1-3]
cough	22.3 [15.8-28.7]
ill_other	0.9 [0-2.2]

Symptom prevalences above are out of all children in the sample (n=442)

Table 3.16 Treatment sought by caregivers of children 6-59 months ill in the two weeks prior to interview (n=156)

Indicator Name	% [CI]
treatment_hospital	1.9 [0-4.6]
treatment_phcc	71.6 [55.4-87.8]
treatment_none	19.4 [7.7-31]
treatment_mobile_clinic	3.2 [0-9.6]
treatment_private_clinic	1.9 [0-5.8]
treatment_traditional	0.6 [0-1.9]

Vaccination, Vitamin A and Deworming

While the majority of children 9-59 months had reportedly received any measles vaccination (73.6%), only some were verified by vaccination card (27.3%). Additionally, only a little more than half of caregivers reported their children having recieved nutrition sensitive health services such as vitamin A supplementatiokn (58.1%) or deworming treatment (62.6%).

Table 3.17 Measles for 9-59 months (n=339), Vitamin A for 6-59 months (n=355) and Deworming for 12-59 months (n=323)

Indicator Name	% [CI]
measles_card	27.3 [16.6-38]
measles_card_recall	73.6 [66-81.2]
measles_verbal_recall	46.3 [35.3-57.3]
vita_yn	58.1 [48.7-67.5]
deworm_yn	62.6 [53.4-71.8]

Programme coverage

Sphere standards recommend a minimum coverage of 50% in rural areas for therapeutic nutrition services. For Panyikang, only one-third of children malnourished by MUAC were reportedly in any OTP or TSFP program (33%). This figure decreases further if we consider children malnourished by weight-for-height criteria (15.5%). Considering that the greatest proporiton of malnourished children in this survey were identified by weight-for-height alone, this suggests that a larger number of potential malnutrition cases in the community are not being captured by programs.

Table 3.18 Program coverage by WHZ (n=58), MUAC (n=21), Combined GAM (n=69)

Indicator Name	% [CI]
program_coverage_wfhz	15.5 [4.5-26.5]
program_coverage_muac	33.3 [6.4-60.3]
program_coverage_cgam	18.8 [7.8-29.9]

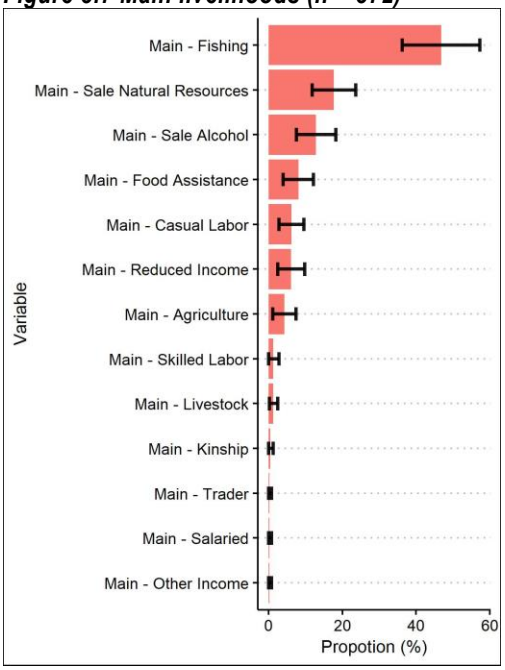
Livelihoods

Respondents were asked to report up to three sources of livelihood, and from that seletion then report their main livelihood. The most frequently reported current livelihoods were fishing (70.2%), selling natural resources like firewood, tall grass, etc. (41.5%), agriculture (33.8%), food assistance (29.6%), and selling alcohol (27%). Of these reported livelihoods, the main reported livehood was most frequently fishing (46.8%), selling natural resources (17.7%), and selling alcohol (12.9%).

Table 3.19: Livelihoods reported (n=429)

Indicator Name	% [CI]
Borrowing	4.4 [2.1-6.8]
Casual Labor	14.5 [8.1-20.8]
Agriculture	33.8 [22.6-45]
Begging	1.6 [0-3.3]
Fishing	70.2 [61.4-78.9]
Food Assistance	29.6 [18.1-41.2]
Kinship	5.4 [0.1-10.6]
Sale Alcohol	27 [19-35.1]
Trader	2.1 [0-4.2]
Sale Natural Resources	41.5 [32.4-50.6]
Wild Foods	1.4 [0-3]
Other Income	0.2 [0-0.7]
Salaried	0.7 [0-1.5]
Skilled Labor	6.1 [2.8-9.3]
None	5.1 [1.7-8.6]

Figure 3.7 Main livelihoods (n = 372)



Shocks

Respondents were asked to report up to three shocks in the previous three months that had affected their household, and from amongst that selection report the main shock that had affected them. Additionally, respondents were asked about the magnitude of the main shock's impact on their ability to get food. The most frequently reported shocks experienced were flooding of homes (73.6%) and flooding of crops (47%), which is as expected given the ongoing floods and localized displacements throughout the county. Aside from flooding, high food prices (23.4%), serious illness (19.8%) and lost work (18%) were also commonly reported. Amongst the reported shocks, the main shocks that were most frequently reported were flooded homes (43%), flooded crops (20.9%), and serious illness of a household member (17.6%). The majority of households reported that their main shock had a large impact on their household's ability to get food (71.9%).

Table 3.20 Shocks experienced in last 3 months (n=394)

Indicator Name	% [CI]
High Food Prices	23.4 [14.1-32.6]
Other Shock	0 [0-0]
COVID	1 [0-2]
Flooded Crops	47 [35.3-58.6]
High Transport Prices	1.3 [0-2.6]
No Shocks	5.1 [1.7-8.5]
Pests / Crop Disease	2 [0-5.7]
Theft	0.3 [0-0.8]
Death Working HH Member	2 [0.4-3.7]
Drought	1.8 [0.1-3.4]
Flooded Home	73.6 [61-86.2]
Insecurity	0.5 [0-1.2]
Livestock Disease	13.2 [6.1-20.3]
Reduced Income	13.5 [6.5-20.4]
Too Much Rain	5.6 [1.7-9.5]
Disease Outbreak	1 [0-2.3]
Flooded Market	14.2 [7-21.4]
Lost Job	18 [5.6-30.4]
Serious Illness	19.8 [7.8-31.8]

Table 3.21 Main shocks experienced in last 3 months (n=374)

Indicator Name	% [CI]
Main - High Food Prices	4.8 [0.8-8.8]
Main - Other Shock	0 [0-0]
Main - COVID	0 [0-0]
Main - Flooded Crops	20.9 [11.9-29.8]
Main - High Transport Prices	0.8 [0-1.7]
Main - Pests / Crop Disease	0.5 [0-1.6]
Main - Theft	0 [0-0]
Main - Death Working HH Member	0.5 [0-1.3]
Main - Drought	0 [0-0]
Main - Flooded Home	43 [32.4-53.7]
Main - Insecurity	0 [0-0]
Main - Livestock Disease	2.7 [0.5-4.8]
Main - Reduced Income	6.1 [2.5-9.8]
Main - Too Much Rain	0.8 [0-1.7]
Main - Disease Outbreak	0.3 [0-0.8]
Main - Flooded Market	0.3 [0-0.8]
Main - Lost Job	1.6 [0-3.4]
Main - Serious Illness	17.6 [5.3-30]

Table 3.22 Impact of main shocks in last 3 months on ability to get food (n= 374)

Indicator Name	% [CI]
Large Impact	71.9 [62.1-81.7]
Small Impact	24.6 [15.5-33.7]
No Impact	3.5 [0-7.2]

Food Security Outcomes

Respondents were asked about their food consumption in the 7 days prior to interview using the Food Consumption score, and about their experienced hunger in the past 30 days with the Household Hunger Scale. Overall, the vast majority of respondents reported ‘Acceptable‘ food consumption scores (91.1%), with only a handful reporting ‘Borderline‘ (5.6%) or ‘Poor‘ (3.3%) scores. The majority of households were classified as ‘Moderate‘ by the Household Hunger Scale (81.6%), with a handful of households classified ‘Little‘ or ‘None‘ by the household hunger scale. Food Consumption scores typically are indicative of the dietary diversity of the household, while Household Hunger Scale is indicative of the quantity of food consumed. These results therefore suggest that at the time of the survey, most people had adequate dietary diversity but somewhat reduced quantity of food. The dietary diversity was likely driven by high access to fish and sorghum. Limited vegetables and legumes were reported, and milk was scarce as the cattle were currently far away and inaccessible to communities due to the current flooding.

Table 3.23 Food Consumption Scores (n=429)

Indicator Name	% [CI]
FCS Acceptable	91.1 [87.8-94.5]
FCS Borderline	5.6 [2.8-8.4]
FCS Poor	3.3 [1.6-5]

Table 3.24 Household Hunger Scale (n=429)

Indicator Name	% [CI]
HHS None	10 [4.2-15.8]
HHS Little	6.8 [3.4-10.1]
HHS Moderate	81.6 [73.9-89.3]
HHS Severe	0.9 [0-2.1]
HHS Very Severe	0.7 [0-2.1]

WASH

The majority of households relied on river water as their main source of drinking water (51%), followed by tapstand water (49.6%) which was provided by World Vision in Tonga town at a single site next to their base. As most communities are living along the river, water collection times for most households is less than 30 minutes (87.2%). A few households had longer water collection times likely due to travel to the tapstand at the World Vision compound. Only slightly more than half of households reportedly had access to soap, while less than one-quarter had access to any kind of latrine (21.7%).

Table 3.25 Main source of drinking water (n=429)

Indicator Name	% [CI]
Borehole	0.9 [0-2.8]
Tapstand	46.9 [32.2-61.5]
Unprotected Well	0.2 [0-0.7]
Hand Dug Well	0.2 [0-0.7]
Handpump	0.2 [0-0.7]
River	51 [36.4-65.7]

Table 3.26 Water collection time (travel to water point, queue, return) (n=429)

Indicator Name	% [CI]
< 30 min	87.2 [80.8-93.6]
> 1hr	0.2 [0-0.7]
30 min - 1hr	11.4 [5-17.8]
Don't know time	0 [0-0]

Table 3.27 Soap Access, Latrine Access, Type of Latrine (n=429)

Indicator Name	% [CI]
Soap Access	61.1 [48.7-73.4]
Latrine Access (Any)	21.7 [10.4-32.9]
Family Latrine	8.9 [1.9-15.9]
Shared Latrine	7 [1.2-12.8]
Communal Latrine	5.8 [0-12.6]
Don't know latrine	0.2 [0-0.7]

Discussion

While there are no past SMART surveys in Panyikang County to compare with, previously the county has been classified as Phase 3 'Serious' in January 2019 and January 2020 IPC AMN workshops based on FSNMS data collected in similar periods (October/November post-harvest). The point estimate of the prevalence of GAM by WHZ is indicative of an emergency situation (17.1%), equivalent to a Phase 4 'Emergency' classification by IPC standards. This atypical nutrition situation is almost certainly exacerbated compared to the past due to the flooding, which has destroyed homes and livelihoods, crops, and caused localised and refugee displacements since early this year, which explain the high levels of malnutrition. Again while there are no past mortality estimates available to compare with, the CMR of 0.63 suggests an elevated by stable situation, most likely below the WHO emergency threshold of 1 death per 10,000 people per day. While we are reporting a result for GAM, we must acknowledge that due to the unexpected access issues and demographic shift in the population, we were unable to meet our target sample size and therefore the precision of these results are lower than was expected.

The main drivers of malnutrition is likely a combination of poor WASH conditions, poor access to health and nutrition services, and to a lesser degree household food insecurity. While water availability was high, the quality was very poor as most people rely on the river (51%) as their main source of drinking water. The survey teams observed women and children swimming out from the river some distance from the town in order to get marginally cleaner water. This combined with the low latrine coverage (21%) increases the risk of diarrhoeal disease for the population. While food security outcomes suggest there was some moderate stress in quantity of food consumed, possibly due to high market prices or reduced food stocks due to lost crops, in general food availablity appeared high in Panyikang at the time of the survey. Fish was a staple and was widely available for most households, and at least for now sorghum was available from household stocks or the market.

Poor health care coverage likely contributes to longer and more severe childhood illness, with reportedly one in five sick children (19.4%) were not brought to any health care facility by their caregivers, possibly due to access challenges and limited availability of mobile services throughout the area. Access to nutrition services and enrollment of children may also be a challenge, with a small minority of malnourished children by any criteria (18.5%) being reported enrolled in a nutrition program...below the 50% coverage recommended by Sphere Standards. This suggests difficulties in reaching children with services in more hard-to-reach villages, but also identification of children even in more accessible, peri-urban sites like Tonga/Atig where services are available.

Looking forward, service providers should monitor a few key risk factors to better plan and respond to the needs of the population. Firstly, partners should monitor the flooding situation through the first several months of 2022. If the waters begin to recede and allow for planting and resuming of livelihoods, then displaced populations may move back to their places of origin which would have implications for provision of services and catchment areas. If the waters do not signficantly recede before the next rainy season come May/June, then people may be unable to plant crops for 2022, may remain in their current locations, or may even further displace to other locations where they can access services such as Sudan or Malakal. Secondly, partners should monitor the returns situation from Sudan camps, because if the situation improves enough than a signficant amount of women and children may return back to their communities in Panyikang. This would have implications for forecasted caseloads and potentially underestimate the estimate children in need later in 2022 if not accounted for. Lastly, given the poor WASH conditions in Panyikang WASH partners should pay attention to how the situation may change in the dry season with remaining flood waters. As the waters recede, people may likely change their water seeking behaviours or rely on more concentrated, contaminated water sources, furthering the risk for diarrhoeal disease.

Conclusions

The flooding that has affected Panyikang since early in the year has likely had an effect on the current severity of the nutrition situation, which appears to be higher than the same season in recent years. If the current situation continues into the next lean season, we could expect either a worsening nutrition season, or greater population movements northwards into the Sudanese camps as a coping mechanism. If the situation improves and populations return to Panyikang, the risk of underestimating nutrition caseloads and needs in the coming year exists based on the demographics of this survey alone. Program implementers should consider the existing see-saw population movements between Panyikang and Sudanese camps when assessing with the coming lean season nutrition situation will be like. In the meantime to address the immediate concerns of high levels of acute malnutrition, partners should aim to to address the current inadequate access to improved or treated water, as well as either the lack of access to nutrition services, or challenges in identification and enrollment of malnourished children in the community. As nutrition services were introduced a few years ago by World Vision in Paniykang County, so it may be time to implement a SQUEAC or other coverage survey to help inform program coverage issues. Additionally, we typically conduct nutrition surveys during the lean season so it may be better suited to conduct another SMART at some point during the May/June lean season in order to better inform annual caseload estimates for the area. In the medium to long-term, partners should continue to monitor the food security situation, specifically the effect of the current flooding on both the next planting season and returns from Sudan.

Appendices

Appendix 1

Plausibility Report

Plausibility check for: REACH_SSD_Panyikang_Oct2021.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	**0** (p=0.631)
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=0.808)
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	**4** (15)
Dig pref score - MUAC	Incl	#	0-7	8-12	13-20	> 20	
			0	2	4	10	**4** (13)
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	**5** (1.10)
Skewness WHZ	Excl	#	<±0.2	<±0.4	<±0.6	>=±0.6	
			0	1	3	5	**0** (0.19)
Kurtosis WHZ	Excl	#	<±0.2	<±0.4	<±0.6	>=±0.6	
			0	1	3	5	**0** (-0.14)
Poisson dist WHZ-2	Excl	p	>0.05	>0.01	>0.001	<=0.001	
			0	1	3	5	**0** (p=0.111)
OVERALL SCORE WHZ =			0-9	10-14	15-24	>25	**18** %

The overall score of this survey is 18 %, this is acceptable.

Appendix 2

Assignment of Clusters

Geographical unitPopulation size Assigned cluster

Geographical unit	Population size	Cluster
Papwoj	553	1,2
Ayithach	480	RC
Nyibood	550	3
Tonga Town1	997	4,5,RC
Tonga Town2	997	6,7,8
Tonga Town3	997	9,10
Tonga Town4	998	11,12,13
Tonga Town5	998	RC,14
Tonga Town6	998	15,16,17
Atig	1000	18,19
Nyibany	300	20
Achobnyibany	100	
Nyijwad/Nyijwad Island	150	21
Deny/Deny Island	100	
Doleib Hill	30	
Adhidhyang	23	
Akug	42	
Pathwor	50	
Paju	60	
Delel	290	22
Patug	130	
Lel	420	23
Thwor	85	24
Duur	150	
Alel	10	
Adoot	115	
Pakang	250	RC
Oburr	580	25
Abojob	150	26
Ajoog	100	
Awajyang	10	
Obay-Dheeg	10	
Agok	10	
Odong	140	27
Dor	200	
Obang	20	
Patug	20	
Pakan	300	28
Thwor	210	
Wuub	200	29
Dyel	159	
Wilnyang	170	30
Bur	167	
Nyilwal	172	31
Odwoj	192	
Pakwar	260	32
Nyiyar	240	
Anakdiar1	1000	33,34,35
Anakdiar2	1000	36,37

Appendix 3

Evaluation of Enumerators

Weight:

	Precision: Sum of Square [W1-W2]		Accuracy: Sum of Square [Enum.(W1+W2)-(Superv.(W1+W2)]		No. +/- Precision		No. +/- Accuracy	
Supervisor	4.20		3/4					
Enumerator 1	0.47	OK	4.41	OK	4/3	5/2		
Enumerator 2	1.10	OK	2.48	OK	1/6	5/3		
Enumerator 3	3.60	OK	4.62	OK	3/5	6/2		
Enumerator 4	2.64	OK	3.50	OK	3/3	2/6		
Enumerator 5	0.53	OK	2.45	OK	1/4	4/5		
Enumerator 6	0.48	OK	5.74	OK	3/4	5/3		
Enumerator 7	26.43	POOR	23.89	POOR			5/4	4/4
Enumerator 8	0.49	OK	6.13	OK	5/2	5/4		

Height:

	Precision: Sum of Square [H1-H2]		Accuracy: Sum of Square [Enum.(H1+H2)-Superv.(H1+H2)]		No. +/- Precision		No. +/- Accuracy	
Supervisor	3.24		5/2					
Enumerator 1	8.73	POOR	34.61	POOR			3/6	4/4
Enumerator 2	5.47	OK	10.77	POOR		3/5	4/5	
Enumerator 3	13.14	POOR	35.78	POOR		1/6	1/8	
Enumerator 4	11.56	POOR	21.24	POOR		2/7	3/6	
Enumerator 5	16.01	POOR	42.91	POOR		6/2	1/8	
Enumerator 6	5.33	OK	15.05	POOR		2/6	4/5	
Enumerator 7	9.92	POOR	17.42	POOR		5/3	3/4	
Enumerator 8	0.49	OK	20.89	POOR		4/3	1/8	

MUAC:

	Precision: Sum of Square [MUAC1-MUAC2]		Accuracy: Sum of Square [Enum.(MUAC1+MUAC2)-Superv.(MUAC1+MUAC2]		No. +/- Precision		No. +/- Accuracy	
Supervisor	109.00		5/3					
Enumerator 1	502.00	POOR	2411.00	POOR			6/3	0/9
Enumerator 2	533.00	POOR	878.00	POOR			2/6	9/0
Enumerator 3	142.00	OK	419.00	POOR			2/5	6/1
Enumerator 4	91.00	OK	218.00	OK		2/4	5/4	
Enumerator 5	130.00	OK	329.00	POOR			5/1	3/6
Enumerator 6	19.00	OK	278.00	OK		2/3	0/9	
Enumerator 7	141.00	OK	1332.00	POOR			5/3	0/9
Enumerator 8	210.00	OK	463.00	POOR			6/2	0/8