



Pre-Harvest Anthropometric and Mortality Survey
Wau County, Western Bahr El Ghazal, South Sudan
2014

PSI South Sudan

in collaboration with

WBEG State Ministry of Health

Wau County Health Department

and

WBEG Relief and Rehabilitation Commission

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Introduction

Wau County is one of the three counties of Western Bahr el Ghazal State. It consists of five administrative payams—Wau North, Bagari, Wau South, Besselia and Kpaile—with an estimated total population of 179,111.^{i, ii, 1} Cattle herding remains the primary determinant of wealth and status. Livestock are sold for cash, traded for other products, are gifted as marriage dowries, and act as a source of milk and meat. Bee hiving also serves as a source of food in the region. Chronic shortages of food in the market worsen food security in the county. Often, commodities are accessible and acquired through the sale of household assets and natural resources.

The region was originally inhabited by the Jur, Balanda, Ndogo, and Keresh peoples who are predominantly agro-pastoralists. In recent years, people from Upper Nile, Unity, and Jonglei have moved into the area. Since December 2013—specifically since fighting erupted in Mapel in April²—large numbers of extended family members have joined these homes, particularly in Bagari and Wau Town Payams³.

Nutrition surveys in neighboring counties have revealed Global Acute Malnutrition (GAM) prevalence of 3.4% in Nagero to the South, 24.9% in Aweil Centre and 27.5% in Gogrial West to the North. Rates of Severe Acute Malnutrition (SAM) in these counties also range widely from 0.6% to 8.2%.^{iii, iv} Prior to this survey, no recent nutrition surveys had been implemented and validated in Wau County.

PSI has been working in South Sudan since 2005. In addition to integrated Community Case Management (iCCM), PSI South Sudan implements a water, sanitation, and hygiene (WASH) program which includes the social marketing of safe water products in Central and Western Equatoria and Western Bahar el Ghazal, as well as LLIN distribution throughout the country.

The anthropometric and retrospective mortality survey was conducted in preparation for upcoming Outpatient Therapeutic Programming (OTP) for the treatment of uncomplicated SAM cases in the Wau and Jur River Counties. The survey was carried out in coordination with the Relief and Rehabilitation Commission (RRC), the Western Bahr El Ghazal State Ministry of Health (SMoH), and the Wau County Health Department (CHD). Data collection was conducted between 21 and 25 July, and a data quality control exercise carried out in the field on 9 and 10 August to investigate outlying findings.

Objectives

Main Objective: The primary objective of this survey was to assess the prevalence of acute malnutrition in children under five, and population mortality rates in Wau County.

Specific Objectives

- To determine the prevalence of malnutrition among children aged 6-59 months
- To estimate the crude and under five mortality rates in Wau county

¹ 2008 Census results were projected for 2014 using the recommended coefficient. I.e. Wau County 2008 population was 151,320. This number is multiplied by coefficient 1.0285 6 times to estimate population for 2014.

² Fighting broke out in Mapel Baraks on 11 April 2014

³ Comments from Wau State Nutritionist

- To estimate the incidences of common illnesses two weeks prior to the assessment among children under five years

Methodology

Sampling

Two-stage cluster sampling with probability proportional to size (PPS) was employed with villages as the primary sampling unit, using Standardized Monitoring and Assessment of Relief and Transition (SMART) methodology. A list of Wau County villages was obtained from the Director of the County Health Department⁴ and clusters were selected from this list using ENA delta. Simple random sampling was used for second stage sampling. For household selection, seventeen households were selected in each village from the household lists generated by Boma Chiefs and other village leaders using the ENA randomization table. In urban areas and larger villages in Wau North and South where it was not possible to obtain a household list, segmentation was guided by boundaries defined by village leaders.

The sample sizes for both anthropometric nutrition and retrospective mortality surveys were determined using Emergency Nutrition Assessment (ENA) delta. Based on ENA calculations 513 households were to be visited in Wau County to obtain the necessary samples of 500 children for the anthropometric survey, and 1721 individuals for the mortality survey⁵. During implementation, a larger sample was obtained due to a larger than expected number of individuals found living together in a household- a total of 696 children aged 6-59 months, and overall population of 3705 individuals were included in the survey.

Thirty clusters were sampled and seventeen households targeted per cluster. Empty households were revisited but none replaced. In this survey, a household was defined as persons or a group of persons residing in the same compound, sharing one household head, and eating from the same pot. The mortality survey was carried out in all households visited. In households with children aged 6-59 months, the anthropometric survey was carried out and children were measured using the height board, electronic weighing scale and MUAC.

Recruitment and Training

Twenty-two survey staff were recruited by PSI and the consultant in collaboration with the County Health Department (CHD), the Relief and Rehabilitation Commission (RRC), and the State Ministry of Health. All survey staff had a minimum of secondary education.

Training was conducted by the consultant and supported by a PSI M&E officer. Six enumerator teams consisting of one team leader and two to three measurers each were trained over the course of four days from 15 to 18 July. The last day of training included a standardization exercise with six children. A follow up session was conducted on Saturday 19 July to ensure accurate measurement.

⁴ Village List included in the appendices

⁵ Sample size calculation for anthropometric and retrospective mortality survey included in the appendices

A field test was conducted in three households on 18 July in a village not selected in the sampling process. The tool was maintained in English and interviews conducted in Arabic, Balanda and Dinka by native speakers to assure comprehension.

Data Collection

Anthropometric survey data was collected on age, sex, weight, height, Mid-Upper Arm Circumference (MUAC), and oedema. A local calendar of events was used to help mothers estimate the age of their children. Children taller than 87cm were measured standing rather than lying down. Respective morbidity for the past two weeks and information on vitamin A supplementation and measles vaccination were also collected. Mothers of children found to have SAM, based on MUAC scores of <115mm, were advised to bring children to Wau PHCC.

The mortality survey collected information on number of people in the household, births, deaths, and reasons for under five deaths. A recall period of 103 days was explained using a local event easily remembered in Wau County-the defection in Mapel. Households with no eligible children for anthropometry were not excluded from the mortality survey.

Data Quality Control

In addition to the extra day of training and standardization testing, supplementary measures were taken during data collection to control quality. Teams were supervised in households on the first day of training by the consultant and PSI M&E officer. Based on this supervision there was a reshuffling of the teams to ensure the presence of a strong measurer and team leader in each team. The observation of differing levels of capacity guided the consultant's consequent approach to supervision to ensure that the teams needing greater assistance were the most heavily supervised.

Although the initial plan was to enter and review the data on a daily basis, using ENA plausibility checks to guide the subsequent day's work, this protocol was not followed, and PSI did not gain access to the data until after completion of data collection due to delayed sharing of the data by the consultant. Partial ENA data was submitted to PSI on 30 July, and paper forms on 4 August.

The preliminary review of the data uncovered a larger than expected number of outliers (7 z-scores out of range⁶). In order to confidently proceed with analysis, a follow up data verification exercise was carried out on 9 and 10 August targeting households in two clusters with many outliers and two clusters with a more normal range of data for comparison purposes. The verification team failed to identify households from the first round of data collection, as they were unable to relocate the field guides used. Referring again to the Boma Chiefs, the team selected a different set of households using the randomization table. The data collected was compared to the survey data from the same clusters using a t-test to determine reliability. The t-test found that the differences between samples in the same groups were not statistically significant. Based on these results, none of the 30 clusters were excluded from the analysis.⁷ Data collected during the data verification exercise was only used for comparison purposes and was not included in the analysis.

⁶ WHO 2006 Standards

⁷ All analysis is for the original data collected (full data set). Data from the data verification exercise was not analyzed beyond the t-test and is not presented here.

Data Entry and Analysis

Data was entered daily by the consultant in the field. To correct data entry errors, the PSI M&E team reviewed entered data against the hard copies and corrected discrepancies. Data was entered into ENA, and exported to Excel for additional analysis in EpiInfo.

Challenges

- Difficulties in finding a qualified consultant (PSI had to advertise twice) delayed the commencement of data collection to the rainy season when travel is difficult.
- The Principal Investigator (PI) for the study did not receive security clearance to travel to the field due to insecurity in Wau prior to data collection; as such, supervision was conducted only by the hired consultant and Wau-based PSI staff.
- The PSI PI had difficulty obtaining data during collection in the field. This created a gap between data collection, and data verification and quality control. The tardy receipt of the data delayed the analysis and preparation of the preliminary report.
- The enumerators' lack of experience with anthropometric measurements made measuring challenging.
- The enumerators' lack of National IDs or any other official documentation delayed the drafting of contracts as HR collected letters from the local RRC to verify identities. Enumerator qualms over the removal of a percentage of their pay for taxes further delayed data collection as contracts were drafted and re-drafted to accommodate expectations.
- Despite use of a local calendar of events to assist mothers with determining the age of their children, the inability to pinpoint birthdays and subsequent age estimates resulted in heaping in the age distribution.
- Efforts to verify data quality after collection were limited by inaccessibility of certain clusters due to heavy rains and inability to locate the initial households sampled.

Results

The anthropometric assessment included 696 children aged 6-59 months; a total of 3705 people in 505 households. The data quality score is 24%, which is considered acceptable⁸. Standard Deviation (SD) for Weight for Height is 1.13, which is also classified as good⁹. Anthropometric and mortality analyses reflect the data after exclusion of 29 SMART flags using ENA. For these analyses, n=667.

Anthropometry

At 14.4%, the rate of Global Acute Malnutrition (GAM) measured through Weight for Height falls just below the 15% WHO emergency threshold. At 3.3%, Severe Acute Malnutrition (SAM) exceeds the WHO emergency threshold of 2%. MUAC measurements indicate a lower prevalence of malnutrition with GAM at 8.6 % and SAM at 2.2 %. Only two cases of oedema are present. No difference in results was observed for sex.

Table 1: Prevalence of Acute Malnutrition

⁸ As it falls within the acceptable range of 0.8-1.2

⁹ Only 4.2% missing/flagged data

Index	Indicator		Results
WHO (2006) (n=667¹⁰)	WHZ	Global Acute Malnutrition <-2 z-score and/or oedema	14.4 % (10.9 - 18.8 95% C.I.)
		Severe Acute Malnutrition <-3 z-score and /or oedema	3.3 % (2.0 - 5.4 95% C.I.)
	MUAC	Global Acute Malnutrition < 125 mm	8.6 % (6.6 - 11.1 95% C.I.)
		Severe Acute Malnutrition < 115 mm	2.2 % (1.2 - 3.8 95% C.I.)

Sex and Age Distribution

The sex ratio is 1.08, with a sample of 347 boys and 320 girls included for analysis. All age segments fall within the acceptable range of 0.8 to 1.2, implying no bias for gender except in children aged 42-53 months where there were significantly more boys than girls in the sample (sex ratio = 1.28). The age distribution shows peaks at 24, 36, and 48 months, suggesting age heaping based on age estimation. Data collectors confirm this theory, reporting that they had to probe extensively to determine age and in many cases were unable to determine an exact birth month.

Morbidity and Health-Seeking Behavior

Sixty-one percent¹¹ of children under five were found to be ill in the two weeks preceding data collection. As shown in Table 2, fever was the most common illness cited (24.7%), followed by diarrhea (18.6%), cough (14.4%), and skin infection (11.3%). High rates of illness may be partially attributed to the beginning of the rainy season when malaria and diarrhea cases typically increase.

Table 2: Frequency of types of illness among children reported to be ill

Illness	Frequency	Percent	95% CI Lower	95% CI Upper
Fever	105	24.7%	20.7%	29.1%
Cough	61	14.4%	11.2%	18.1%
Diarrhea	79	18.6%	15.1%	22.7%
Skin Infections	48	11.3%	8.5%	14.8%
Other	132	31.1%	26.7%	35.7%

¹⁰ n=667 after ENA exclusion of 29 SMART Flags

¹¹ n=696, no entries excluded for analysis of morbidity data

The most common place to seek treatment was in Primary Health Care Centers/Units (PHCC/Us) (41.4%), followed by hospitals (16.9%), and Community Based Distributers (9.6%). In one fifth (20%) of cases no treatment was sought.

Table 3: Treatment sought among children reported to be ill¹²

Treatment	Frequency	Percent	95% CI Lower	95% CI Upper
Hospital	72	16.9%	13.6%	20.9%
PHCC/PHCU	176	41.4%	36.7%	46.3%
Mobile/ outreach clinic	13	3.1%	1.7%	5.3%
Community Based Distributer	41	9.6%	7.1%	13.0%
Private physician	16	3.8%	2.2%	6.2%
Shop	5	1.2%	0.4%	2.9%
Traditional practitioner	1	0.2%	0.0%	1.5%
Pharmacy	11	2.6%	1.4%	4.7%
Other	5	1.2%	0.4%	2.9%
None	85	20.0%	16.4%	24.2%

Immunization and LLITN Coverage

The survey reflects high rates of immunization, with 93.1% of children having received vitamin A supplementation and 87.3% having been immunized against measles, indicating the success of the Expanded Program for Immunization in Wau County.

Table 4: Immunization rates¹³

Indicator	Index	Results
Vitamin A supplementation	Yes	93.1 %
Measles Immunization	Yes EPI card	82.3%
	Yes Recall	5.0%
Long Lasting Insecticide Treated Net (LLITN) use	Yes	55.9 %

Net use was found to be higher in some clusters than others. We suspect that people arriving in the region since the last PSI net distribution in 2011 are not using mosquito nets.

¹² n=696, no entries excluded for analysis of treatment data

¹³ n=696, no entries excluded for analysis of immunization data

Mortality

The crude mortality rate was found to be 2.03¹⁴ overall, and 3.78 for children under five.¹⁵

The leading cause of death for children under five was diarrhea¹⁶ (43.5%), closely followed by fever (30.4%). Other causes included difficulty breathing and accidents. In addition to the causes coded for analysis, data collectors reported that a reason cited for many deaths was a form of traditional poison believed to have been sent by a malicious person in the community.

Table 5: Mortality Rates

Indicator	Results
Crude Mortality Rate (CMR)	2.03 (1.31-3.11) (95% CI)
Under 5 Mortality Rate (U5MR)	3.78 (2.19-6.45) (95% CI)

Discussion

Survey results indicate poor nutrition status in Wau County. At 14.4%, the prevalence of Global Acute Malnutrition (GAM) is just below the WHO emergency threshold of 15%. The 3.3% prevalence of Severe Acute Malnutrition (SAM) exceeds the 2% threshold. Factors that may contribute to the situation include:

- Children in Wau County suffer from common illnesses, such as diarrhea, that contribute to poor nutritional status—61% of children under five were reported to be ill in the two weeks preceding data collection, and 43.5% of under five deaths were reportedly caused by diarrhea.
- Insecurity has caused many people from northern states to relocate to Wau County. People have arrived under difficult conditions and with poor health status.
- Relocation of extended family members into homes in Wau County has increased family size and stretched resources, thus affecting household food security.
- Household members surveyed cited high market prices as a challenge to feeding families. Disruptions in the supply chain may be attributable to recent insecurity in Wau County.
- Lack of access to nutrition services, especially for families living in rural areas far from health facilities, has exacerbated the situation for malnourished children.

The crude mortality rate of 2.03, and for children under five of 3.78, are higher than expected. Various factors may have contributed to these findings, which must be understood for interpretation:

¹⁴ 2.03/10,000 persons/day

¹⁵ The recall event used for the survey was the Mapel incident on 11 April 2014. Although a recall period of 90 days is recommended for SMART, this incident occurred 103 days prior to data collection. The planning portion of ENA was adjusted accordingly to account for the extra days included in the recall period.

¹⁶ Coding for illnesses in mortality data set: 1= Diarrhea, 2 = Fever 3 = Difficulty breathing, 4 = Malnutrition, 5 = Measles, 6 = Accident, 7 = Violence, 66 = Other.

- Households were larger than expected with unusual family composition due to a significant number of extended family members joining the households in recent months. Two clusters in Wau North- Hai Dinka and Hai Ismailia had high numbers of deaths (8 and 11 deaths¹⁷ per respective cluster) and exceptionally large numbers of people joining the households (21 and 30 for the same clusters) in the three months preceding the survey.
- The high number of deaths is likely related to difficult conditions experienced by families fleeing conflict in Upper Nile, Unity, and Jonglei.¹⁸ In many cases, families traveled long distances on foot to reach Wau and arrived in poor health status. New arrivals also changed food security dynamics in host households, by stretching resources.
- For this survey a household was defined as persons or a group of persons residing in the same compound, sharing one household head, and eating from the same pot. This definition has complicated mortality results since it did not predict the large number of extended family members residing under the same roof, including multiple mothers with children.

Conclusion

The results of this survey suggest that Severe Acute Malnutrition is a serious public health problem in Wau County. Most of the factors leading to poor nutritional status in Wau County are unlikely to change in the coming months without nutrition intervention. This survey documents the need for increased nutrition services in Wau County. A targeted programmatic response is critical.

Recommendations

Programming

1. Establish OTP services in rural areas as soon as possible to address emergency level SAM
2. Consider comprehensive nutrition and food security projects to address high levels of GAM
3. Screen all children seen by CBDs for malnutrition using MUAC to detect cases
4. Strengthen collaboration between PSI, Wau CHD and WBEG SMoH to assure comprehensive access to treatment for SAM in Wau County
5. Strengthen collaboration between PSI and Johanniter to eliminate gaps, especially in rural areas
6. Continue government OTP services to address SAM cases in Wau Town Payam
7. Assure PHCU and PHCC staff are equipped with the skills and resources to manage SAM
8. Continue the EPI vaccination program to maintain high levels of immunization

Future Surveys

9. Implement follow-up SMART and SQUEAC surveys next year to reassess the situation
10. Modify planning for future surveys, e.g. collect mortality data at an individual rather than household level¹⁹

¹⁷ In Hai Dinka 156 people were included in the survey; in Hai Ismailia, 106.

¹⁸ According to Wau State Nutritionist, people have been moving into Wau from Upper Nile, Unity and Jonglei since the beginning of the year and particularly since fighting broke out in Mapel in April

¹⁹ Recommendation from South Sudan Nutrition Cluster

11. Communicate with SMoH on specific staff needed 2 months prior to data collection to assure full involvement and communication²⁰
12. Present preliminary reports to SMoH in PowerPoint or any other format preferred by the State Nutritionist 2 weeks after data collection²¹
13. Include additional indicators in future SMART assessments as relevant to PSI, Nutrition Cluster and Wau SMoH such as IYCF, WASH and Food Security²²

²⁰ Recommendation from State Ministry of Health Nutritionist

²¹ Recommendation from State Ministry of Health Nutritionist

²² Recommendation from State Ministry of Health Nutritionist

Appendices

1. Village List
2. Initial ENA sample size calculation

Appendix 1: Village List

Wau County Villages Selected for SMART		
Payam	Name of Villages	Population Size
Wau North	Hai Dinka	2196
	Hai Darajat East	5995
	Hai Darajat west	5947
	Hai Fahal	1990
	Hai Ismailia	6433
	Hai Zaglona	1673
	Hai Sika Hadid	3637
	Hai Lokoloko	6730
	Hai Juma Kayango	1703
Wau South	Hai Keresh	2709
	Hai Jebel khier	8680
	Hai Natabu	2976
	Hai Momoi	1266
	Hai Kenisa	2897
	Hai Muwazafen	7106
	Hai Nazareth	9292
	Hai Kosti	7563
Wau South	Hai Bazia Jedid	4463
Bagari	Natabu	2098
	Bringi	3986
	Farajalla	4463
	Tadu	1099
	Ngo halamia B	3696
	Ngovendgo	1901
	Ugali	2051
Kpaile	Maju	459
	Nakpatagru	487
Besselia	kaabi	1805
	Besselia	4103
	Ngogounda	3888

Wau County Village Population (all villages)						
Payam	Village	Population Size				
1. Wau North	Khorghana-Wau	62	3. Bagari	Natabu	2098	
	Kabi	413		Hai Khorgana	693	
	Beer-Majak	645		Bringi	3986	
	Hai Dinka	2196		Ngodakala	2886	
	Hai Darajat East	5995		Farajalla	4463	
	Hai Darajat west	5947		Ngisa	2992	
	Aweil Jedid	2931		Tadu	1099	
	Hai Fahal	1990		Ngo halamia A	1988	
	Hai Zande	3803		Ngo halamia B	3696	
	Hai Jedid	1875		Ngoku	873	
	Hai Ismailia	6433		Nadaku	3205	
	Hai Grinty	3519		Ngovendgo	1901	
	Hai Zaglona	1673		Ngosoulongo	3097	
	Hai Falata	2737		Ngolimbo B	1198	
	Hai Sika Hadid	3637		Ugali	2051	
	Hai Bilfam	800		Bussere	3669	
	Hai Nivasha	2786		4. Kpaile	Gittan	383
	Hai Lokoloko	6730			Taban	548
	Hai Jerusalem	2561			Maju	459
	Hai Bar Yar	1516			Kpaile	4795
Hai Khor Molang	549	Triga	158			
Hai Juma Kayango	1703	Gumaba	400			
2. Wau South	New Site	651	Nakpatagru		487	
	Hai Nimra Talata	2068	Nyeke		193	
	Hai Keresh	2709	Gedi		77	
	Hai Jebel khier	8680	Khorgizaz		435	
	Hai Natabu	2976	Ngoloto	256		
	Hai Jazeera	3557	Kharufeu	404		
	Hai Vole	1162	Zamoi	399		
	Hai Momoi	1266	Rafeli	412		
	Hai Motamadia	3965	Ngotambura	330		
	Hai Kenisa	2897	5. Besselia	Abu shaka	2058	
Hai Jalaba	2504	kaabi		1805		
Hai Muwazafen	7106	Mboro		2773		
Hai police	891	Besselia		4103		
Hai Prison	570	Rehan fei		700		
Hai Khor korongo	745	Ngo zamani		601		
		Ngogounda		3888		

	Hai Khor Modier	856		Ngonba	345
	Hai Nazareth	9292		Ujod	574
	Hai Kosti	7563		Safa	672
	Hai Bazia Jedid	4463		Ngoboula	590
	Hai Masna Taleeb	1899		Fango Nuer	189
	Hai Masna Bera	645		Fango Mauchar	807
	Agok	1812			

Appendix 2: ENA sample size calculation

Table 1: Sample Size Calculation, Anthropometric Survey

ENA Data	Wau
Estimated prevalence GAM(%)	15
Desired precision	4
Design effect	1.5
Average household size	6
% children under five	19
% non-respondents	5
Households to be included	513
Children to be included	500
Proposed number of clusters	30
Number of children per cluster	17
Number of households per cluster	17

Table 2: Sample Size Calculation, Mortality Survey

ENA data	Wau
Estimated prevalence	2
Desired precision	0.9
Design effect	1.5
Recall period (days)	90
Average household size	6
Percent of non-response households	5
Population to be included	1721
Householdsto be included	302
Proposed number of clusters	30
Number of households per cluster	10

ⁱ 5th Sudan Population and Housing Census. 2008.

ⁱⁱ PSI. Mass Net Distribution Registration. 2012.

ⁱⁱⁱ Nutrition Cluster, Ocha, NBS. SMART Surveys Map January to June 2012.

^{iv} SMART Survey Database 2014