

Additional File IV

A mixed-methods nutrition, water, sanitation and hygiene knowledge, attitudes, and practices survey of IDPs, returnees, and host communities in four counties of Jonglei State, South Sudan

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Table 1: Sample population estimates by Boma Among 859 Households in Jonglei South Sudan, June-July 2023

County	Payam	Boma	Population Host and IDP/HH #	Population Proportion/# surveys ^a	IDP population	Estimated IDP population ^b	n ^c (% per Boma)	Weight	Weighted n
Ayod	Mogok	Mogok-Panyang	27,113/3127	60%/135	15,949	15,464	135 (60%)	1.15	156
		Gar	2,445/282	5%/11	200	2,445	11 (5%)	1.28	14
		Kurwai	15,849/1828	35%/79	9,323	5,417	79 (35%)	1.15	91
		Total Population	45,407/5,237	100%/225	25,472	23,326	225 (100%)	--	--
Nyirol	Pultruk	Bariak	22,440/2,588	59%/135	13,200	1,951	115 (61%)	1.12	129
	Pading	Guer	15,342/1,770	41%/94	9,025	1,451	74 (39%)	1.19	88
		Total Population	37,782/4,358	100%/229	22,225	3,402	189 (100%)	--	--
Pigi	Canal	Canal	9,333/1,076	22%/61	5,490	2,142	61 (28%)	0.88	54
		Korfulus	25,551/2,947	61%/123	15,030	7,686	123 (56%)	1.19	147
		Mat	7,155/825	17%/37	4,209	967	37 (17%)	1.11	41
		Total Population	42,039/4,849	100%/221	24,549	10,795	221 (100%)	--	--
Fangak	Pagwir	Chortbora	13,600/1754	63%/63 ^d	1,608	8,830	62 (28%)	1.41	87
	Toch	Toch	9,010/1,039	37%/162	5,300	5,061	162 (72%)	0.32	52
		Total Population	22,610/2,608	100%/225	6,908	13,891	224 (100%)	--	--
		Total 4 Counties	149,446/17,237	100%/900	79,334	51,414 ^e	859		859

^a Number of surveys conducted includes non-respondents

^b Estimated IDP population based on the sample proportion of respondents identifying as IDP within each boma

^c Number of complete surveys/consenting respondents

^d Proportional sampling was not implemented in Fangak due to flooding

^e The total estimated IDP is based on the calculating the estimated number of IDPs in each boma and then summing it up. In the box below, it is calculated by taking the estimated population (149,446) divided by the average number of household members (8.7) and then taking the sample proportion of 37% IDP households to get 6,378 households

A total of 859 households consented to the study which was composed of IDPs (37%), returnees (18%), and host community members (45%) with response rates of 98% among IDPs and returnees and 90% for host community households. The systematic random selection of households allowed for estimation of the population of IDPs, returnees, and host community members in the project area. Across the 10 bomas, there are an estimated 6,378 IDP, 3,103 returnees, and 7,757 host community households.

Table 2: Demographic characteristics of the WASH and nutrition KAP study participants among 859 Households in Jonglei South Sudan, June-July 2023

	N	All	IDPs	Returnees	Host Community	p-Value ^a	p-Value ^a
		Weighted % (95% CI)	Weighted % (95% CI)	Weighted % (95% CI)	Weighted % (95% CI)	IDP vs Host Community	Returnee vs Host Community
Sex						0.254	0.483
Female	586	68.1 (64.7-71.3)	70.2 (64.4-75.4)	69.2 (61.2-76.3)	66.1 (61.0-70.9)		
Male	273	31.9 (28.7-35.3)	29.8 (24.6-35.6)	30.8 (23.7-38.8)	33.9 (29.1-39.0)		
Response rate							
Female	610	95.9 (94.0-97.4)	98.2 (95.3-99.5)	99.1 (94.9-100.0)	92.8 (88.9-95.6)	0.011	0.031
Male	290	93.8 (90.2-96.3)	99.0 (94.4-100.0)	97.9 (88.7-99.9)	88.3 (81.4-93.3)	0.004	0.098
Household Composition							
Total population (No., range)	849	8.7 (8.3-9.0)	8.3 (7.9-8.8)	8.3 (7.5-9.1)	9.1 (8.6-9.6)	0.022	0.085
Children <5 years	768	2.3 (2.2-2.4)	2.4 (2.2-2.5)	2.3 (2.1-2.4)	2.2 (2.1-2.3)	0.163	0.700
Children <2 years	738	1.2 (1.1-1.2)	1.2 (1.1-1.3)	1.1 (1.0-1.2)	1.2 (1.1-1.2)	0.267	0.665
Ethnic Group						<0.001	0.118
Nuer	640	72.7 (69.4-75.7)	79.9 (74.5-84.3)	68.8 (60.7-75.8)	68.9 (63.9-73.5)		
Dinka	193	24.8 (21.9-28.0)	17.7 (13.5-22.8)	30.4 (23.4-38.4)	27.8 (23.4-32.7)		
Murle	5	0.4 (0.1-1.2)	0.7 (0.2-2.3)	0.9 (0.1-6.0)	0.0 (0.0-0.0)		
Shiluk	6	0.4 (0.2-1.1)	0.1 (0.0-0.8)	0.0 (0.0-0.0)	0.8 (0.3-2.3)		
Anyuak	3	0.4 (0.1-1.3)	1.0 (0.2-3.8)	0.0 (0.0-0.0)	0.1 (0.0-0.6)		
Preferred not to say	12	1.4 (0.7-2.5)	0.7 (0.2-2.8)	0.0 (0.0-0.0)	2.4 (1.2-4.6)		
Knows age (years)							
Female	586	72.4 (68.3-76.1)	77.1 (70.4-82.6)	75.5 (65.9-83.0)	67.3 (61.0-73.0)	<0.001	0.036
Male	273	77.4 (71.7-82.3)	84.0 (74.1-90.5)	77.5 (62.6-87.7)	73.2 (64.4-80.4)	0.103	0.963
Age (years)							
Female	483	31.0 (29.9-32.1)	33.0 (31.1-35.0)	30.0 (28.1-31.9)	29.7 (27.9-31.4)	0.016	0.958
Male	235	36.0 (34.6-37.4)	35.6 (33.3-37.9)	34.9 (32.5-37.3)	36.8 (34.6-39.0)	0.820	0.314
Formal Education (years)							
Female	569	0.6 (0.4-0.8)	0.5 (0.3-0.8)	0.4 (-0.1-1.0)	0.8 (0.5-1.0)	0.229	0.239
Male	268	2.3 (1.6-2.9)	2.4 (1.0-3.7)	2.3 (1.2-3.5)	2.2 (1.2-3.2)	0.957	0.899
Self-reported literacy							
Female	586	12.0 (9.5-15.0)	9.7 (6.2-14.9)	9.9 (5.4-17.4)	14.6 (10.7-19.6)	0.249	0.574
Male	273	27.2 (22.0-33.1)	24.3 (16.1-34.8)	36.9 (23.9-52.2)	25.6 (18.6-34.2)	0.813	0.119
Verified literacy							
Female	77	7.5 (5.6-10.1)	7.7 (4.6-12.7)	6.9 (3.4-13.7)	7.7 (5.0-11.7)	0.126	0.281
Male	77	16.9 (12.7-22.0)	15.6 (9.2-25.3)	19.1 (10.0-33.5)	16.8 (11.2-24.6)	0.333	0.677
Verified literacy by years of education < 4 years							
Female	32	2.7 (1.5-4.6)	1.7 (0.5-5.3)	6.7 (3.1-13.9)	1.7 (0.6-4.8)	0.328	0.021
Male	23	4.9 (2.6-9.0)	3.6 (0.9-13.6)	8.6 (2.6-24.6)	4.3 (1.7-10.7)	0.535	0.994
≥ 4 years							
Female	44	67.8 (52.1-80.3)	80.8 (53.7-93.9)	48.4 ^e	61.7 (41.2-78.8)	0.178	0.495
Male	54	61.9 (47.7-74.3)	58.2 (33.9-79.1)	52.2 (22.0-80.8)	69.3 (46.8-85.3)	0.334	0.366
Self-reported numeracy							
Female	586	20.7 (17.4-24.4)	13.3 (9.1-19.0)	33.0 (24.5-42.8)	21.2 (16.5-26.9)	0.078	0.002
Male	273	35.5 (29.8-41.7)	36.9 (27.1-48.0)	37.4 (24.3-52.7)	33.9 (25.9-42.9)	0.910	0.654
Verified numeracy							
Female	125	13.6 (10.9-16.8)	9.4 (5.9-14.7)	19.0 (12.5-27.8)	14.5 (10.6-19.6)	0.654	0.124
Male	98	27.1 (21.9-33.0)	25.3 (16.9-35.9)	37.4 (24.3-52.7)	24.5 (17.6-33.0)	0.464	0.039
Verified numeracy by years of education < 4 years							
Female	68	8.9 (6.7-11.9)	4.2 (2.0-8.5)	16.7 (10.4-25.8)	9.4 (6.0-14.3)	0.627	0.588
Male	41	15.0 (10.5-20.9)	15.4 (8.2-27.0)	20.7 (9.9-38.5)	12.8 (7.3-21.3)	0.276	0.077
≥ 4 years							
Female	46	60.2 (44.4-74.1)	65.7 (38.1-85.7)	48.4 ^e	57.9 (37.5-75.9)	0.764	0.735
Male	56	73.6 (59.7-84.0)	62.2 (37.4-81.9)	90.6 (48.3-99.0)	74.1 (51.6-88.5)	0.150	0.141
Contributes to household income							
Female	580	74.4 (70.5-78.0)	61.5 (54.3-68.3)	73.7 (64.1-81.5)	85.0 (80.0-88.9)	<0.001	0.006
Male	271	85.7 (80.7-89.5)	78.3 (68.3-85.9)	88.3 (74.1-95.2)	89.5 (82.5-93.9)	0.015	0.793
Weekly household income (USD) ^b							
Female	159	70	Median = 80	45	70	0.227	0.683
Male	118	50	Median = 50	20	80	0.264	0.003
Household owns land	854	76.6 (73.4-79.4)	72.0 (66.3-77.1)	74.4 (66.5-81.0)	80.7 (76.3-84.5)	0.007	0.103

Occupation		854					
Agriculture/Herding/Fishing			53.9 (50.3-57.4)	43.7 (37.8-49.8)	53.8 (45.6-61.8)	61.5 (56.3-66.4)	<0.001
Other ^c			24.7 (21.7-27.9)	23.6 (18.8-29.2)	27.7 (21.0-35.7)	24.2 (20.0-28.9)	0.302
Not working			12.9 (10.8-15.4)	22.9 (18.3-28.3)	7.9 (4.6-13.4)	7.6 (5.3-10.7)	
Small business			8.5 (6.7-10.7)	9.8 (6.7-14.0)	10.5 (6.4-16.7)	6.8 (4.6-9.9)	
Marital Status		856					0.006
Never married			3.3 (2.2-4.8)	2.0 (0.9-4.5)	3.9 (1.8-8.3)	4.0 (2.4-6.7)	0.649
Married			86.3 (83.6-88.5)	91.1 (86.9-94.0)	84.6 (77.9-89.6)	83.4 (79.1-86.9)	
With a partner			4.4 (3.2-6.2)	1.3 (0.4-3.6)	6.3 (3.3-11.7)	6.1 (4.0-9.1)	
Wife/husband missing/conflict			1.7 (1.0-3.0)	1.2 (0.4-3.6)	0.7 (0.1-5.1)	2.6 (1.3-4.9)	
Divorced/separated/no longer in partnership			0.9 (0.4-1.8)	1.6 (0.6-4.2)	0.0 (0.0-0.0)	0.7 (0.2-2.3)	
Widow/widower			3.4 (2.3-5.0)	2.9 (1.5-5.9)	4.5 (2.1-9.2)	3.3 (1.9-5.9)	
Average number of wives (male)		269	2.0 (1.7-2.2)	1.8 (1.6-2.0)	1.9 (1.5-2.3)	2.1 (1.7-2.5)	0.401
Wife number (female) ^d		539					0.007
1st			54.0 (49.7-58.3)	57.2 (49.9-64.1)	50.4 (40.6-60.2)	53.2 (46.8-59.4)	0.065
2nd			24.2 (20.8-28.1)	22.4 (16.9-29.0)	25.0 (17.4-34.5)	25.4 (20.3-31.3)	
3rd or more			13.6 (10.9-16.8)	17.5 (12.7-23.7)	15.9 (9.8-24.7)	9.6 (6.5-14.0)	
Age at marriage							
Female		446	17.9 (17.7-18.1)	18.0 (17.6-18.4)	18.2 (17.6-18.7)	17.7 (17.4-17.9)	0.791
Male		204	22.7 (22.0-23.4)	21.0 (20.0-22.1)	23.2 (22.0-24.5)	23.7 (22.6-24.9)	<0.001
Self-Reported Disability							
Female		584	14.7 (11.9-18.0)	9.8 (6.3-14.9)	15.7 (9.8-24.3)	18.2 (13.8-23.6)	0.008
Male		273	21.7 (16.9-27.3)	17.0 (10.1-27.3)	20.1 (10.7-34.5)	25.2 (18.2-33.9)	0.079
Type of Disability		857					
Vision			6.1 (4.6-8.0)	3.9 (2.1-7.1)	8.2 (4.7-13.9)	6.8 (4.6-10.0)	0.095
Hearing			3.0 (2.0-4.5)	2.0 (0.9-4.7)	4.1 (1.8-8.8)	3.4 (1.9-5.8)	0.285
Mobility			4.8 (3.5-6.5)	2.7 (1.3-5.5)	3.3 (1.4-7.8)	6.9 (4.6-10.0)	0.013
Cognition			0.7 (0.3-1.5)	0.3 (0.0-2.1)	0.0	1.2 (0.5-3.0)	0.182
Self-care			0.9 (0.4-1.8)	1.3 (0.4-3.6)	0.7 (0.2-3.4)	0.6 (0.1-2.4)	0.338
Communication			1.3 (0.7-2.4)	1.2 (0.4-3.7)	1.6 (0.5-5.5)	1.2 (0.5-3.2)	0.997
How long lived in the survey area (years)		789	4.1 (3.8-4.5)	3.3 (2.7-3.9)	1.9 (1.5-2.4)	5.9 (5.3-6.4)	<0.001
Number of displacements over 2 years							
Female		581	1.3 (1.2-1.4)	1.5 (1.4-1.7)	1.8 (1.6-2.0)	0.9 (0.8-1.1)	<0.001
Male		272	1.4 (1.3-1.6)	1.9 (1.6-2.1)	1.8 (1.5-2.2)	1.0 (0.8-1.2)	<0.001
Top three ways for health messaging		859					
Clinic			26.8 (23.8-30.1)	20.8 (16.3-26.1)	29.3 (22.5-37.2)	30.3 (25.7-35.3)	0.004
CHW			29.3 (26.2-32.6)	35.2 (29.6-41.2)	30.2 (23.2-38.3)	24.6 (20.4-29.4)	0.002
Media (Radio, TV, Phone)			12.2 (10.0-14.7)	7.9 (5.2-11.9)	14.8 (9.8-21.8)	14.2 (10.9-18.3)	0.009
Owns							
TV		838	8.1 (6.3-10.3)	10.9 (7.6-15.4)	9.0 (5.3-15.0)	5.6 (3.6-8.6)	0.011
Radio		840	13.7 (11.4-16.4)	14.8 (10.9-19.6)	17.0 (11.7-24.1)	11.5 (8.6-15.3)	0.214
Mobile Phone		838	40.0 (36.5-43.5)	34.9 (29.3-40.9)	53.9 (45.6-62.0)	38.0 (33.0-43.3)	0.394

Abbreviations: CI, confidence interval; USD, United States Dollar (1000 South Sudanese Pound = 1 USD)

^a Categorical variables: Pearson χ^2 test; Continuous variables: two tailed t-test for means.

^b Unweighted medians for those who knew household income (n=277)

^c Other occupation includes: Day labor, Government work, Homemaker, Fetching firewood, Hygiene prompter, Professional, Student, Cutting trees for sale, Hygiene prompter, NGO worker, Teacher

^d Percentages calculated out of all women (including unmarried women) so column percentages do not add up to 100%

^e Only two female returnees with at least 4 years of formal education

Table 3: Weighted Odd Ratios for Knowledge of Handwashing Reasons Among 859 Households in Jonglei South Sudan, June-July 2023

	Weighted OR	95% CI	p-value
IDP vs. Host	1.00	0.97-1.04	0.887
Returnee vs. Host	0.98	0.93-1.03	0.409
Male vs. Female	0.99	0.95-1.04	0.758
Younger age (16-25 yo)	1.03	1.01-1.06	0.007
Underage marriage (<18 yo)	1.01	0.96-1.05	0.748
Less than 4 years of formal education	0.95	0.92-0.98	0.002
Soap in the household	0.99	0.97-1.01	0.238
Pit latrine in the household	0.95	0.92-0.98	0.004
Handwashing station in the household	0.89	0.84-0.95	0.001
Boma			
Bariak (Reference)	1.02	0.98-1.05	0.367
Gar	0.96	0.88-1.04	0.315
Guer	1.02	1.00-1.04	0.049
Korfulus	1.01	1.00-1.03	0.072
Kurwai	1.02	1.00-1.04	0.072
Magok-Panyang	1.03	1.00-1.07	0.048
Mat	0.89	0.82-0.97	0.006
Chortbora	1.01	0.99-1.03	0.170
Pigi	1.03	0.96-1.09	0.424
Tock	1.00	(0.90-1.12)	0.957

Adjusted odds ratios were estimated using a GLM with survey weights

Table 4: Weighted Odds Ratios for Positive Nutrition Attitudes Among 859 Households in Jonglei South Sudan, June-July 2023

	Weighted OR	95% CI	p-value
IDP vs. Host	1.05	0.99-1.12	0.111
Returnee vs. Host	1.05	0.98-1.13	0.190
Male vs. Female	1.01	0.93-1.09	0.887
Younger age (16-25 yo)	0.96	0.90-1.02	0.206
Underage marriage (<18 yo)	1.00	0.94-1.07	0.950
Less than 4 years of formal education	0.93	0.87-0.99	0.030
Second, third, or more wife	0.99	0.93-1.05	0.788
Children screened for malnutrition	1.06	0.98-1.15	0.117
Children treated for malnutrition	0.93	0.88-0.98	0.008
Boma			
Bariak (Reference)			
Guer	1.05	0.99-1.11	0.110
Korfulus	1.01	0.95-1.07	0.793
Kurwai	0.63	0.55-0.72	0.000
Magok-Panyang	0.44	0.40-0.48	0.000
Mat	1.08	1.03-1.14	0.003
Chortbora	1.03	0.98-1.08	0.276
Pigi	1.04	1.00-1.08	0.056
Tock	1.03	0.98-1.07	0.236

Adjusted odds ratios for positive nutrition attitudes were estimated using a GLM with survey weights

Table 5: Characteristics of qualitative interviews quoted for the WASH and nutrition KAP study among 859 Households in Jonglei South Sudan, June-July 2023

Key Informant Code	Sex	Boma	Title
DM1	Female	Juba, Ayod	Survey manager, Nurse Midwife
DM2	Msle	Juba, Nyirol	Survey manager
DM3	Male	Juba, Pigi	Survey manager
DM4	Male	Juba, Fangak	Survey manager
HC1	Male	Ayod	Host community member
CM1	Female	Ayod	Community member

Table 6: Weighted Odds Ratios for Exclusive Breastfeeding Among 859 Households in Jonglei South Sudan, June-July 2023

	Weighted OR	95% CI	p-value
IDP vs. Host	1.11	1.01-1.23	0.038
Returnee vs. Host	0.96	0.85-1.08	0.464
Younger age (16-25 yo)	0.99	0.90-1.09	0.869
Underage marriage (<18 yo)	0.99	0.91-1.09	0.908
Less than 4 years of formal education	1.05	0.95-1.17	0.340
Educated on breastfeeding...	1.18	1.03-1.35	0.015
Second, third, or more wife	0.96	0.88-1.04	0.300
Children screened for malnutrition	0.90	0.79-1.03	0.140
Children treated for malnutrition	0.91	0.78-1.05	0.197
Able to identify at least one strategy to prevent starvation or malnutrition	1.00	0.82-1.22	0.981
Positive nutrition attitudes	1.32	1.09-1.59	0.005
Boma			
Bariak (Reference)	1.00		
Gar	1.29	0.83-2.00	0.251
Guer	0.71	0.55-0.92	0.011
Korfulus	1.37	1.15-1.65	0.001
Kurwai	1.01	0.80-1.27	0.918
Magok-Panyang	1.46	1.12-1.92	0.006
Mat	1.41	1.13-1.77	0.003
Chortbora	0.72	0.56-0.94	0.017
Pigi	1.40	1.16-1.70	0.001
Tock	0.78	0.64-0.95	0.015

Adjusted odds ratios for exclusive breastfeeding were estimated using a GLM with survey weights.

Figure S1: Water Source in Ayod

