The Southern Sudan Maternal and Child Health Transformation (MaCHT) Project
Operational Research Baseline Report July 2013

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Background

Post-conflict South Sudan remains a poor and fragile state, with progress toward reaching the Millennium Development Goals (MDGs) continuing to be a challenge. The country's large urban-rural and regional disparities, geographic isolation, public spending inequities, displacement, second highest illiteracy rate in the world,[1] and limited economic opportunity are all legacies of war that contribute to the challenge. With a population of 8 million people, South Sudan has a little more than 120 medical doctors and just over 100 registered nurses. Additionally, the country has limited institutions for training medical doctors, which includes Juba University, Bahr El Ghazal and Upper Nile universities.[2] Currently, humanitarian agencies provide more than 85 percent of all health care in the country. Located in the western flood plains of the country, Warrap state floods easily during the long rainy season from May through October. While malaria is already endemic in the region, outbreaks of acute watery diarrhea, malaria, and measles are common. Preventive and curative services are either unavailable or inaccessible due to lengthy distances between communities and health facilities, lack of radio communication, and long periods of flooding. These factors, plus low awareness/demand and few skilled staff and medical supplies, cause many communities to remain in poor health, especially the most vulnerable members.

As part of government efforts to address these gaps in coverage of health services and its respective consequences on health outcomes, the Government of South Sudan developed the Basic Package of Health and Nutrition Services For Southern Sudan (January 2009) that stresses the importance of a newly approved cadre of community health providers. These providers are known as Home Health Promoters (HHPs) in the health system and are part of a national strategy to respond to the human resource issues. To support the government's efforts, World Vision (WV), with funding from USAID, is implementing a child survival project, the Mother and Child Health Transformation (MaCHT) project, to reduce maternal, neonatal, infant, and child mortality in Gogrial East and West counties of Warrap State. The program includes operational research (OR) related to the integration of newborn interventions into an integrated

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[1] Government figures indicate that just 27% of the population is literate—40% men, 16% women; Statistical Yearbook for Southern Sudan 2010.
[2] Verbal communication from South Sudan World Vision officer

community case management (iCCM) approach. This report is part of the documentation process of the OR, and it has two main objectives:

1. To determine health coverage and use of basic health care services provided by formal health system and community resources in districts of Warrap state where the WV intervention is taking place.
2. To establish iCCM and newborn interventions' magnitude of coverage, access, and use prior to the implementation of WV's iCCM Plus model in some districts of Warrap state to be used as a post-intervention comparison data. This data will inform the evaluative phase in answering the overall research question, "Do children covered by HHPs using iCCM Plus protocol who are under 5 years old and living in poor and rural communities, show improvement on selected health indicators?"

Methods

A quasi-experimental, community-based, repeated cross-sectional study was designed to determine current beliefs and behaviors around various infant and child health indicators.

Study Population and Procedure

Sampling: A two-stage stratified and weighted random sampling was done. The first stage included the selection of bomas (villages) from four payams (Kuac North, Kuac South, Pathun East, and Pathun West). The total population of these four payams is 131,821. During the first stage, 30 bomas were randomly selected according to population weight. The second stage involved the random selection of 17 households from each boma. Due to the nature of the research objective, only mothers of children under age 2, including newborns, from four specific locations were included. Respondents were chosen through purposive sampling. The sample size for this survey was calculated using the following formula: $n = D [Z\alpha + Z\beta) * (P_1 (1-P_1) + P_2 (1-P_2)/(p_2 - P_1)^2]$.[3] A total population of 511 respondents was included.

Data collection: WVUS staff members went to South Sudan at the end of December 2012 to prepare the logistics of the study. The team consisted of a maternal and child health technical specialist, program management officer, and program associate. WV South Sudan staff members included the field project manager, monitoring and evaluation officer, three supervisors, 12 data collectors, and four data entry clerks. WV South Sudan supervisors underwent virtual training on data collection by WVUS staff. Data collectors received two-day training on how to administer the survey and on selecting the study households. During the training, data collectors went through the survey verbally, question by question, to ensure uniform translation. Questionnaires were then pilot tested in a local village not included in the study. Data collection was conducted for two weeks during February 2013. Respondents were given a structured household-level survey by local staff. Household selection was done through random selection. If there was a child under age 2 within the household, the survey was given. Households were identified as all who share the same kitchen or the same "pot." If there were multiple children under age 2 living in the household, surveyors flipped a coin to determine

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[3] Where n = sample size; D =design effect, since it is a cluster design this will be equal to 2; P_1 = estimated proportion of an indicator measured during baseline (30%); P_2 = estimated target proportion of an indicator (80%); $Z\alpha$ = level of statistical significance of 90%; $Z\beta$ = statistical power of 80%.

which child to include in the survey. Once the first household was surveyed, data collectors continued from house to house until the predetermined number of surveys had been completed for each region. Questionnaires were created by WVUS staff based on set intervention indicators.

Table 1: Household Questionnaire Topic Areas, Warrap State, South Sudan, 2013

Topic Area	Indicators
Demographics	Child sex, Child age, Age of mother, Mother's years of schooling, Languages spoken, Father living in household, Head of household, Mother's employment, Other child caregivers
Maternal and Newborn Care	Antenatal care, Delivery location, Delivery assist, Post-natal check, Newborn care (cord, bathed, wiped, eye ointment), Breastfeeding initiation, First food introduction
Immunizations	Vitamin A supplementation, Vaccination history (including BCG, polio, DTP, measles)
Common Illnesses	Acute respiratory illness and pneumonia, Diarrhea, Fever- including recent history of illness, Care seeking behavior, Treatment

Data Analysis

All collected data were coded and entered into Excel. Data were checked for inaccuracies and inconsistencies, and then entered into SPSS Statistical Analysis software. Data analysis was conducted in two steps. The first step consisted of the production of descriptive statistics for each variable included in the survey. The second included the calculation of p values, confidence intervals, and odds ratios.

Results

General Characteristics of Study Population

All respondents were mothers of children under age 2 (n=511). More than seven of every 10 children included in the study were under age 1 (75 percent, n= 384). Of the children under 1 year old, only 7 percent (n=34) were neonates (birth to 1 month). Child's sex was fairly even, with 55 percent (n=280) of households having a male child (Table 2). The average age of respondents was 29.57 years old with a median of 30 years. The majority of respondents reported not having any schooling (96 percent, n=486). Dinka was the first and most comfortable language for all respondents. A total of 91 percent of households were two-parent (n=467); 68 percent identified the male as the head of the household (n=347). The majority of mothers reported not working outside the home (95 percent, n=484). Of those working outside the home, selling food (2 percent, n=10) and brewing homemade alcohol (0.8 percent, n=4) were the most common professions. Other occupations included handicrafts seller (0.2 percent, n=1), harvester (0.4 percent, n=2), shopkeeper (0.2 percent, n=1), salaried worker (0.2 percent, n=1), irrigation worker (0.2 percent, n=1), and school worker (0.2 percent, n=1). Older siblings were the most common additional caregivers when the mother was outside the home (n=15, 18 percent). Other caregivers include fathers (4 percent, n=3) and grandmothers (5 percent, n=4).

Table 2: Baseline Child Demographics, Warrap State, South Sudan, 2013

Child's Age	<1 month %	1-12 months %	12-24 months %
	34 7%	350 68%	127 25%

Child's Sex	Male %		Female %
	280 54.8%		231 46.2%

Maternal and Newborn Care – Point of service delivery

1. Antenatal Care (ANC)

One third of respondents reported receiving health advice at least once during pregnancy from a health provider (HP).[4] The remaining 70 percent received health advice from community providers (CP),[5] friends, or family members (Table 3).

Table 3: ANC Provider, Warrap State, South Sudan, 2013

	Received health advice
Health Provider	33% (162)
Community Provider	33% (161)
Friend/Relative	34% (165)
Total	488

2. Obstetric Delivery

The majority of children were delivered at home (96 percent, n=491) with a CP assisting 86 percent of the time (n=430). Those mothers who received ANC from an HP were 4.3 times more likely to deliver their child in a hospital compared with those who received ANC from a CP or friend/relative (Table 4) (OR=4.3, p = 0.01).

Table 4: Children ANC by provider and location of delivery, Warrap State, South Sudan, 2013

Where was the child born?				
		Health Facility	Home	Total
ANC Provided by	Health Provider	5% (8)	95% (150)	31% (158)
	Community Provider	1% (2)	99% (158)	32% (160)
	Friend/Relative	1% (2)	99% (163)	32% (163)
	None	0%	100% (22)	4% (22)
	Total	2% (12)	99% (493)	100% (503)

3. Postnatal Care

Of the 511 mothers surveyed, 146 (29 percent) received a postnatal check for their newborn. Almost 8.5 out of 10 postnatal checks were done by community providers, whereas only one

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[4] Doctor, nurse, midwife

[5] Traditional birth attendants (TBA), community health workers (CHW), home health providers (HHP)

out of 10 were done by an HP. Regardless of provider, 55 percent of newborns received a checkup within the recommended three days after delivery (n=84). Children delivered by HPs were almost eight times more likely to receive a postnatal checkup than children delivered by CPs (OR=7.7, p=0.000002). CPs, however, were three times more likely to check on newborns within the three-day recommendation than HPs (OR= 3.3, p= 0.019). See tables 5 and 6.

Table 5: Postnatal checkup and birth assistance provider, Warrap State, South Sudan, 2013

		Did the child receive a postnatal check?		
		PNC Y	PNC N	Total
Who assisted with delivery?	Health Provider	74% (17)	26% (6)	5% (23)
	Community Provider	29% (123)	71% (307	86% (430)
	Friend/Relative	12% (6)	88% (43)	10% (49)
	Total	29% (146)	71% (356)	100% (502)

Table 6: Length of time after birth before postnatal checkup and who performed the check, Warrap State, South Sudan, 2013

		Days after birth			
		<3 days	**3-7 days**	**>7 days**	**Total**
Who performed post-natal check?	Health Provider	20% (16)	43% (6)	50% (3)	25% (25)
	Community Provider	75% (61)	50% (7)	50% (3)	70% (71)
	Friend/Relative	5% (4)	7% (1)	0%	5% (5)
	Total	80% (81)	14% (14)	6% (6)	100% (101)

4. Essential newborn care

The prevalence of newborns receiving all recommended elements of essential newborn care[6] in the surveyed area was 1 percent (n=5). The most common element completed was wrapping the newborn immediately after birth (98 percent, n=502). Only 57 percent of respondents reported using a new razor blade to cut the newborn's cord (n=292). Other items used included used razor blades, boiled scissors, knives, and sorghum stems, which were used 32 percent of the time (n=162). Common items applied to cord after cutting were ash or soot (41 percent, n=149), antiseptic (36 percent, n=133), oil (10 percent, n=38), and dried cow dung (3 percent, n=10). Eye ointment or drops were administered within the first hour after delivery in 6 percent of newborns (n=28). Breastfeeding was common (93 percent, n=465), with 74 percent reporting initiating breastfeeding immediately (n=345). First food introduction was split, with 30 percent (n=126) receiving solids before 6 months old and 43 percent receiving after (n=179). Four out of 10 children under 6 months old (39 percent) were exclusively breastfed.

Immunizations

History of immunization was ascertained both by vaccination card and by mother report, though mother report did not prove to be an accurate source of immunization data (Table 7). Almost half (43 percent, n=222) of all children received the full schedule of recommended

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[6] Essential newborn care includes: cord cut with new razor, antiseptic applied to cord, wiped immediately after birth, bathed six or more hours after birth, wrapped immediately after birth, and breastfed immediately after birth.

immunizations including BCG, polio, DTP, and measles, according to vaccination report cards. A breakdown of prevalence for each individual vaccine is located in Table 7. Over two thirds of mothers (67 percent, n=338) reported their children receiving vaccinations during immunization campaigns within their area.

Table 7: Vaccination prevalence in children birth to 1 year,ᵃ Warrap State, South Sudan, 2013

Vaccine		Mother Report		Vaccine Card	
		Frequency	Percent	Frequency	Percent
BCG		47	19%	112	44%
Polio	0	48	19%	114	45%
	1	36	14%	123	49%
	2	13	5%	114	45%
	3	6	2%	107	42%
	Full	6	2%	104	41%
DPT times	1	33	13%	117	46%
	2	14	6%	112	44%
	3	1	0.4%	104	41%
	Full	1	0.4%	104	41%
Hep B		17	7%	N/A	N/A
Measles		32	13%	106	42%
Vitamin Aᵇ		3	3%	43	40%

ᵃn=253   ᵇn=108 children age 9 months to 1 year

Chart 1: Prevalence of complete immunization and prevalence by type of vaccine among children from birth to 12 months of age, Warrap State, South Sudan, 2013
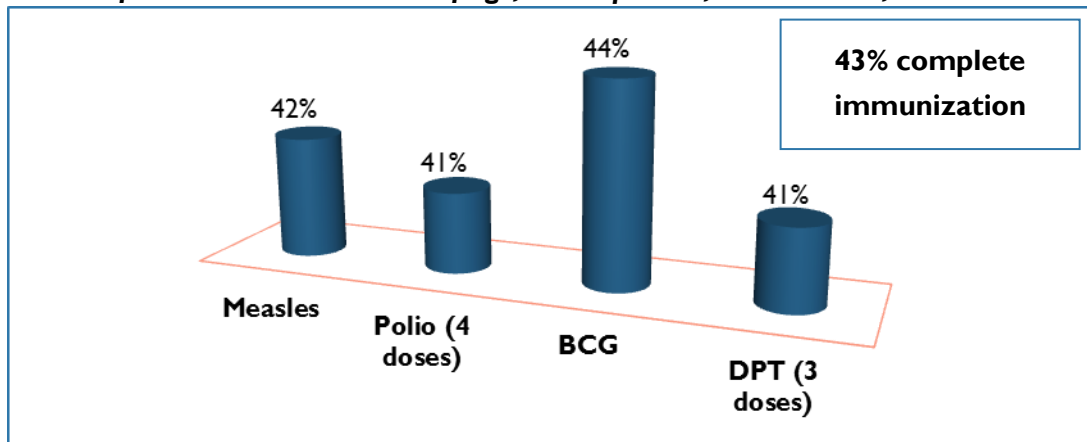
ᵃFor this study, a complete immunization schedule included BCG, three doses of DPT, measles, and four doses of

The DPT drop-out rate was 92.5 percent. Overall, children who received the full schedule of recommended vaccinations were not any more or less likely to suffer from illnesses than those children who did not receive the full schedule of vaccinations. For Acute Respiratory Illness (ARI), children with full vaccines had the same odds of getting ARI than those with incomplete or no vaccinations (OR 0.99, p=0.98). Children with full vaccinations were 1.2 times more likely to have a fever than those with incomplete or no vaccinations, but it was not significant (OR 1.2, p=0.29).

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Common Illnesses

Pneumonia/ARI, diarrhea, and malaria were included in the survey. Mothers were asked to report on symptoms of these illnesses, including cough, difficulty breathing, diarrhea, and fever, in order to estimate the prevalence of the illnesses within the last two weeks. As Table 8 shows, the most prevalent illness found among children under 2 years old was malaria, the most frequent source of delivery care was the heath facility in all three diseases, diarrhea was the disease for which most mothers would seek health care, and timeliness for care seeking was delayed in the majority of cases.

Table 8: Most prevalent illness among children under 2 years old by delivery point, care seeking behavior, and timeliness of care, Warrap State, South Sudan, 2013

| Illness	Prevalence	Delivery point		Care seeking		Timeliness	
		HF	CP	Yes	No	<2 day	2+ day
Malaria	55% (279)	84%(107)	16% (20)	47% (127)	53% (143)	43% (74)	57% (97)
ARI	41% (210)	85% (93)	15% (17)	45% (110)	55% (135)	26% (41)	74% (113)
Diarrhea	35% (178)	74% (69)	26% (24)	52% (93)	48% (85)	NA	NA

Almost half of children with ARI (45 percent) received an antibiotic (amoxicillin) as treatment (Chart 2).

Chart 2: ARI prevalence and type of medicine taken, Warrap State, South Sudan, 2013
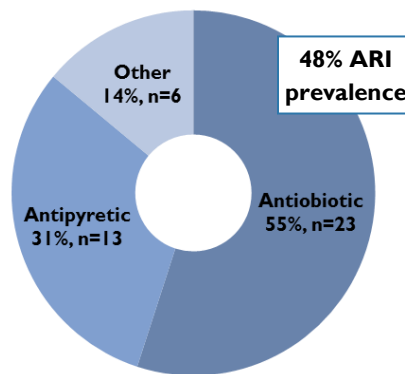

Of the 178 children with diarrhea, 83 percent received an oral rehydration solution (ORS) (n=148), 49 percent an antidiarrheal (n=87), 17 percent antibiotics (n=30), and 21 percent local herbs (n=37) (Chart 3).

Chart 3: Prevalence of diarrhea and liquid replacement, Warrap State,
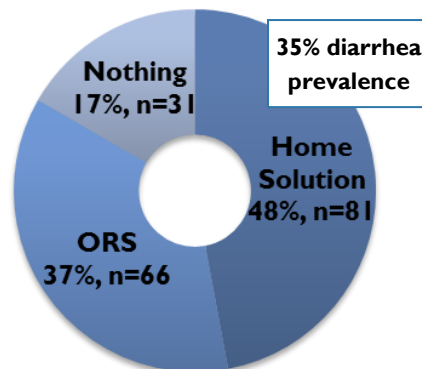
Fever was used as a proxy for malaria as it is a common symptom, and Warrap state is considered an area of intense and stable malaria transmission. Of all children with fevers (n=279), 35 percent were treated with drugs (n=99). Of those who were treated, the majority received antimalarial medications (82 percent, n=81), with Chloroquine being the most common antimalarial prescribed (18 percent, n=28) (Chart 4). Mothers were asked who in the family made the decision to seek care. Mothers reported making the decision themselves half of the time (n=70), fathers decided 23 percent of the time (n=33), and maternal grandmothers 13 percent (n=18) of the time. Malaria medicines were acquired both in the hospital and community settings, though the majority (88 percent, n=67) were acquired at a health facility. Half of surveyed households reported having a mosquito net in the home that children slept under the night before.

Chart 4: Prevalence of malaria and malarial medications taken, Warrap State, South Sudan, 2013
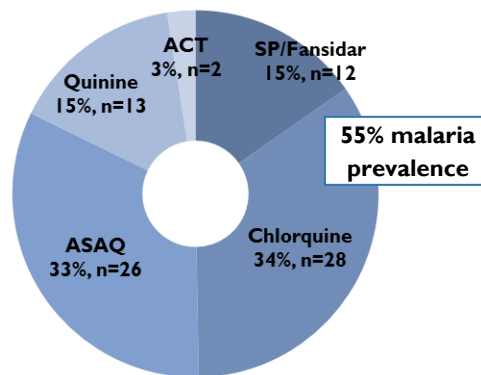
Danger Signs

Mothers were asked which symptoms would cause them to take their newborn or child to a health facility right away. Convulsions and fast or difficult breathing would cause mothers to seek care for their newborns right away, but not older children. Older children would be more likely to be taken to the hospital if they exhibited the following symptoms: not eating, weakness or irritability, vomiting, and diarrhea. Fever was even between both newborns and older children. Overall, mothers reported fever most often as a symptom needing immediate attention. For all illnesses, mothers were almost four times more likely to seek care at a health facility compared with a community setting.

Table 9: Proportion of mothers who would take infant versus child to care for specific illness, Warrap State, South Sudan, 2013

	Neonatal	Post-neo	Total
Convulsions	72% (28)	28% (11)	2% (39)
Not eating	42% (152)	58% (206)	21% (358)
Lethargic, weak, irritable	12% (6)	88% (44)	3% (50)
Fever	50% (354)	50% (359)	41% (713)
Fast or difficult breathing/ cough	63% (179)	37% (103)	16% (282)
Vomiting	13% (32)	87% (218)	14% (250)
Diarrhea	33% (16)	67% (32)	3% (48)

Table 10. iCCM and newborn intervention coverage, access, and use: list of OR baseline indicators

Indicator	Description/definition	WV Baseline	SSHS 2006[7]
Percentage of newborns who started breastfeeding within one hour	# of newborns who were put to the breast within one hour of being born/ Total # of breastfed babies	68% (345/466)	
Proportion of exclusive breastfeeding among children 6 months and under	# of children who did not receive anything other than breast milk until 6 months of age/ Total # of breastfed babies	39% (166/421)	34%
Proportion of mothers of children under 2 who know at least two newborn danger signs	# of mothers who reported that they would seek care for two or more newborn danger signs/ Total # of mothers	52% (264/511)	
Proportion of children who received vitamin A in the last six months	# of children who received vitamin A in the last six months/ Total # of children 9 months or older	17% (43/249)	76%[8]
Proportion of children birth to 1 year who received OPV/BCG vaccination	# of children one year old who received OPV/BCG vaccine/ Total # of 1-year-old children	41% (104/253)	
Proportion of children birth to one-year of age with complete immunization scheme according to MOH (OPV3/DPT3/measles/BCG)	# of children age 1 who received complete immunization/ Total # of 1-year-old children	43% (110/253)	12%
Proportion of neonates visited by a trained worker within three days of birth	# of neonates visited by a trained worker within three days of birth/ Total # of neonates visited by anyone	11% (16/147)	
Proportion of sick children under 5 in CCM target areas taken to CCM-trained HHPs as first source of care	# of sick children taken to CCM trained HHPs as first source of care/ Total # of sick children	7% (ARI: 18/245)	
Proportion of caregivers who know two or more signs of childhood illness that require immediate assessment and treatment if appropriate	# of mothers who reported two or more signs of childhood illness that require immediate care/ Total # of mothers	69% (354/511)	

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[7] The Central Bureau of Statistics (CBS) and the Southern Sudan Commission for Census, Statistics, and Evaluation (SSCCSE). (2007). SSHS: South Sudan Health Survey. Retrieved from http://ssnbs.org/surveys/.
[8] Measurement included children under 5; whereas WV baseline only included population under 2

% of mothers whose newborn's cord was cut with a clean/new instrument or a clean birth kit was used for home deliveries	# of infants whose cord was cut with clean instrument/ Total # of infants	58% (292/500)	
Proportion of newborns with delivery attended at health facility	# of infants who were delivered at a health facility/ Total # of infants	2% (12/511)	10%
Proportion of newborns with delivery attended at home	# of infants who were delivered at home/ Total # of infants	96% (491/511)	
% of mothers whose newborn was not bathed in the first 6 hours after birth	# of infants who were not bathed in the first 6 hours after birth/ Total # of infants	1% (3/511)	

Discussion

The main objective of this survey was to assess the level of coverage of basic health services in selected districts of Warrap State to determine a point of comparison for a post-intervention measurement. As expected, the health system in Warrap State was found to have serious limitations in coverage of basic health services, as well as shortcomings in the quality of rendered services. In a country with one of the highest maternal mortality ratios (2,054 per 100,000 live births),[7] services such as antenatal care and institutional delivery were found to be rare, and in some cases, such as with institutional delivery, almost non-existent, with only 2 percent of deliveries occurring at a clinic and attended by skilled health workers. ANC in the study area was 6 percentage points higher than the national average[7] (32 percent vs. 26 percent); whereas skilled birth assistance was found to be 8 percentage points lower (2 percent vs. 10 percent). Likewise, systemic application of essential newborn care was non-existent even in clinical settings. Only three newborns out of 10 received postnatal care at any time, mostly by community resources. There seems to be a strong and significant association between institutional delivery and postnatal care.

Almost half (43 percent) of children under 12 months old have received a complete immunization scheme (BCG+DPT+polio+measles). This is almost 40 percentage points and 31 percentage points higher than the national and state averages, respectively. In the geographical area included in this study, the main delivery mechanism is not fixed vaccination points but periodic vaccinations campaigns. The DPT drop-out rate was found to be 93 percent, which is an expression of the weakness of the current immunization system. Since the current immunization scheme does not include biological vaccines for protection against diarrhea and/or acute respiratory infections, we did not find a protection factor for these diseases among vaccinated children.

The present recommendations by WHO are that babies should be put to the breast within one hour after birth, be exclusively breastfed for the first six months, and continue to breastfeed along with the introduction of complementary foods for an additional 18 months or longer.[9] The

[9] WHO, Infant and Young Child Feeding. Retrieved from http://www.who.int/mediacentre/factsheets/fs342/en/index.html

prevalence of early initiation of breastfeeding found in the four payams included in this study was 74 percent, which is 24 percentage points higher than the overall average in the African region (50 percent).[10] The overall prevalence of exclusive breastfeeding found in this area of 39 percent is 11 and 19 percentage points higher than state and national averages (20 percent and 28 percent, respectively).[7] Nonetheless, when disaggregated into up to 1 month of age and 1-6 months of age, 29 percent of those exclusively breastfed were newborns, and only 10 percent were in the 1-6 month age group, which is much lower than the global average of 30 percent.[10]

Similar to country prevalence, fever (malaria) was found to be the disease with the highest prevalence in the study area, followed closely by ARI and diarrhea. With the exception of a doubtful pneumonia prevalence, which we found to be 27 percentage points above the national average, diarrhea was found to be eight percentage points below national average (35 percent vs. 43 percent) and malaria was nine percentage points above national average (55 percent vs. 46 percent).[11] Upon questionnaire review, we believe the question regarding pneumonia was not appropriately applied during survey implementation. More than 50 percent of illness cases in the survey area did not receive any health care. Of those who did receive care, the health facility was the most frequent source. However, in seven out of 10 cases, health care was delayed beyond 48 hours. This demonstrates serious limitations in access to care during sickness for children under age 2. Nonetheless, overall access to health care in the area covered by the study is 2.4 times higher than the national average for sick children under 2 (39 percent vs. 16 percent).[12]

Regarding treatment, its coverage and appropriateness varied by disease—diarrhea showed highest compliance with MOH guidelines for those who accessed care. For ARI, considering that a very high number of cases were classified as pneumonia, only half received an antibiotic. As for malaria cases, the study showed a high coverage of cases treated with Chloroquine, which is not the current treatment recommendation within MOH guidelines.[13] Regardless, children under 2 with fever in the study area were more likely to receive treatment within the first 24 hours (17 percent) than the national average.[14] Regarding identification of danger signs, five out of the seven recommended danger signs in the neonatal period were explored in this study. Recognition of three out of five danger signs was 50 percent or above amongst mothers surveyed, with "convulsions" being the most recognized. "Lethargy" and "difficult feeding" were least recognized and therefore are the two danger signs that need to be prioritized during the rest of project implementation.

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[10] Black R E, Vistora CG, Walker SP, et al, and the Maternal and Child Nutrition Study Group. Maternal and child undernutrition and overweight in low-income and middle-income countries. Lancet 2013; published online June 6. http://dx.doi.org/10.1016/S0140-6736 (13) 60937-X

[11] The Central Bureau of Statistics (CBS) and the Southern Sudan Commission for Census, Statistics, and Evaluation (SSCCSE). (2007). SSHS: South Sudan Health Survey. Retrieved from http://ssnbs.org/surveys/.

[12] Idem

[13] Basic package of health and nutrition services for Southern Sudan; Ministry of Health, Government of South Sudan

[14] The Central Bureau of Statistics (CBS) and the Southern Sudan Commission for Census, Statistics, and Evaluation (SSCCSE). (2007). SSHS: South Sudan Health Survey. Retrieved from http://ssnbs.org/surveys/.

Conclusion

These results confirmed the fragile and weak status of health care delivery in Warrap state, South Sudan, and the immense need for the rapid deployment of community-based health services with respective linkages to the primary health care units. Likewise, there seems to be an urgent need to improve competencies and skills at peripheral points of health care delivery within the health system.