



**Sudan (2007): Determinants of  
Mosquito Net Ownership and Use in  
Southern Sudan**

The P S I D a s h b o a r d

**Sudan  
June 2007**

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**Determinants of Mosquito Net Ownership and Use in Southern Sudan**

PSI Research Division  
2007

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*PSI Research Division, "Title," PSI Social Marketing Research Series, (2006)*

*<[http://www.psi.org/research/cat\\_socialresearch\\_smr.asp](http://www.psi.org/research/cat_socialresearch_smr.asp)>.*

## Summary

**Acknowledgements** This MCH (maternal and child health) Tracking Survey was made possible through the support of Global Fund against AIDS, Tuberculosis and Malaria (GFATM). We thank the State authorities in Western Equatoria, Bahr el Jabel and Lake State for authorizing the study. Technical assistance for this study was provided by Saba Khan, the Population Services International (PSI) - Regional Researcher. Data was collected by Research International East Africa Ltd.

**Background & Research Objectives** In March 2007, PSI Sudan conducted a baseline household survey designed to provide evidence for social marketing decision-making. The study had two objectives 1) to measure levels of use of ITNs, WaterGuard safe water product and antimalarials and perceptions towards use of these products 2) to identify the drivers / inhibitors of use of these products and or behaviors. This report presents data for mosquito net ownership and net use analysis.

**Description of Intervention** In 2005 Population Services International (PSI) and the Sudan Secretariat of Health (SOH) launched a social marketing programme to social market long-lasting insecticide treated nets (LLIN) in Southern Sudan with funding from the UK Department for International Development (DFID). During this period PSI initiated preliminary health education and behaviour change communications (BCC) activities to promote the benefits of using LLINs for malaria prevention, and increased the use of commercial channels for access to LLINs in these counties. Over the following months, PSI and the SOH increased their BCC activities, and also expanded LLIN distribution to Mvolo, E. Mundri, W. Mundri, and Yei Counties. The program has also expanded by initiating HIV prevention activities in Tambura, Mvolo and East and West Mundri Counties

**Methodology** A cross sectional household survey was conducted among care takers to children under five years and the general population aged 15-49. The sample was stratified by state; Western Equatoria state; Bahr el Jabal state and Lakes State. A multi – stage cluster sampling approach was used to sample 256 respondents in each strata totaling 768 respondents. The sample for each state was distributed proportionate to size among counties with PSI interventions. In Western Equatoria State, the sample was distributed between villages in 2 counties: Mundri and Mvolo. In Lakes State the sample was distributed between villages in 2 counties: Cueibet and Rumbek and in Bahr el Jabal State, the sample was distributed in villages Yei county only.

Payams were the primary sampling units and ten villages (enumeration areas) were randomly selected from a list of enumeration areas based on the sampling frame used by the Sudan Household and Health Survey (SHHS) in 2006. This list was revised to exclude areas in which security and accessibility were a problem. In each village 25 households were randomly selected and in the household one respondent was randomly chosen using a Kish grid. Multivariate analyses were done to identify factors significantly associated with consistent mosquito net ownership and use. Simple frequencies and means were run to permit monitoring of project indicators. Results are presented in PSI standard dashboard tables. (See appendix 2 for detailed methods).

This study was part of a larger baseline on behalf of the Ministry of Health, Government of Southern Sudan, the National Malaria Control Program and agencies working on the malaria component of the Global Fund for AIDS, Tuberculosis and Malaria (GFATM). Partner NGOs were allocated responsibility for conducting the survey in their areas of operation. The Global Fund sample for the entire study was 729 for Bahr el Ghazal, Equatoria, and Upper Nile Regions. PSI was allocated 9 sites which were incorporated into the survey and data provided to GFTAM.

**Main Findings** 56% of the households own at least one mosquito net. Net ownership is highest in Western Equatoria (67%) and lowest in Bahr el Jabel (48%). About half the children under five years used nets the night before the survey while 62% of pregnant women used nets. Half the nets observed in the households were Serena brand. Use of nets among children under five years of age and pregnant women was highest in Lake State and lowest in Western Equatoria. Two thirds of the respondents know that malaria is transmitted through mosquito bites while 71% know that mosquito nets are the best way of preventing malaria. However, it should be noted that incorrect knowledge about malaria transmission (caused by the sun, dirt, other person, rain, snails) is also high. Overall, perceived availability of nets is low but it is lowest in Bahr el Jabal. Many people think that children under five (65%) are at high risk of malaria, but only a few think pregnant women are at high risk (17%). There is a high level of perceived severity of malaria since over 90% of the respondents think malaria is a major health problem in their community. Majority (90%) of the respondents reported that they are willing to buy a net from the market if it is available but only 34% thought a Mesh net was affordable at SPD 500 and only 25% thought a Dimuria net is affordable at SPD 800.

The survey found that net ownership was strongly associated with availability, knowledge of ITN attributes, knowledge that children under five are at high risk of malaria and knowledge of the impact of malaria on pregnant women. Incorrect beliefs about ITNs (can harm child, causes allergy, affects pregnancy, causes discomfort, causes impotence) were negatively associated with net ownership.

Use of nets among children under five was significantly associated with knowledge of net attributes (kills mosquitoes, protects those who sleep under it daily,). It was also associated with the perception that children are at high risk of malaria. Respondents who reported that nets keep you from getting cold were more likely to report use. Respondents whose spouses had a high education were more likely to be users. Among households with pregnant women, a higher level of knowledge of ITN attributes was associated with use among the risk group (pregnant women). Users also had a high knowledge about the impact of malaria on pregnant women. Respondents with a high socio economic status were more likely to report use among pregnant women.

**Programmatic Recommendations** Interventions should seek to improve availability of mosquito nets in all states. Communication activities should focus on improving knowledge about the risk of pregnant women and children under five to malaria. The program should also promote the numerous ITN attributes / features so as to raise the profile of ITNs.

**Monitoring Table:** Levels of mosquito net use and related Opportunity, Ability and Motivation Indicators in Southern Sudan 2007

**Risk group:** Pregnant Women and Children under five years of age

**Behavior:** Ownership and Use of Mosquito nets

	Lake State (N=256)	Bahr el Jabal (N=256)	Western Equatoria (N=256)	Total (N=768)
<b>Ownership of ITNs</b>	%	%	%	%
Household owns at least one mosquito net <sup>1</sup>	54.7	47.7	66.8	56.4
Household owning two mosquito nets	36.3	21.9	34.8	31.0
Household owning more than two mosquito nets	15.6	4.7	14.8	11.7
<b>Behavior</b> (Use the night before the survey)	%	%	%	%
% of children under 5 who slept under mosquito net (n=622)	61.3	43.6	33.5	46.0
% of pregnant women who slept under a mosquito net (n=125)	79.2	62.2	40.0	61.6
% of people who slept under a mosquito net (n=6250)	71.0	53.7	41.8	56.0
Children under 5 in the household slept under a mosquito net	48.4	27.3	31.7	35.3
Pregnant women in the household slept under a mosquito net	57.4	44.4	30.8	45.1
<b>OPPORTUNITY</b>	Mean	Mean	Mean	Mean
<b>ITN availability</b> (0-1)	.336	.166	.222	.241
<b>Product Attributes</b>	%	%	%	%
Thinks it's hot to sleep under nets	68.8	41.8	35.9	48.8
Thinks setting up a net for people to sleep under is difficult	26.2	17.2	16.4	19.9
Thinks insecticide in treated nets makes them sick	48.0	18.8	29.7	32.2
Thinks nets keep you from getting cold	65.6	45.5	52.0	54.0
Thinks it's uncomfortable to sleep under nets	34.9	20.9	18.8	25.0
<b>ABILITY</b>	%	%	%	%
<b>Knowledge</b>				
Knows a person can catch malaria by being bitten by mosquitoes	75.0	59.0	61.7	65.2
<b>Incorrect knowledge of transmission</b> (0-6)	5.38	3.97	3.88	4.41
<b>Knowledge of Prevention</b>				
Thinks sleeping under a mosquito bed net is the most effective way to protect against Malaria	73.0	66.8	72.3	70.7
<b>Other methods of preventing malaria</b> (0-4)	3.27	2.76	2.71	2.92
<b>Incorrect knowledge about preventing malaria</b> (0-6)	4.84	3.19	3.41	3.82
<b>Impact of malaria on pregnant women</b> (0-5)	1.47	0.98	1.75	1.40
<b>Knowledge of ITN attributes</b> (0-5)	2.80	2.98	3.65	3.14
Thinks children under 5 are most affected by Malaria	52.0	71.1	71.5	64.8
Thinks Pregnant women are most affected by Malaria	17.6	9.8	23.8	17.1

<sup>1</sup> Results are based on nets observed

**Monitoring Table**
**Southern Sudan, 2007**

	Lake State (N=256)	Bahr el Jabal (N=256)	Western Equatoria (N=256)	Total (N=768)
<b>MOTIVATION</b>	%	%	%	%
<b>Perceived severity</b>				
Thinks people die from Malaria	99.2	84.0	98.4	93.8
Thinks Malaria is a major health problem in your community	98.4	89.1	96.1	94.5
<b>Perceived susceptibility for self</b>				
Thinks they are at low risk of getting Malaria	56.6	37.1	46.1	46.6
Thinks people like them get Malaria	59.4	75.4	75.4	70.1
<b>Perceived susceptibility for children under five</b>				
Worried about children under five in their household getting Malaria	39.8	48.0	48.0	45.3
Thinks children are more likely to get Malaria than adults	43.4	48.0	44.5	45.3
<b>Perceived susceptibility for pregnant women (0-1)</b>	.915	.967	.957	.946
<b>Response efficacy for insecticide treated mosquito nets (0-1)</b>	.806	.853	.933	.864
<b>Beliefs (0-1)</b>	.646	.812	.783	.746
<b>Willingness to Pay</b>				
-Willing to buy a net from the market, if it were available	80.5	93.4	96.5	90.1
SPD 500/ USH 1600/ SDD 250 is affordable for a mesh net	44.7	43.4	55.1	34.4
SPD 800/ USH 2400/ SDD 400 is affordable for a Dimuria net	59.4	4.7	14.1	26.0
<b>Exposure</b>	%	%	%	%
Brands of mosquito net heard of				
- Olyset	12.6	2.7	3.1	6.0
- Serena	33.6	51.6	63.7	49.6
- SmartNet	1.6	22.7	3.9	9.4
- Supanet	3.1	2.0	2.7	2.6
- PermaNet	12.1	5.1	6.3	7.8
- Unknown brands	38.3	27.0	27.0	30.7
Ever seen or heard an advertisement for Serena	54.3	53.5	65.2	57.7
Where did you see or hear this advertisement?				
- Special event	1.2	1.6	5.1	20.6
- Shop/product outlet	5.9	5.1	17.2	9.4
- Government office	13.3	3.1	7.4	7.9
- Public Place	33.6	22.3	31.3	29.0
- Radio	0.4	21.5	3.9	8.6
Has ever seen the Serena poster, billboard, signpost, wall message bicycle plaque or other sign	51.2	44.5	62.9	52.9
Heard about the Serena Cup football tournament	12.9	20.3	31.3	21.5
Attended the Serena sports tournament	6.6	13.3	16.0	12.0
Ever hear the Serena radio ad	5.5	31.3	20.3	19.0
Can complete the phrase "You defended your country, now protect your family. Serena..."	93.4	96.9	94.1	94.8
<b>Market Share</b>				



**Monitoring Table****Southern Sudan, 2007**

	<b>Lake State</b> (N=256)	<b>Bahr el</b> <b>Jabal</b> (N=256)	<b>Western</b> <b>Equatoria</b> (N=256)	<b>Total</b> (N=768)
Brand of Nets Owned	N=1590	N=1040	N=860	N=3490
- Serena	27.7	70.2	62.8	49.6
- Permanet	0.6	8.7	5.8	4.3
- Olyset	0.6	1.9	0.0	0.9
- Dumuria	45.9	5.8	12.8	25.8
- Supanet	0.0	1.9	16.3	1.1
- SmartNet	1.3	1.9	2.3	1.1
- DK Brand	23.9	9.6	9.3	17.8

**Monitoring Analysis: Levels of Mosquito Net Ownership and Use and related Opportunity, Ability and Motivation indicators in Southern Sudan, 2007****Net ownership and Use**

Results in the monitoring table above show that a majority of the population own at least one mosquito net. A third of the households (31.0%) reported owning two mosquito nets, while less than one fifth (11.7 %) of the households owned more than 2 nets. Overall, net ownership was highest in Western Equatoria with 66.8% of the households having at least one net, followed by Lake State with 54.7% and Bahr el Jabal with 47.7%.

The survey also sought to find out the proportion of children under 5 who slept under a mosquito net the night preceding the survey. Among the 622 children under 5 investigated, nearly half (46.0%) of the children under 5 had slept under a net the night preceding the survey. A larger proportion (61.3%) of the children under 5 in Lake State had slept under a mosquito net the night preceding the survey as compared to Bahr el Jabal and Western Equatoria which reported a proportion of 43.6% and 33.5% respectively.

To find out what proportion of pregnant women had slept under a mosquito net the night preceding the survey, the respondents were asked if a pregnant woman in the household had slept under the mosquito net. Among the 125 pregnant women found in the households, nearly two thirds (61.6%) reported sleeping under a mosquito net the night preceding the survey.

Results show that 56% of the household members (n=6250) in the surveyed households slept under a mosquito net the night preceding the survey. Of the 56%, 71% were from Lake State, 53.7% were from Bahr el Jabal and 41.8% from Western Equatoria.

**Opportunity, Ability and Motivation Indicators**

Opportunity is a construct that refers to community and service factors that influence ITN use, which is represented by perceptions of availability and product attributes, while ability is a construct that represents an individual's skill and proficiency at solving problems related to ITN use. It is defined by the different levels of knowledge regarding ITNs, knowledge regarding malaria prevention and the impact of malaria on pregnant women. Motivation refers to a construct that describes how a person develops self interest in changing his or her behavior regarding ITN use. It is composed of peoples' perceptions of severity of malaria as a problem, their susceptibility to malaria infection, perceived susceptibility of children under 5 and pregnant women to get infected with malaria. It is also measured by willingness to pay and beliefs regarding ITNs.

**Opportunity**

This was measured by availability of ITNs and measured as a mean ranging from '0' to represent no availability to '1' representing availability of ITNs. Results show that overall, availability was low with a mean score of 0.241. Availability was perceived to be highest in Lake State (0.336) while it was lower in Western Equatoria (0.222) and Bahr el Jabel (0.166).

Attributes of ITNs were reported in percentage form and results portray negative attributes. Nearly half (48.8%) of the respondents reported that they think it is too hot to sleep under a net and nearly one third (32.2%) thought that ITNs make them sick while a quarter (25%) thought that it is uncomfortable to sleep under nets. On a positive note however, more than half (54%) of the respondents thought that nets keep them from getting cold while only one fifth (19.9%) think that setting up a net for people to sleep under is difficult.

Negative attributes were most reported in Lake State as compared to the other states. More than two – thirds (68.8%) of the respondents in Lake State reported that they think it is hot to sleep under a net, 26.2% reported that it is difficult to set up a net for people to sleep under, nearly half (48%) think that insecticide treated nets make them sick. One third (34.9%) of respondents in Lake State reported that they think it is uncomfortable to sleep under nets.

**Ability**

The respondents' ability was measured by their levels of knowledge regarding ways of getting infected with malaria, their knowledge levels on prevention, impact of malaria on pregnant women and children under 5. Results were analyzed and presented in percentage form.

To find out their level of knowledge on how malaria can be got, respondents were asked how is malaria transmitted and 65.2% said it is through mosquito bites. This was highest in Lake State followed by Western Equatoria and Bahr el Jabal with 75%, 62% and 59% respectively. still have incorrect beliefs of causes of malaria. When asked whether working in the sun, drinking dirty water, eating some foods, staying out in the rain and by bathing in rivers or ponds where snails are present, a high mean was recorded. Measured on a scale ranging from 0 representing no knowledge at all to 6 representing very high knowledge, a mean of 4.41 was reported over all the districts.

The study also set out to find the respondents' knowledge on prevention of malaria. Over two thirds (70.7%) of the respondents reported that sleeping under a mosquito bed net would be the most effective way to prevent malaria. This was highest in Lake State with nearly three quarters (73%) reporting in the affirmative while it was lowest in Bahr el Jabal with only two thirds (66.8%).

Knowledge of other ways of preventing malaria was computed in a knowledge index with a scale range of 0 through 4. A mean of 2.92 was recoded in response to the question that malaria can be prevented by killing mosquitoes in the house and by draining all stagnant water. This shows quite low knowledge of other mechanisms of preventing malaria. This was however higher in Lake State with a mean score of 3.27 while it stood at 2.7 in both Bahr el Jabal and Western Equatoria.

Incorrect knowledge of prevention of malaria is also notable and on a scale range of 0 through 6, a mean of 3.82 said that malaria can be prevented through means such as by avoiding contact with people who have malaria, by taking preventive medicinal herbs, by keeping the house clean, by staying away from the sun and by drinking clean water.

At least half of the respondents knew the positive attributes of mosquito nets. On a mean scale of 0 through 5, responses to the questions such as; mosquito bed nets kill mosquitoes; mosquito bed

nets scare away mosquitoes; kill other household insects such as bedbugs, cockroaches; protect those who sleep under it from malaria; lead to reduction of medical bills you pay for treatment of malaria, had a mean score of 3.14. This was highest in western Equatoria (3.65) and lowest in Lake State (2.80).

Respondents think that children under 5 are most affected by malaria compared to pregnant women. Whereas up to 64.8% of the respondents think children under 5 are most at risk, only 17.1% think it is pregnant women who are most at risk. Very few respondents know the effect of malaria on pregnant women. On a scale range of 0 representing no knowledge to 5 representing very high knowledge, a mean of 1.40 was recorded.

### **Motivation**

Motivation was measured by perceptions of severity, susceptibility of the respondents, susceptibility of the pregnant women and susceptibility of children under 5.

Almost all the respondents think that people die from malaria and majority (94%) agree that malaria is a major health problem in their community. Over two thirds (70.1%) of the respondents interviewed perceived that people like them are at risk of getting malaria. This was highest in Bahr el Jabal and Western Equatoria with each having three quarters (75.4%) of the respondents in the affirmative.

The respondents were asked during the survey whether they are worried that children under 5 are at risk of getting malaria. This was aimed to measure their perception of susceptibility of children under 5 to getting malaria. Nearly half (45.3%) of the respondents reported that they are worried that children under 5 in the household were at risk of getting malaria. The same proportion (45.3%) responded that they perceive that children are more likely to get malaria than adults.

There is a very high perception among the respondents that pregnant women are at risk of getting malaria. On a scale range of 0 to 1, a mean score of 0.946 was reported.

To find out the perceived response efficacy for insecticide treated nets, respondents were asked questions such as whether insecticide treated nets are more effective than untreated nets for preventing malaria, if insecticide treated nets protect people from mosquito bites because they

repel mosquitoes, and if sleeping under an insecticide net an effective method of preventing malaria. Their responses were computed to a composite mean score on a scale range of 0 through 1. Results show that people have a very positive response efficacy for insecticide treated nets with a mean of 0.864.

The survey also tested whether people were willing to buy a net in the market and how much they would be willing to pay for it. Ninety percent of the respondents were willing to buy a net from the market if they were available. Willingness to buy was lower in Lake State compared to Bahr el Jabal and Western Equatoria.

About a quarter (26%) were willing to purchase a dimuria net at SPD 800/ SDD 400/ USH 2,400 while about a third (34%) were willing to purchase a mesh net at a lower price of SPD 500/ SDD 250/ USH 1600. Respondents from Western Equatoria were willing to buy a mesh net at the lower price of SPD 500/ SDD 250/ USH 1600 with more than half (55%) reporting they would buy a net at that price but this drops to 14% with a price increase to SPD 800/ SDD 400/ USH 2,400 for a dimuria net. On the contrary, more respondents from Lake State were willing to buy the dimuria net at a higher price while they were less willing to buy a mesh net with the lower price.

### **Exposure to Marketing and Communication for Mosquito Nets**

Respondents were more aware of Serena net brand with nearly half (49.6%) reporting they had ever heard of that brand while respondents are less aware of the other brands such as Olyset, SmartNet, Supernet and PermaNet with less than 10% reporting that they have ever heard each of them. A significant plurality of respondents was also not aware of any brands of nets. A third (30.7%) of the respondents reported that they have never heard of any net brand.

More than half (57.7%) of the respondents reported that they had ever heard an advertisement for Serena net. Most of these saw the adverts at a public place (29%) or at a special event (20.6%). Other places where the adverts were seen or heard were at the shop/product outlet (9.4%), government office (7.9%) and radio (8.6%). In Bahr e Jabal, most respondents saw or heard about Serena from a public place and radio. In Western Equatoria it is through public places and shop/product outlet while in Lake State it is found in public place and government office.

More than half (52.9%) of the respondents had ever seen the Serena poster, bill board, signpost and wall message. Most of these were from West Equatoria (62.9%) and Lake State (51.2%).

Nearly a quarter (21.5%) of the respondents had ever heard about a Serena sports tournament. Most of these were from Western Equatoria with 31.3% reporting that they have ever heard of a Serena sports tournament. At least 12% of the respondents report that they have ever attended a Serena sports tournament.

Results also show that 19% of the respondents have ever heard a Serena radio ad. This was least reported in Lake State (5.5%) while it was most reported in Bahr el Jabal (31.3%).

**Market Share**

The exercise involved identifying the brand of nets owned in households. Of the 3,490 nets observed in the households, nearly half (49.6%) were Serena while 26% were Dumuria. For 18% of the nets observed, their brands were unknown.

**Segmentation Table:** Determinants of mosquito net ownership in Southern Sudan, 2007

**Risk group:** General Population

**Behavior:** Owns at least one mosquito net

	Users N=471 61.3%	Non-Users N=297 38.7%	OR	Sig.
<b>OPPORTUNITY</b>				
<b>Availability</b>	.279	.183	3.18	***
<b>Product Attributes</b>				
Thinks it's hot to sleep under nets	48.6	56.2	-	
Thinks it's difficult to find a place to hang a net	21.7	21.9	-	
Thinks insecticide in treated nets makes them sick	33.8	29.6	-	
Thinks mosquito nets keep a person from getting cold	61.3	42.5	2.194	***
<b>ABILITY</b>				
<b>Knowledge of Transmission</b>				
-Malaria is transmitted by mosquitoes	97.0	96.3	-	
-Knows mosquito nets prevent malaria	97.0	96.6	-	
Knows other methods to prevent malaria	2.834	3.058	.821	***
<b>Knowledge of Prevention</b> (index 0-4)	2.93	2.89	-	
<b>Knowledge of ITN attributes</b> (index 0-5)	3.713	2.246	1.608	***
<b>MOTIVATION</b>				
<b>Perceived severity</b>				
Thinks Malaria affects children's growth	88.2	87.7	-	
Thinks Malaria affects pregnant women's health	93.8	90.6	-	
<b>Perceived susceptibility for self</b>				
Thinks they are at low risk of getting Malaria	47.6	45.1	-	
<b>Perceived susceptibility for children under five</b>				
Thinks children under five are at high risk of malaria	71.4	54.4	2.12	***
<b>Perceived susceptibility for pregnant women</b>				
	.92	.97	-	
<b>Knows impact of malaria on pregnancy</b> (index 0-5)	1.570	1.14	1.449	***
<b>Response efficacy for insecticide treated mosquito nets</b>				
	.89	.81	-	
<b>Beliefs</b>	.723	.784	.416	*
<b>Intention</b>				
Willing to buy a net if available in the market	94.9	82.5	-	
<b>POPULATION CHARACTERISTICS</b>				
<b>Age</b>	29.8	30.7	-	
<b>Socio Economic Status (Quintile)</b>				
Lowest	38.4	40.4		
Second	3.4	10.1	-	
Middle	17.2	18.5		
Fourth	27.4	24.2		
Highest	13.6	6.7		
<b>Marital Status</b>				
Single	24.2	20.9	-	
Married	75.8	79.1		
<b>State</b>				
-Lake State	34.8	31.0	-	
-Bar el Jabel	26.3	44.4		
-Western Equatoria	38.9	24.6		
<b>Education Level</b>				
Secondary & above	15.5	10.1	-	
Primary or less	84.5	89.9		

Hosmer & Lemeshow Goodness of Test Fit p=0.016; Chi square test is 275.933 df 7 p<.001

Cox & Snell R squared = .302;

Nagelkerke R Squared = .410

Note: Proportions or means for each variable are adjusted for all other variables in the model.

† =p<.10 \* =p<.05, \*\* = p<. 001, \*\*\* = p<. 000, blank is not significant



**Segmentation Table:** Determinants of mosquito net use among children under five in Southern Sudan, 2007

**Risk group:** Children under five years of age

**Behavior:** Slept under a mosquito net the night before the survey

	Users N=143 35.6%	Non-Users N=259 64.4%	OR	Sig.
<b>OPPORTUNITY</b>				
<b>Availability</b>	.27	.20	-	
<b>Product Attributes</b>				
Thinks it's hot to sleep under nets	41.0	51.5	-	
Thinks it's difficult to find a place to hang a net	20.1	18.2	-	
Thinks insecticide in treated nets makes them sick	36.1	31.8	-	
Thinks it's uncomfortable to sleep under nets	27.8	18.6	-	
Thinks mosquito nets keep a person from getting cold	68.0	48.1	2.318	***
<b>ABILITY</b>				
<b>Knowledge of Transmission</b>				
-Malaria is transmitted by mosquitoes	97.9	95.8	-	
-Knows mosquito nets prevent malaria	95.8	94.3	-	
<b>Knowledge of Prevention (index 0- 4)</b>	3.06	2.8	-	
<b>Knowledge of ITN attributes (index 0-5)</b>	3.88	2.91	1.399	***
<b>MOTIVATION</b>				
<b>Perceived severity</b>				
Thinks malaria is a major health problem	90.7	95.5	.422	†
Thinks Malaria affects children's growth	83.8	90.0	.532	†
Thinks Malaria affects pregnant women's health	91.7	95.5	-	
<b>Perceived susceptibility for children under five</b>				
Thinks children under five are at high risk of malaria	85.8	72.3	2.49	**
<b>Response efficacy for insecticide treated mosquito nets</b>	.90	.88	-	
<b>Beliefs</b>	.69	.79	-	
<b>Intention</b>				
Willing to buy a net if available in the market	95.8	92.8	-	
<b>POPULATION CHARACTERISTICS</b>				
<b>Age</b>	29.7	30.5	-	
<b>Socio Economic Status (Quintile)</b>				
Lowest	37.5	34.1		
Second	3.5	7.6		
Middle	20.8	17.0	-	
Fourth	22.9	31.8		
Highest	15.3	9.5		
<b>Marital Status</b>				
Single	14.6	18.9	-	
Married	85.4	81.1		
<b>State</b>				
-Lake State	43.1	25.0	.515	***
-Bar el Jabel	29.2	42.4		
-Western Equatoria	27.8	32.6		
<b>Spouse's Education Level (Secondary &amp; above vs. Primary or less)</b>	17.1	12.2	1.776	†
<b>Education Level</b>				
Secondary and above	17.4	15.2	-	
Primary or less	82.6	84.8		

Hosmer & Lemeshow Goodness of Test Fit  $p = .123$  Chi square test is 66.617 df 7  $p < .001$  Cox & Snell R squared = .153 Nagelkerke R Squared = .210 Note: Proportions or means for each variable are adjusted for all other variables in the model. †  $p \leq .10$  \*  $p < .05$ , \*\*  $p \leq .01$ , \*\*\*  $p \leq .000$ , blank is not significant

**Segmentation Table:** Determinants of mosquito net use in Southern Sudan, 2007

**Risk group:** Pregnant Women

**Behavior:** Slept under a mosquito net the night before the survey

	Users N=55 45.1%	Non-Users N=67 54.9%	OR	Sig.
<b>OPPORTUNITY</b>				
<b>Availability</b>	.37	.23	-	
<b>Product Attributes</b>				
Thinks it's hot to sleep under nets	38.2	56.7	-	
Thinks it's difficult to find a place to hang a net	32.7	10.4	-	
Thinks insecticide in treated nets makes them sick	43.6	26.9	-	
Thinks it's uncomfortable to sleep under nets	34.5	22.4	-	
Thinks mosquito nets keep a person from getting cold	67.3	44.8	-	
<b>ABILITY</b>				
<b>Knowledge of Transmission</b>				
-Malaria is transmitted by mosquitoes	96.4	95.5	-	
-Knows mosquito nets prevent malaria	98.2	92.5	-	
<b>Knowledge of Prevention (index 0- 4)</b>	3.0	2.97	-	
<b>Knows impact of malaria on pregnant women (index 0-5)</b>	1.88	1.316	1.607	*
<b>Knowledge of ITN attributes (index 0-5)</b>	3.99	3.03	1.511	**
<b>MOTIVATION</b>				
<b>Perceived severity</b>				
Thinks Malaria affects children's growth	87.3	89.6	-	
Thinks Malaria affects pregnant women's health	98.2	94.0	-	
<b>Perceived susceptibility for self</b>				
Thinks they are at low risk of getting Malaria	47.3	40.3	-	
<b>Perceived susceptibility for pregnant women</b>				
	.58	.72	-	
<b>Response efficacy for insecticide treated mosquito nets</b>				
	.90	.86	-	
<b>Beliefs</b>				
	.62	.74	-	
<b>Intention</b>				
Willing to buy net if available	96.5	84.9	10.604	*
<b>POPULATION CHARACTERISTICS</b>				
<b>Age</b>				
	30.2	28.5	-	
<b>Socio Economic Status (Quintile)</b>				
Lowest	34.5	34.3		
Second	3.6	6.0	1.579	*
Middle	18.2	23.9		
Fourth	21.8	29.9		
Highest	21.8	6.0		
<b>Marital Status</b>				
Single	14.5	16.4	-	
Married	85.5	83.6		
<b>State</b>				
-Lake State	49.1	29.9	.259	***
-Bar el Jabel	29.1	29.9		
-Western Equatoria	21.8	40.3		
<b>Education Level</b>				
Secondary & above	14.5	13.4	-	
Primary or less	85.5	86.6		

Hosmer & Lemeshow Goodness of Test Fit p=.823

Chi square test is 40.542 df 5 p<.001

Cox & Snell R squared = .283

Nagelkerke R Squared = .378

Note: Proportions or means for each variable are adjusted for all other variables in the model.

† =p≤.10 \* =p<.05, \*\* = p≤. 001, \*\*\* = p≤. 000, blank is not significant

**Segmentation Analysis: Determinants of mosquito net ownership, use by children under five and pregnant women, Southern Sudan, 2007**

In the three segmentation tables above logistic regression analysis was conducted and for each table the dependent variables were 1) net ownership 2) net use by children under five 3) net use by pregnant women respectively (1=yes, 0=no). Mean scores and adjusted percentages for determinants that were found to be statistically significant are shown in the table with a narrative below. Proportions for users and non – users are also presented for non-significant factors but their odds ratios are not included and they are not accompanied by narrative. The mean scores and percentages are adjusted for other significant factors in the final logistic regression model.

**Determinants of Net Ownership:** Nearly two thirds of the households reported that they own mosquito nets. Respondents who think that nets are easily accessible were 3.1 times more likely to own nets. Knowledge of ITN attributes was positively associated with net ownership. High knowledge that children under five are at high risk of malaria was also positively associated with net ownership. Respondents with a high knowledge of the impact of malaria were 1.4 times more likely to own mosquito nets. Respondents with high knowledge of other prevention methods were more likely to own mosquito nets. Incorrect beliefs about ITNs (can harm child, causes allergy, affects pregnancy, causes discomfort, causes impotence) was negatively associated with net ownership.

**Determinants of Net Use by Children Under Five:** Out of the 402 households who reported having children under five, only one third (36%) reported that children under five slept under an ITN the night before the survey (users). Respondents with correct knowledge of net attributes (kills mosquitoes, repels mosquitoes, kills other household insects, protects those who sleep under it daily, leads to reduction in medical bills) were 1.3 times more likely to be users. Respondents who think that under fives are at risk of malaria were more likely to be users. Respondents who reported that nets keep you from getting cold were 2.3 times more likely to be users. Respondents whose spouses had a high education were more likely to be users. Non – users were more likely to think that malaria has a higher level of severity compared to users. Use of nets by under fives is significantly lower in the Lakes State compared to the others.

**Determinants of Net Use by Pregnant Women:** Out of the 122 households who reported having pregnant women 45% reported that the pregnant women had slept under an ITN the night before the survey (users). Respondents with a higher level of knowledge of ITN attributes (kills mosquitoes, repels mosquitoes, kills other household insects, protects those who sleep under it daily, leads to reduction in medical bills) were 1.5 times more likely to be users. Respondents with a high knowledge about the impact of malaria on pregnant women were 1.6 times more likely to be users. A high willingness to buy nets was strongly associated with use of ITNs by pregnant women in the household. Respondents with a high SES level were 1.5 times more likely to be users.

**Programmatic Recommendations**

The following recommendations are derived from the study results:

- The program should improve availability of mosquito nets in all states since this indicator is low and yet it is a driver of net ownership.
- There is a need to further increase awareness about the key risk groups for malaria i.e. children under five and pregnant women should be raised. There is very low awareness of the risk of malaria especially among pregnant women. The target group should be given more knowledge about the impact of malaria especially on pregnant women.
- Net promotions should focus on the multitude of net attributes that were found to be associated with net ownership and use among the risk group. Nets may be promoted as; kills and repels mosquitoes, kills other household insects, protects those who sleep under it daily, leads to reduction in medical bills. Knowledge of these attributes was significant driver of use and ownership.
- Interventions should be done using community level activities such as IPC since other channels like radio have small audiences, especially in Lake and Western Equatoria States.

**SOCIODEMOGRAPHIC CHARACTERISTICS**

Indicator	Lakes State % (N=256)	Bahr el Jabal % (N=256)	Western Equatoria % (N=256)	Total % (N=768)
Age group				
15-19	14.8	19.6	17.6	17.1
20-24	14.8	18.4	19.9	17.7
25-29	17.6	19.5	23.0	20.1
30-34	16.0	10.2	11.7	12.6
35-39	11.7	10.5	10.5	10.9
40-44	12.1	8.2	5.1	8.5
45-49	5.1	7.4	5.9	6.1
50+	7.8	6.3	6.3	6.8
Current marital status				
Never married	17.6	13.3	23.4	18.1
Married	78.5	78.1	73.0	76.6
With Partner	0	1.2	0.4	0.5
Widowed	3.5	4.3	2.0	3.3
Divorced/separated	0.4	3.1	1.2	1.6
Highest level of education attained				
None	86.7	36.7	50.0	57.8
Primary Education	8.6	41.0	36.7	28.8
Secondary school	4.7	21.3	13.3	13.5
Can read and understand a newspaper...Easily	7.0	27.0	22.3	18.8
Income sources				
Crop Farming	64.5	71.9	73.8	70.0
Cattle rearing	19.5	4.3	3.9	9.2
Poultry farming	4.7	2.0	2.7	3.1
Trading/small scale business	28.1	30.9	11.3	23.4
Casual laboring	0.8	16.4	17.2	11.5
Spouse's Highest level of education				
None	85.9	55.5	68.8	70.1
Primary Education	9.0	25.4	18.4	17.6
Secondary school	5.1	19.2	12.9	12.3
Spouse's source of income				
Crop Farming	48.0	53.5	54.3	52.0
Cattle rearing	16.4	5.1	2.7	8.1
Poultry farming	4.3	3.3	1.6	2.7
Trading/small scale business	18.0	27.3	7.4	17.6
Casual laboring	3.1	8.2	5.5	5.6
Employment	3.9	4.3	4.3	4.2
Type of dwelling				
Brick house	6.3	17.2	5.1	9.5
Mud house w/ grass roof	54.3	80.2	76.2	70.4
Grass/bamboo house	39.1	2.0	18.0	19.7
Household toilet				
Own outdoor pit latrine	3.9	63.7	20.7	29.4
Public pit latrine	1.2	4.7	5.9	3.9
Open space	58.2	4.7	16.4	26.4
Bush	34.0	28.5	56.3	39.6

**Appendix 2: Population Characteristics and Other Indicators**

**Southern Sudan, 2007**

Assets in the house					
	Radio	23.8	74.6	51.6	50.0
	Cassette player	14.5	30.1	41.4	28.6
	Bicycle	44.5	71.5	66.8	60.9
<b>MEDIA UTILIZATION</b>					
Frequency of listening to the radio					
	Never	77.0	18.4	38.7	44.7
	2-3 days a week	5.5	3.5	12.1	7.6
	4-5 days a week	2.3	5.5	5.1	4.3
	Every day	12.9	64.8	29.3	35.7
Radio stations listened to					
	Sudan Radio Service	64.4	4.3	80.3	40.7
	Koboko FM	1.7	15.3	0	7.8
	Radio Juba	10.2	3.3	11.5	7.3
	Liberty FM	5.1	13.4	0	7.3
	Capital FM	5.1	0	0	0.7
	Voice of Hope	5.1	1.0	9.6	4.7
	BBC World Service	55.9	27.8	22.7	37.2
	Spirit Fm	0	81.3	0	40.0
Type of radio program do you liked					
	Educational	8.5	19.6	13.4	15.8
	Health	18.6	32.1	22.3	26.6
	Entertainment	27.1	14.4	10.2	14.6
	News	33.9	16.7	44.6	29.4
	Announcements	11.9	17.2	9.6	13.6
Preferred radio listening times					
	6 - 9 A.M	47.5	88.5	68.8	75.5
	3 - 6 P.M	80.4	19.9	42.9	48.2

OTHERS INDICATORS

	Lakes State % (N=256)	Bahr el Jabal % (N=256)	Western Equatoria % (N=256)	Total % (N=768)
<b>OPPORTUNITY</b>	%	%	%	%
<b>ITN availability</b>				
Thinks treated mosquito nets are easily available	36.7	17.6	25.4	26.6
Thinks Serena brand treated mosquito nets are available here	34.8	17.6	25.4	25.9
<b>Product Attributes</b>				
Thinks it's difficult to find a place to hang a net	28.9	18.0	18.4	21.7
Thinks nets provide protection from other insects	71.9	66.4	74.6	71.0
Thinks nets protect from falling debris from the roof	64.5	60.2	61.3	62.0
Thinks sleeping under a net makes you feel constrained	50.8	26.2	27.6	34.6
It's necessary to wash treated nets several times before use	59.8	43.0	46.5	49.7
Thinks hanging and removing nets frequently is tiresome	32.4	23.8	33.2	29.8
Thinks nets that are available are too big for you	22.3	28.1	42.6	31.0
<b>ABILITY</b>	%	%	%	%
<b>Incorrect knowledge about transmission</b>				
Thinks that a person can catch malaria by				
▪ working in the sun	80.9	66.8	58.2	68.6
▪ drinking dirty water	36.3	18.4	19.5	24.7
▪ eating some foods	18.8	12.1	15.2	15.4
▪ staying out in the rain	50.4	37.1	43.4	43.6
▪ From another person with malaria	33.2	5.1	6.3	14.8
▪ Playing or bathing in rivers or ponds where snails are present	31.6	14.5	14.5	20.2
<b>Knowledge of Prevention</b>				
Thinks the most effective way to protect against Malaria is by				
▪ avoiding mosquito bites	65.6	43.8	49.2	52.9
▪ spraying with insecticide	15.6	16.4	24.2	18.8
▪ draining/treating stagnant water	14.1	10.5	10.9	11.8
<b>Incorrect knowledge about prevention (0-6)</b>				
Thinks that one can protect self against malaria by				
▪ avoiding contact with people with malaria	58.6	5.9	10.2	24.9
▪ taking preventive medication/herbs	33.6	24.6	24.6	27.6
▪ using amulets	10.5	5.5	9.4	8.5
▪ avoiding to stay too long in the sun	51.2	31.6	26.6	36.5
▪ keeping the house clean	46.9	23.8	34.8	35.2
▪ keeping the windows closed	16.0	4.3	10.9	10.4
▪ drinking clean water	30.1	24.2	16.8	23.7
<b>Impact of malaria on pregnant women</b>				
Thinks the following could happen to a pregnant woman if she gets Malaria				
▪ Miscarriage/baby could die	56.6	28.5	14.0	44.4
▪ Woman could die	35.2	18.4	44.5	32.7
▪ Underweight baby	12.5	17.2	32.4	20.7
▪ Anaemia (blood could diminish)	14.8	10.2	17.6	14.2
▪ Difficult delivery	28.5	23.8	32.8	28.4
▪ Woman's health would deteriorate	5.1	38.3	26.6	23.3
<b>MOTIVATION</b>	%	%	%	%
<b>Perceived severity</b>				
Thinks Malaria affects children's growth	89.1	89.8	84.8	84.8
Thinks Malaria affects pregnant women's health	93.0	93.0	91.8	92.6
Malaria affects children's growth while they are in the womb	92.6	72.7	75.4	80.2
<b>Perceived susceptibility for self</b>				



**Appendix 2: Population Characteristics and Other Indicators**
**Southern Sudan, 2007**

	Lakes State % (N=256)	Bahr el Jabal % (N=256)	Western Equatoria % (N=256)	Total % (N=768)
Thinks they are at low risk of getting Malaria	56.6	37.1	46.1	46.6
Thinks people like them get Malaria	59.4	75.4	75.4	70.1
<b>Perceived susceptibility for children under five</b>				
Believes children (child) under five in their household could fight off Malaria because their bodies are (is) healthy	28.1	18.2	9.5	18.6
Believes children under five are too young to experience serious medical problems from Malaria	24.6	25.8	30.6	27.1
<b>Perceived susceptibility for pregnant women</b>				
Thinks children are at low risk of getting Malaria	9.4	4.3	6.3	6.6
Thinks pregnant women are at low risk of getting Malaria	10.2	4.7	5.9	6.9
Believes pregnant women in the household could fight Malaria	5.9	.8	.8	2.5
Worried about pregnant women in this home getting Malaria	10.5	10.9	10.5	10.7
<b>Response efficacy for insecticide treated mosquito nets</b>				
ITNs are more effective than untreated mosquito nets for preventing Malaria	74.6	82.8	92.2	83.2
ITNs protect people from mosquito bites because they repel mosquitoes	83.2	89.1	94.5	88.9
Sleeping under an ITN is an effective method for preventing Malaria	80.5	86.3	93.0	86.6
ITNs provide full protection from mosquito bites when people sleep under them	84.4	83.2	93.8	87.1
<b>Beliefs</b>				
Thinks an insecticide treated mosquito bed net				
▪ Causes harm to a child if they sleep under it or chew on it	40.2	22.7	27.7	30.2
▪ Causes skin allergy (itching, coughing, headache or eye sensation when first used	48.4	25.0	29.7	34.4
▪ Affects pregnancy if an expectant woman sleeps under it	31.6	14.8	17.2	21.2
▪ Causes discomfort (reduced fresh air when slept under	37.1	19.5	19.1	25.3
▪ Causes impotence among male users	19.5	11.7	15.6	15.6
<b>Willingness to Pay</b>				
-Willing to pay 750 SPD / 2400 Ush / 375 SDD for Mesh	2.7	31.6	37.9	24.1
-Willing to pay 600 SPD/ 1900 Ush/ 300 SDD for Mesh	71.4	77.8	79.4	78.4
-Willing to pay 1000 SPD / 3200 Ush /500 SDD for Mesh	2.3	28.9	30.9	20.7
-Willing to pay 1200 SPD / 3200 Ush / 600 SDD for Dimuria	40.2	4.3	8.2	17.6
-Willing to pay 1600 SPD / 4800 Ush /800 SDD for Dimuria	35.2	4.3	6.3	15.2
-Willing to pay 950 SPD / 2900 Ush/475 SDD for Dimuria	83.5	72.7	71.4	80.7
<b>Characteristics of Nets Observed</b>	<b>(N=314)</b>	<b>(N=196)</b>	<b>(N=320)</b>	<b>(N=828)</b>
% of nets observed in new / good condition	84.6	79.6	72.8	78.9
% of nets obtained more than 2 years ago	44.6	33.7	33.3	37.7
How often was this net used in the past year?				
▪ Every night	93.8	82.4	26.9	65.1
▪ During the rainy season	5.4	11.2	71.3	32.2
<b>Source of Nets</b>				

## Appendix 2: Population Characteristics and Other Indicators

Southern Sudan, 2007

	Lakes State % (N=256)	Bahr el Jabal % (N=256)	Western Equatoria % (N=256)	Total % (N=768)
% of nets obtained from				
▪ Dukan	67.9	46.4	53.6	57.3
▪ Tabuliyu	6.7	15.8	16.3	12.6
▪ Bicycle Peddler	1.3	3.6	0.3	1.5
▪ Women's group	1.3	3.6	4.4	6.4
▪ Youth Group	1.9	0.0	3.4	2.1
▪ Other shop	2.6	2.6	2.8	2.7
▪ Hawker/outdoor	2.6	7.7	3.8	4.2
▪ Donation/gift	3.5	20.4	15.0	12.0
% of nets got from their payam	70.5	48.0	65.9	63.3
% of nets that were already treated with an insecticide to kill or repel mosquitoes	58.7	68.4	73.1	66.5
% of nets that were first washed before use for the first time	80.1	59.7	67.2	70.3
% of nets that are stored outside in the sun when not in use	14.1	2.0	12.2	10.5
% of nets that are stored inside the house when not in use	85.9	98.0	87.8	89.5

Log frame Indicators				
<b>Malaria</b>				
The % of households owning at least one LLIN	48.4	40.6	55.1	48.0
The % of pregnant women and of children under the age of five who slept under a net last night				
The % of men and women who know malaria is transmitted only through mosquito bites (spontaneous)	0	10.9	12.1	7.7
The % of men and women who know malaria is most serious for pregnant women and children under age five.	13.7	5.9	17.2	12.2
The % of men and women who cite mosquito nets as the most effective method of preventing malaria	73.0	66.8	72.3	70.7
The % of men and women who know where to buy LLINs				
The % of men and women who report LLINs as being affordable	2.7	2.7	5.1	3.5
<b>MCH</b>				
% of mothers or caregivers of children under age five with correct knowledge of diarrhoea causes and treatment	55.1	47.7	53.5	52.1
% of children under age five with diarrhoea in past 2 weeks who are reported by mother or care giver as being appropriately treated (e.g., more liquid intake, food not withheld)	41.4	20.8	34.5	33.3
% of children under age five with diarrhoea in past 2 weeks who are reported by mother or care giver as being treated with ORS/zinc	65.5	70.8	65.5	66.7
% of households with correct knowledge and practice of healthy hygiene and water sanitation				

### Notes

- LLINs include : Serena, Permanet, Olyset, Dumuria, Supanet, SmartNet
- Affordability was measured using questions about the affordability of Dumuria nets at the pre set price of SPD 800 / USH 2400 /SDD 400. And affordability of Mesh nets at SPD 500 /USH 1600 /SDD 250.
- Knowledge of diarrhoea causes includes; knowledge of at least one of these as a cause of diarrhoea; dirty water, contaminated food, flies, poor hygiene
- Knowledge of diarrhoea treatment: was derived from knowledge of 'more fluids', 'more drinks', 'ORS' or 'Zinc' were reported as known treatments

### Methodology

**Sampling and participants:** The sample was stratified by state for three states i.e. Western Equatoria, Bahr el Jabal and Lakes state. The sample per strata was arrived at by calculating the sample size for the key indicator for the program ‘% of children under five sleeping under a net the previous night’. The best estimate of this indicator is provided by SOSUS MICS 1999, which found 36% of children sleep under a bednet. Based on this figure, we set a baseline estimate of net use by children under age five at 36% with a target of 54%. A minimum sample size to detect an increase from 36% to 54% in net use by children under age five with 80 percent power at a 95 percent level of significance.<sup>2</sup> Using the formula for determining minimum sample size at these levels results in a minimum sample size of N=230 for each subgroup (state). Allowing for 5% refusals increases this to N=242; for simplicity in setting sample size at each of the three geographical strata, this is set at the nearest number divisible by 16 or N=256 per state. Thus the total sample size was 256\*3 or 768. The sample for each state was distributed proportionate to size among counties with PSI interventions. In Western Equatoria State, the sample was distributed between villages in 2 counties: Mundri and Mvolo. In Lakes State the sample was distributed between villages in 2 counties: Cueibet and Rumbek and in Bahr el Jabal State, the sample was distributed in villages Yei county only.

The primary sampling units (PSUs) were payams from the selected counties. Individuals were selected for the survey in the following sampling design:

- 1) The number of enumeration areas (villages) to be selected in state was determined by dividing the population sample size required in each state by the number of household to be selected (256 / 25 HH = 10 villages per state). The required number of villages was then randomly selected from a list of enumeration areas based on the sampling frame used by the Sudan Household and Health Survey (SHHS) in 2006. This list was revised to exclude areas in which security and accessibility were a problem.
- 2) At the second stage a total of 25 households were randomly selected from each village.
- 3) At the third stage all household members in the selected household were listed in the household roster. From the list of eligible individuals one respondent was randomly chosen using

<sup>2</sup> The formula for minimum sample size is:

$$n = \frac{deff \times \left[ Z_{1-\alpha} \sqrt{2P(1-P)} + Z_{1-\beta} \sqrt{P_1(1-P_1) + P_2(1-P_2)} \right]^2}{(P_2 - P_1)^2}$$

where:

D = design effect (set at 2);

P<sub>1</sub> = the estimated proportion at the time of the first survey; P<sub>2</sub> = the proportion at some future date such that the quantity (P<sub>2</sub>-P<sub>1</sub>) is the size of the magnitude of change that one wishes to be able to detect;

P = (P<sub>1</sub>+P<sub>2</sub>) / 2;

Z<sub>1- $\alpha$</sub>  = the z-score corresponding to the probability with which one can be certain that an observed change of size (P<sub>2</sub>-P<sub>1</sub>) did not occur by chance (that is, the level of significance); (set at 1.645 for 95% level)

Z<sub>1- $\beta$</sub>  = the z-score corresponding to the probability with which one wishes to be certain that a change of size (P<sub>2</sub>-P<sub>1</sub>) will be detected (that is, the power of the survey) (set at 0.84 for 80% power)

Taken from FHI. 2001. Evaluating Programs for HIV/AIDS Prevention and Care in Developing Countries: A Handbook for Program Managers and Decision Makers.

a Kish grid. Two call-backs were made if the selected individual was not at home. If the selected individual could be located in three visits to the household, he or she was replaced

This study was part of a larger baseline study on behalf of the Ministry of Health, Government of Southern Sudan, the National Malaria Control Program and agencies working on the malaria component of the Global Fund for AIDS, Tuberculosis and Malaria (GFATM). Partner NGOs were allocated responsibility for conducting the survey, including remuneration of field staff and supervision of the data collection in their areas of operation. The Global Fund sample size for the entire study was 729 across Bahr el Ghazal, Equatoria, and Upper Nile Regions, with 20 interviews to be conducted in each village. PSI was allocated 9 sites. The allocated sites were incorporated into the PSI survey with the understanding that PSI would provide GFATM with a dataset from which they would conduct analysis as required.

**Data Collection Procedure** PSI hired a consultancy firm (Research International East Africa Ltd) to conduct the data collection and data entry for this exercise. Research assistants were trained by the agency for XX days with the assistance of PSI staff. Having obtained permission from the county and boma authorities to conduct the study, a research assistant moved to the selected household and after introducing him/her self, obtained informed consent to conduct the interview and then conducted the interview.

**Survey Instrument(s)** A structured questionnaire, which measured use of mosquito nets, antimalarials, WaterGuard and perceptions related to these products categorized in terms of Opportunity, Ability and Motivation and population characteristics was used. Perceptions were measured through several items for which responses were dichotomous i.e. agree '1' disagree '0'. The questionnaire was pre –tested and pilot tested, for validity and reliability. Items that were not valid measures of a determinant or were not consistent measures of a construct were dropped and other items added to the scale. Other items were also rephrased to ensure that the tone was not offensive.

**Analytic Technique** Data was entered by a team of research assistants supervised by the Research Agency and analyzed by a PSI consultant using SPSS 12. The following analyses were conducted:

- Perceptions measured using multi – item scales were constructed into composite variables in the following steps. First, factor and reliability tests were done to determine whether they were uni-dimensional measures of a construct and were reliable. Scales were reliable at Cronbachs alpha  $>.70$ . Composite scores were created from multi-item scales which were found to be uni – dimensional and reliable.
- In cases where a scale was not reliable, individual scale items were used to represent the constructs.
- Monitoring analysis was conducted by producing cross tabulations of the relevant variables by state.
- Before segmentation analysis using logistic regression was completed, data was tested for bivariate correlations to detect multi-collinearity and explanatory variables were dropped or combined if they had a high correlation with other variables in that analysis.
- In the initial logistic regression model, all OAM construct items/scales and population characteristics were included. Logistic regression analyses were conducted until a model containing only significant independent predictors of use of the product or targeted behaviour were produced.
- To compare users and non-users, adjusted proportions and means were generated using UNIANOVA with all significant factors as controls

## Reliability Analysis – Mosquito Nets

Composite Variables	2007 (N=768) Cronbach's Alpha	Number of items
<i>Availability</i>	0.868	7
<i>Perceived susceptibility of pregnant women</i>	0.827	3
<i>Response Efficacy</i>	0.821	4
<i>Beliefs</i>	0.769	5

*Items for composite variables:**Availability*

- Are treated mosquito nets easily available?
- Are treated mosquito nets available during all seasons?
- Is the Serena brand treated mosquito net available here?
- Are treated mosquito nets available within walking distance from your home?
- Can you always find treated mosquito nets at nearby shops?
- Are treated mosquito nets available in different types of shops?
- Are treated mosquito nets available within 2 Km from your house?

*Perceived susceptibility of pregnant women*

- Are children at low risk for getting Malaria?
- Are pregnant women at low risk for getting Malaria?
- Do you believe the pregnant woman (woman) in this household could fight off Malaria because their bodies (her body) could fight off Malaria?

*Response Efficacy*

- Are Insecticide treated mosquito nets more effective than untreated mosquito nets for preventing Malaria?
- Do Insecticide treated nets protect people from mosquito bites because they repel mosquitoes?
- Is sleeping under an insecticide treated net an effective method for preventing Malaria?
- Do Insecticide treated nets provide full protection from mosquito bites when people sleep under them?

*Beliefs*

Can an insecticide treated mosquito bed net (read list)?

- Cause harm to a child/baby if they sleep under it or chew on it
- Cause skin allergy (itching, coughing, headache or eye sensation when first used)
- Affect the pregnancy if an expectant woman sleeps under it
- Cause discomfort (reduced fresh air/warmth) when slept under
- Cause impotence among male users
- Be protected from destruction (from rodents/children/fire) easily

*Items for Indexes**Knowledge of ITN attributes*

Can an insecticide treated mosquito bed net (read list)?

- Kill mosquitoes
- Scare away or repel mosquitoes
- Kill other household insects bed bugs, cockroaches, etc
- Protect those who sleep daily under it from malaria
- Lead to reduction of medical bills you pay in this household

*Knowledge of transmission (incorrect)*

How can a person catch Malaria?

- By working in the sun
- By drinking dirty water
- By eating some foods
- By staying out in the rain
- From another person with malaria
- By playing or bathing in rivers or ponds where snails are present

***Knowledge of Prevention (Other methods other than use of mosquito nets)***

What is the most effective way to protect yourself against Malaria?

- By avoiding mosquito bites
- By taking preventive medication/herbs
- By spraying with insecticide

***Knowledge of Prevention (Incorrect)***

What is the most effective way to protect yourself against Malaria?

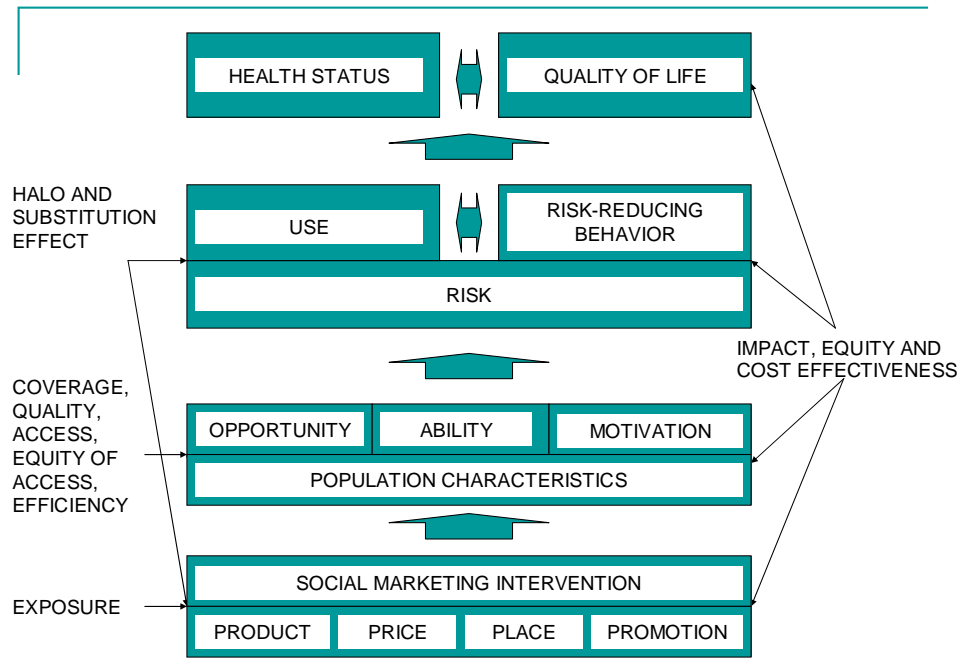
- By draining/treating stagnant water
- By avoiding contact with people with malaria
- By using amulets
- By avoiding to stay too long in the sun
- By keeping the house clean
- By keeping the windows closed

***Knowledge of impact of malaria on pregnant women***

What might happen to a pregnant woman if she gets Malaria?

- Miscarriage/baby could die
- Woman could die
- Underweight baby
- Anaemia/blood could diminish
- Difficult delivery
- Woman's health would deteriorate

▪ Performance Framework for Social Marketing



This study design is guided by PSI’s PERForM framework. PERForM describes the social marketing research process, identifies key concepts important for designing and evaluating social marketing interventions and mirrors the four levels and concepts in the logical framework.

The top level consists of the goal of social marketing for any health promotion intervention, namely improved health status and/or for interventions relating to coping with sickness or disability, quality of life.

The second level consists of the objectives of social marketing stated as product or service use on the left side and/or other risk-reducing behaviours that do not involve the use of a product or service on the right side. The adoption or maintenance of these behaviours in the presence of a given risk or need for health services is causally antecedent to improving or maintaining health and or quality of life.

The third level consists of the determinants of PSI Behaviour Change framework summarised in terms of opportunity, ability and motivation that may differ by population characteristics such as age and sex. The fourth level consists of the characteristics of the social marketing intervention.

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