Liberia Malaria Indicators Survey 2004/2005

DRAFT 1

Final Report

NATIONAL MALARIA CONTROL PROGRAM (NMCP)
MINISTRY OF HEALTH & SOCIAL WELFARE
REPUBLIC OF LIBERIA

In collaboration with:

MINISTRY OF PLANNING & ECONOMIC AFFAIRS (MPEA)
REPUBLIC OF LIBERIA

Funded by:

UNITED NATIONS DEVELOPMENT PROGRAM (UNDP)/
GLOBAL FUNDS TO FIGHT HIV/AIDS, TB & MALARIA (GFATM)
&
WORLD HEALTH ORGANIZATION (WHO)

August 2006

Content

i. Acronyms

Item	Description

Chapter 1. Introduction

1.1. Country profile

Geography And Climate

"Liberia is located in West Africa between 4.24° to 8.50° North and 7.25° to 11.5° West. The country has a land area of 110.080 Km^2 and a coast line of 560 Km along the Atlantic Ocean. It is surrounded by Sierra Leone to the west , Guinea to the north west, and Côte d'Ivoire to the north east and the east (See fig. 1). Most of the country lies below 500 m and is forested and swamps areas are common feature. The climate is suitable for malaria transmission throughout the year for almost all parts of the country. During the main rainy season , July to September, temperatures average 24.5° C and rise to 26.5° C in December and January when it is predominantly dry. Rainfall in the coastal areas such as Monrovia is over 5000 mm per annum, but this decreases as one moves inland to as little as about 2000m m. Average humidity is believed to be about 72 %"[1].

Administration And Vital Statistics

"The country is now divided into 15 Counties that are further subdivided into Districts, Chiefdoms and Clans". The total population is estimated to be between 2,7 and 3 million. Table 1 shows population structure and vital statistics[2].

Table 1. Population Structure and Vital Statistics in Liberia, 2001

Population	2.9 million
Under Five Mortality Rate Per 1000	235 (ranked 5th worldwide)
Annual number of births	129,000
Population under five years	475,000 (16,3 %)
Annual number of under five deaths	30,000
Adult literacy rate – Mean, Male, Female	25 %, 36 %, 18 %
Primary school attendance as % of boys and girls	43 % , 31 %
Secondary school attendance as % of boys and girls	31 %, 12 %
Maternal Mortality Rate	780/100, 000

Malaria situation

"Malaria is endemic in Liberia and one of the main public health problems. It is the leading cause of OPD attendance (40-45%) and is also the number one cause of inpatient deaths. Hospital records suggest that at least 17.8% of inpatient deaths are attributable to malaria. In addition, accessibility due to insecurity has meant that medications and control tools have not been available to the population"[3]

The climate in Liberia is suitable for malaria transmission throughout the year for almost all parts of the country. The transmission is believed to be caused by *Anopheles gambiae* and *An.Funestus* The main parasite is *Plasmodium falciparum* and the entire population is at Risk of malaria[4]

[1] Roll Back Malaria Situation Analysis, Liberia, MOH 2001, pp 6-7
[2] Strategic Plan
[3] Strategic Plan
[4] Country Profile

Fig.1. Map of Liberia showing administrative counties and neighbor Countries

1.2. Survey rationale and objectives

Rationale

Malaria is endemic in Liberia and one of the main public health problems and the entire population is at risk of malaria according to available information. Moreover, "there is evidence of worsening global malaria situation. Malaria mortality rates in Africa are rising…Malaria contributes to widespread human suffering, particularly among the poorest billion people in the world"[5].

"In October 1998, WHO, UNICEF, WORLD BANK and UNDP launched Roll Back Malaria (RBM) as a catalyst for a renewed global commitment to tackle a disease that has been ignored by the world for far too long – a single disease that puts a brake on development, particularly in Africa"[6]. Then after, the African Summit on RBM, held in April 2000 in Abuja, Nigeria, committed "to halve the malaria mortality for Africa's people by 2010" and adopted intermediate objectives to be achieved by 2005 regarding malaria case management and prevention particularly among pregnant women and children[7]. Finally, the 6th goal of the UN Millennium Development Goals (MDGs) set up a target expressing to "have halted by 2015 and begun to reverse the incidence of malaria and other major diseases".

But which baseline data will be used to measure progress achieved after implementing available recommended strategies and state properly that malaria burden is being or has been reduced? We know that "accurate statistics on malaria in Africa have been difficult to collect and report because of the enormity of the disease problem, the weakness of health information systems, and the fact that treatment of most malaria cases, as well as many deaths from the disease, occurs outside the formal health system"[8]. This situation sounds like worse in Liberia where the long civil war (1989-2003) has caused widespread destruction in the national health systems including the health management information system database. To obtain the required information through the national health system is most of time impossible in those "complex contexts". Therefore, a nationally representative survey such as a Malaria Indicators Survey can fill the gap and help to estimate the burden of the disease in terms of morbidity and mortality, as well as gather information related to the coverage achieved so far with the ongoing interventions. That is the rationale of this survey.

Objectives

Overall objective

The overall objective of the Liberia Malaria Indicators Survey (LMIS) is to update the baseline core indicators of malaria in this country.

Specific objectives

- To obtain baseline data on the current status of household possession and use of insecticide-treated mosquito nets (ITNs) among target populations (pregnant women and children under five).
- To obtain baseline data on the current status of treatment of reported fevers with effective antimalarials among children under five

[5] Country Updates, WHO/CDS/RBM/2000.24, p.5
[6] WHO and UNICEF, The Africa Malaria Report 2003, p.7
[7] The African Summit on Roll Back Malaria , WHO/CDS/RBM/2000.17, p.17
[8] Who and UNICEF ,The Africa Malaria Report 2003, p.13

- To obtain baseline data on the current status of pregnant women receiving preventive treatment with antimalarials (SP as IPT) according to national policy
- To obtain baseline data on the prevalence of malaria and anemia in children under five
- To explore the malaria related knowledge, attitude and practice among the Liberian population
- To enhance the RBM initiative in Liberia.

Chapter 2 : Methodology

2.1. Study population and Enumeration Areas (EAs)

All the 15 counties were included in the study, hence the entire population of Liberia constitutes the study universe, but the study population is only from selected Enumeration Areas (EAs). See Table 1 on the next page. The main indicators are determined at the household (HH) level and deal with the most vulnerable groups to malaria; therefore, the target population for the LMIS is defined as all women of reproductive age (15-49) and all children under five years of age.

The last Population and Housing Census for Liberia was conducted in 1984. At that time, a National Sampling Frame comprising of 4,800 EAs was constructed for the Census. Not only is this frame 20 years old, but there has also been many undocumented changes in the size, structure and distribution of population and dwellings. During the 20 years period, many new communities were established, while existing ones had expanded or contracted due to migration and changes in socio-economic development. Additionally, the civil war led to the destruction of many communities and dwellings and massive displacements of the population of certain communities, as well as the death of thousands of people. These new developments have not been documented, what makes the existing sampling frame to be outdated and obsolete to be used in selecting samples for the Liberia Malaria Indicators Survey (LMIS) without undertaking a major verification exercise.

Indeed, in 1999/2000, the Government of Liberia and its partners conducted a Demographic and Health Survey (DHS) using the 1984 National Sampling Frame to select and verify 600 EAs[9]. Even though these 600 EAs are more than 5 years old now and were affected by recent civil wars, they have been considered a National Sampling Frame for the LMIS, since in fact they were nationally selected, verified and can be easily identified and verified at this point of time, thereby saving cost.

A two-stage (EAs at first stage and households at second stage) stratified sample design was developed for the 2005 LMIS. At the first stage, the 600 EAs were stratified by county and rural-urban residence. There are 15 counties and 2 rural-urban strata. The urban stratum comprised all county capitals/headquarters plus the City of Monrovia and was divided into 2 domains: (1) City of Monrovia and (2) the county capitals/headquarters. The rural stratum included the rest of the country, that is, all areas outside of the City of Monrovia and the county capitals/headquarters.
Hence, a total of 17 sampling strata were identified, that is, the City of Monrovia, all county capitals/headquarters grouped together as one stratum, and the reminder (rural parts) of the 15 counties. In view of the foregoing and based on the availability of funds, a total of 360 EAs (60%) were selected out of the 600 EAs with probability proportional to size, that is, to the number of households/structures in 1999/2000 DHS Sampling Frame.

[9] Ministry of Planning & Economic Affairs Republic of Liberia, University of Liberia and UNFPA. Demographic and Health Survey 1999/2000, Volume III Analytic Report, 2000, pp 5-6.

Table 1: Distribution of LMIS Sample Clusters and HHs among the strata

1	2	3	4	5
Serial	**County**	**Rural areas**	**Urban Areas**	**Number of HHs (LMIS Listing)**
1	Bomi	12	--	2,106
2	Bong	21	--	1,938
3	Grand Cape Mount	17	--	1,623
4	River Gee	8	--	425
5	Gbarpolu	8	--	694
6	Grand/Bassa	19	--	1,644
7	Grand Gedeh	14	--	696
8	Grand Kru	17	--	909
9	Lofa	21	--	2,416
10	Margibi	18	--	1,423
11	Maryland	16	--	808
12	Montserrado	20	--	1,106
13	Nimba	33	--	3,164
14	Rivercess	17	--	1,937
15	Sinoe	16	--	779
16	Monrovia	--	69	5,704
17	Other urban	--	34	1,826
	Total	**257**	**103**	**29,198**

In addition to identification and updating of EAs, a complete listing of dwellings/households in the EAs was necessary prior to the selection of households. The listing operation consisted of visiting each of the selected clusters, recording on listing forms a description of every structure together with the names of the heads of the households found in the structure, and drawing a location map of the cluster as well as a sketch map of the structures in the cluster. Twenty field workers (4 teams of 8 interviewers, 4 cartographers and 4 supervisors) completed household listing exercises of the 360 EAs in approximately 40 days (February 25-first week in April, 2005). At the end of the exercise a total of 9000 households were statistically selected for the LMIS from a total of 29,198 households

2.2. Sampling

A. Selection of LMIS Clusters (EAs)

The selection of EAs within each stratum was undertaken through the following steps:

i) Assign measures of size (MoS) to sample EAs based on the 1999/2000 number of households/structures listed. Let the MoS for the i^{th} EA in the h^{th} stratum = M_{hi}

ii) Cumulate the $\mathbf{M_{hi}}$ values, i.e., $\sum M_{hi}$ = M_h

iii) Compute the sampling interval (I) as given in the formula below:

$$I_h = \Sigma\{\frac{M_{hi}}{\sum Mhi} a_h\}$$

Where:

a_h = assigned number of sample EAs (see column 3, table 1) for the h^{th} strata,

iv) Using a random number table, find a random number, R, between one and I.

v) Compute the sequence of sampling numbers:

R; R+I; R+2I; R+3I; etc.

B. Cluster Selection Probabilities:

The cluster selection probability for the **i**th cluster in the **h**th stratum will be given by:

$$f_{hi} = a_h x \frac{M_{hi}}{\Sigma M_{hi}}$$

where: f_{hi} = 1st stage selection probability for the **i**th PSU in the **h**th stratum

Since the EAs are sub-samples of the LDHS, the actual selection probability for the i^{th} EA will be given by:

$$f_{1hi} = [a_h x \frac{M_{hi}}{\Sigma M_{hi}}] p_{hi}$$

Where $\mathbf{p_{hi}}$ = LDHS selection probability for the **i**th Cluster in the **h**th stratum

The values of the P_{hi} were retrieved from the LDHS report

C. Selecting the Secondary Selection Units (SSUs)

The listing teams undertook the following:

- Identifying the location of the selected EAs
- Drawing a sketch map of the EAs
- Sketching structures on the sketch maps
- Listing names of household heads, number of females and males and eligible women (15 - 49 years old)

Sub-sampling of Households

The practical selection procedures are indicated below:

i) Calculate the interval as;

$$I_{hi} = \frac{N_{hi}}{K_{hi}}$$

Where;

N_{hi} = listed number of HHs in the **i**th PSU, in the **h**th stratum
K_{hi} = Allocated sample HHs in the **i**th PSU, in the **h**th stratum

ii) Using a random number table, find a random number, R, between 1 and I.

iii) Compute the sequence of sampling numbers:

R; R+I; R+2I; R+3I; etc.

iv) Sample households, which should be separately listed, are those with associated serial numbers

Household selection probability:

$$f_{2hi} = \frac{n_{hi}}{N_{hi}}$$

where;

f_{2hi} = the probability of selecting a household in the **i**th cluster in the **h**th stratum

$\mathbf{n_{hi}}$ = Sample number of households in the ith cluster in the hth stratum

(D) Overall Household Selection Probabilities

Overall selection probability, for a given sample household, will be the product of selection probabilities at all stages.

Thus, overall selection probability for sample HHs in the **i**th PSU in the **h**th stratum will be calculated as the product of the first and second stage selection probabilities;

$$P_{hi} = f_{1hi} f_{2hi}$$

E. Weights for each sample household:

Sampling weights for the ith cluster in the hth stratum is given by:

$$W_{hi} = 1 / P_{hi}$$

2.3. Data collection

Elaboration of the questionnaire

The LMIS technical committee used existing DHS, WHO & MACRO Survey instruments (manuals, questionnaires, etc references to add) to produce the LMIS survey tools. Two types of questionnaires were developed: the Household questionnaire and the women's questionnaire.

The HH questionnaire is intended to capture information on the characteristic of people in a household : socioeconomic status, water, sanitation, ITNs ownership and use, status of anemia and malaria parasitemia. It comprises 6 sections :

- Section 0 : Introduction and the interviewee's consent (see Annex 1)
- Section 1: HH information (see Annex 2)
- Section 2 : Knowledge , Attitude and Practice (see Annex 3)
- Section 3: Preventive measures (see Annex 4)
- Section 4: Fever in children under 5 years old (see annex 5)
- Section 5: Mortality data (see Annex 6)

On the other hand, the women's questionnaire was aimed at collecting information on the use of IPT as part of antenatal service during the last pregnancy that ended in a life birth, prevalence of fever/convulsion among children under five years of age and type/promptness of anti-malarial treatment given to these children. Three sections are noted:

- Section 6: Introduction and woman's consent (see Annex 7)
- Section 7: Malaria and pregnancy (see Annex 8)
- Section 8: Fever in children under five years old (see Annex 9)

Questionnaire codification

Responses to questionnaire were codified to facilitate computerization and analysis. Each expected response was assigned a number ranging between 1 and 99 in the questionnaire format. In example, "YES" would be noted << 1 >> while << 8 >> would mean "I DON'T KNOW", etc…

Training and Fieldwork

From the 23rd May to 3rd June, 2005, a 10-day training workshop (5 days theory and 5 days practical) was held in Monrovia for 63 participants (Supervisors, Interviewers, Lab technicians/Nurses and Data Entry Clerks) plus an additional seven Sub-Recipients. At the end of the workshop, a total of 59 participants were selected for the LMIS field exercise (after WHO agreed to provide funding for 16 additional interviewers). All survey personnel, including supervisors, received few days training on general topics of the survey, such as consent statements, greetings, interview techniques, teamwork, rules and regulations of the survey, etc. Later in the week, specialized training sessions were conducted for interviewers, lab technicians, supervisors, etc. Various training techniques (lectures, presentations, role-plays, group works, etc) were used during the training sessions.

Once the theoretical training sessions were completed, all questionnaires, as well as anemia and malaria testing methods were field-tested. A 5-day field practice in non-sample households was conducted (May 30-June 3rd, 2005). The purpose of the field practice was two-fold: to allow fieldwork staff to practice survey methods in real life situation and to test the competency of the staff for selection purposes.
After being proven to be working and after some minor modifications, the survey questionnaires were printed and ready for use.

For this exercise, eight (8) teams, each comprising 4 interviewers, 2 lab technicians/nurses, a supervisor/editor, and 2 drivers, were recruited to cover 9,000 households in 33 days of fieldwork. Eight (8) teams were assigned each to approximately 45 EAs. Field staffs, particularly interviewers, were assigned to clusters in which they spoke or understood the local languages.

The LMIS interview phase started on July 1st, 2005 and ended in August, 2005. Four of the 8 teams completed their assignment within 33 days. Four teams (Nimba, Lofa, Sinoe and South Eastern) were delayed for an additional 7 days due to constant vehicle breakdown.

A written informed consent of the head of household was sought from each selected house, using the information and consent forms in the household and women questionnaires.

2.4. Data analysis

Raw data were entered in the computers using the software IMPS and analysis was done using SPSS.

LMIS DATA ANALYSIS PLAN

Step 1: Denominator

Population type	Targeted	Actual Achieved
Household	9,000	8,226
Overall Sample size	All members of sampled HH	40,757
Women (15-49)	All wom. aged 15-49 in sampled HH	9,181
Pregnant women	All Preg. women in sampled HH	755
Children <5	All children <5 in sampled HH	8,933

Step 2: Define main variables

The main variables (indicators) of the LMIS are:
A. Malaria prevention using ITNs
B. Malaria prevention using IPT by pregnant women
C. Treatment of malaria with effective antimalarial according to national policy
D. Malaria Knowledge, Attitude & Practice
E. Prevalence (period) of malaria in <5
F. Prevalence of anaemia

Step 3: Define other variables

Other variables (characteristics) are as follows
Age group (<5, >5, women 15-49)
Sex (Male or Female)
Education (never attended, primary, secondary, post-secondary, college/university)
Marital Status (single, married, widowed, divorced/separated, living together)
Residence (rural/urban)
County (Bomi, Bong, Bassa, Lofa, Cape Mt, Gbarpolu, Nimba, Margibi, Montserrado, Rivercess, Sinoe, G. Gedeh, R. Gee, G. Kru and Maryland)

Step 4: Univariate analysis: Description of each variable

A. Malaria prevention using ITNs

B. Malaria prevention using IPT by pregnant women

C. Treatment of malaria with effective antimalarial according to national policy

D. Malaria Knowledge, Attitude & Practice

E. Prevalence (period) of malaria in <5

F. Prevalence of anaemia

Step 5: Bivariate analysis

A
Malaria prevention using ITNs **X (by)** Age group
Malaria prevention using ITNs **X (by)** Sex
Malaria prevention using ITNs **X (by)** Employment

Malaria prevention using ITNs **X (by)** Education
Malaria prevention using ITNs **X (by)** Marital Status
Malaria prevention using ITNs **X (by)** Residence (rural/urban)
Malaria prevention using ITNs **X (by)** County

B
Malaria prevention using IPT by pregnant women **X (by)** Employment
Malaria prevention using IPT by pregnant women **X (by)** Education
Malaria prevention using IPT by pregnant women **X (by)** Marital Status
Malaria prevention using IPT by pregnant women **X (by)** Residence (rural/urban)
Malaria prevention using IPT by pregnant women **X (by)** County

C
Treatment of malaria with effective antimalarial according to national policy **X (by)** Sex
Treatment of malaria with effective antimalarial according to national policy **X (by)** Employment
Treatment of malaria with effective antimalarial according to national policy **X (by)** Education
Treatment of malaria with effective antimalarial according to national policy **X (by)** Marital Status
Treatment of malaria with effective antimalarial according to national policy **X (by)** Residence (rural/urban)
Treatment of malaria with effective antimalarial according to national policy **X (by)** County

D
Malaria Knowledge, Attitude & Practice **X (by)** Sex
Malaria Knowledge, Attitude & Practice **X (by)** Employment
Malaria Knowledge, Attitude & Practice **X (by)** Education
Malaria Knowledge, Attitude & Practice **X (by)** Marital Status
Malaria Knowledge, Attitude & Practice **X (by)** Residence (rural/urban)
Malaria Knowledge, Attitude & Practice **X (by)** County

E
Prevalence (period) of malaria in <5 **X (by)** Age Group
Prevalence (period) of malaria in <5 **X (by)** Sex
Prevalence (period) of malaria in <5 **X (by)** Residence (rural/urban)
Prevalence (period) of malaria in <5 **X (by)** County

F
Prevalence of anaemia in <5 **X (by)** Age Group
Prevalence of anaemia in <5 **X (by)** Sex
Prevalence of anaemia in <5 **X (by)** Residence (rural/urban)
Prevalence of anaemia in <5 **X (by)** County

Step 6: Multivariate analysis
Step by step decreasing logistic regression

Chapter 3. Findings

3.1. Summary of the demographic characteristics of the sample population

3.1.1. Basic characteristics of sample population

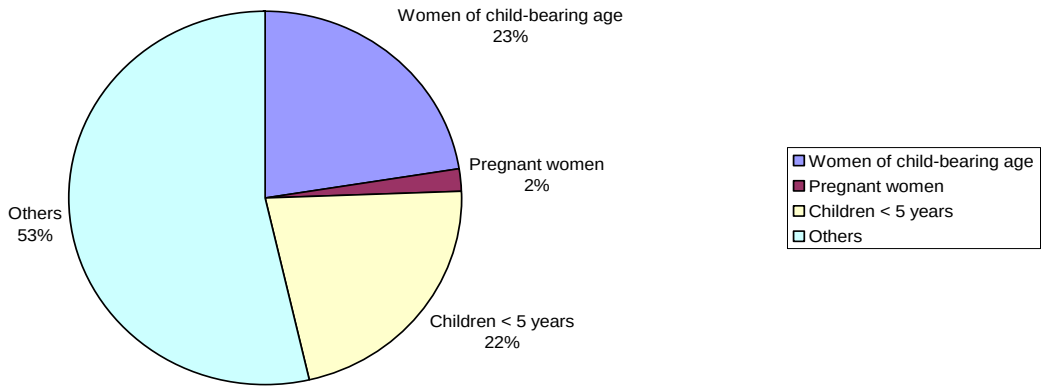
The sample population comprised all heads of households, all women of child-bearing age (15-49), all pregnant women and all children under five years in the sampled households. The table 1 below gives the summary of the different population groups of the survey.

Table 2. Summary of the study targeted population groups

Population Type	Study Targets	Actual Achieved	Proportion (in %)
Households	9,000	8,226	91.40
Overall sample size	All members of sampled HH	40,757	100.00
Women of Child-bearing age	All women 15-49 in sampled HH	9,181	22.53
Pregnant Women	All Preg. Women in sampled HH	755	1.85
Children under five years	All children <5 in sampled HH	8,933	21.92
Others	All than the 3 groups above	21,888	53.70

On 9,000 targeted HH only 8,226 representing 91, 4 % were reached. The figure 2 below shows up the distribution of the different population groups in study.

Fig. 1. Proportion of population groups, LMIS 2005

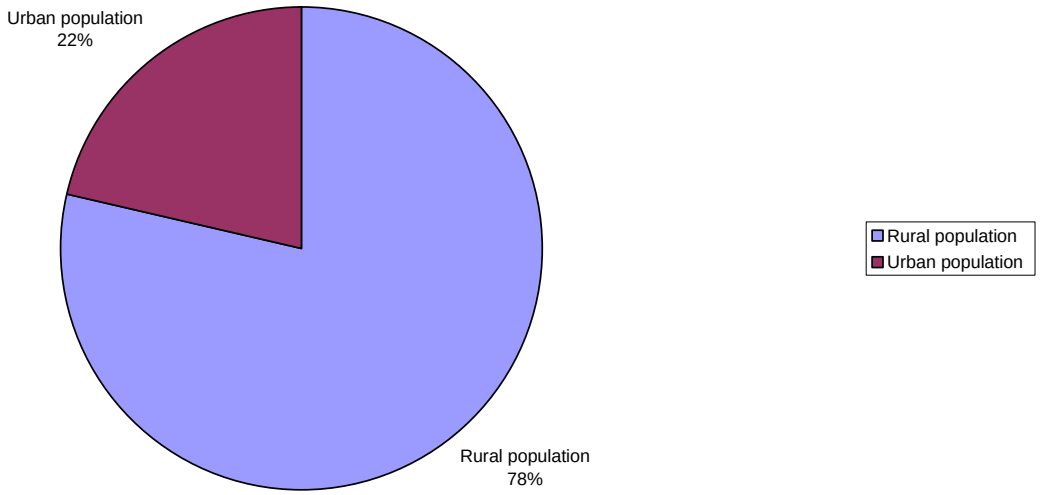


"A household is defined as a socio-economic unit as well as a unit of enumeration for many demographic and social investigations"[10]. This definition is used in this report. However, we would want to make it clearer by considering also a household as "the people of a house collectively" according to Webster's dictionary. The details on HH population are given in Table 4. on page 19.

[10] Ministry of Planning & Economic Affairs Republic of Liberia, University of Liberia and UNFPA. Demographic and Health Survey 1999/2000, Volume III Analytic Report, 2000, p. 11

A total of 40,757 people were living in 8,226 HH with a mean of about 5 people per HH. There were 20,292 males (49.8 %) and 20,465 females (50.2 %). The majority of the population , 31,999 people representing 78.5 % were found in rural zones while 8,758 people (21.5 %) were residing in urban areas as illustrated in the figure 3.

Fig.2. Proportion of rural and urban population, LMIS 2005



3.1.2. Characteristics of the specific population groups.

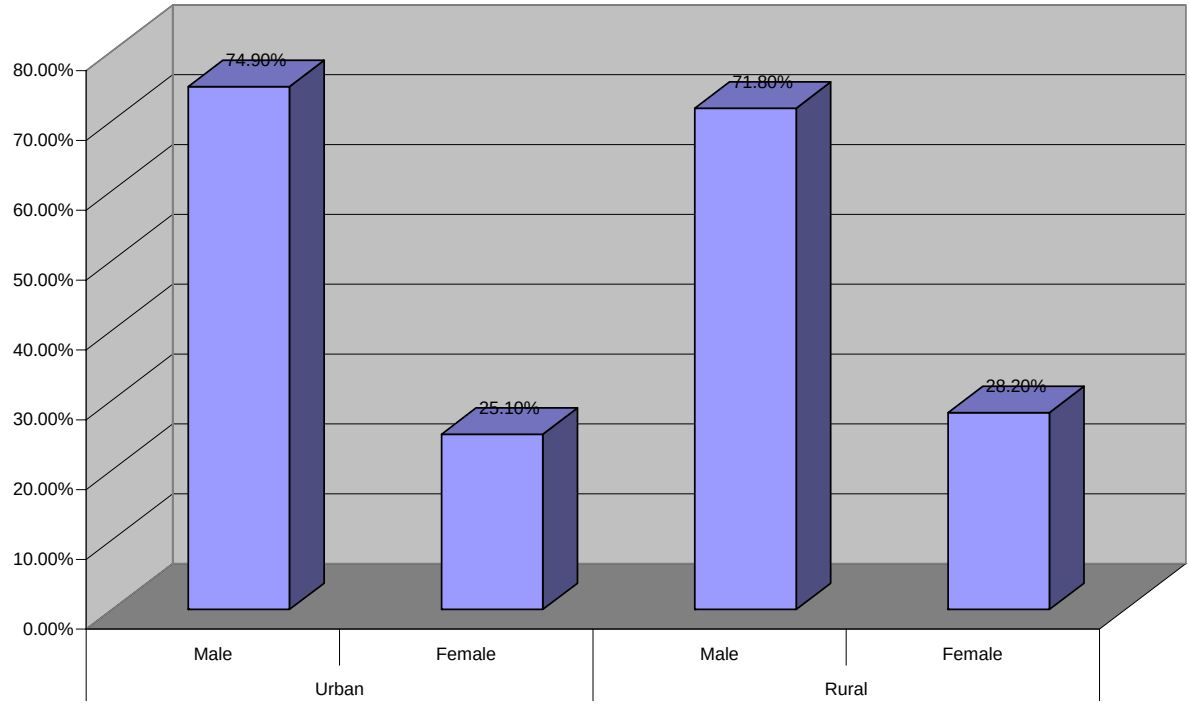
i. Household headship per sex and marital status

In both urban and rural zones the head of HH is dominantly a male. Indeed, 74.9 % and 71.8 % of HH were headed by a male in urban and rural areas respectively as illustrated in the table 3. However, the proportion of females being heads of HH is relatively higher in rural zones (28.2 %) than in urban habitations (25.1 %). See figure 4.

Table 3. Household headship per sex

Head of HH Sex	Urban		Rural		Total	
	Number	%	Number	%	Number	%
Male	1,415	74.9	4,514	71.8	5,929	72,1
Female	474	25.1	1,823	28.2	2,297	27.9
Total	**1,889**	**100**	**6,337**	**100**	**8,226**	**100**

Fig. 4. Household headship per sex, LMIS 2005



ii. Children under five

There are 8,933 children under five years in the sample constituting 22 % (CI 95 %: 21.6-22.4) of the study population (see table 1 above). Among them 4,556 are males (51 %) and 4,337 are females (49 %).

iii. Women of child-bearing age and pregnant women

The women of age between 15 and 49 years old account for 9,181 individuals (23 %) of the study population. Among them 755 were pregnant (1.85 % of the sample)

iv. School attendance

The school attendance is shown in the table 5.

Level of education	Number	Percentage
No education	3,971	
Primary	1,669	
Secondary	1,915	
Post-secondary	365	
College	307	
Total **subtract < 6 years children**		

For marital status : subtract male under 18 and women under 15 years

questionnaire did not capture the information related to primary, secondary and third levels of school attendance. 14,781 individuals were 6 to 24 years old.

v. Employment

vi. **Water ??**

Table 3. HH population by five-year age groups, sex and rural/urban residence

Age of household members	URBAN						RURAL						TOTAL					
	Male		Female		Total		Male		Female		Total		Male		Female		Total	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Total	4,301	49.1	4,457	50.9	8,758	100.0	15,991	50.0	16,008	50.0	31,999	100.0	20,292	49.8	20,465	50.2	40,757	100.0
< 5 years	673	50.4	662	49.6	1,335	100.0	3,883	51.1	3,715	48.9	7,598	100.0	4,556	51.0	4,377	49.0	8,933	100.0
5 - 9 years	561	46.9	635	53.1	1,196	100.0	2,156	51.9	2,000	48.1	4,156	100.0	2,717	50.8	2,635	49.2	5,352	100.0
10 - 14 years	528	47.4	587	52.6	1,115	100.0	1,577	51.7	1,476	48.3	3,053	100.0	2,105	50.5	2,063	49.5	4,168	100.0
15 - 19 years	470	47.8	513	52.2	983	100.0	1,218	51.6	1,141	48.4	2,359	100.0	1,688	50.5	1,654	49.5	3,342	100.0
20 - 24 years	361	45.0	441	55.0	802	100.0	919	39.5	1,409	60.5	2,328	100.0	1,280	40.9	1,850	59.1	3,130	100.0
25 - 29 years	335	45.0	410	55.0	745	100.0	926	42.1	1,275	57.9	2,201	100.0	1,261	42.8	1,685	57.2	2,946	100.0
30 - 34 years	281	46.9	318	53.1	599	100.0	826	44.3	1,038	55.7	1,864	100.0	1,107	44.9	1,356	55.1	2,463	100.0
35 - 39 years	267	48.6	282	51.4	549	100.0	949	47.1	1,067	52.9	2,016	100.0	1,216	47.4	1,349	52.6	2,565	100.0
40 - 44 years	241	58.8	169	41.2	410	100.0	846	59.2	583	40.8	1,429	100.0	1,087	59.1	752	40.9	1,839	100.0
45 - 49 years	221	64.8	120	35.2	341	100.0	815	66.3	415	33.7	1,230	100.0	1,036	65.9	535	34.1	1,571	100.0
50 - 44 years	135	48.9	141	51.1	276	100.0	533	39.5	816	60.5	1,349	100.0	668	41.1	957	58.9	1,625	100.0
55 - 59 years	105	65.2	56	34.8	161	100.0	374	52.5	338	47.5	712	100.0	479	54.9	394	45.1	873	100.0
60 - 64 years	41	52.6	37	47.4	78	100.0	325	52.2	298	47.8	623	100.0	366	52.2	335	47.8	701	100.0
65 - 69 years	38	44.7	47	55.3	85	100.0	256	56.8	195	43.2	451	100.0	294	54.9	242	45.1	536	100.0
70 - 74 years	21	56.8	16	43.2	37	100.0	165	68.5	76	31.5	241	100.0	186	66.9	92	33.1	278	100.0
75 - 79 years	13	59.1	9	40.9	22	100.0	110	54.2	93	45.8	203	100.0	123	54.7	102	45.3	225	100.0
80 years plus	10	45.5	12	54.5	22	100.0	109	61.2	69	38.8	178	100.0	119	59.5	81	40.5	200	100.0
Don't know/missing	-	-	2	100.0	2	100.0	4	50.0	4	50.0	8	100.0	4	40.0	6	60.0	10	100.0

3.2. Malaria baseline indicators

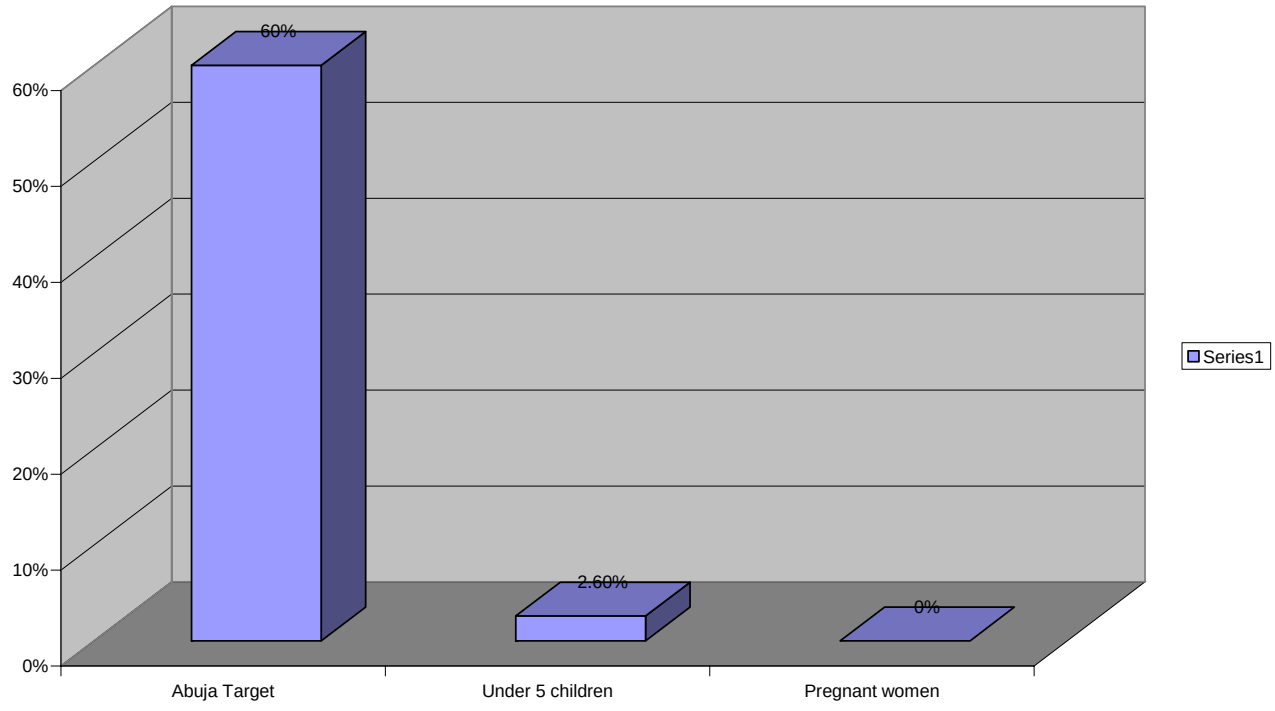
3.2.1. Indicators related to malaria prevention using ITN

Three indicators are presented in this section: percentage of HH owning at least one ITN, percentage of children under 5 years who slept under an ITN the previous night and the percentage of pregnant women who slept under an ITN the previous night. Only 2.6 % of children under five years and XXX % of pregnant women slept under ITN the last night while the proportions of those who slept under any net are 11 % and 31 % respectively. More details are found in table 4. The ITN coverage sounds like too low if compared to Abuja target as shown in figure 5.

Table 4. Target groups who slept under ITN last night, LMIS 2005

Children under five years					Pregnant women				
	Slept under any Net		Slept under ITN			Slept under any Net		Slept under ITN	
Total	Number	%	Number	%	Total	Number	%	Number	%
8,933	973	11	237	2.6	755	234	31	-	-

Fig.5. ITN coverage in Liberia compared to Abuja targets, LMIS 2005



We looked further at the sources of nets and at the reasons for not having nets. According to data in the table 5 below, almost 52 % of the nets were provided by the private sector which comprises market and shop. The second source of net is NGOs which furnish 32.8 % of the nets.

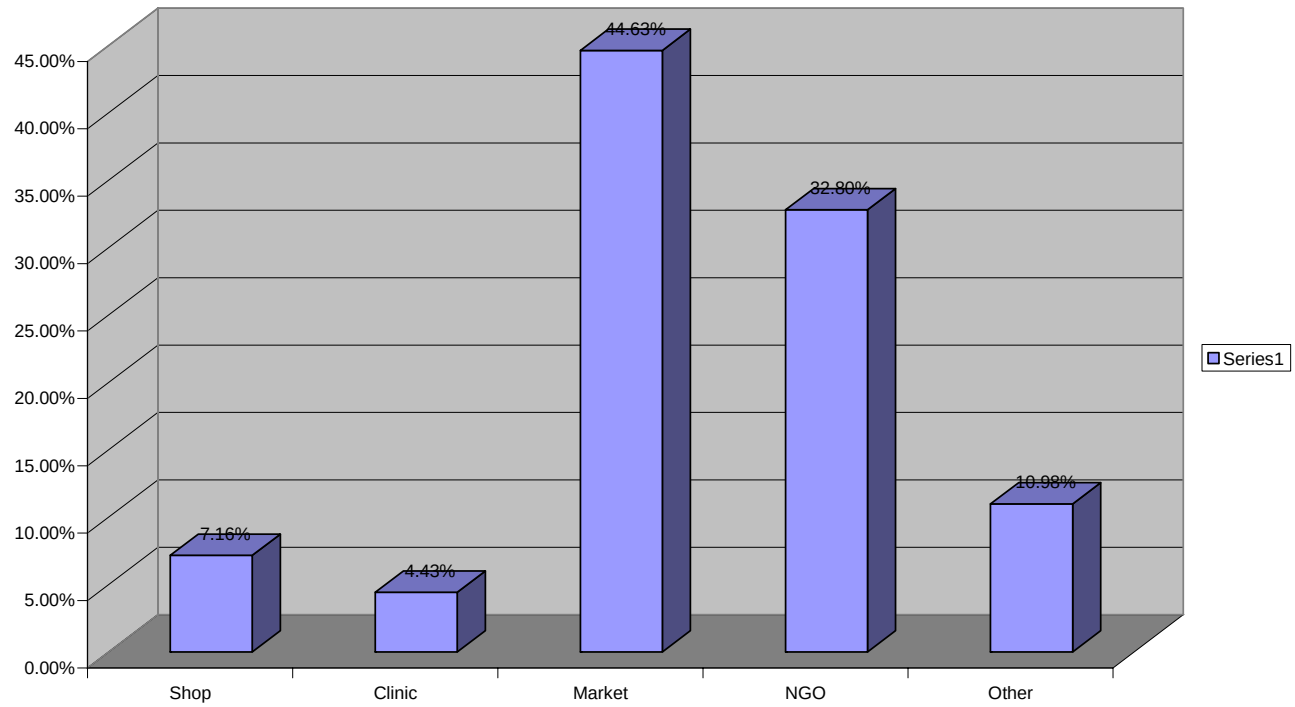
Table 5. Sources of nets found in HH, LMIS 2005

Sources	Respondents sex				Total	
	Male		Female			
	Number	%	Number	%	Number	%
Shop	75	6	43	10.3	118	7.16
Clinic	49	4	24	5.8	73	4.43
Market	554	45	182	43.8	736	44.63
NGO	408	33	133	32.0	541	32.8
Other*	147	12	34	8.2	181	10.98
Total	**1233**	**100**	**416**	**100**	**1649**	**100**

* .....

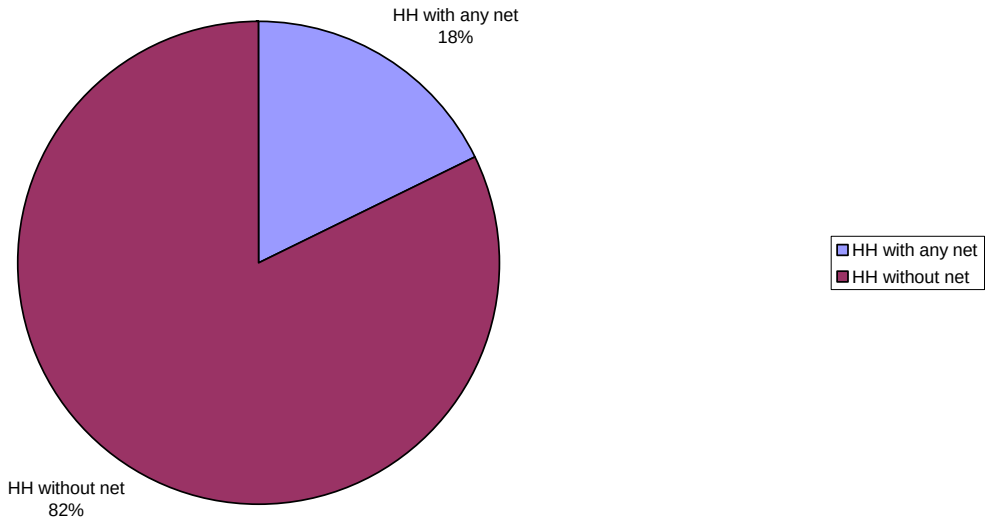
The nets distributed by the clinics come from donors such as Global Fund and are ITN intended to cover children less than 5 years of age and pregnant women at the PSC and ANC. The figure 6 illustrates the proportion of nets supplying sources.

Fig 6. Sources of households nets, LMIS 2005



The HH ownership of mosquito nets was measured. Out of 8,226 HH only 1, 468 (17.85 %) had any mosquito net (insecticide treated or not). The figure 7 illustrates the ownership of nets

Fig. 7. Households ownership of mosquito nets, LMIS 2005



Those who had nets were divided in two categories related to "any nets" and "Insecticide Treated Nets" (ITN) as indicated in table 6.

Table 6. Households' ownership of nets and of ITN in rural and urban areas, LMIS 2005

Regarding the reasons for not having a net almost 41 % of interviewees said it was too expensive (price???) and 30 % evoked its unavailability (are them ready to use???). Only 4 % admitted to do not like net. Table 6 gives all the details related to low use of net in communities.

Table 7. Reasons evoked for not having nets in HH, LMIS 2005

Reasons	Respondents sex				Total	
	Male		Female			
	Number	%	Number	%	Number	%
Too Expensive	1,323	40.8	524	39.9	1,847	40.6
Not available	930	28.7	419	31.9	1,349	29.6
Don't like	121	3.7	59	4.5	180	4
Other*	840	25.9	300	22.9	1,140	25
Don't know	28	0.9	10	0.8	38	0.8
Total	3,242	100	1,312	100	4,554	100

* ----------

3.2.2. Indicator related to malaria prevention using IPTp by pregnant women

This indicator was measured among women who had a live birth in the five years preceding the survey and who took antimalarial drugs for malaria prevention during pregnancy for the most recent birth. The figures in table 8 highlight the low coverage of IPTp in Liberia (15 %). However, the rural areas performance (11.6 %) is nearly 3 times higher than the urban achievement (3.4 %).

Table 8. Mothers who had live birth and who took IPTp, LMIS 2005

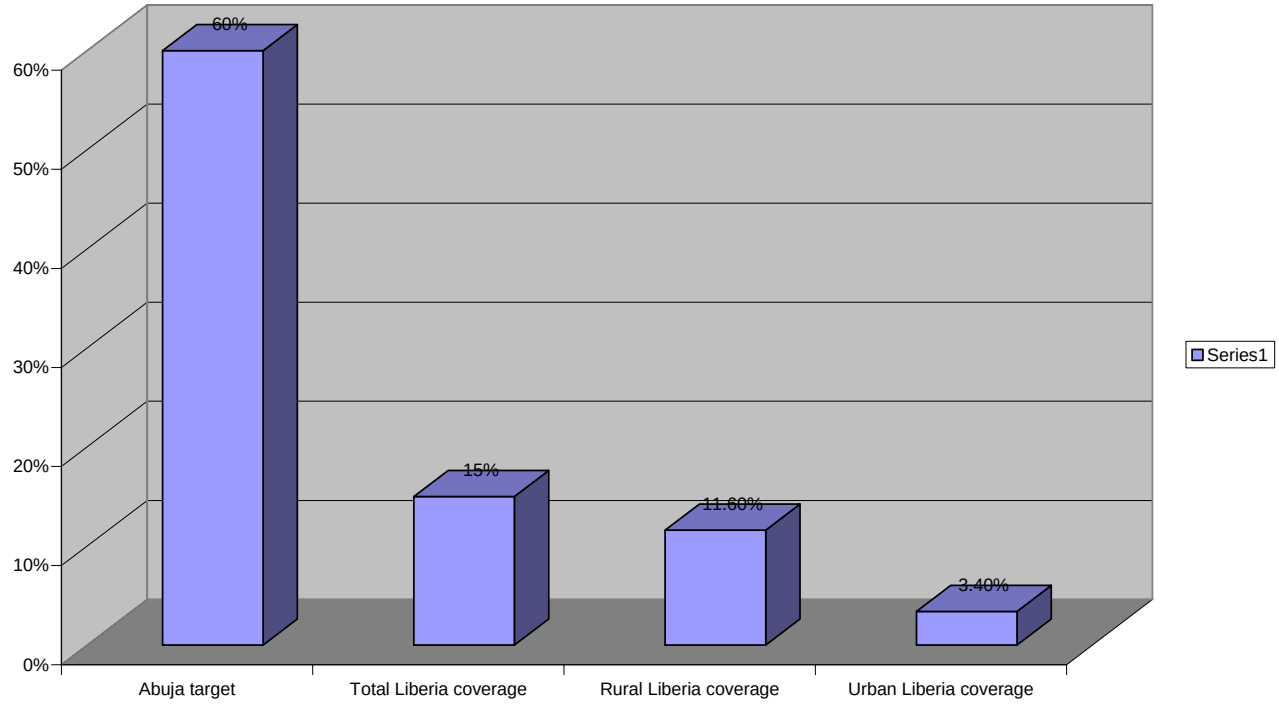
Residence	Respondent mothers	Mothers who took IPT	
		Number	Percentage*
Rural	345	48	11.6 %
Urban	67	14	3.4 %
Total	**412**	**62**	**15.0 %**

* The denominator is the total of respondent mothers

The figure 8 on the next page uncovers the gap between the Abuja target and IPTp coverage among Liberian women.

However, SP was not the only drug taken to prevent malaria during pregnancy.Chloroquine use by pregnant women is not clear

Fig.8. IPT coverage in Liberia compared to Abuja target, LMIS 2005



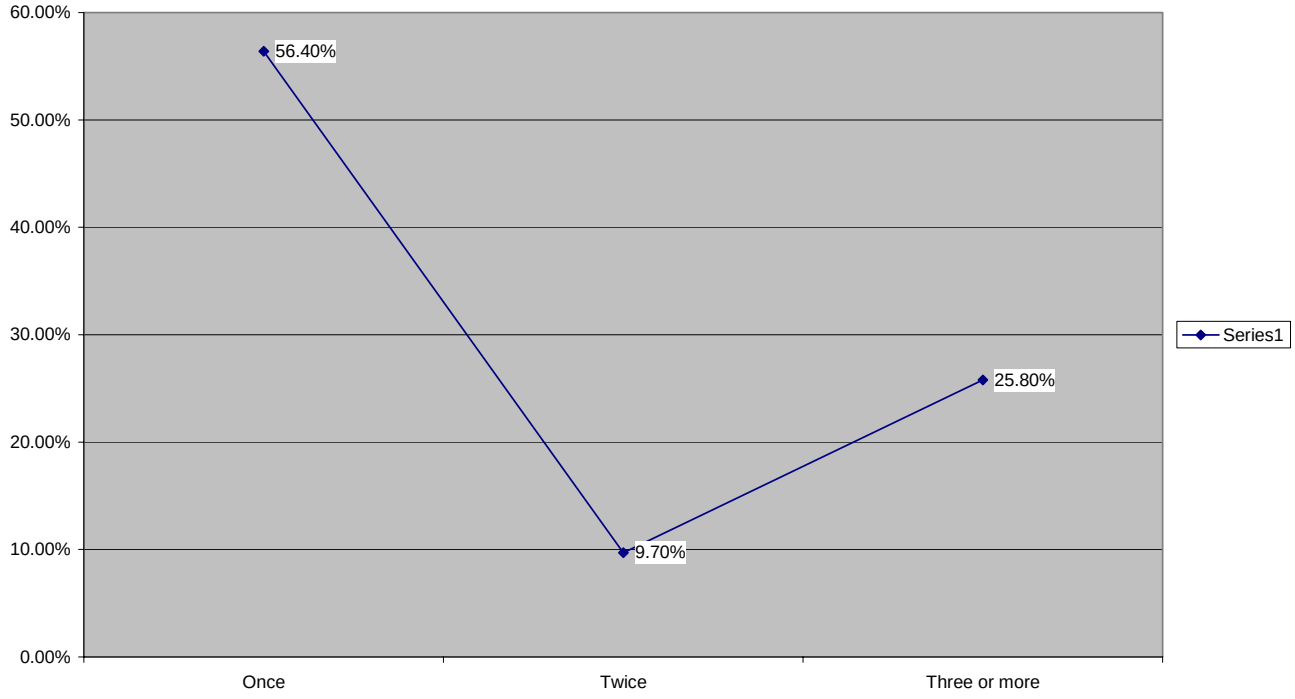
There is a disparity regarding the number of times mothers took SP drug for IPTp. Only 9.7 % took the drug twice as recommended by the policy and 25.8 % took SP for more than three times. The majority took the drug only once (56.4 %). The details may be found in the table 9. The intervention is more applied in rural areas (77.42 %) than in urban zones (22.58 %) . See figure 8 above.

Table 9. Number of times mothers took SP drug to prevent malaria, LMIS 2005

Residence	**Number of times mother took SP drug**				**Total**
	Once (%)	Twice (%)	Three or more (%)	Don't know (%)	Number (%)
Rural	26(41.9 %)	5(8.1 %)	12(19.4 %)	5(8.1 %)	48(77.42 %)
Urban	9(14.5 %)	1(1.6 %)	4(6.4 %)	-	14(22.58 %)
Total	**35(56.4 %)**	**6(9.7 %)**	**16(25.8 %)**	**5(8.1 %)**	**62(100 %)**

The figure 9 on the next page illustrates that most of mothers did not return for a second dose of SP to prevent malaria when they were pregnant the last time as recommended by the policy.

Fig. 9. Number of times mothers took SP as IPTp, LMIS 2005



3.2.3. Indicators related to treatment of malaria with effective antimalarial drug according to national policy

These indicators refer to the management of fever among children under five years and comprise : the place where parent sought treatment, whether or not a drug was taken to treat fever, the type of drug taken, the time it took to start drug administration since the onset of fever, the proportion of HH who didn't complete their treatment and reasons for, and other interventions used to treat fever/convulsions.

i. The place where parent sought the treatment of fever

The table 10 gives all needed details on the places where parents sought the treatment for their children's fever. It is clear that only 14.3 % of the parents took their children to hospital. The remaining 85.7 % are managed in community which includes clinics in Liberia (reference)

Table 10. Places where parents sought their children's fever treatment, LMIS 2005

Sex	**Place of fever treatment**								
	Hospital (%)	Clinic (%)	Mobil clinic (%)	Field worker (%)	Pharmacy (%)	Shop (%)	Traditional Practitioner (%)	Others (%)	**Total**
Male	62	340	5	16	14	9	13	18	**477**
Female	40	177	3	3	6	2	3	4	**238**
Total	**102 (14.3)**	**517 (72.3)**	**8 (1.1)**	**19 (2.7)**	**20 (2.8)**	**11 (1.5)**	**16 (2.2)**	**22 (3.1)**	**715 (100)**

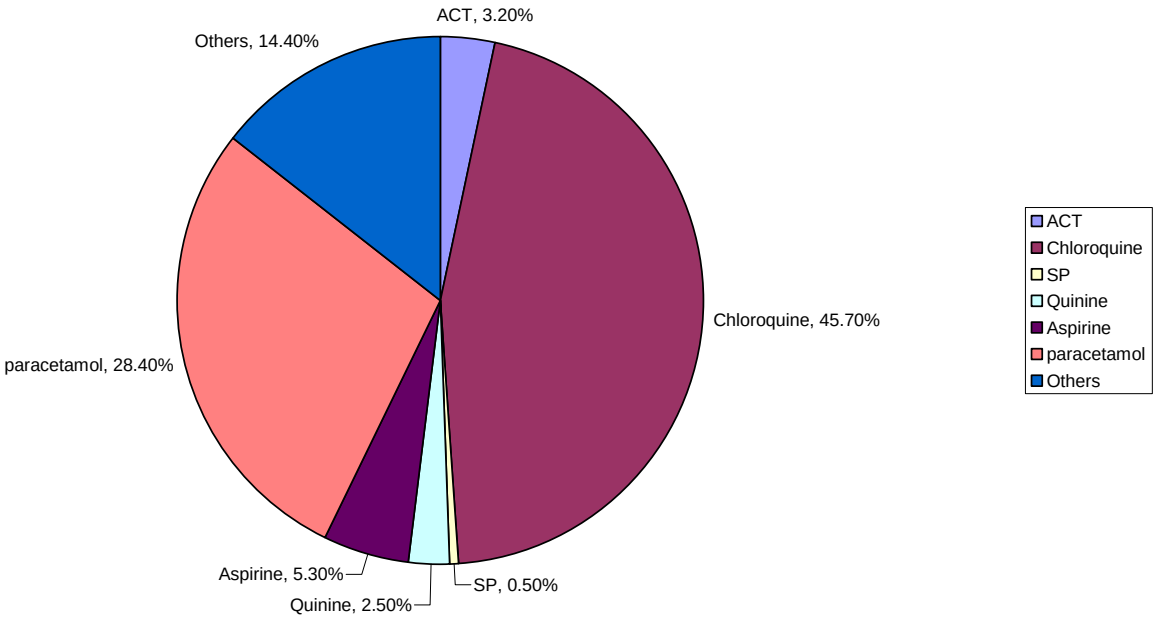
ii. The type of drug taken to treat fever in children

The details on the type of drug taken to treat fever are given in the table 11. ACT (Artesunate + Amodiaquine) , the new recommended drug by the policy, was cited only by 3.2 % of users. Chloroquine is still the most used drug: 45.7 %. The item " Others" needs to be clarified as it comes up with 14,4 % . The figure 10 highlights the proportion of each drug used to treat fever in community

Table 11. Type of drug taken to treat fever in children, LMIS 2005

Description	**Type of drug**							**Total**
	ACT	CQ	SP/ Fansidar	Quinine	Aspirin	Paracetamol	Others	
Male	30	404	6	24	49	240	128	881
Female	12	202	1	9	21	137	63	445
Total	42	606	7	33	70	377	191	1,326
Percentage	**3.2 %**	**45.7 %**	**0.5 %**	**2.5 %**	**5.3 %**	**28.4**	**14.4 %**	**100 %**

Fig.10. Drugs used to treat fever in children <5, LMIS 2005



iii. The time it took to start fever treatment since the onset of symptoms

About 95 % of parents sought the treatment of their children's fever 2 days or more after the onset of the symptoms. (see table 12). The figure 11 illustrates better the situation.

Table 12. Time spent between the onset of fever and the start of treatment according to parents' sex, LMIS 2005

Description	Time taken to seek care			Total
	Same day	Next day	More than 2 days	
Male	22	9	545	576
Female	8	6	264	278
Total	30	15	809	854
Percentage	**3.50 %**	**1.76 %**	**94.74 %**	**100 %**

Fig.11. Time parents took to seek children fever treatment, LMIS 2005

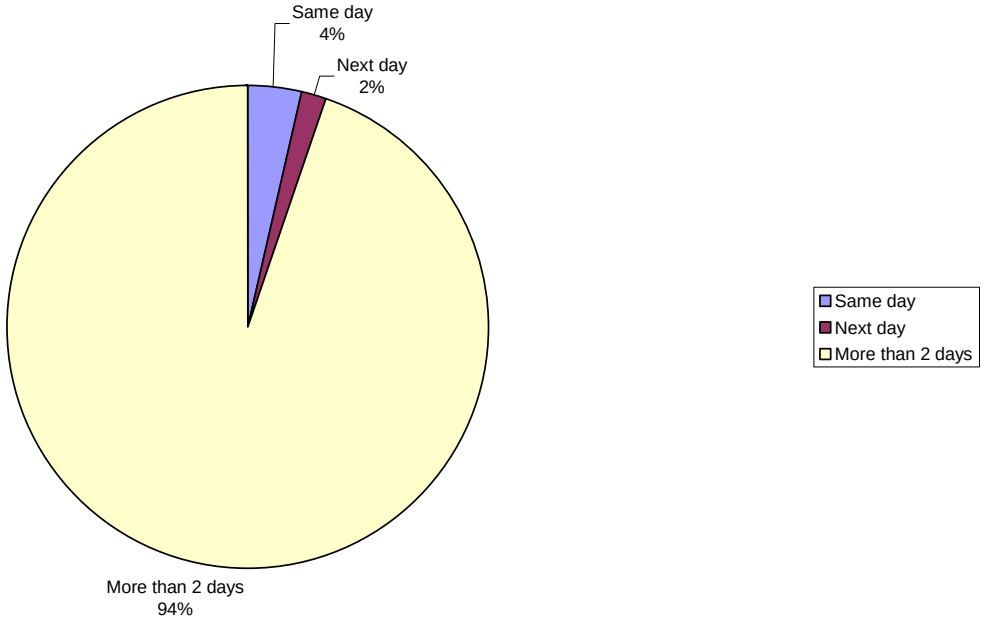
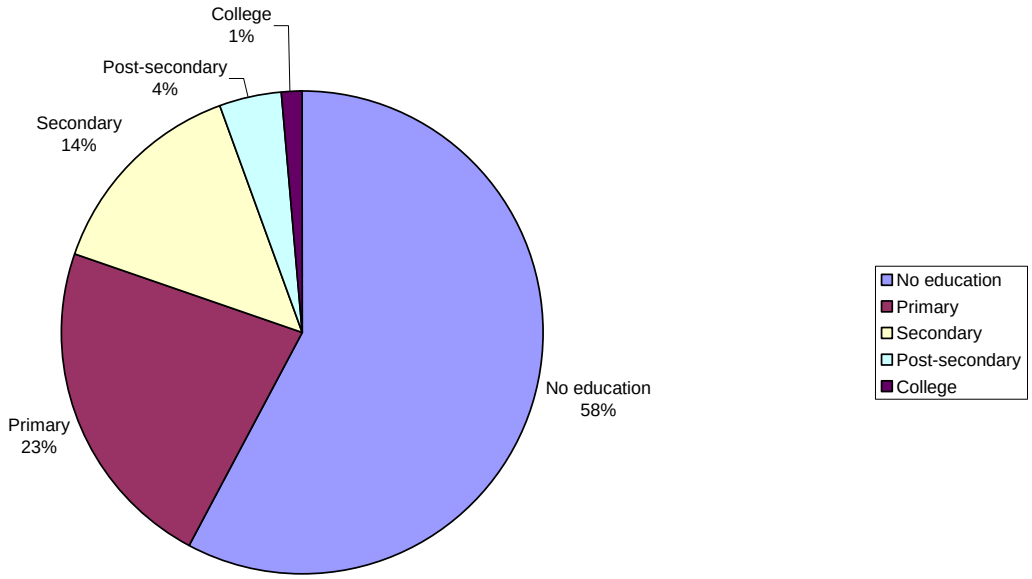


Table 13. Education level of parents seeking fever treatment two days later, LMIS 2005

Parents education	Two days later or more after fever onset	
	Number	Percentage
No education	467	57.72
Primary	183	22.62
Secondary	115	14,22
Post secondary	33	4.08
College	11	1.36
Total	**809**	**100**

Was the parents' education level one of the factors contributing to this long delay before seeking fever treatment? Yes it was, according to data in table 13. Indeed, among the 809 parents who sought children's fever treatment two days later or more after the onset of symptoms, 57.72 % had no education and 22.62 % were of primary school level. These two sub-groups account for 80.34 % of the parents neglecting to seek assistance in 24 hours after the onset of fever. The figure 12 restitutes better the relationship between educational level and care seeking behavior.

Fig.12. Education of parents seeking fever care 2 days later after onset, LMIS 2005



iv. Other interventions used to treat fever/convulsions

Different interventions were used to treat fever with convulsion, namely: giving any drug (80.06 %) , taking child to traditional healer (0.95 %), tepid sponging (4.43 %) , giving herbs (0.95 %) and others (13.61 %). The summary of all these interventions may be found in table 14.

Table 14. Different intervention used to treat fever with convulsion

Residence	Number of Children	Given any drug (%)	Taken to traditional healer (%)	Given tepid sponging (%)	Given herbs (%)	Given other treatments (%)
Rural	296	239 (75.63)	3 (0.95)	12 (3.80)	3 (0.95)	39 (12.34)
Urban	20	14 (4.43)	-	2 (0.63)	-	4(1.26)
Total	**316**	**253(80.06)**	**3 (0.95)**	**14(4.43)**	**3(0.95)**	**43 (13.61)**

3.2.4. Prevalence of malaria among children under 5 years old

The prevalence of Plasmodium *falciparum* malaria was calculated among 7, 666 children under five years old without fever. The RDT was positive to P. *falciparum* in 5,029 children representing 66 % (CI 95 % : 64.9 % - 67.1 %). See table 15 for details.

Table 15. Results of malaria test among U5 children without fever, LMIS 2005

Test	Fever Absent	
	Cases	**Percentage**
RDT positive	5,038	65.72 %
RDT negative	2,628	34.28 %
Total	**7,666**	**100 %**

3.2.5. Incidence of malaria among children under 5 years old

The incidence of P. *falciparum* malaria was calculated among 4,099 children under five years old who had fever in the last 48 hours (axillary's temperature equals or superior to 37.5^{o} C). The RDT was positive to P. *falciparum* in 3,612 children representing 88.12 % (CI 95 %: 86.98 % - 89.02 %). See table 16 for details.

Table 16. Results of a malaria test among U5 children presenting fever, LMIS 2005

Test	Fever present	
	Cases	**percentage**
RDT positive	3,672	88,12 %
RDT negative	487	11,88 %
Total	**4,099**	**100 %**

3.2.6. Prevalence of anemia among tested children

Using a hemocue device (a portable photospectometer), we looked for anemia among 7,666 children under 5 years of age. We found that 6,643 children (86.7 % , CI 95 % : 85,92 % - 87,48 %) were anemic versus 1,023 children (13.3 %, CI 95 % : 12,22 %-13,78 %) who met the requirement of normal Hemoglobin defined as a value equal to or more than 11 g/dl of blood). See table 17 for needed details. However, it was not established that this anemia was due to malaria alone, even tough it is obviously known that malaria does contribute to this morbid phenomenon due to massive destruction of blood red cells.

Table 17. Prevalence of anemia among tested children

	Fever absent	**Percentage**
Anemia positive	6,643	86.7 %
Anemia negative	1,023	13.3 %
Total	7,666	100 %

Children suffering anemia were divided into three sub-groups: (References)

- Mild anemia : Hemoglobin ≥ 7.0 g/dl of blood and < 11.0 g/dl of blood
- Moderate anemia: Hemoglobin ≥ 5.0 g/dl of blood and < 7.0 g/dl of blood
- Severe anemia : Hemoglobin < 5.0 g/dl of blood

The table 18 presents the proportions of children falling in each category of anemia. Mild anemia accounted for 82.34 % (CI 95 %: 81.40 % - 83.28 %) of all recorded cases. And 10 % of children were severely affected (CI 95 %: 9.26 % -10.74 %).

Table18. Distribution of anemia cases into different categories, LMIS 2005

Anemia Present		**Anemia Absent**	**Total of tested children**
Categories	Cases (%)	Cases	7,666
Severe anemia	662 (10.00 %)	-	-
Moderate anemia	511 (7.66 %)	-	-
Mild anemia	5,470 (82.34 %)	-	-
Total	**6,643**	**1,023**	**7,666**

3.2.7. Malaria Knowledge, Attitude and Practice (KAP)

The KAP of the population study has once been evoked above in section related to care seeking behavior when children had hot body / fever or convulsion. This section will focus more on type of messages related to malaria prevention and treatment, to the recognition of signs of uncomplicated and severe malaria and to knowledge of causes of malaria.

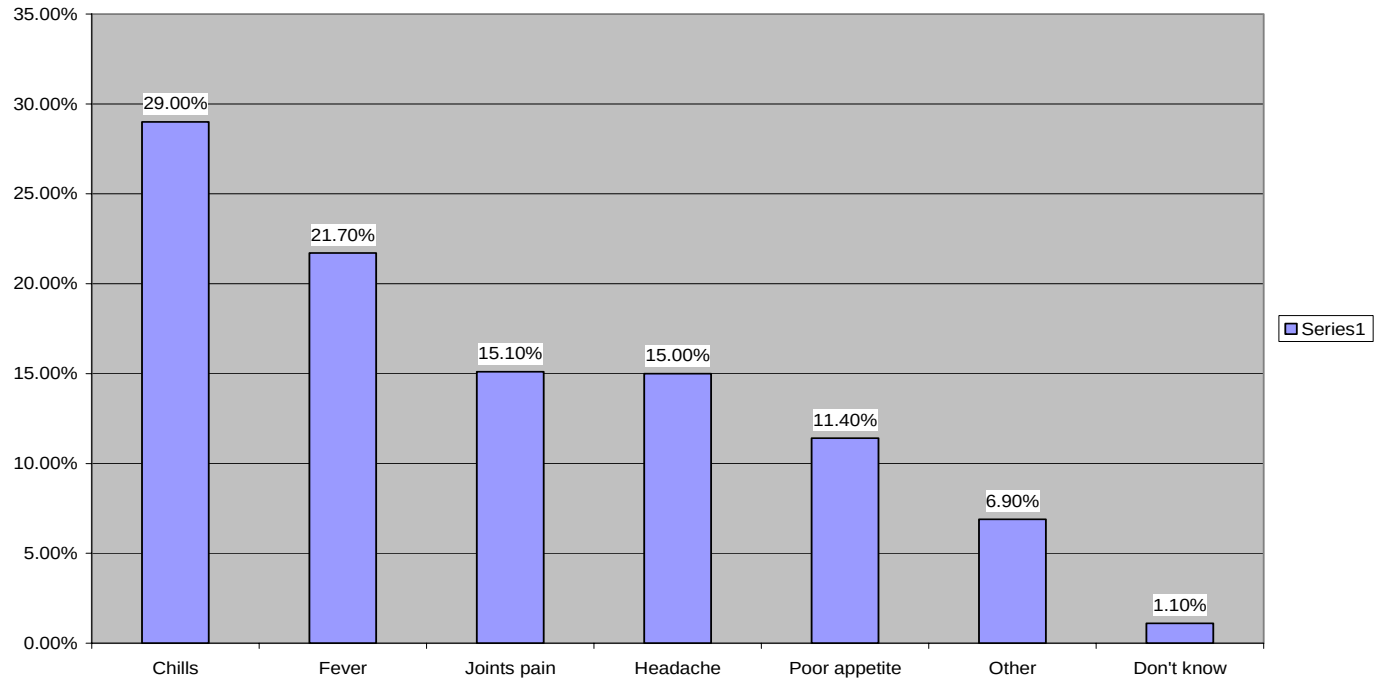
i. Symptoms of uncomplicated malaria

In a sample of 16,185 people we found that "Chills" (29 %) was the most cited symptom of malaria according to different categories of education levels summarized in table 19. Fever was second with 21.7 %, followed by joints pain (15.1 %) and headache (15 %). The figure13 on the next page illustrates the proportion of each cited symptom

Table 19. Cited symptoms of uncomplicated malaria according to education level

Education / Malaria symptoms	**No education**	**Primary**	**Secondary**	**Post secondary**	**College**	**Total**
Fever	1,533	713	912	168	183	**3,509**
(%)	(20.4)	(22.2)	(22.6)	(24.4)	(25.1)	**(21.7)**
Chills	2,295	928	1,108	196	159	**4,686**
(%)	(30.5)	(28.9)	(27.5)	(28.5)	(21.8)	**(29.0)**
Headache	1,311	499	592	97	108	**2,427**
(%)	(15.0)	(15.5)	(14.7)	(14.1)	(14.8)	**(15.0)**
Joints pain	1,219	470	559	77	112	**2,437**
(%)	(16.2)	(14.6)	(13.9)	(11.2)	(15,4)	**(15.1)**
Poor appetite	842	346	470	78	112	**1,838**
(%)	(11.2)	(10.8)	(11.7)	(11.3)	(15.4)	**(11.4)**
Other	428	228	336	62	61	**1,115**
(%)	(5.7)	(7.1)	(8.3)	(9.0)	(8.4)	**(6.9)**
Don't know	81	26	51	11	4	**173**
(%)	(1.1)	(0.8)	(1.3)	(1.6)	(0.5)	**(1.1)**
Total	**7, 529**	**3,210**	**4,028**	**689**	**729**	**16,185**
						(100 %)

Fig. 13. Most cited symptoms of uncomplicated malaria, LMIS 2005



ii. Social groups deemed likely to get complicated/severe malaria

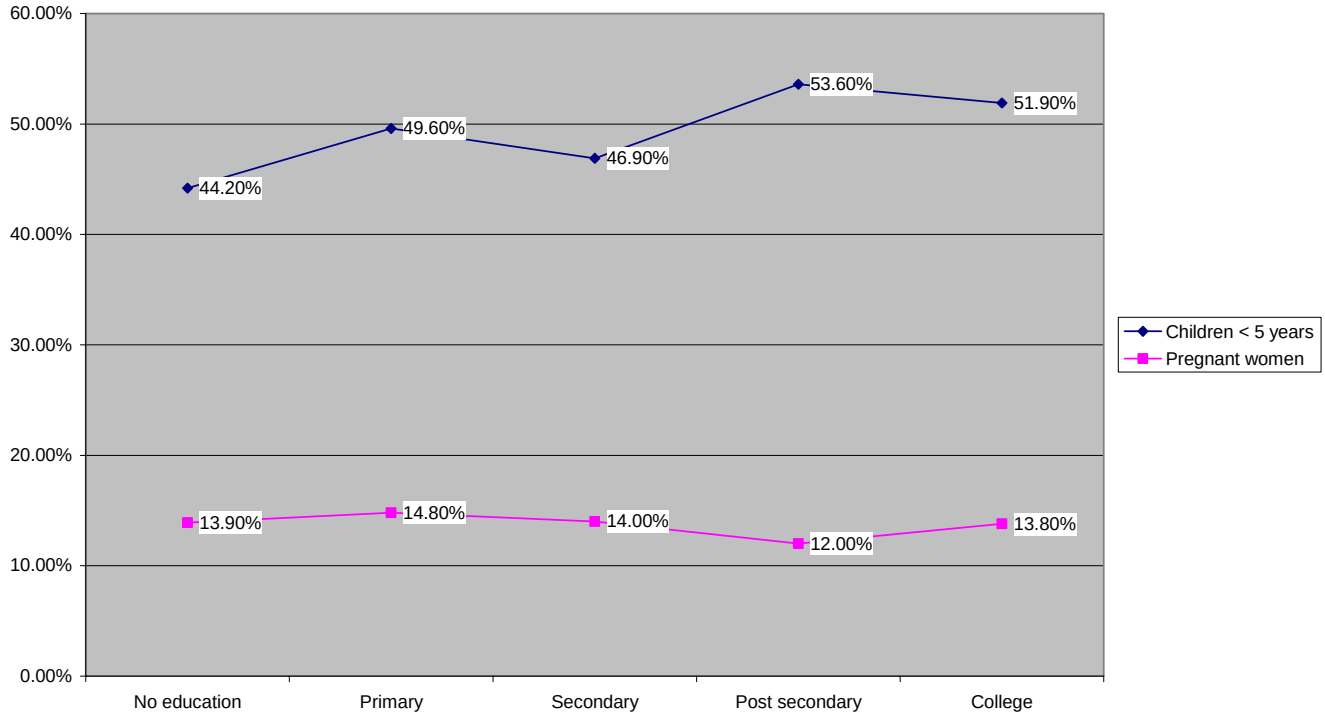
A total of 12,480 people of different education levels were asked to tell the social groups who seemed more likely to get serious case of malaria. Children less than 5 years come up with 46.6 %.

Table 20. Social groups believed likely to get serious case of malaria according to education level of respondents, LMIS 2005

Education / Social groups	No education	Primary	Secondary	Post secondary	College	Total
Children < 5 years	2,702 (44.2 %)	1,214 (49.6 %)	1,383 (46.9 %)	267 (53.6 %)	245 (51.9 %)	**5,811 (46.6 %)**
Pregnant Women	851 (13.9 %)	363 (14.8 %)	412 (14.0 %)	60 (12.0 %)	65 (13.8 %)	**1,751 (14.0 %)**
Adults	907 (14.8 %)	377 (15.4 %)	473 (16.0 %)	75 (15.1 %)	75 (15.9 %)	**1,907 (15.3 %)**
Elderly	819 (13.4 %)	215 (8.8 %)	269 (9.1 %)	44 (8.8 %)	23 (4.9 %)	**1,370 (11.0 %)**
Everyone	604 (9.9 %)	200 (8.2 %)	295 (10.0 %)	38 (7.6 %)	39 (8.3)	**1,176 (9.4 %)**
Other	29 (0.5 %)	12 (0.5 %)	18 (0.6 %)	2 (0.4 %)	2 (0.4 %)	**63 (0.5 %)**
Don't know	200 (3.3 %)	65 (2.7 %)	102 (3.5 %)	12 (2.4 %)	23 (4.9 %)	**402 (3.2 %)**
Total	**6,112**	**2,446**	**2,952**	**498**	**472**	**12,480**

The percentages in table 20 show slightly that more people have a high level of education more they consider children under five as susceptible of getting severe disease. On the other hand, pregnant women were quoted almost the same percentage (14 %) in all categories of education levels. See the curves in Fig. 14 fore more details.

Fig.20. Groups likely to get serious malaria according to respondents' education, LMIS 2005



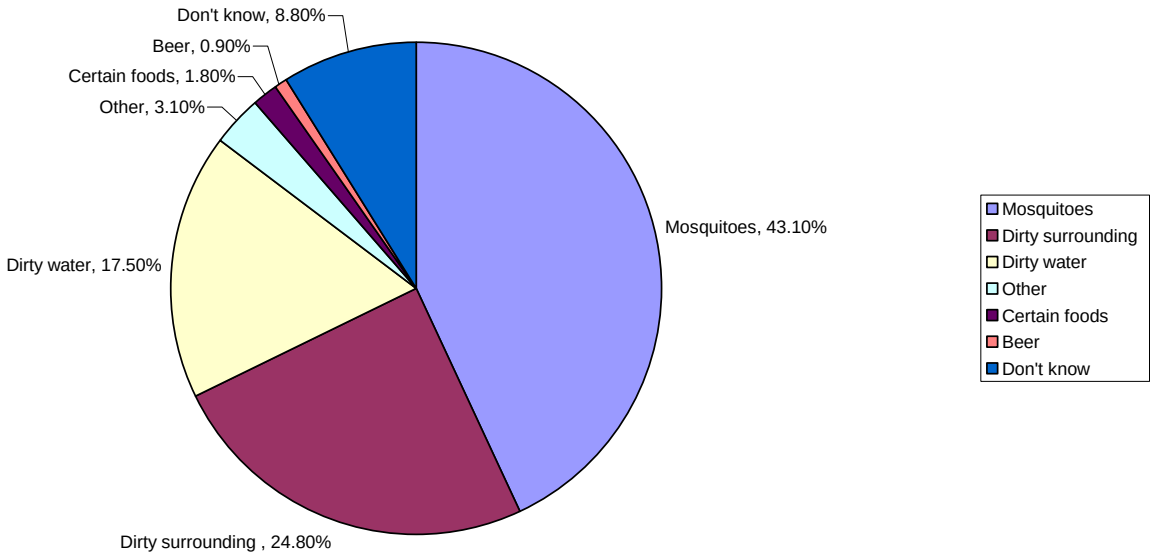
iii. Causes of malaria

Different causes of malaria were cited by 12, 719 respondents. They include in a decreasing order: mosquitoes (43.1 %), dirty surrounding (24.8 %), dirty water (17.5 %), other (3.1 %) , certain food (1.8 %) and beer (0.9 %) . Among them 8.8 % said "I don't know ". The table 21 on the next page gives all the needed details. But the figure 21 shows the proportions of responses to causes of malaria.

Table 21. Causes of malaria according to respondents' education, LMIS 2005

Education / Malaria's causes	No education	Primary	Secondary	Post secondary	College	Total
Mosquitoes	2,424	1,087	1,439	278	259	5,487 (43.1 %)
Dirty water	1,023	503	539	75	85	2,225 (17.5 %)
Dirty surround.	1,502	604	797	122	123	3,148 (24.8%)
Beer	51	26	33	2	3	115 (0.9 5)
Certain foods	91	61	61	8	8	229 (1.8 %)
Other	176	88	105	19	12	400 (3.1 %)
Don't know	659	215	197	30	14	1,115(8.8 %)
Total	**5,926**	**2,584**	**3,171**	**534**	**504**	**12,719**

Fig. 21. Causes of malaria according to respondents, LMIS 2005



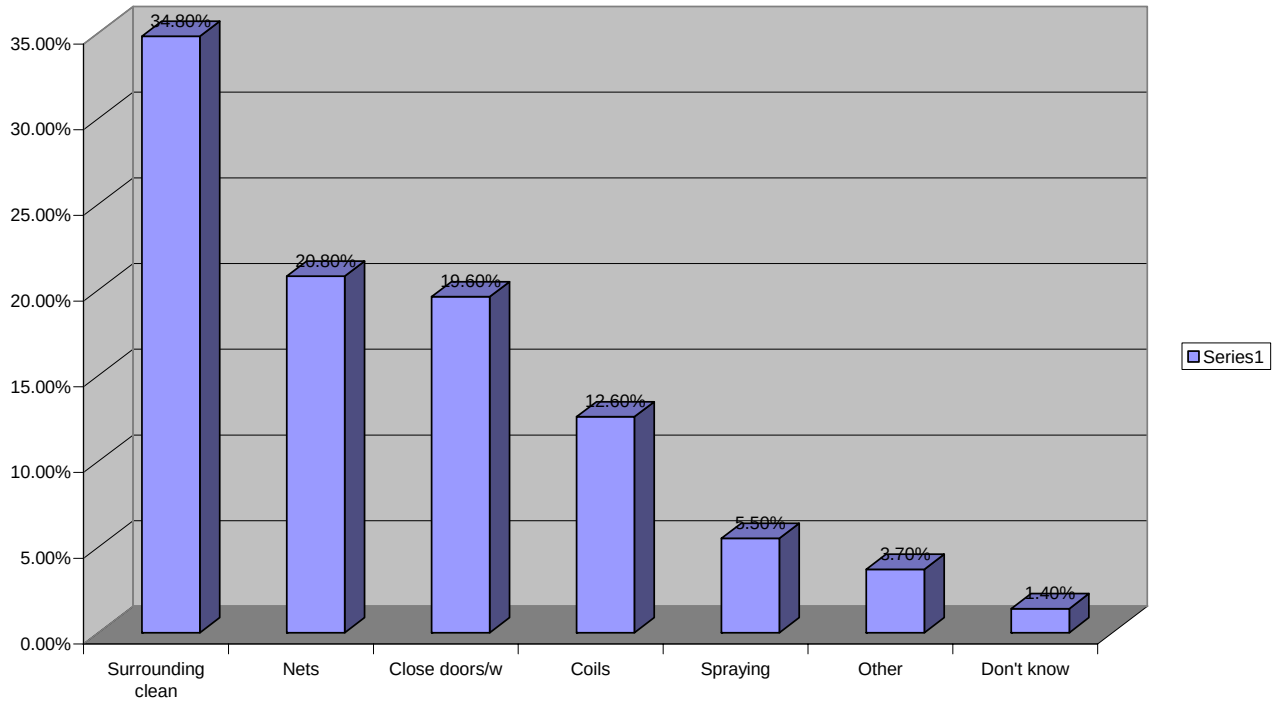
iv. Ways to avoid getting malaria

The sample related to ways used to avoid malaria includes 11,491 people. Their responses are summarized in the table 22. Cleaning surrounding is classed first (34.8 %) followed by use of nets (20.8 %) and keeping doors and windows closed (19.6 %).

Table 22. Ways to avoid getting malaria according to respondents education level, LMIS 2005

Education / Ways to Avoid malaria	No education	Primary	Secondary	Post secondary	College	Total (%)
Mosquito net	1,055	456	664	93	126	2,394 (20.8 %)
Mosquito coils	700	224	405	60	54	1,443 (12.6 %)
Insecticide spraying	138	87	269	47	89	630 (5.5 %)
Keep doors, windows closed	1,274	441	425	49	66	2,255 (19.6 %)
Mosquito repellants	70	35	43	7	9	164 (1.4 %)
Clean surrounding	1,771	815	1,026	202	187	4,001 (34.8 %)
Other	181	75	122	29	20	427 (3.7 %)
Don't know	101	33	37	4	2	177 (1.5 %)
Total	5,290	2,166	2,991	491	553	11,491 (100 %)

Fig. 22. Ways to avoid getting malaria according to respondents, LMIS 2005



v. Sources of messages heard in community about malaria

We asked 6,230 people to tell if they have heard any message regarding malaria prevention and treatment and if yes, what was their sources of information. According to their responses the most heard message were related to mosquitoes, fever, bed nets, IPT and danger signs of malaria. We looked more for the sources of their information and found that

Table 23. Sources of messages heard in community regarding malaria prevention and Treatment according to education levels, LMIS 2005

Education / Sources of messages	No education	Primary	Secondary	Post secondary	College	Total (%)
Total						

vi. Sources of message heard about malaria

Education / Malaria's causes	No education	Primary	Secondary	Post secondary	College	Total (%)
Mosquito net	1,055	456	664	93	126	2,394 (20.8 %)
Mosquito coils	700	224	405	60	54	1,443 (12.6 %)
Insecticide spraying	138	87	269	47	89	630 (5.5 %)
Keep doors, windows closed	1,274	441	425	49	66	2,255 (19.6 %)
Mosquito repellants	70	35	43	7	9	164 (1.4 %)
Clean surrounding	1,771	815	1,026	202	187	4,001 (34.8 %)
Other	181	75	122	29	20	427 (3.7 %)
Don't know	101	33	37	4	2	177 (1.5 %)
Total	5,290	2,166	2,991	491	553	11,491 (100 %)

Chapter 4: Discussions

The proportions of different population groups found in the survey are obviously different from those usually used in health planning where it is believed that children < five years are 17 %, women of child-bearing age 6 %

Chapter 5: Constraints

Chapter 6: Conclusions

Annexes

References