

Final report

Evaluation of the Ownership and the Usage of Long Lasting Insecticidal Nets (LLINs) in Mali Eight Months after the December 2007 Integrated Campaign

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Summary

Introduction

In December 2007, Mali launched a national integrated health campaign which included five interventions: vaccination against measles and polio, and the distribution of vitamin A, albendazole and long lasting insecticidal nets (LLINs). The beneficiaries of the campaign were children under 5 years of age and postpartum women. A primary objective of the campaign was to reduce morbidity and mortality in young children. The campaign was held December 13-19, 2007. In June 2007, LLINs were also distributed during the Nutrition Weeks (SIAN) in two of the regions of the country, Gao and Tombouctou. Beginning in 2006, long lasting insecticidal nets were distributed free to pregnant women through the public health sector at the time of the prenatal consultation (CPN).

Eight months after the campaign, from August 9-23, 2008 an evaluation of the impact of the campaign was done. This evaluation was based on data collection on the ownership of the mosquito nets at the household level, the receipt of LLINs by targeted groups during the integrated campaign (children of less than five years), and the usage of impregnated insecticide mosquito nets (MIIs) by the three segments of the population indexed by Roll Back Malaria (RBM): households, children under five years of age, and pregnant women .

In this report, we present the results for the primary objectives for the survey, at the national and regional level. This information could help the efforts of Mali's Ministry of Health and its partners to identify and refine the strategies to improve the prevention and the control of malaria in the country.

Methodology

The survey was a community-based cross-sectional survey, carried out using a stratified multi-stage sample design. Each of the eight regions was considered as an individual stratum, giving a total of eight strata for the entire nation. In the first step (for every region except for the district of Bamako) nine communes were selected with the population proportional to population size (PPS) sampling method. In the second step, three enumeration areas (EAs) were selected with the PPS method, in each of the selected communes. Within every EA, 18 households were selected by systematic sampling. In Bamako, five quartiers (neighbourhoods) were selected using PPS. The proportional estimates were adjusted for the probability of unequal selection. The sample size targeted for the survey was 3942 households. The survey data was collected using handheld computers (PDAs).

¹ MII=ITN+LLIN

Results

Three thousand seven hundred and fifty-seven (3,757) households were surveyed, of which 70.5% had at least one child less than five years old. At the national level 81.0% (CI 78.5-83.5) of households having children less than five years old had received at least one LLIN during the campaign, 54.3% (CI 49.4-59.1) of households having at least two eligible children during the campaign received at least two LLINs. At the national level, 47.2% (CI 43.5-50.9) of pregnant women that were eligible to receive an MII during prenatal consultations (CPN) received an MII, and if one considers only pregnant women that attended prenatal consultations the rate increases to 58.2% (CI 54.5-61.9). MII ownership at the national level is 81.7% (CI 79.5- 83.8). At the national level the MII suspension rate was 76.9% (CI 74.5-79.3). The MIIs usage at the national level is 78.5% (CI 76.0-81.0) for children of less than five years, and 73.9% (CI 68.7-79.0) for pregnant women.

Conclusion

The results indicate that the free distribution of LLINs through the integrated campaign, targeting households with children of under five years of age, had a significant impact on the ownership of LLINs at the household level.

Also, the free distribution of LLINs to pregnant women during routine prenatal services/consultations played an important role in the increase of the ownership of LLINs by pregnant women.

The MII usage rate at the household level for groups targeted by RBM increased significantly during the last two years in Mali and this survey showed that the Abuja objectives were attained at the national level and that Mali is moving rapidly towards the achievement of the 80% objectives for the year 2010.

Principal Partners of the Evaluation

Mali Ministry of Health- Programme National de Lutte contre le Paludisme (PNLP- National Malaria Control Program), Cellule de Planification et de Statistique (CPS- Unit for Planning and Statistics), Programme Élargi de Vaccination (PEV- Expanded Vaccination Program)
Direction Nationale de la Santé (DNS- National Directorate of Health)
Direction Nationale de la Statistique et l'Informatique (DNSI- National Statistical Office)
Division Statistiques et Démographiques (DSD- Statistics and Demography Division)
HealthBridge
Canadian Red Cross (CRC)
President's Malaria Initiative (PMI)/ United States Agency for International Development (USAID)
Assistance Technique Nationale Santé (ATN- Technical Assistance National Health)/USAID
Population Services International (PSI)
Canadian International Development Agency (CIDA)
Malaria No More
United Nations Foundation (UNF)
Groupe Pivot Santé Population (GP/SP)

Principal Partners of the Integrated Campaign

Ministère de la Santé- Programme National de Lutte contre le Paludisme (PNLP) et Programme élargi de vaccination (PEV)
UNICEF/Mali
Canadian Red Cross (CRC)
Canadian International Development Agency (CIDA)
United States Agency for International Development (USAID)- President's Malaria Initiative (PMI) and Technical Assistance National Health (ATN)
Mali Red Cross (MRC)
World Health Organization (WHO)
Population Services International (PSI)
Malaria No More (MNM)
United Nations Foundation (UNF)
VOICES
Groupe Pivot Santé Population (GP/SP)
FENASCOM

Abbreviations

ASACO	Association de Santé Communautaire
ATN	Assistance Technique Nationale
CDC	U.S. Centers for Disease Control and Prevention
CI	Confidence Interval
CPN	Prenatal Consultation
CSCOM	Centre de Santé Communautaire (Community Health Center)
CSRef	Centre de Santé de Référence (Health Center of Reference)
DHS	Demographic and Health Survey and Health
Inf	Lower Confidence Interval Limit
IC	Interval of Confidence
ITN	Insecticide treated mosquito nets
MdS	(Ministry of Health)
MII	Impregnated Insecticide Mosquito (LLIN + ITN)
LLINs	Long Lasting Insecticidal Nets
PEV	Programme Élargi de Vaccination (Expanded Vaccination Programme)
PDA	Personal Digital Assistants (or handheld computers)
PNLP	National Malaria Control Program
PPS	Probability Proportional to Population Size
RPGH	General Census of the Population and Habitat
EA	Enumeration Area
SIAN	Nutrition Week
Sup	Upper Confidence Interval Limit
IPT	Intermittent Preventive Treatment

Introduction

The introduction on a large scale of the Impregnated Insecticide Mosquito (MII) becomes more and more a basic measure in the efforts set up to fight against malaria. The Impregnated Insecticide Mosquito Net contributes efficiently to the morbidity and mortality reduction of the young children (Lengeler, 2004). Nevertheless, to reach a 60% distribution cover of the Impregnated Insecticide Mosquito with children of less than 5 years as well as pregnant women constitute one of the principal objectives set up by WHO (WHO, 2000) and recently the objectives of $\geq 80\%$ which cover more of these targeted groups have been established for 2010 (RBM, 2005).

Recent studies showed that the cover rate in impregnated mosquito nets was and remains the lowest in Africa ($<5\%$), particularly among the most vulnerable groups (young children and pregnant women) (UNICEF, 2003). On the other hand, routine vaccination campaigns in sub-Saharan Africa have attained more than 90% coverage with more than 90 million vaccinated children since 2001 (Grabowsky, 2005a).

The twinning of Impregnated Insecticide Mosquito distribution with vaccination campaigns had showed that it is an effective strategy that allows the increase of Impregnated Insecticide Mosquito usage (Grabowsky, 2005b). This integration approach was used in an effective way in countries such as Togo, Niger, Ghana, Zambia, Mozambique, Kenya and Sierra Leone, increasing thus the cover often to more than 80% among the target population (Grabowsky, 2005a, b).

It is worth noting that, a lot of programs integrated the free distribution of nets during popular vaccination campaigns, but studies remain unclear in what concern their correct usage and display in the users' houses (Grabowsky 2005A, CDC 2005, and CDC 2006). This contradiction motivates the follow up and the documentation on the nets usage.

The development of the technology of long lasting Insecticidal Nets (LLIN's) against the malaria has improved greatly its length and its effectiveness, when we compare it to other impregnated mosquito nets that exist on the market as well as their cost. Also, it is known that long lasting Insecticidal Nets can maintain effectiveness against the different vectors for more than three years (Guillet 2001).

An adequate system of follow up and of evaluation in the distribution of long lasting Insecticidal Nets at the region and national levels is very important in order to help to determine the impact of these LLIN'S with the users and to maximize their usage through the national programs for the eradication and prevention of malaria.

Malaria in Mali

In Mali, 100% of the population is at risk of malaria, yet malaria is one of the principal causes of morbidity and mortality among children less than 5 years and pregnant women. Malaria generally experiences three types of malaria transmission each year: 1) six

months of seasonal transmission in the south; 2) three months of transmission in the Sahel region (August to October); and 3) irregular transmission with risk of epidemics in the north (WHO, 2005). Malaria transmission is endemic in the Delta region of the Niger River as well in the neighbouring dams and rice fields. Malaria is also an endemic in urban centers such as Bamako and Mopti, even if it is at a low level.

The Impregnated Insecticide Mosquito (MII) for Malaria Prevention

MII promotion and usage is a priority for the Ministry of Health intervention. From now till 2011, the National Malaria Control Program (PNLP) strategy aims at reaching an 80% rate of MII usage among children of less than five years and pregnant women. A new Ministry of Health policy adopted in July 2006 supports the free distribution of MIIs to pregnant women during their first prenatal consultation and to children of less than five years after their vaccination against measles or during the healthy child consultation.

The major channels of the distribution of MIIs in Mali are: (1) the public health sector, with distribution at the CSCOM or the CSRef during routine services of antenatal care (CPN) or immunization (PEV); and (2) the private sector, through sales by local retailers (especially in Bamako and urban zones). According to a relatively new policy, mosquito nets distributed through the public sector that are LLINs must be clearly distinguished from the nets sold commercially.

From 2003 to 2006, close to two million mosquito nets (LLINs and conventional treated nets) were distributed thanks to the support of donors and NGOs. A dynamic private sector provided a wide selection of mosquito nets to households. Between 2003 and 2006, NetMark, supported by USAID, launched a program to create a durable commercial market for MIIs while improving their availability through the private sector (with retreatment kits) and while collaborating with four large net distributors and importers to facilitate their access to the international suppliers of LLINs. Information on the quantities and LLIN types as well as distributed mosquito nets is difficult to obtain in Mali because there is no entity or organisation responsible for the follow up and compiling of the data.

The Integrated Campaign of December 2007

To reinforce the fight against malaria and reduce morbidity and mortality among children under 5 years, in particular the ones that had measles and malaria, the government of Mali, in collaboration with its multiple international partners, implemented a national campaign for the distribution of Long Lasting Insecticidal Nets (LLINs), integrated with the vaccination campaign against measles and poliomyelitis, from the 13 to 19 December 2007. The campaign had as its goal the protection against measles, poliomyelitis, vitamin A deficiency, intestinal worms, and malaria, of more than 2.8 million children aged from 0 to 5 years.

This campaign, known under the name of “integrated campaign”, combined several interventions, and it was the first time in Mali that the five interventions are offered in a single campaign. For the Ministry of Health and its technical and

financial partners, the integration activities allow the creation of a synergy between these complementary interventions. During this campaign, postpartum women also were targeted: they received Vitamin A supplements and albendazole.

About 2.8 million children less than 5 years benefited from this campaign. More than 2.3 million impregnated insecticide mosquito nets (LLINs) were distributed to prevent malaria in seven of the country's nine regions. The table, below, shows the target population (children under 5 years) and the total number of mosquito nets that were distributed during the campaigns in every region, and the district of Bamako.

Table: Objectives and Results of the LLIN Distribution Campaign (Shkrob, 2008).

REGIONS OF MALI	Target population (children of less than 5 years) for the distribution	Total number LLINs distributed in June 2007	Total number of LLINs distributed in December 2007	Coverage
Kayes	317 756		325 928	102.57 %
Koulikoro	375 223		384 050	102.35 %
Sikasso	438 427		477 116	108.82 %
Segou	396 158		407 002	102.74 %
Mopti	340 485		336 422	98.81 %
* Tombouctou	111 849	118,450	1594	1.43 %
* Gao	84 197	82,363	8200	9.74 %
Kidal	9686		9783	101.00 %
District de Bamako	296 125		312 309	105.47 %
TOTAL	2 369 905	200 813	2 262 404	95.46 %

* The LLINs for Tombouctou and Gao were distributed during another integrated campaign, the June 2007 National Nutrition weeks (SIAN) (by PSI). The LLINs for the region of Kidal were bought in June 2007, but were only distributed in December 2007.

The social mobilization was an important factor of the campaign (Shkrob 2008). For the social mobilization, several media, such as radio, television, meetings with religious leaders, press conferences, as well as volunteering were used. The Mali Red Cross (MRC) was one of the partners in the campaign. Of a total of about 13,000 volunteers needed for the campaign, the MRC contributed about 2,500 volunteers. The MRC was involved in the campaign in six regions (Bamako, Kayes, Sikasso, Koulikoro, Ségou, and Mopti). Volunteers carried out social mobilization before the campaign itself to assure a good participation of the childrens' mothers. During the campaign, the volunteers supported the Ministry

of Health at the vaccination sites, helped with crowd control and the administration of vitamin A and albendazole as well as with the distribution of the LLINs. After the campaign, the volunteers of the MRC continued their activities of social mobilization in order to assure that the LLINs distributed during the campaign were hung up and used by children and pregnant women. The follow up activities continued for 6 days with a strategy of door to door visits.

The survey goal and objectives

Survey goal

The principal goal was to obtain information that will be representative of each of the regions in Mali, as well as the nation, showing the ownership and usage of the Impregnated Insecticide Mosquito (MIIs) at the level of the households.

General objective

The general objective of this survey was to assess retention and usage of the Long Lasting Insecticidal Nets (LLINs) in Mali during the rainy season, eight months after the December 2007 integrated campaign. The objective includes evaluating the coverage in three population groups as determined by RBM/WHO /World Bank, that is: households, children under five years of age (0-59 months), and pregnant women. The survey used normalized indicators for every segment.

In addition, the survey evaluated the campaign targets. Since children that were targeted in December 2007 grew since the campaign, we evaluated the receipt of the LLINs among children from 8 to 67 months (they were eligible in December 2007): also, due to the fact there was the integrated campaign in the regions of Gao and Tombouctou in June 2007(during Nutrition Week-(SIAN)), we evaluated the receipt of LLINs among children from 14 months to 73 months (they were eligible in June 2007).

The ownership of LLINs also were evaluated for pregnant women eligible to receive a free LLIN during the routine services for prenatal consultations (CPN).

Specific Objectives

1. Measure the ownership of the nets
 - a. Proportion of household having one or more nets of any type
 - b. Proportion of household having one or more Impregnated Insecticide Mosquito Net (MIIs)
 - c. Proportion of household having one or more Long Lasting Insecticidal Nets (LLINs)
 - d. Proportion of pregnant women having received an LLIN during the routine service for prenatal consultations (CPN).

2. Measure the ownership of LLINs in target groups for the integrated campaign
 - a. Proportion of households with children 8 to 67 months that received a LLIN during the December 2007 integrated campaign (aged from 14 to 73 months for the June 2007 Nutrition Week (SIAN)¹).
 - b. Proportion of households with children from 8 to 67 months that received 2 LLINs during the December 2007 integrated campaign (from 14 to 73 months for the June 2007 Nutrition Week (SIAN)).
3. Measure the usage of impregnated insecticide mosquito nets
 - a. Proportion of households having at least one MII hung up the night preceding the survey.
 - b. Proportion of children from 0 to 59 months that slept under an MII the night preceding the survey.
 - c. Proportion of pregnant women who slept under an MII the night preceding the survey.
4. Evaluate the ownership and usage of MIIs according to the economic status of households.
5. Evaluate the ownership and usage of MIIs by the sources of supply.

Methodology

Survey period

The survey was done during peak season of malaria transmission, from August the 9th to August 23rd 2008, eight months after the December 2007 integrated campaign.

Survey site

The estimations of the ownership and usage of the nets were measured at several levels to reflect the geographic regions for the interventions against malaria in Mali. In addition to the national level estimations, this report takes into consideration eight regions (among which are seven administrative regions and the Bamako district).

Type of survey and sample size

This study is a community-based cross-sectional survey. Multi-step sampling was done. The DNSI carried out the sampling using PPS (probability proportional to population size) and sampling was based on the 2008 population projections from the most recent national census (RPGH), held in 1998. In addition to the 1998 RPGH, the DNSI had forecasted in 2003 the number of inhabitants in Mali (1999-2024). Population data was thus available by region, commune, village and enumeration area (EA).

¹ The LLINs were distributed in June 2007 during the Nutrition Week in Gao and Tombouctou.

The number of households was selected to be sufficiently high enough to provide statistically reliable estimates for a number of key indicators, including MII ownership and usage for under-fives, at the national level, as well as for the regions.

Sampling frame

The sampling was done using multi-stage sampling, drawn to several degrees using PPS. Each of the eight regions was considered as an individual stratum, giving a total of eight strata for the entire nation.

In the first step (for every region except for the district of Bamako) nine (9) communes were selected with the PPS sampling method. In the second step, three (3) villages/EAs were selected with the PPS method, in each of the selected communes. A village was able to be an EA on its own or a group of EAs (in the case of small EAs). Within every EA, 18 households were selected by systematic sampling. The households were selected irrespective of the presence of children under the age of five.

In Bamako, five (5) quartiers (neighbourhoods) were selected using PPS. For each selected quartier, 18 households were selected by systematic sampling.

A household for this survey was defined as "an ordinary household" in accordance with the definition used in preceding surveys in Mali, with the sub-households conforming to the distribution strategy of LLINs used in the campaigns of June and December 2007.²

The enumerators applied a sampling interval to determine which household would be interviewed. The necessary interval was calculated in advance for every EA. The interval was calculated according to the estimated population of the selected EA divided by 6.0 which is the average number of persons in a household in Mali.

In summary, eight regions with a draw of 69 communes and 219 EAs were to be included in the survey. In every region the sample determination was "self weighting" which means that every person had the same probability of selection.

The sample size was chosen to obtain usefully precise estimates for each region and for the nation, for the primary RBM indicators (eg., for the national level: household ownership of MIIs $\pm 1.9\%$; usage of MII by children under five $\pm 2.9\%$).

² For the December 2007 campaign it was determined that a maximum of two LLINs would be distributed to a mother with children under five years regardless of the number of under-fives she had. In the SIAN campaign in June 2007, the distribution strategy was one LLIN for every child under five, without any limit.

Limitations

Due to problems of access that were encountered in the field in four regions of the country, the exclusion of some EAs was necessary. Eight EAs in total were replaced: two EAs in Gao; four EAs in Tombouctou; an EA in Mopti; and an EA in Ségou. In every case, another EA in the same commune was selected as a replacement by the DNSI, using PPS sampling

Survey Procedures

The survey was carried out from the 9th to 23rd of August 2008. The survey was conducted by 11 teams composed each of a supervisor/enumerator and three enumerators. In every region, nine communes and 27 EAs were selected. In Bamako, five quartiers were selected. Every team covered one to three EAs a day, depending on the location of the selected EA and the logistical considerations. In total, 219 EAs were selected and households interviewed within each.

The 2nd and 3rd first days of the survey were devoted to Bamako, with 9 teams in the field do the interviews. Two teams were sent to some regions (Kayes, Koulikoro, Ségou, Sikasso) while a team was deployed in each of the 3 other regions (Mopti, Tombouctou and Gao).

The surveyors planned their route so that they would canvass the entire EA. The surveyor travelled in a systematic manner, continuing until they could assure that the entire EA was covered and all households within the canvassed area interviewed even if that meant a surplus in the number of households to be interviewed. Any excess in number of households interviewed was treated during the data analysis phase.

The team, headed by a supervisor, divided the EAs in the field, chose the departure point for every enumerator at the periphery of the EA, and decided the number of interviews to be completed by every surveyor. From the starting point, the surveyor applied the given sampling interval.

The survey

The surveyors asked questions on the household, nets in the household, pregnant women in the household, and children less than 67 months (73 months for Gao and Tombouctou), malaria knowledge, visits of the Red Cross, and the household economic characteristics. The interview was conducted using a survey-specific questionnaire that was programmed for administration using a handheld computer (PDA).

Data

In the field, during the survey, all answers were directly entered into a database on the PDA (application software: Visual CE, 8.0, Syware Inc, Cambridge, Massachusetts). Each day, the team supervisors backed up the survey data. At the end of the survey the data of all the teams was downloaded and saved into a central database (Microsoft Access).

Statistical analyses

The final data from the interviews was in Microsoft Access. Due to multi-stage and PPS sampling, specialized survey analysis software was used to produce valid estimates and standard errors using the sampling weights: ie., SAS (version 9. 2, SAS Institute, Cary, NC). Applying the appropriate methods, the statistical analyses took into consideration the sampling weights and effects of clustering.

The households were stratified by their economical scores, based on criteria developed by the World Bank to classify a household's economic status and used in the Mali DHS 2000. All the households were divided in five equal groups (quintiles) according to their level of wealth, and by definition, ~20% were in every quintile. Quintile 1 represents the poorest households and quintile 5 represents the richest households. The economic equity ratio was calculated as the proportional rate in the poorest quintile (quintile 1) compared to the richest one (quintile 5). A ratio of 1.0 indicates equity between the quintiles.

All the percentages presented in this report are the result of a weighted analysis unless otherwise indicated. The results are estimations with 95% intervals of confidence (CI /IC) indicated in parentheses.

Results

The results of the survey are presented here at the national and regional level. The regions are Gao, Kayes, Koulikoro, Mopti, Sikasso, Ségou and Tombouctou, and the district of Bamako. For the categories of the mosquito nets, the terms used and their definitions are: ITN is a mosquito net, initially treated or not, that was impregnated with insecticide within the past six months; a LLIN is Long Lasting Insecticidal Net that does not require any additional treatment; and MIIs are insecticide-treated mosquito nets made up of the ITNs and the LLINs.

Characteristics of the households

In the 3,757 households surveyed there were 17,856 persons, with 3850 children under five years of age, and 4,182 women of childbearing age (15 to 49 years). 530 women were pregnant at the survey. 2,648 households had at least one child

less than five years of age.

Ownership of MIIs in the households

Eight months after the integrated campaign of December 2007, at the national level 91.0% (CI 89.4-92.5) of households owned at least one net of any type, and 29.9% (CI 27.1-32.7) households possessed at least one untreated net. 81.7% (CI 79.5-83.8) of households owned at least one MII. The vast majority 80.6% (CI 78.5-82.7) of all the treated nets in households is a LLIN, with 2.6% (CI 2.0-3.2) being an ITN (Table 1a, Figure 1a).

The rate of ownership of at least any type of mosquito nets was lowest in Mopti at 88.8% (CI 84.7-92.8) and highest in Kayes at 94.0% (CI 91.8-96.1) (Table 1b, Figure 1a). There were regional differences in the possession of the MIIs in the households. The rate of ownership in the regions was (from the lowest to highest) : Gao 73.9% (CI 65.6-82.1); Tombouctou 75.4 (CI 69.1-81.7); Bamako 77.0% (CI 72.7-81.3); Mopti 77.0% (CI 71.8-82.2); Ségou 79.3% (CI 74.4-84.1); Koulikoro 82.9% (CI 76.4-89.5); Kayes 84.1% (CI 80,9- 87,3); and Sikasso 88.1% (CI 83.3-92.9) (Table 1b, Figure 1a).

Ownership of nets and equity

The ownership rate of mosquito nets of any type was the lowest in the poorest quintile (poorest to wealthiest): 83.2% (CI 78.5-87.8); 89.6% (CI 86.4-92.8); 92.8% (CI 90.7-95.0); 93.6% (CI 91.3- 95.8); and 93.8% (CI 92.0-95.7). The equity ratio was 0.88 (Table 1c, Figure 1b).

There was also variation in the rate of the ownership of the MIIs across the economic quintiles (poorest to the wealthiest): 71. 2% (CI 65.5-76.9);

81. 6% (CI 77.5-85.7); 81.6% (CI 77.6-85.7); 86.2% (CI 83.2-89.2); and 85. 6% (CI 82.7-88.4). The equity ratio was 0.83 (Table 1c, Figure 1c,).

The suspension of MIIs

The MII suspension rate was lower than the rate of ownership. At the national level, 76.9% (CI 74.5-79.3) of the 3,757 households that were surveyed had at least one MII suspended the preceding night (Figure 4). There were regional variations (form lowest to the highest) : Gao 65.6% (CI 56.4-74.7); Tombouctou 66.4% (CI 59.5-73.4); Bamako 68.3% (CI 64.4-72.3); Mopti 74.0 (CI 68.6-79.3); Ségou 76.1% (CI 70.3-82.0); Koulikoro 78.1% (CI 71.4-84.9); Kayes 78.8% (CI 75,0- 82,7); and Sikasso 82.3% (CI 76.4-88.1) (Table 1b, Figure 4a).

The suspension rate of MIIs varied across the quintiles (from the poorest to the wealthiest): 65.4% (CI 59.9-70.8); 77.8% (CI 73.2-82.5); 76.3% (CI 71.6-80.9); 81.9% (CI 78.5-85.3); and 80.9% (CI 77.6-84.1) (Table 1c, Figure 4b). The equity ratio was 0.81.

Receipt of MIIs by pregnant women during the CPN and equity

At the national level, (CI 43.5-50.9) 47.2% of 990 women who reported having had a pregnancy since 2006 received a MII during the CPN (Figure 2a). This rate increased to 58.2% (CI 54.5-61.9) taking into account only the women that attended the CPN (Table 2b).

There were regional variations in the rate of the receipt of a MII by a woman at the time of pregnancy (in ascending order) : Koulikoro 38.8% (CI 31.4-46.3); Bamako 42.2% (CI 35.5-48.9); Mopti 42.2% (CI 33.4-51.0); Sikasso 44.1% (CI 35.9-52.2); Gao 47.9% (CI 37.6-58.2); Tombouctou 49.8% (CI 38,2- 61,4); Kayes 56.6% (CI 46.8-66.4); and Ségou 59.9% (CI 50.1-69.8) (Table 2a).

There were also variations across the economic quintiles (poorest to wealthiest): 37.2% (CI 30.2-44.3); 45.5% (CI 39.0-51.9); 45.4% (CI 39,3- 51,5); 53.6% (CI 47.2-60.1); and 51.6% (CI 45.1-58.0). The equity ratio was 0.72. (Table 2a, Figure 2b).

There was a wide regional variation in the rate of the receipt of a MII by the pregnant women at the time of the CPN when one considers only the pregnant women that had attended the CPN (in ascending order) : Bamako 43.3% (CI 36,3- 50,3); Koulikoro 48.6% (CI 40.9-56.3); Mopti 52.9% (CI 43.4-62.3); Sikasso 56.8% (CI 50.1-63.5); Gao 64.8% (CI 53.4-76.1); Kayes 66.6% (CI 56.6-76.6) : Tombouctou 70.4% (CI 59.1-81.6); and Ségou 72.6% (CI 62.7-82.5) (Table 2b).

There were also variations through the economic quintiles for the receipt of a MII by the pregnant women that attended the CPN (poorest to wealthiest): 51. 5% (CI 43.0-60.0); 58.2% (CI 51.3-65.1); 59.0% (CI 51.8-66.2); 64.1% (CI 51.5-70.8) and 54. 8% ((CI 47.9-61.7) (Table 2b, Figure 2b). The equity ratio was 0.94.

Receipt of LLINs in the group targeted by the integrated campaign

At the national level 81.0 % (CI 78.5-83.5) of all the households with eligible children for the campaign (n = 2,636) received at least one LLIN during the campaign (Table 3a, Figure 3a).

The rate of the receipt of at least one LLIN during the campaign was (in rising

order) : Gao 67.6% (CI 58.3-76.8); Tombouctou 67.6% (CI 57.4-77.8); Bamako 76.9% (CI 72.0-81.8); Mopti 79.1% (CI 74.5-83.6); Sikasso 80.0% (CI 73.2-86.7); Kayes 80.8% (CI 75.5-86.2); Koulikoro 82.1% (CI 76.7-87.5); and Ségou 86.5% (CI 81.3-91.60) (Table 3a, Figure 3a).

There was variation across the economic quintiles (from the poorest to the wealthiest) : 73.4% (CI 67.2-79.6); 79.9% (CI 74.8-85.0); 84.1% (CI 80.3-87.9); 83.5% (CI 79.8-87.1); and 81.6% (CI 77.3-85.9) (Table 3a), with the equity ratio of 0.90.

At the national level, from all the households with two or more eligible children for the campaign (n=1,085), 54. 3% (CI 49.4-59.1) received two or more LLINs at the time of the campaign (Table 3b).

At the regional level, there were notable variations between the regions (in rising order) : Sikasso 34.4% (CI 25.0-43.8); Tombouctou 43.7% (CI 31.9-55.6); Gao 48.0% (CI 36.9-59.0); Bamako 48.7% CI 40.9-56.6); Mopti 56.5% (CI 43,5-69,5); Koulikoro 56.9% (CI 47.3-66.5); Kayes 69.1% (CI 60.4-77.7); and Ségou 69.2% (CI 57.5-80.8) (Table 3b).

There were also variations between the economic quintiles (from the lowest to the highest): 39.4% (CI 27.0-51.8); 54.6% (CI 45.7-63.6); 50.9% (CI 41.7-60.2); 64.2% (CI 56.6-71.8); and 58.8% (CI 49.8-67.8) (Table 3b). The equity ratio was 0.67.

The usage of MIIs by children younger than five years

At the national level, 78.5% (CI 76.0-81.0) of the 3,850 children less than five years of age in the surveyed households were reported to have slept under a MII the night preceding the survey (table 5a). This rate increases to 96.3% (CI 95.5-97.2) when considering the 3040 children under five years that live in a household that owned at least one MII (Table 6b).

The percentage of the children that slept under a MII the preceding night varied in the regions (from lowest to highest) : Gao 66.8% (CI 58.0-75.5); Bamako 69.4% (CI 64.5-74.4); Tombouctou 70.0% (CI 62.1-77.9); Kayes 78.1% (CI 72,7- 83,5); Sikasso 78.9% (CI 72.6-85.2); Mopti 79.1% (CI 74.1-84.1); Koulikoro 79.5% (CI 73.9-85.2); and Ségou 80.4% (CI 74.9-85.9) (Table 5a, Figure 5a).

By economic quintile the proportion of the children less than five years that slept under a MII the night preceding the survey was: the poorest quintile 74.7% (CI 69.4-80.1); 2nd quintile 81.8% (CI 76.8-86.8); 3rd quintile 76.9% (CI 72,3-81,5); 4th quintile 80.8% (CI 77.0-84.7); the richest quintile 77.1% (CI 71,8-82,3) (Table 5a , Figure 5b). The usage of MIIs by children under five years was similar in the households in the poorest and the richest quintiles, with an

equity ratio of 0.97.

The usage rate of MIIs by the children of less than five years in the households that possessed at least one MII was (in ascending order) : Gao 93.9% (CI 91.0-96.7); Kayes 94.8% (CI 92.5-97.0); Bamako 95.7% (CI 92.7-98.6); Sikasso 95.8% (CI 93.9-97.7); Tombouctou 96.1% (CI 93.9-98.4); Koulikoro 96.1% (CI 94.1-98.1); Ségou 96.8% (CI 94.5-99.1) and Mopti 97.9% (CI 96.4-99.4) (Table 6b).

The usage of MIIs by pregnant women

At the national level, 73.9% (CI 68.7-79.0) of the 530 pregnant women that were surveyed slept under a MII the night preceding the survey (Table 6). The usage in the regions was (in rising order) : Gao 59.3% (CI 43.5-75.0); Tombouctou 61.2% (CI 43.9-78.5); Bamako 66.7% (CI 54.7-78.8); Ségou 70.1% (CI 58.1-82.1); Kayes 72.1% (CI 60.1-84.1); Koulikoro 73.5% (CI 58.8-88.1); Sikasso 78.1% (CI 66.9-89.2); and Mopti 80.2% (CI 68.6-91.9) (Table 6, Figure 6a).

Source of supply of LLINs

The contribution of the different sources of supply of LLINs at the national and regional level is shown in Tables 7a and 7b. The survey collected data from seven sources of LLINs: the integrated campaign ; the market; CSCCom or CSRef during the CPN; CSCCom or CSRef during vaccination (PEV); pharmacy/ private depot; NGO/associations; (parents/friends); does not know; and others . The LLINs sources at the national level are shown in Figure 7.

The five principal sources of supply of LLINs at the national level (in descending order) were: the integrated campaign (64.4%, n=3816)); CSCCom or CSRef during the CPN (16.7%, n = 987); CSCCom or CSRef during vaccination (PEV) (6.7%, n = 399); the market (6.1%, n = 364); and friends/relatives (3.8%, n = 224) (Tables 7a, 7b).

93% of all the LLINs owned by the households were the Permanet brand, and 7% were the Olyset brand (Table 8).

Limitations

Flooding in some regions required that an adjustment be made in the sampling in these regions. The exclusion of inaccessible villages could diminish the representativeness of the sampling. If a village was inaccessible at the time of the survey as well as during the LLINs distribution during the June or December 2007 campaign, results of the survey could show an artificial increase of the

LLINs ownership. The replacement villages were selected by DNSI using a valid method, thus minimizing this effect.

In Mali, households and the structural organization of the family can be complex and consequently it is possible that the teams of the survey or the individual enumerators may have defined households in different ways despite a definition provided during the training.

Discussion

The results of this cross-sectional survey carried out during the rainy season in Mali showed a high rate of ownership of nets with more than 91.0% of households having at least one net of any type. There were regional differences, with the lowest rate in Bamako (87.2%) and the highest in Gao (95.1%).

Nationally, 82% of households have at least one MII. The vast majority of treated nets owned by households were LLINs.

The vaccination campaigns typically achieve more than 90% coverage of children. For the first time, during the 2007 campaign, free distribution of LLINs to children of less than 5 years was integrated to a vaccination campaign in Mali. The results confirm that the June and December 2007 campaigns quickly attained high and lasting levels as far as the ownership of LLINs is concerned. At the national level, the ownership level in households of at least one LLIN was 82%. At the regional level, the ownership rate of LLINs in Bamako, Gao and Tombouctou was the lowest (73% to 75%). The distribution of LLINs in Gao and Tombouctou took place in June 2007 (six months before the December 2007 integrated campaign, therefore 15 months before this survey) and this could be a factor in this observation. The equity of ownership of LLINs by households does not seem to have been fully attained, with a level of lower possession in the poorest quintile.

A new policy of the Ministry of Health adopted in June 2006 supported the free distribution of LLINs to pregnant women during the first prenatal consultation and for children of less than five years who had received the vaccination against measles or during the consultation of healthy children. Even though the objective to reach 80% of pregnant women was not obtained, it appears that this strategy contributed to the increase in ownership of the LLINs by pregnant women. At the national level, the rate of receipt of the LLINs by pregnant women that had a CPN was 58%. Wide regional variations appeared, from 43% in Bamako to 73% in Ségou. Even if these results are encouraging, it remains that a significant proportion of pregnant women did not benefit from the distribution strategy of the LLINs during the prenatal services. It was acknowledged that directives given by

the Ministry of Health for the implementation of the policy were not yet completely applied and that adequate stocks of LLINs were not available everywhere in the country. The receipt of a LLIN by the pregnant women was at the lowest in the poorest quintile. The difference in the receipt of a LLIN across the quintiles indicates that it is necessary to explore further this observation.

While the percentage of households with an eligible child that received a LLIN during the campaign was more than 65% in all the regions, there were still some large variations throughout these regions, with only four regions reaching the target of 80% (Sikasso, Kayes, Koulikoro and Ségou). In only four regions, more than 50% of households with two or more of eligible children received two or more LLINs during the campaign. The reason for such results is not known but may, in certain regions, be linked to a scarcity of LLINs. The equity ratio is 0.67, and the finding that only 39% of households with two or more eligible children received two or more LLINs in the poorest quintile, indicates the need to improve the strategies to ensure that the poorest households benefit from and take part in the integrated campaigns .

As a whole, though the usage rate of MIIs was lower than the ownership rate, there was a high rate of usage of MIIs in households that owned MIIs. The rate of suspension of MIIs was 76% in this survey, including all the households that did not have an eligible child during the campaign and that therefore did not receive a MII at that time.

The survey shows an increase in the usage of MIIs in Mali by the two population groups most at risk: children of less than five years and pregnant women (the RBM Abuja target is 60%). The proportion of children that slept under a MII the night preceding the survey increased from the rate of 27% as found in the 2006 DHS survey to 76% at the national level in this survey. The rate increased to more than 90% in households that possessed a MII, with a high of 98% at Mopti. These results indicate that for the households that have a MII, it was used to protect children of less than five years against malaria. Equity in the usage of LLINs by children of less than five years seems to have been attained, with the equity ratio for usage being 0.97 at the national level.

The proportion of pregnant women that slept under a MII the preceding night was 74% at the national level, compared to 29% in the DHS 2006 survey. There was a wide regional gap (low in Gao of 59% and high in Mopti of 80%).

The factors that played a role in the increase and the usage of the MIIs include a national social mobilization effort that involved about 13, 000 volunteers (of which 2500 were from the Mali Red Cross (MRC)). Before the campaign, volunteers carried out social mobilization to ensure the participation of mothers

and children. After the campaign, 2438 volunteers from MRC visited households to make sure that the MIIs distributed during the campaign were suspended and used by children and pregnant women. The follow up activities continued for six days with a strategy of door to door visits. Nevertheless, there may be other factors of importance that affect the suspension rate: climate and the cultural behaviours that vary between the geographic regions of the country.

Despite the investments made in Mali during the last years on the distribution of impregnated mosquito nets with short duration and the promotion of insecticide retreatment of nets, less than 3% of all the nets in the households that participated in the survey were ITNs. A factor that could explain this result would be a lack of follow up in the households for the retreatment of nets with insecticide within the prescribed time period. In Togo, it was shown that despite a reasonable number of stations in the community for the free retreatment of the existing nets (set up by the Togolese MOH with the support of the WHO) less than 10% of the nets in the anaemia survey of September 2004 had been treated with insecticide during the 6 preceding months (Wolken et al 2005). These results highlight the need to examine the strategies used to increase the rate of ownership and the usage of treated nets.

Conclusion

Results indicate that distribution of free LLINs through an integrated campaign, targeting households with children under five years, had a significant impact on the ownership of LLINs at the household level.

The free distribution of MIIs to pregnant women during prenatal/CPN routine services played an important role in the increase of the ownership of the MIIs by pregnant women.

The usage rate of the MIIs at the household level among the groups targeted by RBM increased in a significant way during the past two years and this survey showed that the objectives of Abuja were attained at the national level and that Mali is reaching quickly the target of 80% for the year 2010.

These data will help the government of Mali as well as its partners to refine the strategies and programs for the prevention and control of malaria in Mali .

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The 44 members of the survey team worked with professionalism, in difficult conditions. The names of team supervisors and the enumerators are shown on the next page.

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Tables

Table 1a. Net ownership in Mali, at the national level.

Household proportion having at least one net of any type, at least one untreated net, at least one LLIN, at least one ITN, or at least one MII, at the national level (denominator: all households, n=3757).

Response	Frequency	Percentage	95% CI	
			Lower	Upper
At least any type of net				
No	320	9.0	7.5	10.6
Yes	3437	91.0	89.4	92.5
At least a non-treated net				
No	2493	70.1	67.3	72.9
Yes	1264	29.9	27.1	32.7
At least a LLIN				
No	782	19.2	17.0	21.3
Yes	2975	80.6	78.7	83.0
At least a ITN				
No	3655	97.4	96.9	98.2
Yes	102	2.6	1.8	3.1
At least a MII				
No	748	18.3	16.2	20.5
Yes	3009	81.7	79.5	83.8

Table 1b. Ownership of net in Mali, by region.

Household proportion having at least one net of any type, at least one non impregnated net , at least one LLIN, at least one ITN, or at least one MII (denominator: all households, n=3757).

	Frequency	Percentage	95% IC	
			Lower	Upper
At least any type of net				
Bamako	449	87.2	84.0	90.3
Gao	431	95.1	92.8	97.4
Kayes	436	94.0	91.8	96.1
Koulikoro	410	89.1	83.9	94.4
Mopti	411	88.8	84.7	92.8
Sikasso	459	92.7	89.2	96.1
Ségou	435	91.9	89.3	94.5
Tombouctou	406	92.8	89.5	96.2
Total	3437	91.0	89.4	92.5
At least a non-impregnated net				
Bamako	166	31.1	26.1	36.1
Gao	210	47.1	38.5	55.6
Kayes	170	36.6	28.2	44.9
Koulikoro	102	23.0	16.9	29.1
Mopti	130	28.4	21.5	35.2
Sikasso	123	24.8	19.7	29.9
Ségou	165	35.6	28.2	42.9
Tombouctou	198	45.4	36.3	54.5
Total	1264	29.9	27.1	32.7
At least a LLIN				
Bamako	377	73.9	69.7	78.1
Gao	334	73.2	65.1	81.4
Kayes	390	83.7	80.1	87.2
Koulikoro	382	82.8	76.2	89.3
Mopti	356	76.6	71.3	81.9
Sikasso	432	87.0	82.2	91.7
Ségou	374	78.3	73.3	83.2
Tombouctou	330	75.2	68.8	81.6
Total	2975	80.6	78.7	83.0
At least an ITN				
Bamako	39	7.4	4.9	9.8
Gao	11	2.4	0.8	4.0
Kayes	13	2.8	1.2	4.4
Koulikoro	4	0.9	0.0	1.7
Mopti	9	2.0	0.4	3.6

Sikasso	11	2.3	0.9	3.8
Ségou	12	2.7	1.1	4.3
Tombouctou	3	0.6	0.0	1.2
Total	102	2.6	1.8	3.1

At least a MII (LLIN or ITN)

Bamako	393	77.0	72.7	81.3
Gao	337	73.9	65.6	82.1
Kayes	392	84.1	80.9	87.3
Koulikoro	383	82.9	76.4	89.5
Mopti	358	77.0	71.8	82.2
Sikasso	437	88.1	83.3	92.9
Ségou	378	79.3	74.4	84.1
Tombouctou	331	75.4	69.1	81.7
Total	3009	81.7	79.5	83.8

Table 2b. MIIs received by pregnant women and equity.

Percentage of pregnant women that received a MII during prenatal services/CPN, at the national level and by region (denominator: all pregnant women that visited the CPN services, eligible to receive a MII during the pregnancy, n=1684). The receipt of MIIs is shown by economical quintile.

				95% IC	
		Frequency	Percentage	Inf.	Sup.
National	No	694	42.3	38.6	45.9
	Yes	990	58.2	54.5	61.9
Regional					
	Bamako	91	43.3	36.3	50.3
	Gao	109	64.8	53.4	76.1
	Kayes	162	66.6	56.6	76.6
	Koulikoro	112	48.6	40.9	56.3
	Mopti	115	52.9	43.4	62.3
	Sikasso	142	56.8	50.1	63.5
	Ségou	141	72.6	62.7	82.5
	Tombouctou	118	70.4	59.1	81.6
	Total	990	58.2	54.5	61.9
By economical quintile					
	1 st (poorest)	150	51.5	43.0	60.0
	2 nd	216	58.2	51.3	65.1
	3 rd	194	59.0	51.8	66.2
	4 th	253	64.1	57.5	70.8
	5 th (richest)	177	54.8	47.9	61.7
	Total	990	58.2	54.5	61.9

Table 3a. LLINs received by eligible children for the campaign.

The household percentage with eligible children for the country that received at least one net during the campaign, at the national level and by region (denominator: all households with at least an eligible child for the campaign, n=2636). The receipt of LLINs is classified by economical quintile, at the national level.

		Frequency	Percentage	95% IC	
				Inf.	Sup.
National	No	586	19.0	16.5	21.5
	Yes	2050	81.0	78.5	83.5
Regional					
	Bamako	228	76.9	72.0	81.8
	Gao	212	67.6	58.3	76.8
	Kayes	273	80.8	75.5	86.2
	Koulikoro	290	82.1	76.7	87.5
	Mopti	262	79.1	74.5	83.6
	Sikasso	329	80.0	73.2	86.7
	Ségou	269	86.5	81.3	91.6
	Tombouctou	187	67.6	57.4	77.8
	Total	2050	81.0	78.5	83.5
By economical quintile					
	1 st (poorest)	349	73.4	67.2	79.6
	2 nd	424	79.9	74.8	85.0
	3 rd	440	84.1	80.3	87.9
	4 th	456	83.5	79.8	87.1
	5 th (richest)	381	81.6	77.3	85.9
	Total	2050	81.0	78.5	83.5

Table 3b. LLINs received by eligible children for the campaign and equity.

The household percentage with two or more eligible children for the campaign that received at least two nets during the campaign, at the national level and by region (denominator: all households with at least two eligible children for the campaign, n=1085). The reception of LLINs is classified by economical quintile, at the national level.

				95% IC	
	n LLIN	Frequency	Percentage	Inf.	Sup.
National	0 or 1	511	45.7	40.9	50.6
	>=2	574	54.3	49.4	59.1
Regional	>=2 LLINs				
	Bamako	45	48.7	40.9	56.6
	Gao	74	48.0	36.9	59.0
	Kayes	97	69.1	60.4	77.7
	Koulikoro	85	56.9	47.3	66.5
	Mopti	79	56.5	43.5	69.5
	Sikasso	60	34.4	25.0	43.8
	Ségou	84	69.2	57.5	80.8
	Tombouctou	50	43.7	31.9	55.6
	Total	574	54.3	49.4	59.1
By economical quintile					
	1 st (poorest)	82	39.4	27.0	51.8
	2 nd	125	54.6	45.7	63.6
	3 rd	124	50.9	41.7	60.2
	4 th	152	64.2	56.6	71.8
	5 th (richest)	91	58.8	49.8	67.8
	Total	574	54.3	49.4	59.1

Table 4. The MIIs suspension and equity.

The household percentage in Mali having at least one MII (LLIN or ITN) suspended the preceding night of the survey, at the national level and by region (denominator: all households, n = 3757). The MIIs suspension at the national level is classified by economical quintile.

		Frequency	Percentage	Inf.	Sup.
National	No	974	23.1	20.7	2.5
	Yes	2783	76.9	74.5	79.3
Regional					
	Bamako	348	68.3	64.4	72.3
	Gao	298	65.6	56.4	74.7
	Kayes	369	78.8	75.0	82.7
	Koulikoro	360	78.1	71.4	84.9
	Mopti	344	74.0	68.6	79.3
	Sikasso	407	82.3	76.4	88.1
	Ségou	364	76.1	70.3	82.0
	Tombouctou	293	66.4	59.5	73.4
	Total	2783	76.9	74.5	79.3
By economical quintile					
	1 st (poorest)	472	65.4	59.9	70.8
	2 nd	570	77.8	73.2	82.5
	3 rd	567	76.3	71.6	80.9
	4 th	603	81.9	78.5	85.3
	5 th (richest)	571	80.9	77.6	84.1
	Total	2783	76.9	74.5	79.3

Table 5a. MIIs usage by children of less than five years.

The percentage of children of less than five years (0 to 59 months) that slept under a MII the preceding night, national and by region (denominator: all children of less than five years, n=3850). MIIs usage at the national level is classified by economical quintile.

		Frequency	Percentage	95% IC	
				Inf.	Sup.
National	No	938	21.5	19.0	24.0
	Yes	2912	78.5	76.0	81.0
Regional					
	Bamako	266	69.4	64.5	74.4
	Gao	352	66.8	58.0	75.5
	Kayes	377	78.1	72.7	83.5
	Koulikoro	397	79.5	73.9	85.2
	Mopti	402	79.1	74.1	84.1
	Sikasso	481	78.9	72.6	85.2
	Ségou	352	80.4	74.9	85.9
	Tombouctou	285	70.0	62.1	77.9
	Total	2912	78.5	76.0	81.0
By economical quintile					
	1 st (poorest)	528	74.7	69.4	80.1
	2 nd	654	81.8	76.8	86.8
	3 rd	588	76.9	72.3	81.5
	4 th	662	80.8	77.0	84.7
	5 th (richest)	480	77.1	71.8	82.3
	Total	2912	78.5	76.0	81.0

Table 5b. MIIs usage by children of less than five years.

The percentage of children of less than five years (0 to 59 months) that slept under a MII preceding night, in households that possessed at least a MII, at the national level (denominator: children that slept in a household that possessed at least one MII, n=3040).

				95% IC	
		Frequency	Percentage	Inf.	Sup.
National	No	128	3.7	2.8	4.5
	Yes	2912	96.3	95.5	97.2
Regional					
	Bamako	266	95.7	92.7	98.6
	Gao	352	93.9	91.0	96.7
	Kayes	377	94.8	92.5	97.0
	Koulikoro	397	96.1	94.1	98.1
	Mopti	402	97.9	96.4	99.4
	Sikasso	481	95.8	93.9	97.7
	Ségou	352	96.8	94.5	99.1
	Tombouctou	285	96.1	93.9	98.4
	Total	2912	96.3	95.5	97.2

Table 6. MIIs usage by pregnant women.

The percentage pregnant women that slept under a MII the preceding night, at the national level and by region (denominator: all pregnant women; n=530). LLINs usage by pregnant women is classified by economical quintile, at the national level.

				95% IC	
		Frequency	Percentage	Lower	Higher
National	No	154	26.1	21.0	31.3
	Yes	376	73.9	68.7	79.0
Regional					
	Bamako	57	66.7	54.7	78.8
	Gao	34	59.3	43.5	75.0
	Kayes	59	72.1	60.1	84.1
	Koulikoro	52	73.5	58.8	88.1
	Mopti	46	80.2	68.6	91.9
	Sikasso	54	78.1	66.9	89.2
	Ségou	46	70.1	58.1	82.1
	Tombouctou	28	61.2	43.9	78.5
	Total	376	73.9	68.7	79.0
By economical quintile					
	1 st (poorest)	52	64.6	51.2	78.1
	2 nd	72	81.3	72.4	90.3
	3 rd	77	73.0	63.4	82.6
	4 th	87	75.1	65.8	84.5
	5 th (richest)	88	72.6	64.3	80.9
	Total	376	73.9	68.7	79.0

Table 7a. Source of supply of LLINs.

The percentage for every LLIN source, at the national level and by region.

LLINs source (%)									
Region	Campaign	Market	CSCom or CSRef during CPN	CSCom or CSRef during PEV	Pharmacy/ Private depot	NGO/ associations	Friends/ Relatives	Does not know	Other
Kayes	61.8	5.5	20.1	8.4	0.2	0.0	2.8	0.2	0.9
Koulikora	59.8	5.8	17.4	13.3	0.1	0.4	2.4	0.3	0.5
Sikasso	69.1	3.7	13.6	9.2	0.1	0.4	3.5	0.1	0.3
Segou	62.6	5.2	19.8	4.8	1.1	0.8	5.4	0.3	0.0
Mopti	71.6	4.6	17.3	3.0	1.0	0.0	2.5	0.0	0.0
Tombouctou	64.3	3.8	22.8	3.7	0.0	0.5	2.8	0.2	1.8
Gao	65.4	8.6	13.6	5.5	0.4	0.3	4.5	0.0	1.8
Bamako	62.3	11.2	10.0	4.7	2.7	1.4	5.8	0.3	1.7
TOTAL	64.4	6.1	16.7	6.7	0.7	0.5	3.8	0.2	0.9

Table 7b. Source of supply of LLINs.

The frequency for every source of LLINs, at the national level and by region.

LLINs source by region and at the nation level (frequency)									
LLINs sources (frequency)									
Region	Campaign	Market	CSCom or CSRef during CPN	CSCom or CSRef during PEV	Pharmacy/ Private depot	NGO/ associations	Friends/ Relatives	Does not know	Other
Kayes	506	45	165	69	2	0	23	2	7
Koulikora	453	44	132	101	1	3	18	2	4
Sikasso	535	29	105	71	1	3	27	1	2
Segou	494	41	156	38	9	6	43	2	0
Mopti	452	29	109	19	6	0	16	0	0
Tombouctou	386	23	137	22	0	3	17	1	11
Gao	510	67	106	43	3	2	35		14
Bamako	480	86	77	36	21	11	45	2	13
TOTAL	3816	364	987	399	43	28	224	10	51

Table 8. LLINs brands.

The LLIN brand possessed by households, region and nation.

	LLIN			
	Permanet		Olyset	
Region	n	%	n	%
Kayes	789	96	30	4
Koulikoro	737	97	21	3
Sikasso	692	89	82	11
Segou	777	98	12	2
Mopti	620	98	11	2
Tombouctou	474	79	126	21
Gao	713	91	67	9
Bamako	702	91	69	9
TOTAL	5504	93	418	7

Figures

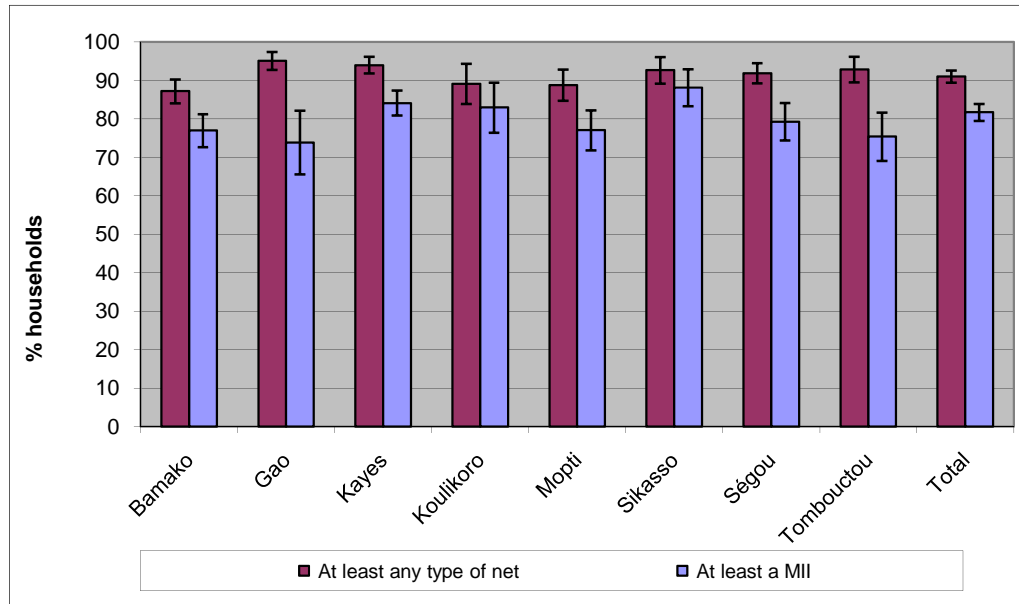


Figure1a. Ownership of nets by households.

The ownership of any type of nets and MII in households by region and at the national level.

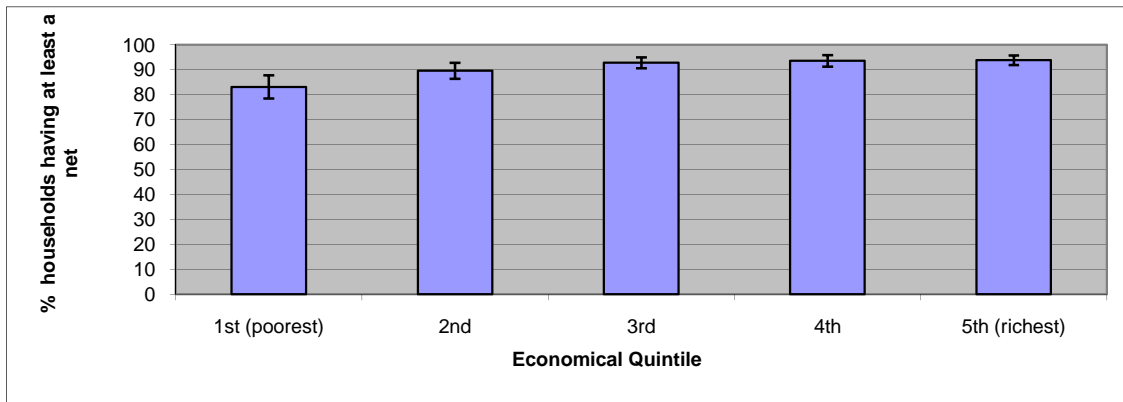


Figure 1b. The equity of ownership of any type of net.

The rate of ownership of any type of net in households is classified by economical quintile. The wealth quintiles are calculated based on economic indicators from the Mali DHS 2000. The error bars indicate the 95% confidence intervals.

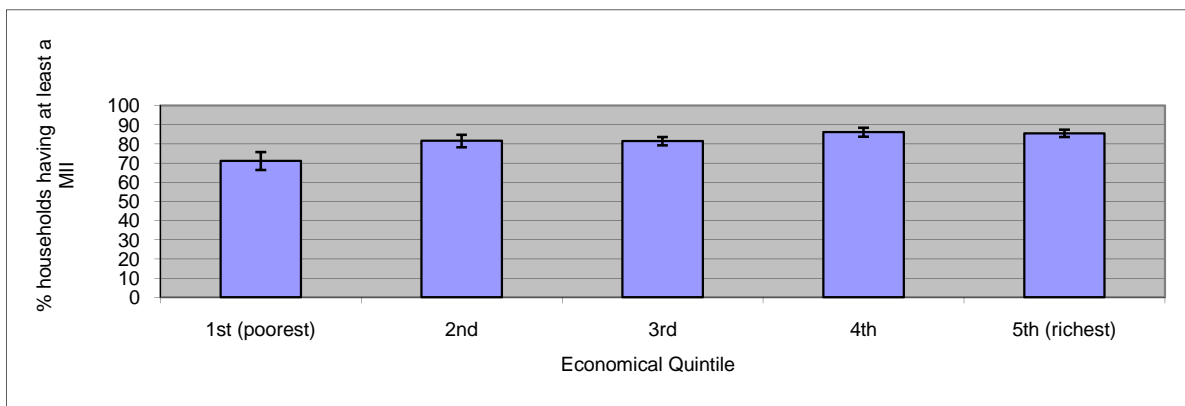


Figure 1c. The equity of ownership of MIIs nets.

The MIIs ownership in households is classified by economical quintile.

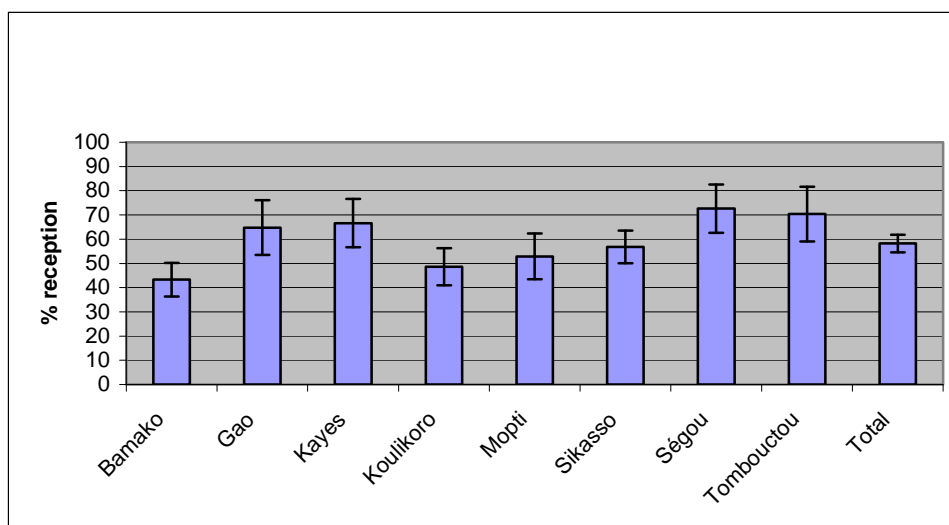


Figure 2a. The receipt of MII by eligible pregnant women.

The percentage of eligible pregnant women that received a MII, by region and at the national level (denominator: all pregnant women).

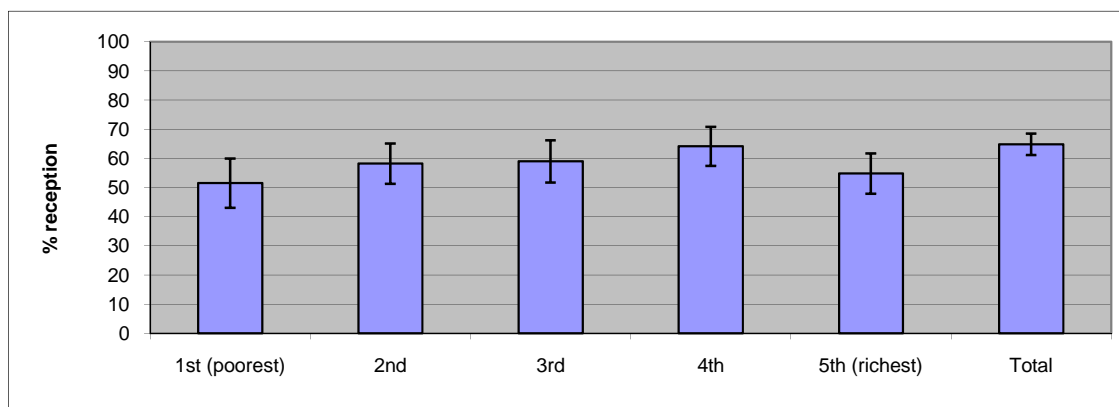


Figure 2b. The equity of receipt of a MII by eligible pregnant women.

The percentage of eligible pregnant women that received a MII, by economical quintile, at the national level (denominator: only pregnant women that attended the CPN).

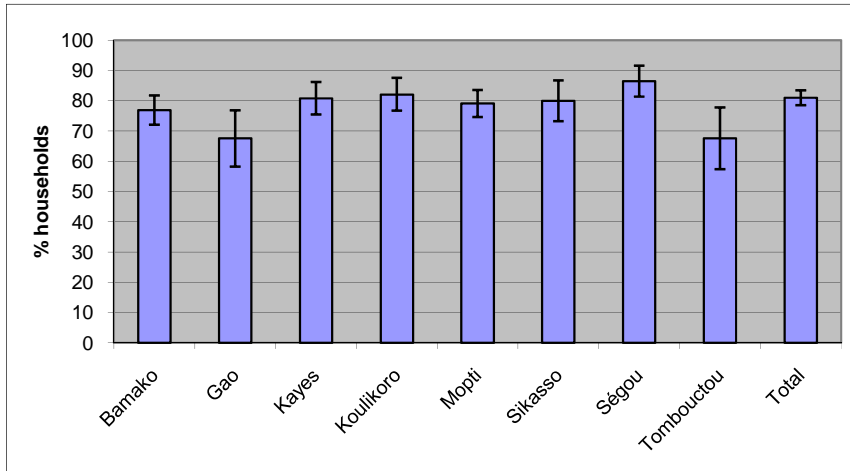


Figure 3a. The LLINs receipt by households with eligible children for the campaign. The household percentage with eligible children that received at least one LLIN during the campaign by region and at the national level (denominator: All households having an eligible child).

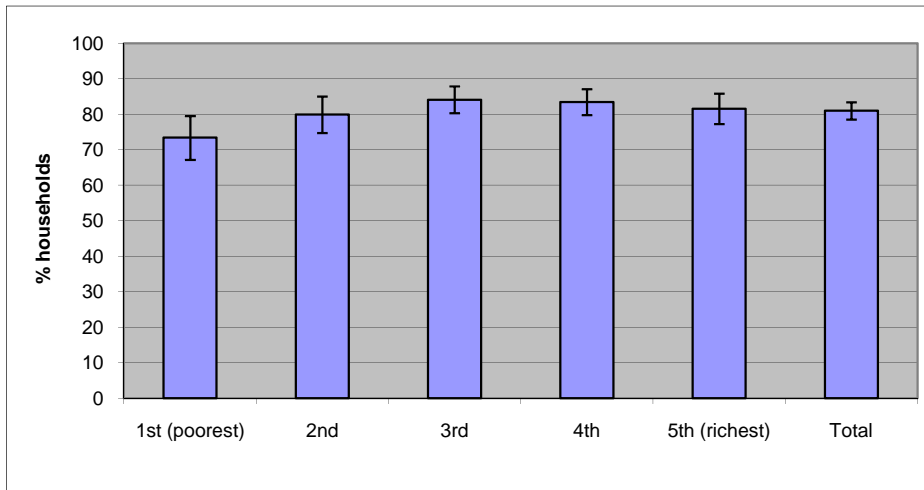


Figure 3b. The equity of receipt of LLINs by households with eligible children for the campaign.

The household percentage with eligible child that received a LLIN during the campaign by economical quintile at the national level.

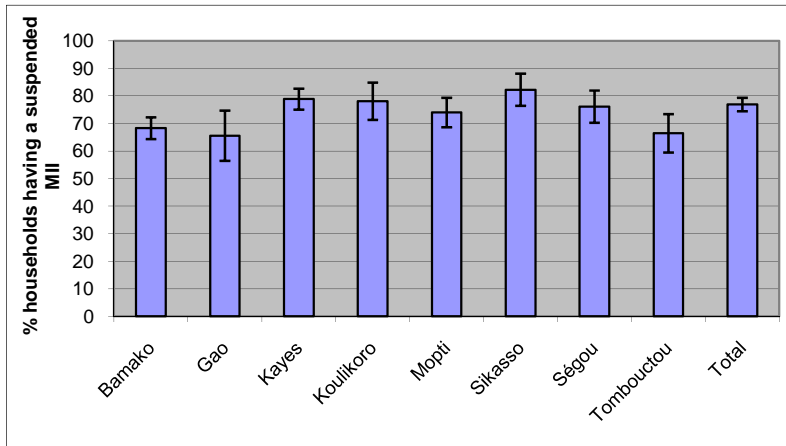


Figure 4a. The MIIs Suspension.

The household percentage having at least a suspended MII, by region and at the national level.

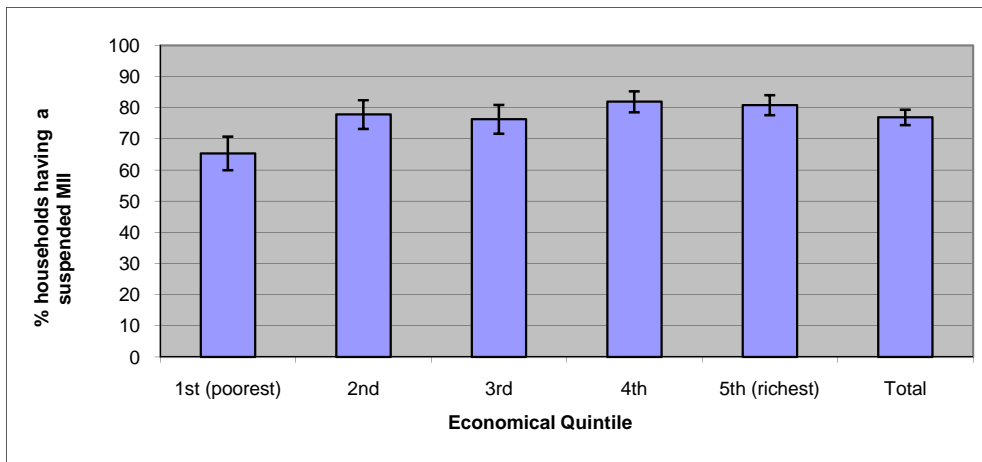


Figure 4b. The MIIs suspension and equity.

The MIIs suspension in households is classified by economical quintile.

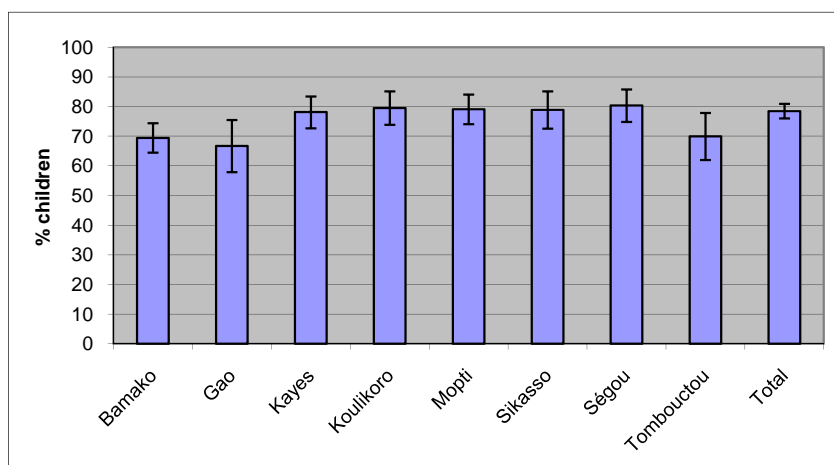


Figure 5a. The MIIs usage by children of less than five years.

The percentage of children that slept under a MII the preceding night, by region at the national level.

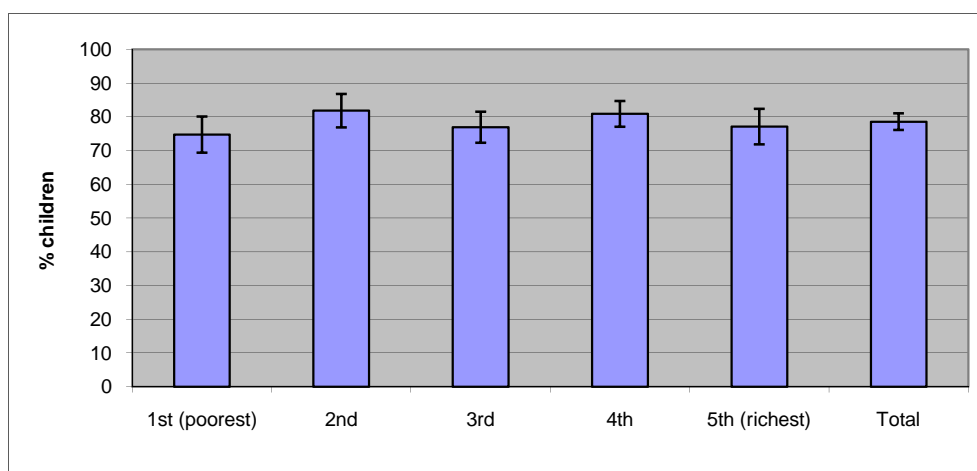


Figure 5b. The equity of usage of MIIs by children of less than five years.

The MIIs usage by children of less than five years, by economical quintile, at the national level.

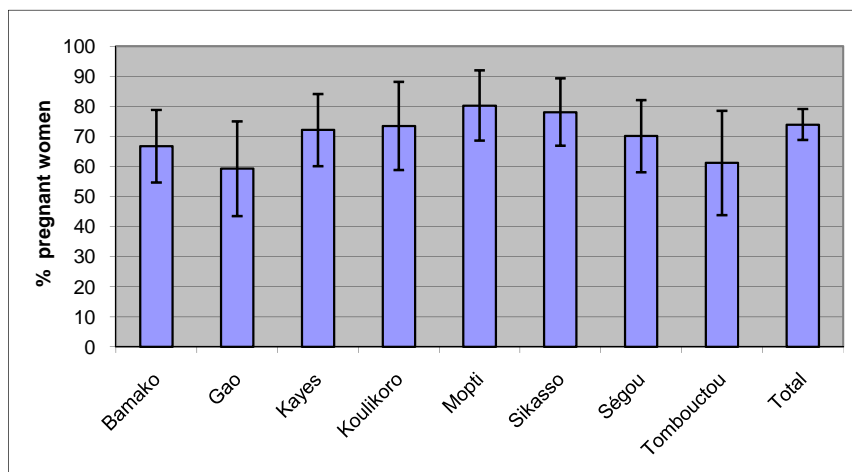


Figure 6a. The usage of MIIs by pregnant women.

The percentage of pregnant women that slept under a MII the preceding night.

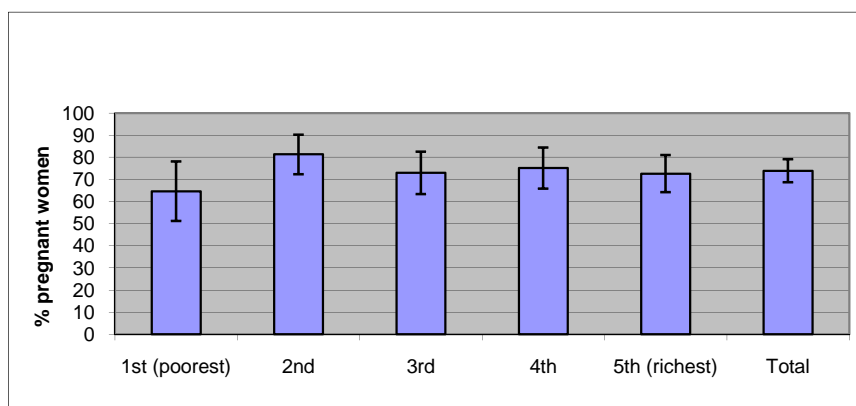


Figure 6b. The equity of usage of MIIs by pregnant women.

The MIIs usage by pregnant women, by economical quintile, at the national level.

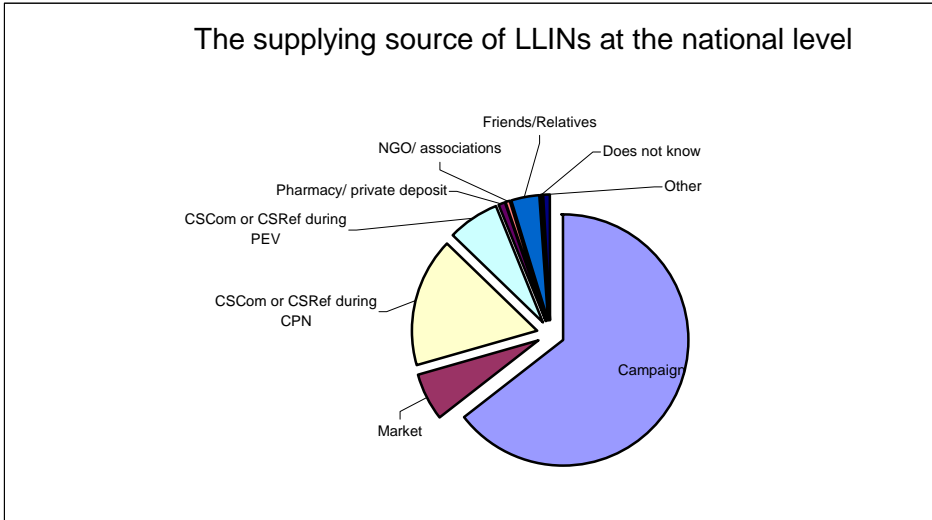


Figure 7. LLIN sources.
 The sources of supply of LLINs at the national level.