

# Factors Associated with Low Use of Insecticide-Treated Nets among Children under 5 Years of Age in Fo-Boure (Benin) in 2019

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## Abstract

Despite the free distribution of insecticide impregnated nets, malaria is still the cause of many deaths, particularly among children under 5 years old, casting doubt on the real use of these mosquito nets by parents. The present work aimed to identify the factors associated with the low use of mosquito nets. This was a cross-sectional study with an analytical aim, carried out in the locality of Fô-Bouré (Sinendé) in 2019 among children under 5 years old and their parents. A cluster random sampling was carried out according to the WHO technique. The dependent variable was the low use of LLINs and the independent variables were: socio-demographic, economic, relative to parents' knowledge of the causes and control methods of malaria. **Results:** The factors identified as associated with the low use of LLINs were: female sex ( $p = 0.0059$ ), low level of education ( $p = 0.0001$ ), free mode of acquisition ( $p = 0.0476$ ), poor knowledge of control methods ( $p = 0.0389$ ), type of house: mud or tent house ( $p = 0.0034$ ), unsanitary immediate environment ( $p = 0.0002$ ) and children's evening dressing style ( $p = 0.0001$ ). **Conclusion:** A global development policy, especially in terms of education, sanitation and housing improvement as recommended by the "Roll Back Malaria" initiative is necessary to improve the rate of insecticide impregnated nets use.

## Keywords

Use, LLIN, Associated Factors, Benin

## 1. Introduction

According to WHO in 2013, out of 3.2 billion people exposed to malaria in 97

countries, 584,000 deaths were counted, mainly in children under 5 years old in sub-Saharan Africa, posing a major problem for economic development [1] [2]. In Benin, the National Malaria Control Program, as part of the “Roll Back Malaria” initiative, has opted for prevention through the promotion of the Long-Lasting Insecticide-Treated Net (LLIN) [3]. Despite the promotion of LLINs, the cumulative incidence of malaria was 17% in 2013 [4]. At the same time that the State makes LLINs available to all households, malaria continues to kill children in almost identical proportions, posing the problem of its regular and appropriate use [5]. The objective of this study was to identify the factors associated with the low use of LLINs among children under 5 years old in Fô-Bouré in 2019.

## 2. Materials and Methods

This was an analytical and descriptive cross-sectional study. Data collection covered a period of 7 days from December 5 to 11, 2019. The study population consisted of children under 5 years from the area of Fô-Bouré located in the municipality of Sinendé in northern Benin. Fô-Bouré is an area with a population of 15,268 inhabitants, 03 public health centers and 01 confessional center [6]. The sample size was calculated using Schwartz formula. The size was 420 households. A random cluster sampling was carried out according to WHO technique [7]. The questionnaire was administered to men and women caring for at least one child under the age of 5 years through individual face-to-face structured interviews. The variable of interest was the low use of LLINs. The independent variables were: socio-demographic, economic and those related to parents’ knowledge of both malaria and its prevention.

The Interprofessional Guaranteed Minimum Wage (SMIG) was 40,000 FCFA or US\$65.

Knowledge of malaria was in the “Yes” option if the respondent declares that malaria was caused by mosquito bites.

Evening dressing is the wearing of long-sleeved shirts and trousers by children from 6 pm to protect them against mosquito bites.

The quality of the LLIN was considered good when the respondent answers that the LLIN he owns was of good quality.

Data collection sheets were manually counting and a double entry was made using Epi Data version 3.1 software. A univariate analysis of the data entered was performed using the Pearson Chi2 test with Epi Info software version 7.2. and a significance level of 0.05. Text processing, tables and graphs were done using Microsoft Word and Excel version 2007 softwares. Central tendencies and dispersion parameters (Mode, Mean, Median, Variance and Standard Deviation) were used for the description of the quantitative variables. The proportions with their confidence interval were used to describe the qualitative variables.

### **Ethical and deontological considerations**

The agreement of the administrative and health authorities was obtained before data collection. Then the written or oral informed consent of both the head

of household and the subjects surveyed was obtained before the administration of the questionnaire. Data confidentiality was ensured.

### 3. Results

#### 3.1. Description of Population

Four hundred and twenty households actually took part in the survey, housing 599 children under the age of 5 years, including 344 boys and 255 girls or a sex ratio of 1.35. The average age of the children was 28.50 months  $\pm$  12.17 months. Among the responding parents, 60.00% had no level of education. Households had an income under US\$2 per day in 75.24% of cases.

#### 3.2. Prevalence of LLINs Low Use

Out of 420 households surveyed, 400 respondents (95.23%) declared having LLINs. Among them, 326 respondents said they had used the LLIN for their children the night before this survey, *i.e.* 81.50%.

Among the 400 households with LLINs, 189 respondents regularly used LLINs in children under 5 (47.25%) compared to 231 using it irregularly, *i.e.* a prevalence of low use of 52.75%.

#### 3.3. Factors Associated with the Low Use of LLINs

##### **Relationship between low use of LLIN and socio-demographic characteristics**

**Table 1** shows the prevalence of low use of LLINs according to socio-demographic characteristics.

##### **Relationship between the low use, socio-economic characteristics and net-related characteristics**

**Table 2** shows the prevalence of the low use of LLINs according to economic characteristics and those related to the mosquito net.

##### **Relationship between the low use of LLINs, environmental, behavioral characteristics and those related to knowledge about malaria and its prevention**

**Table 3** shows the prevalence of the low use of LLINs according to environmental, behavioral characteristics and those related to knowledge of both malaria and its control methods.

### 4. Discussion

The cluster sampling as recommended by WHO, used in this population-based study, can make it possible to extrapolate the results obtained to the entire area of Fô-Bouré.

#### **Prevalence of the low use of LLINs among children under 5 years of age**

The prevalence of LLIN low use among children under 5 was 52.75%. This high prevalence in a context of high availability of mosquito nets (95.24%) made possible through the free distribution, highlights the complexity of the question

**Table 1.** Prevalence of the low use of LLINs in children under 5 according to socio-demographic characteristics of respondents, Fô-Bouré, 2019.

	Total (N)	Low use of LLINs				P
		n	%	PR	CI <sub>95%</sub>	
<b>Sex of the respondent</b>						<b>0.0059</b>
Male*	86	40	46.51	1		
Female	314	191	60.83	1.31	1.22 - 1.41	
<b>Sex of the child</b>						<b>0.2549</b>
Male*	239	143	59.83	1		
Female	161	88	54.66	0.91	0.86 - 0.98	
<b>Child's age (month)</b>						<b>0.3597</b>
1 - 12*	150	36	24	1		
12 - 24	140	63	45	1.87	1.82 - 1.93	
24 - 36	191	89	46.6	1.94	1.89 - 1.99	
36 - 48	103	33	32.04	1.33	1.29 - 1.37	
48 - 59	15	10	66.66	2.78	2.74 - 2.82	
<b>Level of education</b>						<b>0.0001</b>
None*	240	142	59.17	1		
Primary	101	73	72.28	1.22	1.16 - 1.28	
Secondary	38	10	26.31	0.44	0.38 - 0.5	
Higher	21	6	28.57	0.48	0.43 - 0.53	
<b>Marital status</b>						<b>0.6446</b>
Single*	7	5	71.43	1		
Married/As a couple	349	203	58.17	0.81	0.75 - 0.87	
Divorced	15	8	53.33	0.75	0.70 - 0.80	
Widow(er)	29	15	51.72	0.72	0.68 - 0.78	

\* Reference category.

**Table 2.** Prevalence of the low use of LLINs among children under 5 years of age according to economic, cultural and net-related characteristics, Fô-Bouré, 2019.

	Total (N)	Low use of LLINs				P
		N	%	PR	CI <sub>95%</sub>	
<b>Monthly income</b>						<b>0.8539</b>
<SMIG*	315	185	58.73	1		
>SMIG	85	46	54.12	0.92	0.86 - 0.98	

## Continued

<b>Number of rooms</b>						<b>0.0062</b>
1 - 2*	155	80	51.61	1		
3 - 5	245	151	61.63	1.19	1.12 - 1.27	
<b>Mode of acquisition</b>						<b>0.0476</b>
Free distribution *	358	214	59.78	1		
Other means of acquisition	42	17	40.48	0.68	0.60 - 0.76	
<b>Number of LLINs in good condition</b>						<b>0.3488</b>
0*	61	39	63.93	1		
1	168	102	60.71	0.95	0.90 - 1.01	
2	159	83	52.2	0.82	0.77 - 0.89	
3	12	7	58.33	0.91	0.85 - 0.97	
<b>Quality of the LLIN</b>						<b>0.1371</b>
Good*	321	177	55.14	1		
Poor	79	54	68.35	1.24	1.19 - 1.30	

\* Reference category.

**Table 3.** Prevalence of the low use of LLINs in children under 5 years old according to environmental, behavioral characteristics and those related to knowledge of malaria and its control methods, Fô-Bouré, 2019.

Variables	Total (N)	Low use of LLINs				P
		N	%	PR	CI <sub>95%</sub>	
<b>Knowledge about the causes of malaria</b>						<b>0.7569</b>
Yes*	387	212	54.78	1		
No	33	19	57.58	1.05	1.01 - 1.11	
<b>Knowledge of the control methods</b>						<b>0.0389</b>
LLINs*	232	120	51.72	1		
Non-recommended means	167	94	56.29	1.09	1.04 - 1.15	
None control method	21	21	100	1.93	1.88 - 1.98	
<b>Knowledge of the utility of LLINs</b>						<b>0.1269</b>
Yes*	365	206	56.44	1		
No	55	25	45.45	0.8	0.75 - 0.85	
<b>Type of inhabited house</b>						<b>0.0341</b>
In cement*	74	30	40.54	1		
Mud house	338	195	57.69	1.42	1.35 - 1.50	
Tent	8	6	75	1.85	1.77 - 1.92	

**Continued**

<b>Immediate environment</b>						<b>0.0002</b>
Clean*	92	51	55.43	1		
Waste in open-air	286	170	59.44	1.07	1.01 - 1.14	
Stagnant water	42	10	23.81	0.43	0.37 - 0.49	
<b>Dressing mode of the child</b>						<b>0.0001</b>
Dressed*	261	132	50.57	1		
No dressing	159	99	62.26	1.23	1.18 - 1.29	

\* Reference category.

relating to the real use of mosquito nets by the communities. This use can be determined by several categories of factors as shown by the results of the study which underline a statistically significant association between the low use of LLINs and socio-demographic factors (female sex of the respondents, low level of education), economic and cultural (number of rooms available in the household, the mode of acquisition), environmental, behavioral and those related to parents' knowledge of malaria and its control methods (poor knowledge of LLINs, type of house inhabited, immediate environment). Actions relating to these different factors could improve the use of LLINs. Studies carried out in Congo Brazaville by Talani, *et al.* [8] and in the Democratic Republic of Congo by Cilundika, *et al.* [9] led to similar results. More broadly, Konlan, *et al.*, in a review of the literature on several countries in sub-Saharan Africa, reported similar data [10].

The study also showed that the acquisition of LLINs through free distribution organized by the State was statistically associated with its low use. This can be explained by the low consideration accorded by human nature to all that is granted without effort, without difficulty, without participation. These mosquito nets acquired free of charge are not only used to protect children against malaria but are also used for other purposes (market gardening, body care) as shown by Dye, *et al.* [11] in their studies. This situation raises the thorny question of the effectiveness of the free distribution of mosquito nets by our States, which could guarantee the availability of mosquito nets at a lower cost to involve the beneficiaries in the acquisition and make them realize their responsibilities.

## 5. Conclusion

The study showed that less than one in two children do not regularly use LLINs in the area of Fô-Bouré. Univariate analysis identified several sociodemographic, economic, and knowledge-related factors about malaria as associated with the low use of LLINs. A global development policy, especially in terms of education, sanitation and housing improvement as recommended by the "Roll Back Malaria" initiative is necessary to improve the rate of insecticide impregnated nets use.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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By the authors.

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