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EFFECTS AND PERCEPTION OF POPULATIONS RELATED TO THE DISCONTINUATION OF IRS ON THE EPIDEMIOLOGY OF MALARIA AMONG CHILDREN UNDER FIVE YEARS OF AGE IN EKPE IN BENIN

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Abstract

The present work aims to study the effects of stopping IRS campaigns on the epidemiology of malaria in children under five years old in Ekpè, in 2011. This is a cross-sectional, descriptive and analytical study having included 232 mothers or caregivers. The methodology revolves around the data used, materials, data collection tools and techniques. Then methods of processing and analyzing the results made it possible to obtain results.

In 2007 (pre-IRS period), the monthly average of malaria cases was 180, between 2008 and 2010 (IRS period), the monthly average of malaria in children under five increased to 170. This which reflects a slight decrease in malaria cases. In 2011, the year of our study, the monthly average of malaria was 181. It therefore experienced a small increase. From these results, it appears that stopping IRS caused a slight increase in the malaria rate. Indoor spraying, one year after its cessation, has no significant effect on the epidemiology of malaria in children under five years of age in the Ekpè district.

Key words: Ekpè, effects of stopping, indoor spraying, malaria epidemiology, children under 5 years old.

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Introduction

The World Malaria Report revealed 216 million cases of malaria recorded in 2010, 81% of which were in the Africa region with 655,000 deaths or 91% in Africa (WHO, 2011). According to the World Health Organization (WHO), "malaria continues to place an unacceptable burden on the health and economic development of more than one hundred countries around the world. Every 30 seconds, a child dies from malaria in Africa. It constitutes the main cause of morbidity and mortality in children under five (WHO, 2008) and more than three million children under five (5) die each year from causes and conditions linked to the environment. The environment is therefore among the factors most often responsible for child deaths, the number of which exceeds ten million per year, and it has a huge influence on the health and well-being, particularly of mothers (WHO, 2010).

It is estimated that in many countries, malaria spending can be as high as 40% of health sector spending and 20-50% of hospital admissions are attributable to it (WHO and UNICEF, 2003). Indeed, according to the WHO, a family affected by malaria spends on average 25% of its annual income on treatment.

In order to curb this situation, health actors have implemented different strategies to control mosquitoes, vectors of this disease, namely the use of mosquito nets impregnated with long-acting insecticide, spraying of insecticides inside homes.

In Benin, the prevalence rate of malaria has increased considerably (MS, 2007). This is why the National Malaria Control Program (PNLP) is constantly looking for ways to combat the mosquito vector and effective care against this disease. It is not only responsible for the morbid state of populations, but also for enormous economic and social losses, human capital being the basis of all development (Djogbenou, 2009). During the 1940s to 1960s, the spraying of interior surfaces of homes using residual insecticides has made it possible to reduce the incidence of malaria to almost zero in regions with high endemicity (Curtis and Lines, 2000). Spraying homes with residual insecticides is useful to reduce the number of people contaminated by the bite of the female Anopheles mosquito, which transmits the disease (Faye, 2008). It has proven to be more cost-effective than other malaria prevention measures (Chéhouenou, 2009). Due to the reduced willingness or ability of governments (donors) to continue funding large-scale spraying programs, there has been a resurgence of malaria, although not to the levels of the 1930s. (Christopher, Curtis and Abraham, 2001).

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Several studies have been carried out on the effectiveness of the methods used in the fight against malaria. In Benin, since July 2008, spraying campaigns have resumed, but this time with the insecticide Bendiocarb 800 g/kg (Ficam®), unlike Dichloro-Diphenyl-Trichloroethane (DDT) which was used previously. They were implemented in four municipalities in Benin, namely: Sèmè-Podji, Akpro-Missérété, Dangbo and Adjohoun. Our study setting, the district of Ekpè is located in the commune of Sèmè-Podji in the south of the Republic of Benin. It has climatic and ecological conditions that are very favorable to the proliferation of mosquitoes.

The district of Ekpè is located in the Commune of Sèmè-Podji in the Department of Ouémé, in the southeast of the Republic of Benin. It is limited to the north by Lake Nokoué and the district of Aholouyèmè, to the east by the district of Agblangandan, to the west by the district of Sèmè-Podji and to the south by the Atlantic Ocean.

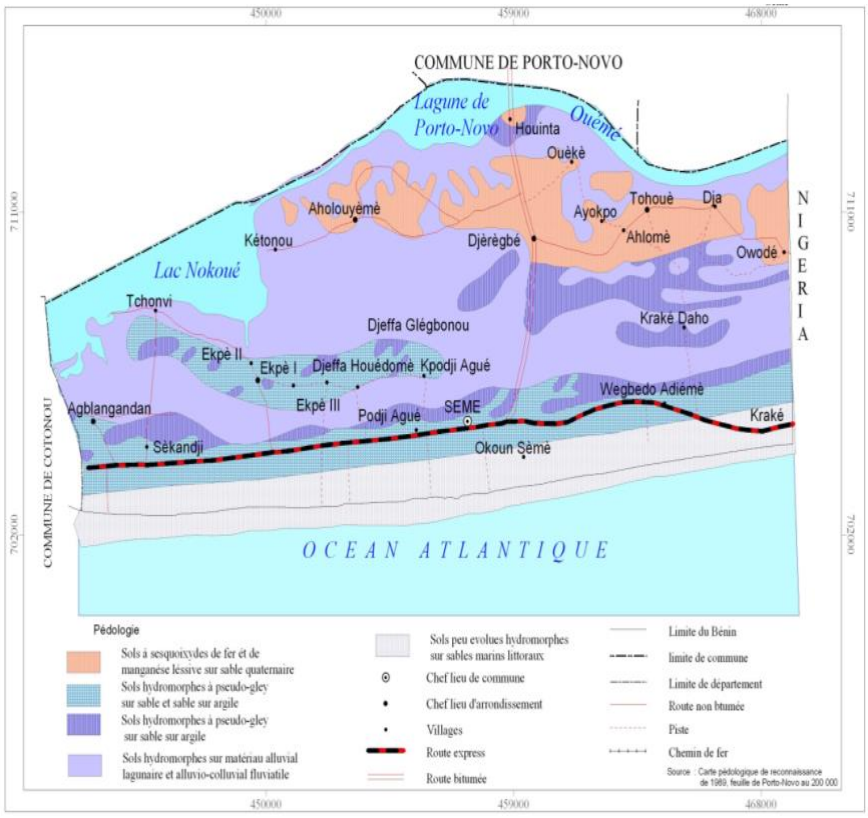

Figure 1: Geographic location of the study environment

2- Methodology

- **Material**

During this work, we used: a digital camera to capture the images, a calculator to carry out the operations and a mini-computer to write the dissertation and process the data.

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- **Type of study**

This is a descriptive, cross-sectional and analytical study which covered the period from December 2011 to June 2012. The target population is made up of two categories: primary target (children aged 0 to 5), secondary targets (households with dependent on children under 5 years old) and finally spraying agents.


Plate 1: Administration of the questionnaire by a community relay,
Shooting: Akakpo, February 2012

2.1-Sampling

The Schwartz formula was used to determine our sample size:

$$n = \frac{1{,}96^2(p \times q)}{i^2} \qquad \text{(www.analyse-donnees.fr)}$$

n = expected sample size, t = confidence level deduced from the confidence rate (traditionally 1.96 for a confidence rate of 95%) - reduced centered normal distribution.

p = estimated proportion of the population with the characteristic investigated in the study; it is the prevalence of malaria among children aged 0 to 5 years in the municipality.

According to the 2010 statistical yearbook, the prevalence of malaria among children under 5 years old in the Ouémé department is 31.7%.

2.2-Data processing and analysis

The questionnaires were processed manually (coding, counting) and the results were integrated into the computer using the epi data version 1.6.1 software. The summary information produced was translated into tabular data. The interview guides were analyzed manually. Statistical and graphical analyzes of the data were carried out using Excel, Stata, SPSS 16.0 software.

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3-Results

3.1-Characteristics of households caring for children under 5 years old

3.1.1-Distribution of surveyed populations by gender

The figure below presents the characteristics of households caring for children under 5 years old according to their gender.

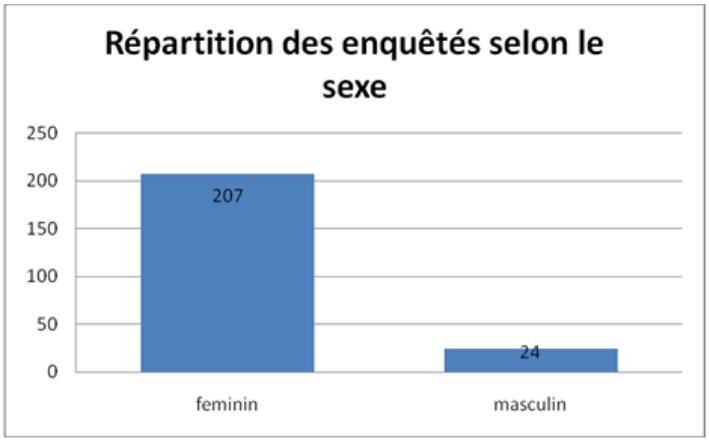

Figure 2: Distribution of respondents by gender

It emerges from the analysis of this figure that the distribution of respondents according to gender, we see that women were mainly represented, i.e. 90%.

3.1.2-Knowledge of malaria by those interviewed

The results showed that the populations had a fairly high level of knowledge of malaria. 100% of the population had heard of malaria and knew that it is caused by the Anopheles mosquito. Regarding the means of protection against mosquitoes the majority, i.e. 72%, cited the impregnated mosquito net as an effective means of protection. More than half of the people questioned, or 56.2%, knew that Anopheles mosquito bites are responsible for malaria. They recognized that mosquitoes breed in bodies of water and larval breeding sites existed not far from the homes of 88% of those questioned. The results are presented in Table II below:

Table I: Knowledge of malaria by respondents

Dependent variables	**Number**	**%**
Have you heard of malaria		
Yes	232	100
No	0	0
• Diseases caused by mosquitoes		
Malaria	144	100
Means of protection against mosquitoes		
Single mosquito net	5	1,58

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Impregnated mosquito net	226	71,74
Repellent ointment	0	0
Repellent bomb	0	0
Screened doors and windows	7	2.22
Traditional medicines	151	48,00
Pray	0	0
Others	0	0
Cause du paludisme		
Piqûre de moustiqueMosquito bite	177	56,19
Fatigue	128	40,63
drinking water	0	0
Wizard	0	0
Other	0	0
Where mosquitoes breed		
Open sump	59	18,73
Water collectors	109	34,60
Puddles	110	34,92
Are there larval breeding sites near your house?		
Yes	204	88,70
No	26	11,30

Source: Field survey results, July 2011

3.2-Population perception following the cessation of indoor spraying

The majority of populations surveyed (i.e. 99%) knew that indoor spraying had contributed to the reduction in the mosquito population and therefore malaria. 88% of the populations surveyed attributed the reduction in mosquito bites to In-Home Spraying.

Table II: Population perception following the cessation of IRS

Dependent variables	*Number*	*%*
Population perception following the cessation of indoor spraying		
Reduction of mosquitoes		
Yes	266	87,78%
No	07	2,31%
Reduction of insects		
Yes	211	87,19%
No	31	12,80%

Source: Field survey results, July 2011

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3.3-Evolution of malaria cases during the period from 2007 to 2011

Figures 11, 12, 13, 14, 15, 16 and 17 show the evolution of malaria cases in children under five years of age in 2007, 2008, 2009, 2010, and 2011 respectively.

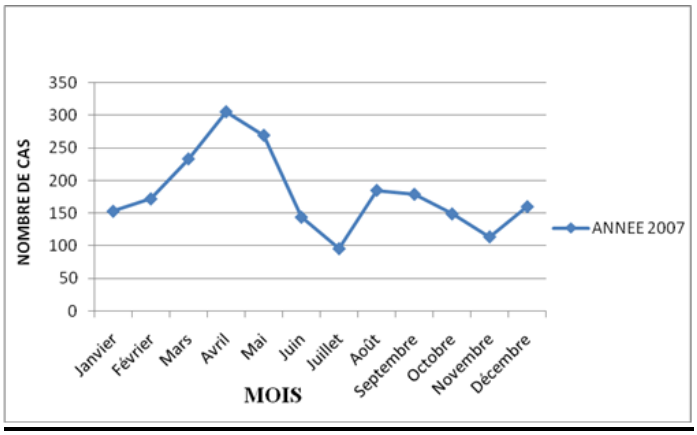

Figure 3: Evolution of malaria cases among children under five years of age in 2007

The number of malaria cases had seen a steady increase from January to May; then from July to September but less important than the previous one. The decrease in the number of malaria cases is observed from May to July then from September to November. April and August were the months when high rates of malaria were observed.

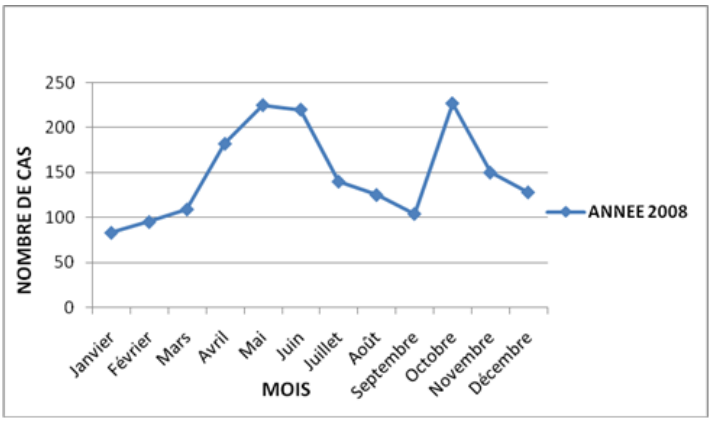

Figure 4: Evolution of the number of malaria cases among children under five years old, in 2008

In 2008, the number of malaria cases experienced a constant increase from January to June and from September to October, but less significant than the previous one. The decrease in the number of malaria cases was observed from June to September then from October to December. The months of May-June and October were the months when high rates of malaria were observed among under-fives.

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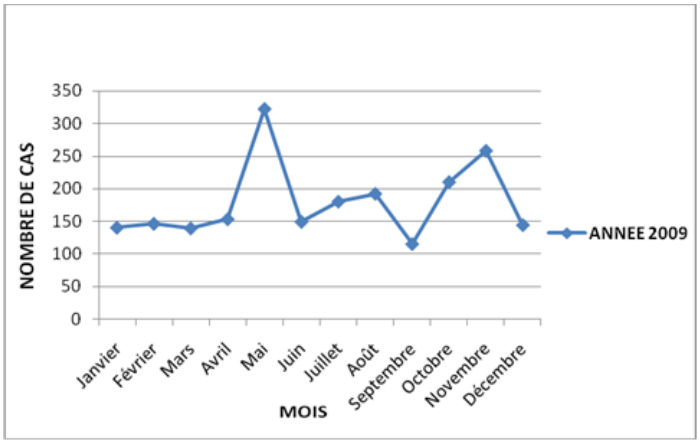

Figure 5: Evolution of the number of malaria cases among children under five years old, in 2009

The number of malaria cases had seen a constant increase from April to May, from June to August then from September to November but not significant in the same way. The decrease in the number of malaria cases was observed from May to June, from August to September then from November to September. May, August and November were the months when high rates of malaria were observed among under-fives in 2009.

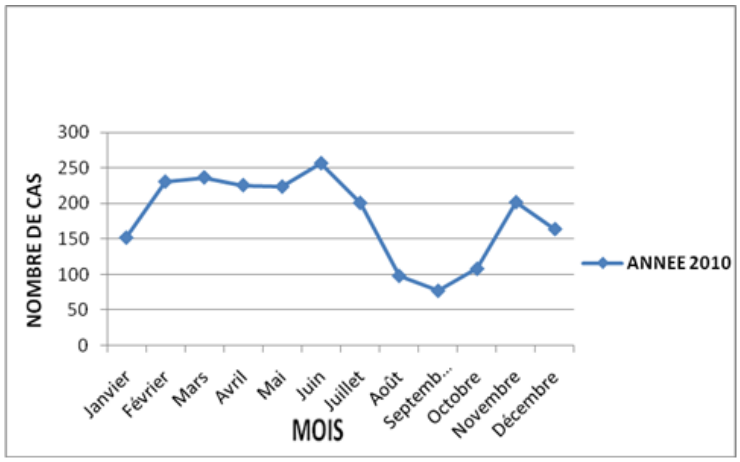

Figure 6: Evolution of the number of malaria cases among children under five years old in 2010

The number of malaria cases had seen a steady increase from January to June; then from September to October but less than the previous one. The decrease in the number of malaria cases was observed from May to July then from September to November. The months of June and November were the months when high rates of malaria were observed among children under five years of age in 2010.

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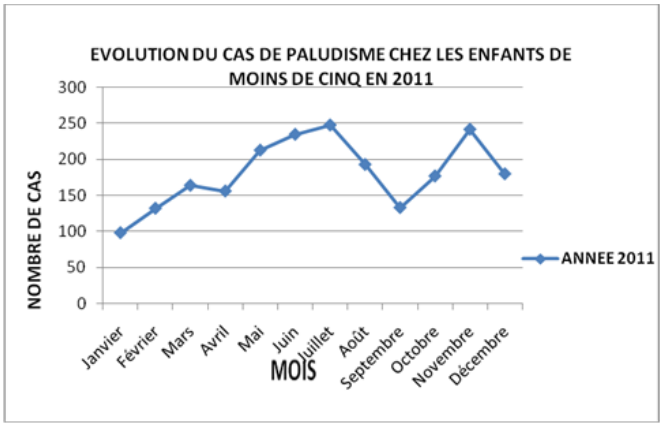

Figure 7: Evolution of the number of malaria cases among children under five in 2011

The number of malaria cases had seen a steady increase from January to July, then from September to November; the decrease from July to September; an increase from September to November from May there is again an increase to reach a peak in July in September and November are the months when high rates of malaria were observed among under-fives in 2011.

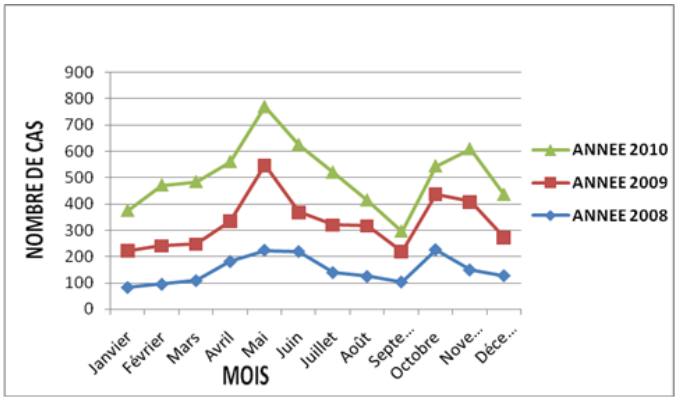

Figure 8: Evolution of the number of malaria cases among children under five from 2008 to 2010

The months of May-June and October-November are the months when high rates of malaria were observed among under-fives from 2008 to 2010.

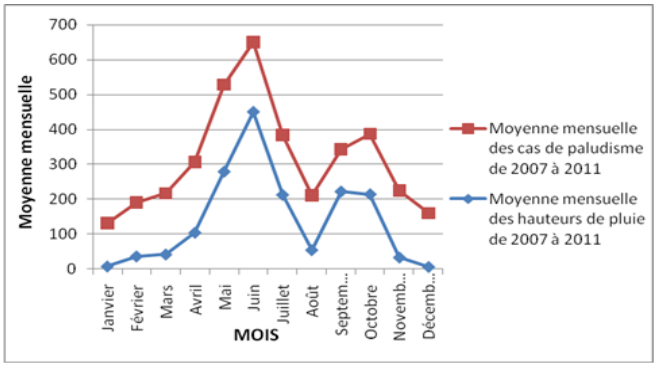

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Figure 9: Monthly average rainfall amounts and malaria cases among children under 5 years old from 2007 to 2011

It appears that the variation in the number of malaria cases evolves in the same way as rainfall. The periods of high occurrence of malaria were from April to July with a peak in June then from September to November with a peak in October. The rainy season lasted from March to July with a peak in June, then from August to November with a peak in October. From the shape of the two curves, we can affirm that the larval breeding sites were noticed the most during rainy periods.

Table III: Significance of malaria case before and during IRS

Période	Moyenne mensuelle de cas paludisme	Valeur P (Probabilité)
Avant la pulvérisation (2007)	180	-
Pendant la pulvérisation (2008 à 2010)	170	0,6

Source: Field survey results, July 2011

The average number of malaria cases during the period before the spraying (2007) was 180 while during the spraying (2009 to 2010) it was 170 (Table V). By comparing these two averages with the Student t test we see that there was not a statistically significant difference at the 5% level. The occurrence of malaria cases was constant between the two periods.

Table IV: Significance of malaria case during and after IRS

Period	Monthly average of malaria cases	P value (probability
During spraying (2008 to 2010)	170	-
After Spraying (2011)	181	0,55

Source: Field survey results, July 2011

Table IV, the average number of malaria cases during the spraying (2008-2010) was 170 while after the spraying (2011), it was 181. Comparing these two averages with the Student t test we see that there was not a statistically significant difference. The occurrence of malaria cases was also constant between the two periods.

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Table V: Significance of malaria case before and after IRS

Period	Monthly average of malaria cases	P value (probability
During spraying (2007)	180	-
After Spraying (2011)	181	0,96

Source: Field survey results, July 2011

The average number of malaria cases before the spraying (2007) was 180 while after the spraying (2011), it was 181 (Table V). By comparing these two averages with the Student t test we see that there was not a statistically significant difference. The occurrence of malaria cases was constant between the two periods.

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Discussion

According to surveys, the mosquito (Anopheles) is the cause of malaria, among which 56.19% knew that it is caused by mosquito bites. Furthermore, 40.63% attributed the causes of malaria to fatigue apart from mosquito bites. As a preventive measure, 71.74% of respondents used impregnated mosquito nets, the others, simple mosquito nets, mesh doors and windows and traditional medicines. This level of knowledge contributes to reducing the number of malaria cases. This could also influence the results of the evolution of malaria cases after stopping IRS (Houéfa N. Gbaguidi, 2011).

According to the population's perception, IRS had contributed to the reduction in the frequency of malaria. They also knew that there were benefits of spraying and that the harms were negligible. Indeed, after the PID operations, not only was the presence of mosquitoes rare and cases of diseases also as proven by the studies of Houéfa N. Gbaguidi (2011), but other insects such as cockroaches were eliminated. .

By observing the different curves reflecting the evolution of the number of malaria cases from 2007 to 2011, we notice that their appearances are similar to each other. They each have two peaks reflecting the months where the malaria rate is high except in 2009 where the curve has three peaks. These observations correspond to periods of rainy seasons in the district of Ekpè. During these periods, a high number of mosquito populations is observed in the area which is full of swamps.

We can therefore affirm that indoor spraying, one year after its cessation, has no significant effect on the epidemiology of malaria in children under five years of age in the Ekpè district.

It should be noted that universal access to mosquito nets impregnated with long-lasting insecticide through the large-scale distribution campaign took place in 2011. It could also influence the evolution of the number of cases of malaria in this locality. None of the fourteen beneficiary countries of the PID financed by the PMI has yet stopped the operation in a locality, as was the case in Benin, allowing us to know the possible effects that this could cause.

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Conclusion

This work allowed us to determine the effects linked to the cessation of indoor spraying in the district of Ekpè. Several factors are associated with these effects such as geographic, environmental, socio-cultural and health factors. Mothers and caregivers had good knowledge of malaria and most knew ways to protect against malaria. A high rate of malaria cases was observed during 2009, which is believed to be due to the excess rainfall this year.

Also from the analysis of the curves reflecting the evolution of malaria cases from 2007 to 2011, that is to say before, during and after indoor spraying, it appears that the malaria rate did not experience an increase. significant variation during these periods. These results could be influenced by the use of other means of prevention such as LLINs.

At the end of this study, we can deduce that the cessation of indoor spraying has no significant effect on the occurrence of malaria in children under five years old in 2011. Pending a resumption of indoor spraying, it is necessary to strengthen the capacities of the populations through awareness sessions, on the measures to be taken to contribute not only to the reduction of cases of malaria but also to the development of the locality.

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