

A Study to Determine Possible Key Factors Affecting Malaria Intervention and Control among Communities in Ntambu Area of Mwinilunga District

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Abstract

The aim of this study is to determine key factors affecting malaria interventions and control among communities in Ntambu Area of Mwinilunga District. An equal status sequential mixed methods design was adopted for this study. Three and fifty-eight respondents were enrolled from 109 villages as clusters using systematic sampling as well as purposeful sampling. Data was collected using a guided structured questionnaire and in-depth interviews. The findings are that social economic status, spray operator selection, and performance, negative experiences from previous IRS campaigns and political factors were negative factors whereas community solidarity was a positive factor for acceptance of IRS and ITNs. What can be inferred in this study is that the success of any malaria intervention in Ntambu area relies a lot on how the benefitting communities view and embrace the interventions. Individual factors like sex and level of education of household head are associated in varying ways with willingness to take up the interventions. This should be noted considering that level of education was associated with acceptance of IRS and yet not associated with repeat IRS as well as gender. The availability of antimalarial drugs, ITN, IRS acceptance and refusal in Ntambu, leave much to be desired. ITN use and availability appears to be the most accepted and easily available intervention though a few respondents appeared not to be aware or sure of what was happening in the area.

Background

Mwinilunga is a town in the North-Western Province of Zambia and headquarters of a district of that name. It lies on the West Lunga River, not far from the borders with the Democratic Republic of the Congo and Angola. Mwinilunga District in particular has a population of 133 169. Ntambu is about 145 Km south east of Mwinilunga town and 220 Km west of Solwezi the provincial capital of north western province. Ntambu area consist of the following neighbourhood health committees; Ntambu central, Nyantombu, Kapidi A, Kapidi B, Ndonga, Shilungu, Mumpulumba, Kewundu, Makuya, Muteba and Muchanka. Ntambu area is developing with a lot of activities taking place, farming and fishing are the major occupation and has a population of 21,228 (CSO, 2010). Mwinilunga is a high-risk malaria area in the Solwezi district.

The Zambia National Malaria Indicator Survey 2006 represented the first nationally representative assessment of the coverage of the key malaria interventions in combination with the measures of malaria-related burden using malaria parasite and anaemia prevalence testing among children under-five years of age (ZNIS, 2006).

Review of relevant literature

The goal of most current National Malaria Control Programs and most malaria activities is to reduce the number of malaria-related cases and deaths. To reduce malaria transmission to a level where it is no longer a public health problem is the goal of what is called malaria “control.” Recent increases in resources, political will, and commitment have led to discussion of the possibility of malaria elimination and ultimately eradication.

Where malaria exacts the largest burden, Africa, it has been extremely difficult to control. Many reasons account for this: an efficient mosquito that transmits the infection, a high prevalence of the deadly species of the parasite, favourable climate, weak infrastructure to address the disease, and high intervention costs that are difficult to bear in poor countries.

The effect of malaria control is poorly understood

Malaria remains a public health crisis in areas where it has resisted control efforts. In Nchelenge District, a high- transmission area in northern Zambia, malaria accounts for more than one-third of paediatric hospitalizations and nearly one-half of hospital deaths in children Mulenga, et`al, (2018). To identify risk factors for death due to malaria, they conducted a retrospective time-matched case-control study of 126 children hospitalized with malaria who died (cases) and 126 children who survived (controls). There were no differences in age, gender, haemoglobin concentration, or prevalence of severe anaemia between cases and controls. Children who died were more likely to come from villages located at greater distances from the hospital than children who survived (median 13.5 versus 3.2 km). Each additional kilometre of distance from the hospital increased the odds of death by 4%. Zingani, et`al, (2017) in their study states that malaria remains one of the leading causes of morbidity and mortality in Zambia. Despite Zambia implementing a number of interventions aimed at controlling malaria, the disease prevalence remains high (above 50%) in Milenge district, Luapula province. This is a cause of great concern.

Study design

This was a mixed methods study design. The Triangulation Design (Quan to Qual) (Creswell et al., 2003) was used in this study. The purpose of this design is “to obtain different but complementary data on the same topic” (Morse, 1991: 122) to best understand the research problem. The intent in using this design is to bring together the differing strengths and non-overlapping weaknesses of quantitative methods (large sample size, trends, generalization) with those of qualitative methods (small N, details, in depth) (Patton, 1990). This design was chosen because the researcher wanted to directly compare and contrast quantitative statistical results with qualitative findings or to validate or expand quantitative results with qualitative data.

Study site

The study was conducted among communities within Ntambu Area of Mwinilunga District in North- western province, Zambia. Ntambu is about 145 Km south east of Mwinilunga town and 220 Km west of Solwezi the provincial capital of north western province, with population of 21,228. Ntambu area consist of the following neighbourhood health committee; Ntambu central, Nyantombu, Kapidi A, Kapidi B, Ndonga, Shilungu, Mumpulumba, Kewundu, Makuya, Muteba and Muchanka. Ntambu was estimated to have a population of about 3 000 from 109 villages. Ntambu area was chosen purposefully because it is one of the places in the rural areas of Zambia in which malaria cases are very high though it lies in low to moderate transmission based on the provincial

Study target population

The target population in this study were heads of households. The inclusion criterion was that heads needed to be men and women of reproductive age group.

Sample size

From the population that was estimated to be just over 3 000, the sample size was $n = 358$ was considered ideal under this study as shown in the formular.

$$n = N / (1 + N (e)^2)$$

Where n is the designed sample

N is the known population

e is the precision set at 0.5

In this study, sampling as done in the villages as clusters and based on the register that was available in the village, simple random sampling with replacement was done until the desired sample size was reached. Households were selected at random from a regularly updated housing list maintained in the communities by chairpersons.

The sample size for in-depth interviews was set at 18 and Creswell (1998) advises qualitative researchers desiring to conduct 5 to 28 in-depth interviews and in this study, the researcher was within the limits.

Data collection tools

Data was collected by the researcher using a guided structured questionnaires and in-depth interviews with respondents. Interviews were done with purposefully selected respondents who seemed to exhibit deviant positions as well as ideal positions on the subject under inquiry.

Trustworthiness of the quantitative part

Since this study is a mixed methods study, trustworthiness was handled in two ways. One way relates to the quantitative part and the second way relates to the qualitative part. Below is the description.

Trustworthiness for the quantitative part

Validity

Validity was measured by ensuring that the same questions are asked to each respondent in the same sequence. Questions were clearly constructed to avoid ambiguity. Simple terms, translated in vernacular language when necessary, were instituted instead of medical language so that the community respondents understand the questions.

Reliability

In this research, the researcher ensured consistency, stability and repeatability of the results by standardizing the instrument. The research tools were tested before the main study was conducted using a Pre-test study in a different environment with similar characteristics.

Trustworthiness of the qualitative part

Credibility

Credibility refers to the conscious effort to establish confidence in an accurate interpretation of the meaning of the data (Carboni, 1995). It corresponds to internal validity in quantitative research. Credibility in this study was achieved by rendering thick descriptions. This was involved by providing descriptions not only of respondent's' experiences of phenomena but also of the contexts in which those experiences occurred. The "thickness" of the descriptions relates to the respondents' thoughts, intentionality to the observed behaviour, the multiple layers of culture and context in which the experiences were embedded (Carboni, 1995).

Authenticity

The authenticity of this study was about convincing readers, not only that the interpretation is drawn from the data, but also that the researcher has spent time in the field and has really experienced the "lived worlds" of the informants. In this study, authenticity was met by conveying clearly depicting the processes of data collection and analysis, together with demonstrating the researcher's thoroughness in these processes and qualifying anything that might compromise this, i.e. personal biases. (Hogg and Maclaran, 2008).

Confirmability

Confirmability, which is the counterpart of objectivity, is based on the acknowledgment that research is never objective. It addresses the core issue that "findings should represent, as far as is (humanly) possible, the situation being researched rather than the beliefs, pet theories, or biases of the researcher" (Gasson, 2004: 93). It was based on the perspective that the integrity of findings which were rooted in the data and that the researcher must adequately tie together the data, analytic processes, and findings in such a way that the reader is able to confirm the adequacy of the findings.

Transferability

Transferability is considered parallel to external validity or generalisability in quantitative research. This parallel criterion refers to the extent to which the reader is able to transfer or extrapolate the findings of a study to her or his own context or another setting (Gasson, 2004: 98). Transferability was achieved in this study because the researcher would provide sufficient information about the research setting (Firestone, 1993).

Data collection

Data was collected in two phases. The first phase was a piloting experience and the second phase was the main study.

Pre-test study

A pre-test study was conducted before the actual research just after ethical approval. It was observed that the initial questionnaire that was designed could not render the ideal picture. However, the initial questionnaire was adjusted using a round robin with other health staff. Necessary adjustments to the questionnaire were made after the pre-test study (see Appendices I and II). Thirteen people five men and 8 women participated in the study a village Ntambu Area. The adjustments were made further following a review of the pilot with health centre staff.

Plans for data processing and analysis

Qualitative data was analysed using content analysis to show how things are on the ground. Quantitative data was coded and analysed using the Statistical Package for the Social Sciences (SPSS). Unlike the rule of thumb that is applied in small scale explorative studies whereby the results are analysed without conducting any formal statistical tests, this study was set to conduct statistical tests in order to accord the sought reliability and validity for future wide scale research. Measures of dispersion and central tendency, Odds ratios, chi square tests and Logistic regression was computed.

Ethical matters

The fact that humans are the objects of study. The researcher in planning this study paid special attention to ethical matters. Ethical considerations that were focused on cover obtaining informed consent and maintaining participant confidentiality. Informed consent is defined as “the voluntary and revocable agreement of a competent individual to participate in a therapeutic or research procedure, based on an adequate understanding of its nature, purpose, and implications”. Informed consent may be broken down into four constituent elements: disclosure (providing adequate information), comprehension (understanding of information), and competence (ability of participants to make a rational decision), and voluntariness (no coercion).

All participants were provided with information sheets detailing the aims of the study and the process. These information sheets were provided to the participants directly. All participants were given the opportunity to ask questions about the study, and that they could withdraw from this study at any time without negative consequences. And the full details appear in the Appendices.

Research findings

The study was conducted in Ntambu area of Mwinilunga district, located in the Northeast rural area of the district. Agriculture is the backbone of the area’s economy and most of the villages’ produce is consumed locally or sold to cooperatives within Mwinilunga. The climate of the study area is of the tropical type with a single rainy season lasting from November to March. The monthly mean temperature ranges from 24 °C (November–March) to 4 to 15 °C (April –July). The main agricultural crops in the study area are millet, maize, and sorghum. The area is embraced with numerous scattered villages. Each village has 20 to 150 households. At the time of the study, there were malaria hotspot villages, defined as localities which have reported at least 8 malaria cases in a day during the previous rain season. There was a regular spraying in the previous season according to the records and each dwelling was treated by trained sprayers who were hired locally from the village communities within each of the villages.

The training/refreshing of locally hired spray operators took place one to two months before the starting of each Indoor Residual Spraying (IRS) campaign and lasted at least 1 or 3 weeks based on the previous experience of sprayers. The training sessions were animated by the District Health Management staffs of Mwinilunga, who are highly trained in the implementation of IRS.

Baseline data

This study enlisted 358 participants of whom n = 270 (75.4%) were females and n = 88 (2.6%) were males. Of the female's sample, n = 163 (45.5%) were expecting and n = 107 (29.9%) were not at the time of the study. The youngest expectant mother was 18 and the oldest was 58. This shows a wide age range difference of 40 years. However, the sample mean age was 31 (SD ± 7.4). This sample was relatively homogenous in important socio-demographic characteristics, such as education, religion and level of education as shown below. Most of the respondents lived outside the expected 5km radius to the health facility. The mean distance from the facility was 8 (2.7) km

Extent malaria interventions available to the community in Ntambu area of Mwinilunga district

This section looks at research question number one which is “to what extent are malaria interventions available to the community in Ntambu area of Mwinilunga district?” The findings are presented below.

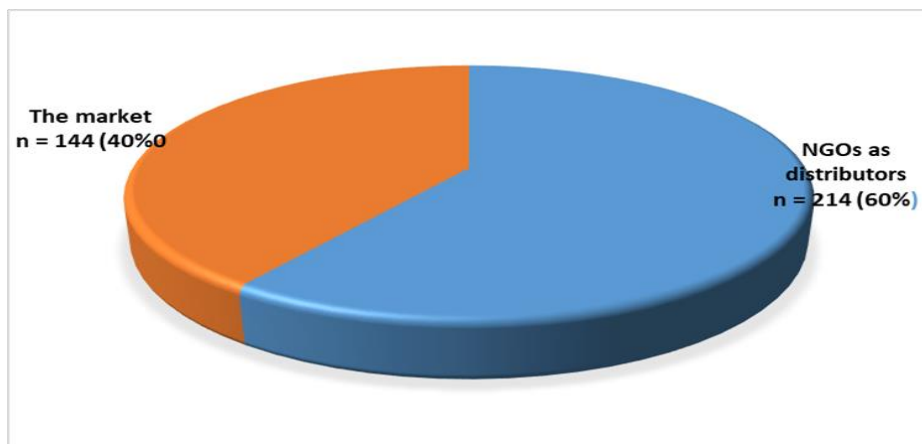
Availability of ITNs

Just over half of the respondent's n = 214 agreed that mosquito nets were readily available in homes for under 5s, and that mosquito nets were also available for the elderly and expectant mothers. Fewer elderly people as compared to expectant mothers had mosquito nets.

Table 1. Availability of ITNs

	I am not sure		Frequency			
			Yes		No	
	N	%	N	%	n	%
Are mosquito nets readily available in your home for under 5s	-	-	214	59.8	144	40.2
Those who are eligible for mosquito nets at the facility include the elderly	-	-	142	39.7	0	0
Those who are eligible for mosquito nets at the facility include children under 5 years	-	-	346	96.6	12	3.4
Those who are eligible for mosquito nets at the facility include expectant mothers	60	16.8	292	81.6	6	1.7
Are mosquito nets readily available from the nearest facility?	-	-	189	52.7	169	47.3
Mosquito nets are						
a) Sold	-	-	144	40.2	-	-
b) Given free	-	-	214	59.8	-	-

Apart from accessing ITNs from the health facilities, n = 144 (40%) noted that ITNs were available from the market and n= 215 (60%) said that they were available from NGO distributors (Figure 4). Those from the market were actually for sale and from NGO distributors were given free and mostly to elderly people and very vulnerable members of the communities.



The use rate of ITNs in the households is rather low as it stands at 43.8% (those who use them always and frequently) when compared to n = 56.1% those who use them occasionally and rarely.

Indoor Residual Spraying (IRS)

The study revealed that the district embarked on IRS seasonally. Over three quarters of the respondent's n = 268 (74.9%) agreed that spraying was as compared to n = 142 (39.7%) who said no. Majority of the respondent's n = 256 (71.5%) agree that spraying is done regularly as compared to those n = 102 (28.5%) who see it done once in a while (Table 2).

Table 2. IRS Profile

	<i>I am not sure</i>		<i>Yes</i>		<i>No</i>	
	<i>N</i>	<i>%</i>	<i>N</i>	<i>%</i>	<i>n</i>	<i>%</i>
Has your home been sprayed in each of the spraying seasons?	-	-	268	74.9	90	25.1
Spraying is done						
Regularly	-	-	256	71.5	-	-
Once in a while	-	-	102	28.5	-	-

Factors influencing malaria intervention and control among communities in Ntambu area of Mwinilunga district

This section is looking at the second research question which is “what are the factors influencing malaria intervention and control among communities in Ntambu area of Mwinilunga district?”

When some heads of households were interviewed, a number of barriers and facilitators were noted for the three interventions and these are presented below:

- a) Spray operator selection and performance
- b) Negative experiences from previous IRS campaigns
- c) Community solidarity and Acceptance of IRS and ITNs

Generally, the villagers seemed to be satisfied with the outcomes of the interventions even though there were points of dissatisfaction with the program. Each of the factors is discussed below.

Community solidarity and Acceptance of IRS and ITNs

The most frequently mentioned motivation for acceptance of IRS and ITNs was solidarity among neighbours. The respondents reported that when a house was not sprayed, mosquitoes from that house could go to the neighbours' homes and infect residents with malaria, underscoring the importance of IRS for community protection. Community members also influenced one another's acceptance by describing their positive experiences. They also supported the need for children and mothers (as well as fathers) to sleep under the net. They argued that death did not only affect one household as it strained the neighbourhood.

At first I did not mind if my neighbour house was not sprayed. Now, this is not my position. I encourage every member in the village to do so. These mosquitoes can fly all over the villages and therefore every home must be touched.

Preference for ITNs over IRS

Lastly, respondents mentioned preference for other, non-IRS malaria prevention methods such as ITNs as one of the barriers to the acceptability of spraying. Respondents in nearly every village expressed reticence to accept IRS because they believed that by accepting such a method of prevention, they would not receive ITNs. One community leader explained.

Here the people want more mosquito nets instead of spraying, so they don't accept the spray, stating that 'we are waiting for the nets'.

The preference for ITNs was generally because they had more comparative multipurpose uses. ITNs were used as fishing nets, protectors of seedlings and grain. Below are some pictures of the uses.



Use of ITNs for seedling protection

Desire to reduce insect population of homes and Incidences of malaria

Some respondents accepted Coartem/fansidar, IRS and ITNs because of a desire to reduce the number of mosquitoes and cases of malaria in the community. As for IRS, they accepted because it killed other insects inside houses. Even though IRS was promoted by health workers as a malaria prevention tool, respondents were often motivated to accept because of perceived collateral benefits of IRS such as the killing of fleas and other insects.

"I was very happy because there were lots of cockroaches, fleas and mosquitoes in my house. All the mosquitoes and fleas and cockroaches have already died from this spraying."

Interviews revealed that the main motivation for many respondents to accept ITNs and spraying was to eliminate other insects and reduce contact from mosquito bites which were responsible for malaria and death. Nevertheless, respondents were also motivated by the desire to provide protection from malaria for their children.

My kids used to be sick often, but now I'm happy. They do not fall sick as often as before.

Another motivation for IRS acceptance was the perceived expenditure. The latter was very prominent as spray acceptance was also attributed to the fear of future problems with district health authorities in case a household member got malaria.

In many cases, some of the respondents justified their decision to accept the spraying as an important prerequisite for future government services.

These health workers keep a record of all who have received ITNs and which homes have been sprayed. We have to accept, if you don't accept IRS and use ITNs. This is because if tomorrow you go to the hospital with malaria they will send you away, they will say you are the one who denied the spraying, and have sold or used the net for other things ...so you will treat yourself.

We have tried to advance the agenda of free ITNs. When it comes to voting time, this is when we make sure that every household has at least one or two ITNs...we do not care this time whether one belongs to the opposition.

There are disagreements at the district office especially when there are representatives from the ruling party and the opposition as it is in most instances tense to come to an agreement in terms of where the interventions have to begin from or be intensified. This is evidenced in the excerpts below.

Discussion and conclusion

Discussion

The aim of this study is to determine key factors affecting malaria interventions and control among communities in Ntambu Area of Mwinilunga District. The study has established that social economic status, spray operator selection, and performance, negative experiences from previous IRS campaigns and political factors were negative factors whereas community solidarity was a positive factor for acceptance of IRS and ITNs.

What can be inferred in this study is that the success of any malaria intervention in Ntambu area relies a lot on how the benefitting communities view and embrace the interventions. Individual factors like sex and level of education of household head are associated in varying ways with willingness to take up the interventions. This should be noted considering that level of education was associated with acceptance of IRS and yet not associated with repeat IRS. Gender on one hand was associated with repeat IRS.

These results are similar to barriers noted in studies from other countries such as Tanzania, Uganda (Kaufman et al., 2012; Larsen et al., 2017; Wadunde et al., 2018). Interestingly, these findings are similar to those that were noted in lower transmission areas in Ntambu, providing some evidence that local malaria burden may not be the most important influence on IRS acceptance (WHO, 2015b).

While some community members were motivated by perceived malaria-related benefits of IRS, others reported that they accepted IRS because of their desire to reduce other household insects like fleas and to comply with governmental and community expectations.

Motivators of acceptance of spraying in Ntambu as a high transmission areas are similar to those noted for acceptance of IRS in a low transmission area in previous research (WHO, 2015a; Larsen et al., 2017; Bridges et al., 2018), which found that adherence to ITN use and IRS acceptance were driven by trust in local health authorities, the need for solidarity and the influence of community leaders. This was not the case in Ntambu only in one instance relating to very little trust in local health authorities. This finding on the importance of community solidarity across transmission settings has implications especially for ITN and IRS communication strategies and overall engagement with communities. For example, in Ntambu, key messages for future campaigns might better capitalize on this solidarity by emphasizing that by accepting more of IRS, community members are being good neighbours and helping to protect their communities, rather than only emphasizing individual or familial benefits. This is true when one looks at the numerous households that have varying reasons for not accepting IRS. This is particularly relevant given the importance of high community acceptance for IRS to be effective. Additionally, it underscores the value of having strong buy-in from community leaders as these individuals can leverage community cohesion for the benefit of the campaign when sufficiently engaged, or can influence widespread refusal when the leaders do not have sufficient buy-in in the campaign. For example, studies elsewhere found that acceptance of IRS and ITN was motivated by delivery by known individuals (WHO, 2015a; Larsen et al., 2017; Bridges et al., 2018), like women NGOs or other local NGOs underscoring the important role of community leader engagement.

A notable finding of this study is that many respondents did not perceive IRS to be very effective and many reported preferences for ITNs and showed low to consent to spraying. This acceptance of IRS, despite the perception of its lack of effectiveness has also been noted in other African settings (Ediau, 2013; Wadunde et al. 2018) and not only Ntambu. In particular, respondents in this study reported concerns about the residual efficacy of IRS like smell, movement of furniture and skin allergy among others. This is an interesting finding given that residual efficacy of IRS campaigns elsewhere.

Findings across countries underscore the importance of education and IRS knowledge on IRS acceptance. For example, respondents in this study and others (Kaufman et al., 2012) were able to explain the IRS procedures, but they often did not understand the residual efficacy of IRS or the fact that it only killed mosquitoes that rest indoors. Thus, families may not perceive the benefit of IRS if they continue to have many mosquitoes in or near their homes following the campaign, as was also noted in other studies (Bridges et al., 2018). This low perceived effectiveness underscores the complexity in communication promoting IRS acceptance.

Following these observations, in order to promote IRS without raising false expectations, communication should specify that IRS prevents the mosquitoes that cause malaria. This nuanced message is, however, often lost since it is more complicated and less salient than messages such as the common IRS mantra in Ntambu, “kuzhaha g`weneni!” (Kill mosquitoes!).

Recommendations

Looking at the data that shows low uptake of fansidar, and ITN as well as IRS coverage, there numerous lessons learnt and a number of recommendations to be made. While governments and donors may be willing to subsidise ITNs, low availability of ITNs limits the community's potential to benefit from interventions, implying that those who need ITNs continue to buy them at a higher price and not from more trustworthy and acceptable sources. This would often require additional costs that may have been unnecessary if the subsidised ITNs matched communities' needs, and if the community trusted the distributing NGO agency.

Regarding the misuse IRS and ITNs, it is recommended that incorporating community preferences when designing interventions by providing timely and adequate information can help address some of the misuses in this study, minimise rumours and suspicions, strengthen trust in the distribution agencies, and ultimately promote acceptability and ITNs use and acceptance of IRS.

Gender differences in access to resources can hinder ITN ownership and use. Though this study did not address this aspect, the data seems to suggest so. In the study setting, as elsewhere in sub-Saharan Africa, men control resources and are the main decision makers in the households (see Moluneux, 2002). There is concern that information regarding malaria control interventions is often given to women mainly during maternal and child health clinics, yet it is the men who have money and make decisions on whether or not to buy ITNs. This study is recommending engaging men more actively in malaria control through education and this could empower them to accept IRS and buy ITNs when resources are available, and be more willing to use them when they share a bed with a young child and their spouses.

Limitations and significance of the findings

This study was limited to Ntambu and as such, the findings do not reflect the happenings in Mwinilunga district. Interpretations of these results therefore, need to be handled with caution. It is important to note that this study has not looked at the effectiveness of the interventions and despite these limitations, this study still found key information for programmatic review.

This case study has provided factors that were found to be significantly associated with malaria interventions which were not known and could be linked to the high incidence rate of malaria. The findings of this study demonstrate the complexity of the drivers of malaria interventions; while interventions like fansidar/Coartem, ITNs and IRS have been demonstrated to bring down malaria, the true malaria point prevalence may, therefore, may not have been overestimated.

Conclusion

The findings from this study highlight important factors associated with the malaria prevention and control program in Ntambu. The availability of antimalarial drugs like fansidar/Coartem, ITNs, IRS acceptance and refusal in Ntambu, leave much to be desired. A large proportion of the respondents appear not to have benefitted from the program. ITN use and availability appears to be the most accepted and easily available intervention though a few respondents appeared not to be aware or sure of what was happening in the area. Antimalarials are not readily available and IRS is the least accepted intervention.

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