CHAPTER ONE

1.0 INTRODUCTION

Malaria remains a leading cause of ill health globally, causing an estimated 216 million cases of clinical malaria and 655 thousand deaths in 2010 (WHO, 2011). More than 85% of malaria cases and 90% of malaria deaths occur in Africa south of the Sahara, where the vast majority of cases and deaths occur in young children. Across the Sahel sub-region most childhood malaria mortality and morbidity occurs during the rainy season, which is generally short. The implementation of indoor residual spraying (IRS) during this period has been shown to prevent illness and death from malaria in children and the whole population at large.

Malaria remains a major public health problem in Zambia. In 2010, there was an estimated 4.2 million cases of malaria (both confirmed and unconfirmed) country wide and a total of 4834 deaths were recorded (Zambia Malaria National Control Action Plan, 2011). Malaria transmission in Zambia occurs throughout the year with the peak during the rainy season, which occurs between November and April. *Plasmodium falciparum* accounts for more than 90% of all infections. *Anopheles gambiae* mosquito is the major malaria vector. Malaria is endemic in all ten provinces of Zambia with 90-100% of the population at risk of illness. Malaria still accounts for 45% of outpatient visits, 45% of hospital admissions, 47% of overall disease burden among pregnant women, and 50% of disease burden among children under five years of age. Malaria also has a serious economic impact on Zambia, accounting for an estimated 6.8 million Disability Adjusted Life Years lost (Zambia Health Management Information System, 2008).

Key interventions currently recommended by WHO for the control of malaria are the use of insecticide treated nets (ITNs) and/or indoor residual spraying (IRS) for vector control, and prompt access to diagnostic testing of suspected cases of malaria and treatment of confirmed cases (World Health Organization, 2009). The Government of Zambia through the Ministry of Health has prioritized efforts to mitigate the effects of malaria. These efforts are outlined in the National Health Strategic plans (NHSP) and the National Malaria Strategic Plan (Integrated Vector Management Report, 2009). Government believes in equitable distribution of effective malaria preventive and curative services as close to the household as possible. The key

preventive interventions are: Indoor residual spraying of structures in eligible areas, promotion and distribution of long lasting insecticide treated mosquito nets, especially for children under the age of five years and pregnant women, and intermittent preventive therapy (IPT) of malaria in pregnancy (Zambia/USAID FY09, 2009).

Indoor Residual Spraying (IRS), with overwhelming evidence of it reducing malaria transmission and incidence, is one of the key preventive malaria control interventions used in the fight against malaria. Zambia has conducted IRS campaigns since 2003/2004 during the peak transmission seasons (November to December and March to April) (Chanda *et al*., 2008). Since then, the spraying has scaled up from five (5) to now 36 districts, providing coverage to more than 1.5 million homes. Indoor Residual Spraying (IRS) using pyrethroids and DDT was targeted predominantly at urban and peri-urban areas and Long-Lasting Insecticidal Nets (LLINs) at rural areas. These interventions are being scaled up and monitored by entomological and epidemiological indicators (Chanda *et al.*, 2011). Implementation of IRS protected 5.7 million people in 2008 with an average coverage of 90% of over 1.0 million targeted households (Chanda, 2011). The national coverage of both LLINs and IRS has surpassed the international targets of at least 80% of households and it provides a unique opportunity for evaluating the impact of these interventions but for IRS alone very little has been done to address the challenges surrounding the implementation of the program (Chizema-Kawesha *et al*., 2010).
In this study, the focus was to analyze the effect of community sensitization on the outcome of indoor residual spraying against mosquitoes. The study was conducted in Mpumba and Mpika Boma catchment areas of Mpika District.

1.1 Justification of the study

Since the introduction of Indoor Residual Spraying in Zambia, a number of challenges have arisen to the efficient implementation of IRS program. Cardinal amongst these challenges has been the lack of accurate information and education in the general community on the benefits of IRS. This lack of information and education has resulted in myths, misconceptions and a number of community concerns such as skin and eye irritations, and the apparent increase in the number of cockroaches, fleas, bed bugs and other household insects that emerge after spraying. Another

challenge has been the lack of adequate notice given to designated communities prior to the spraying campaign (National Malaria Indicator Survey Report, 2008). This again could be attributed to the lack of adequate community sensitization.

The findings generated from this study would contribute to the knowledge and understanding of the best ways to sensitize local community in IRS program in order to control malaria incidences and also be useful in developing interventions that would be undertaken to address challenges such as myths, misconceptions, lack of information by community and others in order to improve the IRS outcome.

1.2 Objectives of the Study

1.3 Main Objective

The main objective of this study is to analyze the effect of local community sensitization on the outcome of indoor residual spraying program against mosquitoes.

1.4 Specific Objectives are:

1. To analyze the outcome of IRS program in sensitized community compared to non-sensitized community.
2. To identify the best way to sensitize local community on IRS.
3. To identify perceived benefits of IRS by households exposed to IRS in the study areas.

1.5 Null hypotheses

1. There is no effect on the outcome of indoor residual spraying program in the area where community was sensitized.

CHAPTER TWO

2.0 Literature Review

2.1 Malaria control methods

Currently, malaria control in urban African settings consist mainly of early diagnosis and prompt treatment, and the promotion of ITNs. It is proposed to strengthen these programs and include environmental management as a key feature for sustainable mitigation of the burden of malaria in urban Africa. Interventions that consider the different facets of the urban environment have the potential to be broadly applicable and affect the health of many inhabitants (Vlahov and Galea, 2003). Malaria control remains a challenge in sub-Saharan Africa; Indoor Residual Spraying (IRS) is a highly effective method of malaria control recommended by the World Health Organization. Unfortunately it remains underutilized in sub-Saharan Africa, where, each year, malaria kills over a million people and drains the continent of US$12 billion for curative services (Musawenkosi *et al*., 2004). World Malaria Day 2008 focused on malaria across borders – some of the best cross-border malaria control programs rely heavily on IRS. Yet most donor agencies are loath to strengthen IRS programs in Africa, train medical entomologists to run them, and invest in new insecticides (Southern Africa Malaria Control, 2010).

2.2 Indoor residual spraying (IRS)

In 2006, the World Health Organization (WHO) reinforced the recommendation of indoor residual spraying (IRS) with dichlorodiphenyltrichloroethane (DDT) to reduce malaria transmission. Information, education, and communication (IEC) and community mobilization is one of the key components of IRS. This component creates an enabling environment for a successful spray campaign to take place. The purposes of IEC and community participation in IRS are to sensitize communities and stakeholders on the importance of IRS as a malaria prevention strategy and to inform the target population of the necessary preparations required to assure adequate human and environmental safety for successful spray operations. In addition, IEC and community sensitization increases acceptability of IRS activities among target populations by engaging them and encouraging their active participation in project activities. Door-to-door sensitization is the key community mobilization strategy, supplemented by advocacy, mass media, and IEC materials (WHO, 2006).

In September 2006, Research Triangle Institute (RTI) was awarded the Indoor Residual Spraying contract (IRS 1) by the United States Agency for International Development (USAID) to expand IRS programs in sub-Saharan Africa as part of the President's (George W. Bush) Malaria Initiative (PMI) to reduce the impact of malaria in sub-Saharan African countries. One of PMI's four objectives is to reduce malaria-related mortality by 50% in 70% of the at-risk populations in sub-Saharan Africa. The related IRS objective was to achieve at least 85% coverage (outcome) in targeted communities.

2.3 Indoor residual spraying innovations

In 2010, RTI embarked on improving IRS operations through the introduction of innovations to the IEC/community sensitization component. These innovations resulted in significant improvements on IRS operations (RTI, 2011). The innovations included the following:

1) **A pictorial IRS brochure**: A user-friendly, pictorial output-based brochure was developed to replace the various brochures that existed in IRS countries. This was part of harmonization of the IEC component. The brochure is precise and simple; it summarizes the key IRS messages.
2) **Use of the Ministry of Social Affairs to conduct community sensitization**: In many countries, various structures (Ministry/departments) within the government system are responsible for mobilizing communities for any event. In 2010, use of these structures to conduct community mobilization was explored in some countries. This approach was in line with the IRS project's mandate to build local capacity for project sustainability. Mali and Benin used these structures and reported successful IRS campaigns and high acceptance of IRS among target communities.
3) **IEC mobilizer training guide**: A standardized IEC mobilizer training guide was developed and shared with all the IRS countries with the aim of harmonizing content. The guide is currently in use in most countries.

2.4 Factors that make indoor residual spraying implementation easy

Factors that made RTI to succeed and ease of implementation of IRS included the following:

1) **RTI implementation of IEC and community mobilization**: Programs where RTI was mandated to conduct IEC and community mobilization were implemented successfully and with minimal challenges. RTI's strategy of using local structures, such as local leaders, women's groups, school clubs, youth groups, and CHWs, to conduct community mobilization was effective in promoting the project's objectives and creating buy-in, which led to high acceptance of IRS among community members. The strategy was carried out using proper community entry processes, including respecting and observing all necessary protocols. Where this approach was used, a high acceptance of the IRS project was experienced.
2) **Tailoring messages to address IRS specific issues**: IRS specific messages were developed to create awareness among target communities with information on household preparations before, during and after spraying. These messages disseminated information on increased activity of insects after spraying, re-plastering and covering of wall surfaces after spraying.
3) **Recruitment of community mobilizers from their localities**: This increased IRS acceptance among community members since they knew the mobilizer. The strategy also increased coverage, as mobilizers knew their geographical areas very well. Therefore, they were able to mobilize all the eligible structures and guide the spray operators to them. The strategy reduced costs, resulting in savings on mobilizer allowance and transport costs. Mobilizers were engaged for a period of 4–5 days, and they did not have to be transported from one point to another because the distances were short.
4) **Engaging key stakeholders early**: This is critical to the success of the IRS project, especially to the community mobilization component. The planning and successful implementation of community mobilization requires time and external human resources to coordinate activities. Where stakeholders were engaged early, strong partnerships were formed, leading to good participation and successful spray campaigns. Therefore, it is recommended to engage stakeholders early to ensure adequate time for IEC preparations. This yielded active participation in project activities by community members and created a strong sense of project ownership. This was demonstrated by the

participation of local leaders in the identification of IRS temporary staff for the community mobilization process and the participation of CHWs in community sensitization.

2.5 Community sensitization on indoor residual spraying Program

The local leaders assisted in resolving any matters arising between community members and project staff, such as refusals for IRS and conflicts between RTI workers and IRS temporary staff. The strong partnership also led to good participation of, and support from, community members. For example, well-sensitized communities often provided water to the spray operators, cutting operating costs.

1) **Use of local CHWs to conduct community mobilization**: This is an effective strategy to build local capacity and retain knowledge. CHWs rarely move from their communities, thereby reducing the need to train people annually; refresher trainings are all that is required. Because CHWs are part of the Ministry of Health community health education structure, the addition of IRS messages into their workload ensures that IRS messages are disseminated to community members all year long, like other public health messages. This ensures continuity of IRS message dissemination. The other advantage of using CHWs is to gain high acceptance for IRS because the workers are well known to community members.

The IRS undertaken in the 23 high risk villages of Kalol taluka in Gandhinagar district of India with Synthetic Pyrethroid during 2006 and 2007 as intervention measure for control of malaria has given significant impact on total malaria incidence and Annual Parasitic Incidence (API). The API which was 33.43 in 2005 declined to 8.80 in 2006 (71 % in total reduction) (Malaria Action Program, Delhi, 2008). The parasite incidence was 1.5 in 2007 which indicates the significant impact of IRS on malaria transmission. This impact could be achieved with the minimum cost of 5 to 6 rupees per capita. This study had clearly proved that, in spite of the constraints associated with IRS, it had a major role in the control of malaria if implemented with proper supervision, better coverage and community sensitization (Vijayakumar *et al*., 2009). Though the epidemiological impact was quite evident, the entomological impact could not be

ascertained due to insufficient data pertaining to the sprayed villages and therefore studies should be undertaken to monitor the density of vector species also to see the impact of vector control tools directly on vectors as well in such situations (Delhi Malaria Research Centre, 2009).

A study was carried out from September to October 2009 in Geita district in northwest Tanzania about the knowledge, Attitudes, and Practices about Malaria and Its Control in Rural Areas. The results showed that about half of the respondents reported that they had heard of IRS campaigns and the main sources of information were radio programs and government campaigns. When asked if they were ready for their houses to be sprayed with insecticides, 86% accepted. Whereas the perceived main benefit of accepting IRS was to kill mosquitoes, only 17% mentioned protection from malaria. The reasons of rejecting IRS were mainly bad smell of the insecticides and the fear that insecticides may kill their domestic animals. The results of study could be incorporated into the decision-making processes, the design of sustainable interventions with active community participation, and the implementation of educational schemes. The findings of this study indicate that rural communities in northwestern Tanzania have high knowledge on malaria transmission, symptoms, and preventive measures (Humphrey *et al.*, 2010).

Study carried out in Mozambique about what drives community adherence to indoor residual spraying (IRS) against malaria in Manhiça district, rural Mozambique IRS was well received in most neighbourhoods. Results indicated that the overall coverage rates varied between 29% and 41% throughout the study period. The factors related to adherence to IRS were: immediate impact on insects in general, trust and obedience in the health authority, community leaders' influence and sensitization, and acquaintance with the sprayers. Fighting malaria was not an important motivation for IRS adherence. There was a perception of limited efficacy of IRS against mosquitoes, but this did not affect adherence. Non-adherence to the intervention was mainly due to inadequate sensitization of key householders, disagreement with the procedures, and the perception that spraying increased the burden of insects (Khátia *et al.,* 2011)**.**

2.6 Indoor residual spraying programs in Zambia

Zambia has conducted IRS campaigns since 2003/2004 during the peak transmission season (November to April). Since then, the spraying has scaled up from five (5) to 36 districts,

providing coverage to more than 1.5 million homes (Integrated Vector Management Report, 2005). Since the introduction of Indoor Residual Spraying in Zambia, a number of challenges have arisen to the efficient implementation of IRS program. Cardinal amongst these challenges has been the lack of accurate information and education in the general community on the benefits of IRS. This lack of information and sensitization has resulted in myths, misconceptions and a number of community concerns such as skin and eye irritations, and the apparent increase in the number of cockroaches, fleas, bed bugs and other household insects that emerge after spraying (Chanda *et al.*, 2011).

Another challenge has been the lack of adequate notice given to designated communities prior to the spraying campaign. This again could be attributed to the lack of adequate community sensitization campaigns and local community participation. There is need, therefore, to strengthen Information, Education and Communication activities at community level to guide the smooth implementation of malaria control and prevention activities by health providers. In order to ensure successful Indoor Residual Spraying campaigns in the IRS targeted districts, the National Malaria Control Centre and partners have developed this communication strategy as a guide to all stakeholders implementing malaria control and prevention interventions (Indoor Residual Communication Strategy for Zambia, 2008).

According to the Zambia Indoor Residual Communication Strategy (2008), the National Malaria Control Centre has developed a Malaria Communication Strategy, a guide that paves the way for the successful distribution and use of the proven malaria interventions adopted by the Government of Zambia. However, despite the availability of the Malaria Communication Strategy, there have been a notable number of refusals at household level during spraying campaigns. This IRS communications strategy was therefore designed to directly address community concerns, serving as a handbook of recommended messages and methods to sensitize the local communities and reduce the number of refusals at household level. The success of IRS depends on full sensitization of the community. The malaria-carrying mosquito must not be accorded safe havens in peoples' homes to transmit the deadly parasite.

2.7 Statement of the Problem

Zambia has conducted IRS campaigns since 2003/2004 during the peak transmission season (November to April). Since the introduction of Indoor Residual Spraying in Zambia, a number of challenges have arisen to the efficient implementation of IRS program. Some of these challenges have been the lack of adequate local community participation, accurate information and education in the general community on the benefits of IRS.

However, it naturally happened in Mpika district that in one catchment area local people were sensitized on IRS program while other area local people were sensitized. And, no study had ever been conducted to analyze the effect of local community sensitization on the outcome of indoor residual spraying program against mosquitoes in this district.

2.8 Conceptual framework for determining outcome in the indoor residual spraying program

In order to understand the concept of outcome in IRS program, logical framework in monitoring and evaluation were used such as input, output, outcome and impact.

Below are various variables/indictors that help to understand the outcome of IRS program. Lack of community sensitization may result into few number of household been sprayed (outcome) hence poor performance in the overall program (impact).

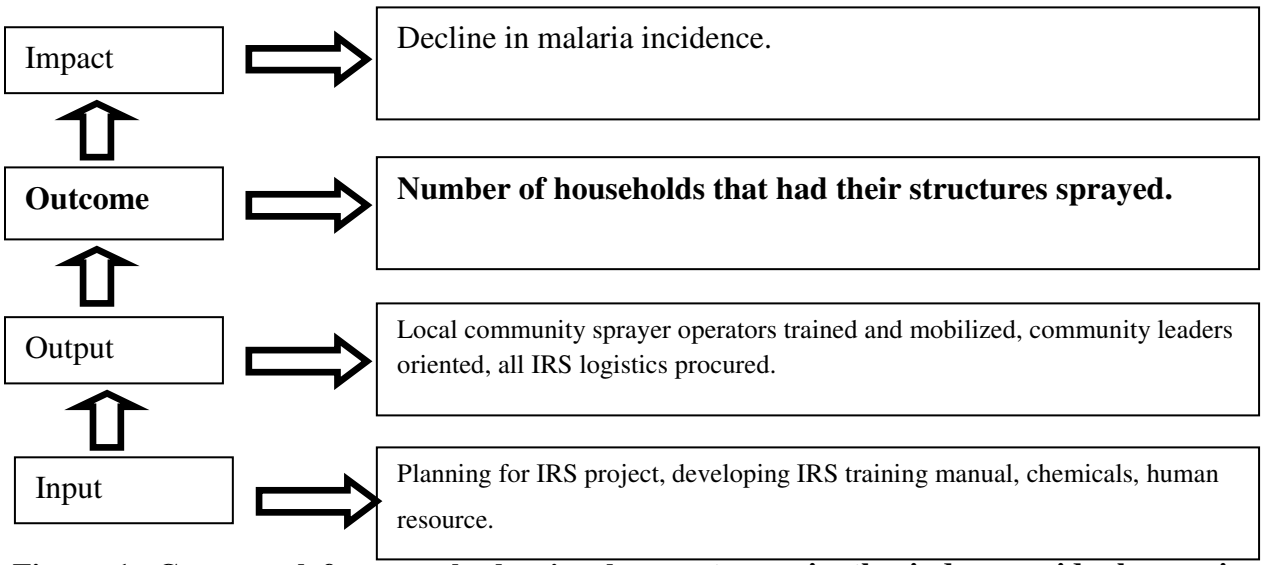

Figure 1: Conceptual framework showing how outcome in the indoor residual spraying program can be achieved.

Results of this study will help IRS implementers to efficiently implement the program in order to obtain the desired outcome and impact.

CHAPTER THREE

3.0 MATERIALS AND METHODS

3.1 Materials

3.2 Composition / Information on the Ingredients

The IRS exercise which was done in Mpika district in 2012 used; "bendiocarb 80% w/w", a carbamate insecticide with a trade name of Ficam® as a wettable powder. It is recommended that indoor spraying with Ficam is done at an interval of one month for spraying season (September to January) has an effective residual life of 6 months.

3.3 Key concepts of the study.

In order to understand they key terms used in the methodology, their definitions and brief explanations are given below.

1. **Impact:** measure change in conditions of the community (e.g. reduced malaria incidence in the community).
2. **Indoor Residual Spraying (IRS):** is the application of a long-lasting, residual insecticide to potential malaria vector resting surfaces such as internal walls, eaves, and ceilings of all houses or structures (including domestic animal shelters) where such malaria vectors might come into contact with the insecticide.
3. **Input**: describe what goes on in the activities (e.g. Chemicals, human resource)
4. **Local Community Sensitization on IRS:** refers to the modification of behaviour by raising awareness of IRS concerns to local community people.
5. **Non-community sensitization on IRS:** refers to the non modification of behaviour of local community people by not raising awareness of IRS concerns.
6. **Outcome:** describe the product of the activity (e.g. number of household sprayed).
7. **Output:** describe the project activity (e.g. All IRS logistics procured, people trained in IRS program).

3.4 Study area

Mpika District is situated on the Southern part of the Muchinga Province in the heart of Central-Southern Africa. It's the largest district in Zambia with a surface area of approximately 41 000 square km. The district shares boundaries with Lundazi and Mambwe districts of Eastern Province across the Luangwa River. Kasama, Luwingu and Chilubi Island are to the west of Mpika separated by the Chambeshi River. In the north, Mpika shares borders with Shiwang'andu district and to the south lies Serenje district in Central Province. Centrally, Mpika district lies at latitude of 12.09^{o} South of Equator and longitude of 31.45^{o} East of prime Meridian. Mpika lies at an altitude of 600-1500 m above sea level and is home to the Luangwa valley a continuum of the Great Rift Valley from which the Muchinga escarpment originates. The Muchinga escarpment slopes gradually to the west into the Bangweulu swamps and Chambeshi flood plains. Mpika has vast forest resources and is endowed with numerous water bodies; swamps, rivers and streams. The presence of water bodies in the district have given a favourable condition for mosquitoes to survive throughout the year. Mpika experiences three seasons; cool dry winters from May to September, hot dry summer from October to November and hot-wet rainy season from December to April. In this region, mostly mosquitoes start bleeding from hot dry summer to hot-wet rainy season and it is advisable to do indoor residual spraying during these periods. According to the 2010 Census Report, Mpika had an extrapolated population of 211,425 people and an Annual Population Growth Rate of 3.8%. The projected population for 2012 based on the 3.8% population increase was 227,799 (Mpika District Health Action Plan, 2012).

The research was conducted in two catchment areas: Boma and Mpumba comprising 14 zones and 10 zones respectively. The catchment areas were selected on the basis of being sensitized on the indoor residual spraying program during 2012 period. The program was conducted in two phases, phase1 was conducted between March and April while phase 2 was conducted between October and November of the same year because that's the period mosquitoes breeds and increase in number. However, it happened naturally that local people from Mpumba catchment area had not been sensitized on IRS program while people from Boma area had been fully sensitized and some were even trained as sprayer operators. The sprayer operators who were oriented and trained in IRS from Boma catchment area went and did spraying in the Mpumba

catchment area. The houses were randomly selected from a list of villages which were on the IRS program

3.5 Study design

A retrospective cohort study design was used in this study which involved collection of 2012 data of households planned for IRS program, and the data was collected from Mpika District Health Office. Since the study involved two areas, Mpika Boma catchment area was considered as cluster A where community sensitization on IRS program was done and Mpumba catchment area was considered as cluster B where community sensitization on IRS program was not done. In order to achieve some of the objectives of the study such as the best way to sensitize local community on IRS and identify perceived benefits of IRS by households exposed to IRS, the focus group discussions were also conducted in two study sites. However, IRS program outcome has been defined as the total number of households that had their structures sprayed (***see figure* 1**).

3.6 Sample size

The sample size for study areas was estimated by using the formula described by Pfeiffer (2002)

$n=Z^2 P (1-P)/d^2$

Where:

n = required sample size

Z = multiplier from normal distribution 95% CI (1.96)

P = estimated proportions of households that had their structures sprayed were 60% and 34% for Boma area and Mpumba area respectively.

(1-p) = the probability of having no households' structure sprayed.

d = desired precision (5%)

In this study, it was anticipated that the sample size would be 369 households from Boma area and 345 from Mpumba area. The total sample size was 714.

3.7 Sampling technique

The sampling procedure was purely purposive because the catchment areas were selected by being considered and involved in the IRS program in 2012, but the study units (households) were randomly selected and also the number of households who had their structures to be sprayed was unknown.

3.8 Study Population.

The study population included households targeted to be sprayed for year 2012 in the study areas. Boma households where local people had been sensitized on IRS program considered as cluster A and Mpumba households where local people had been not sensitized on IRS program were regarded as cluster B.

3.9 Inclusion criteria

Households

- Households that had structures projected by CSO in 2012 and captured in the data.

Health workers

- Malaria focal person at the district level.
- Working as focal point person since 2012.

3.10 Exclusion criteria

Households

- Households outside study areas but captured in the data.
- Households not captured in data.

Health workers

- Working as a focal point person less than one year.
- No interaction with IRS program.

3.11 Data Collection Methods

Different methods of data collections were used in this study. These included;

3.12 Check List

Check list was designed in such a way as to collect the secondary data of number of households who had their structures sprayed and those who did not have their structures sprayed in the study areas. The registers for IRS data were obtained from Mpika District Community Development Mother and Child Health Office (CDMCH); records for all beneficiaries (households sprayed) were retrieved to substantiate information regarding non-beneficiaries (households not sprayed). Observation was also made during consultation to collect information on the operating structures.

3.13 Focus Group discussions

In order to achieve the specific objectives such as; to identify the best way to sensitize local community on IRS and to identify perceived benefits of IRS by households exposed to IRS in the study areas, focus group discussion was conducted in both areas and a specific question guide for focus group discussion was developed. For the purpose of data verifications, the data which was collected from the community during focus group discussions about the best way to sensitize the community on IRS program and perceived benefits were compared with the one collected at Mpika District Health Office. Since these variables were qualitative in nature, the data was triangulated into quantitative form for proper analysis. Attendance for focus group discussions was as follows; all the zones in Boma catchment area were represented and 14 people attended the meeting. Equally, all zones in Mpumba catchment area were represented and 10 people attended. The common feature observed from both clusters was, meeting was dominated by general community, Malaria Control Agents (MCAs) and leaders from Neighbourhood Health Committees (NHCs). This gave an advantage of collecting the required data.

3.14 DATA ANALYSIS

Data collected from the study areas about IRS outcome (number of households that had structures sprayed) and number of households that did not have their structures sprayed were

coded in Microsoft excel 2007, entered into SPSS version 16.0 and the following analyses were done. The association of IRS program outcome with community sensitization was analyzed using Chi-square and a p-value of less than 0.05 was used to determine significance. Measure of effects/comparing of IRS program outcome between two areas was done using odds ratios. Comparing of how community responded to IRS program in the study areas logistic regression model was used.

In order to take care of confounding variables, the elements/variables of interest were restricted to households who had the structures in both study areas clusters. Structures such as schools, churches and others were not included in this study.

3.15 ETHICAL CONSIDERATION

Confidentiality was observed and no unauthorized persons had access to data which was collected. All information collected in the study was kept confidential. Permission to conduct study was obtained from Directorate of Research and Graduate Studies (DRGS) through the Assistant Dean Post Graduate and the Permanent Secretary Ministry of Community Development Mother and Child Heath (MCDCH). Ethical approval to conduct the study was obtained from the ERES Converge IBR members. The District Malaria Focal Person (DMFP) and health workers from study areas were well informed that their data would be used anonymously, and that aim of the study was to analyze the effect of local community sensitization on the outcome of indoor residual spraying against mosquitoes. Informed consent was obtained.

CHAPTER FOUR

4.0 RESULTS

4.1 Comparing IRS outcome between sensitized and non-sensitized communities.

4.2 Proportion of spraying phases per cluster

Table 1 shows spraying phases, households (sprayed and not sprayed) and their respective percentages. The IRS program was conducted in two phases, phase1 was conducted between March and April of 2012, phase 2 was conducted between October and November of the same year because during these periods mosquitoes breeds and increase in number. The proportion of households who had structures sprayed in first phase was 98.1% (n = 369) and 51.1% (n = 369) for second phase in cluster A. While in cluster B the proportion of households or structures sprayed in first phase was 33.8% (n = 345) and 47.6% (n = 345) for second phase. Comparing the proportions of households sprayed per phase between cluster A and cluster B indicates that phase 1, cluster A had higher proportion of households who had their structures sprayed than cluster B with statistical significance of P- value = < 0.0001, 95% CI, 0.59 to 0.69. In phase 2, there was no significant difference in the proportion of households who had their structures sprayed between cluster A and cluster B with P-value = 0.085, 95% CI, - 0.037 to 0.11

Table 1: Proportion of spraying phases per cluster

Characteristics	**Households Sprayed** n (%)	**Households Not Sprayed** n (%)	**Total**
Cluster A (Sensitized)			
Phase1 (March-April)	362 (98.1)	7 (1.9)	**369**
Phase 2 (Oct-December)	189 (51.1)	180 (48.9)	
Cluster B (Not sensitized)			
Phase 1 (March-April)	117(33.8)	228 (66.2)	**345**
Phase 2 (Oct-December)	164 (47.6)	181(52.4)	
Total			**714**

It was found that cluster A had average proportion of households who had their structures sprayed per phase of 74.62% (n = 275) and 25.38% (n= 94) were not sprayed. For cluster B, average proportion of households who had their structures sprayed per phase were 40.77% (n= 141) and 59.23% (n = 204) were not sprayed. Comparing average proportion of households that

had their structures sprayed per phase between clusters showed that, cluster A had significantly more households who had their structures sprayed than cluster B with [P-Value < 0.0001, 95% CI, 0.269 to 0.407]. (Figure 2)

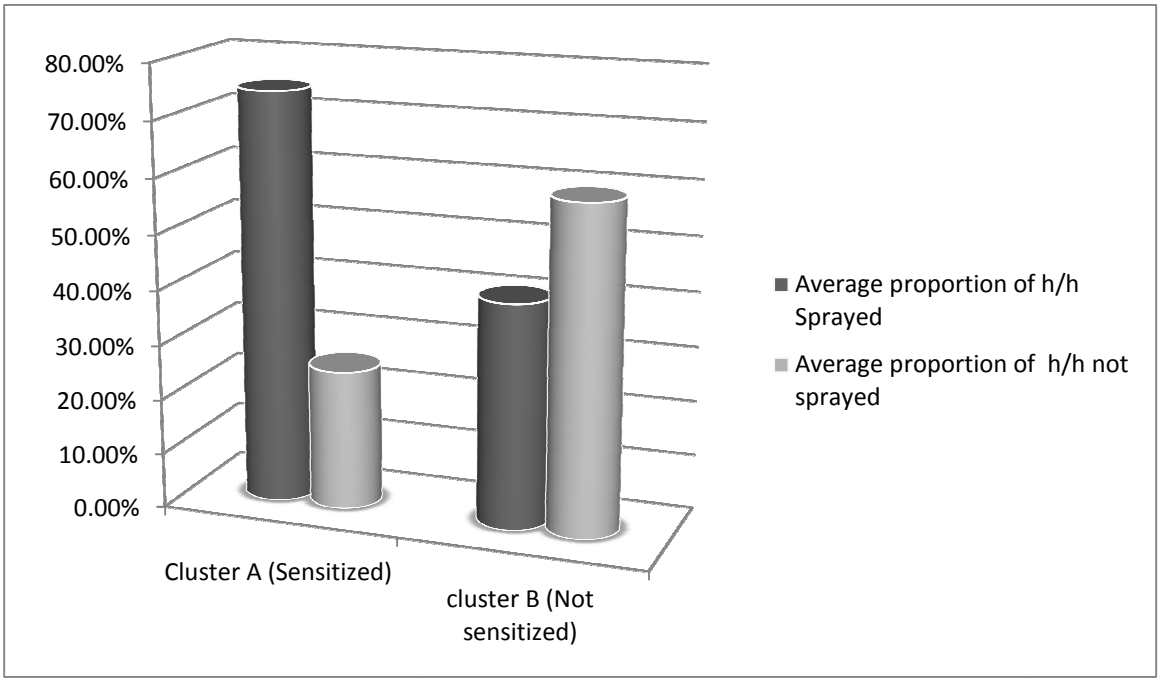

Figure 2: Average proportion of households sprayed and not sprayed per phase

4.3 Effect of community sensitization on IRS program outcome

Table 2 shows the average number of households that had their structures sprayed and not sprayed per phase. Cluster A had 275 households that had structures sprayed, 94 were not sprayed (n_1 = 369). Cluster B had 141 households that were sprayed, while 204 had not sprayed (n_2 = 345). When comparing the effect of community sensitization on IRS program outcome, the analysis revealed that the odds of IRS program outcome are 4.23 times higher in sensitized community compared to non sensitized community in the IRS program [95% C.I. 3.08, 5.81].

Table 2: The average number of households sprayed per phase in all clusters.

	Characteristics		**Odds Ratio**	**95% Confidence Interval**
Clusters	Sprayed	Not sprayed		
Cluster A (Sensitized)	275	94	**4.23**	**(3.08, 5.81)**
Cluster B(Not sensitized)	141	204		
Total	416	298		

4.4 Association of IRS program outcome with community sensitization

The table 3 presents the data about IRS program (households sprayed and not sprayed per phase) and the characteristics (cluster A and cluster B) where study was conducted. In total, cluster A 275 households that had their structures sprayed and 94 had not been sprayed. In cluster B 141 households that had their structures sprayed and 204 were not sprayed. Between the factors (community sensitized or not sensitized) associated with IRS program outcome, the results revealed that there was association between community sensitization and IRS program outcome (χ^2 = 83.05, df = 1, ρ <0.0001). In terms of average outcome per phase, 74.6% households had their structures sprayed in cluster A and 40.8% households had their structures sprayed in cluster B.

Table 3: Association of IRS program outcome with community sensitization

Characteristics	Cluster A (Sensitized)	Cluster B (Not Sensitized)	**TOTAL**	χ^2	**P-Value**
Sprayed	275(74.5%)	141(40.8%)	416 (58.3%)		
Not sprayed	94 (25.5%)	204 (59.2%)	298(41.7%)	**83.05**	**<0.0001**
TOTAL	369	345	**714**		

4.5 Comparing responses to IRS program between Clusters

Table 4: Average proportion of households that had their structures sprayed per phase.

Cluster	Proportion of outcome per phase	Probability of outcome per phase
ClusterA (Sensitized)	74.6%	0.75
Cluster B (Not Sensitized)	40.8%	0.41

The probability of households that had their structures sprayed were 0.75 and 0.41 for cluster A and cluster B respectively (Table 4).

The output of logistic regression model to explain on how people responded to IRS program was as follows;

$$\text{Logit}\,[p/(1-p)] = -0.775 + 1.443\ \text{Sent}, \qquad (\text{sprayed} = 0, \text{not sprayed} = 1)$$

$$\omega_{Sent} / \omega_{not\ sent} = e^{1.443\,(0-1)} \quad (\text{sent} = \text{sensitized, not sent} = \text{not sensitized})$$

Comparing of how people responded to IRS program between the clusters, the results revealed that the chance of getting positive responses to IRS program from cluster A was (0.24) or 5 times larger than the chance of getting positive responses in cluster B. Equivalently the chances of response to IRS in cluster A was 24% greater than chances of response to IRS in cluster B, [95% C.I. (0.17, 0.33].

4.6 Best way to sensitize local community in IRS.

During focus group discussion most participants revealed that it was better to sensitize the local community on IRS program by involving them in dissemination of information, using brochures, community radios and public gathering. A few of the participants were skeptical about how to sensitize the local community on IRS due to its technicalities. Results indicate that 80% (n = 14) and 87.5% (n=10) participants were in favour of sensitizing local community on IRS program

using above approach from cluster A and cluster B respectively. Comparing the results of respondents who were in favour of sensitizing local community on IRS program using above approach between cluster A and cluster B, the difference in the proportion of cluster A and cluster B was not statistically significant [P-Value = 0.09, 95% CI, -0.06 to 0.316]. (Figure 3)

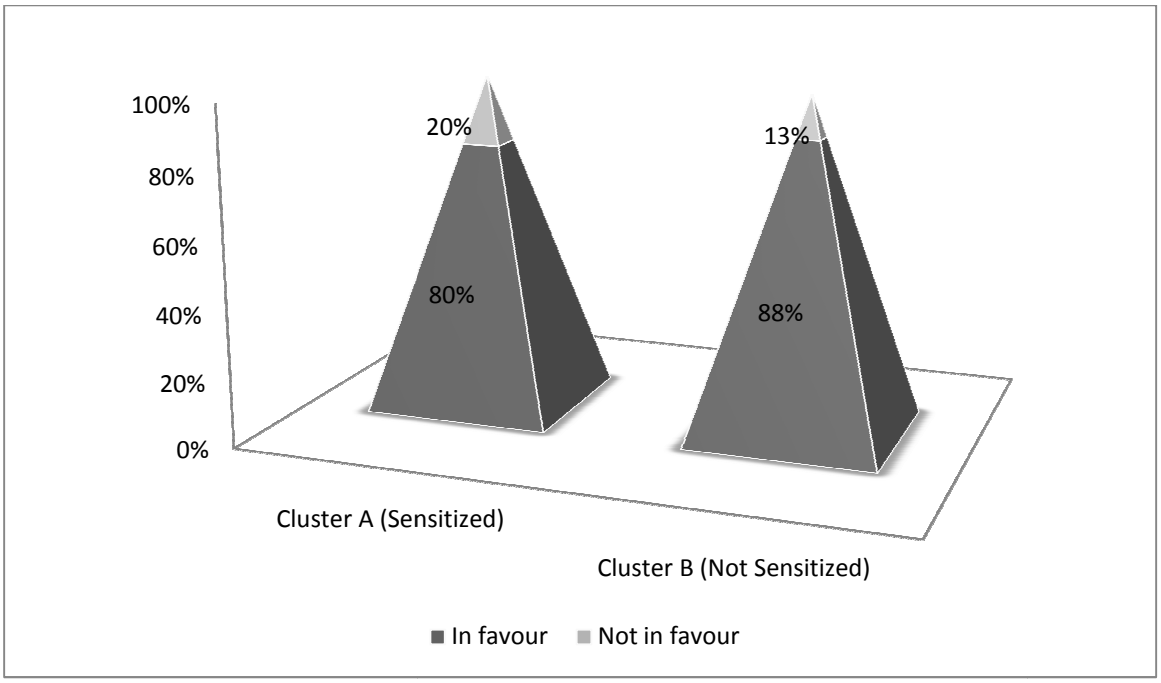

Figure 3: Proportion of people in favour of community sensitization in IRS program

4.7 Perceived benefits of IRS by households exposed to IRS in the study areas

A total number of 18 people were interviewed during focus group discussions, including 55.6% (n =10) and 44.6% (n = 8) from cluster A and cluster B respectively. Focus group discussion revealed that IRS reduced the existence of vectors and vermins namely, bedbugs, cockroaches, and ticks within their structures which were sprayed. The respondents further revealed that since the inception of IRS program in their respective areas, the population of mosquitoes had been reduced. Therefore, other perceived benefits accrued through the use of IRS such as reduced fever; reduced visits to health facility; and the overall reduction in deaths. The HMIS data collected at Mpika District Community Development Health Office for 2012 it showed that there was a general reduction in the incidence rate of confirmed malaria cases in study areas (figure 4). With lesser incidence rate in cluster A where local people had been sensitized on the program

compared to the cluster B where local people had not been sensitized in the program (*both with negative serial correlation of d > 2.0*). Although this reduction could not be attributed to IRS alone, there were also other interventions that could have contributed to that effect.

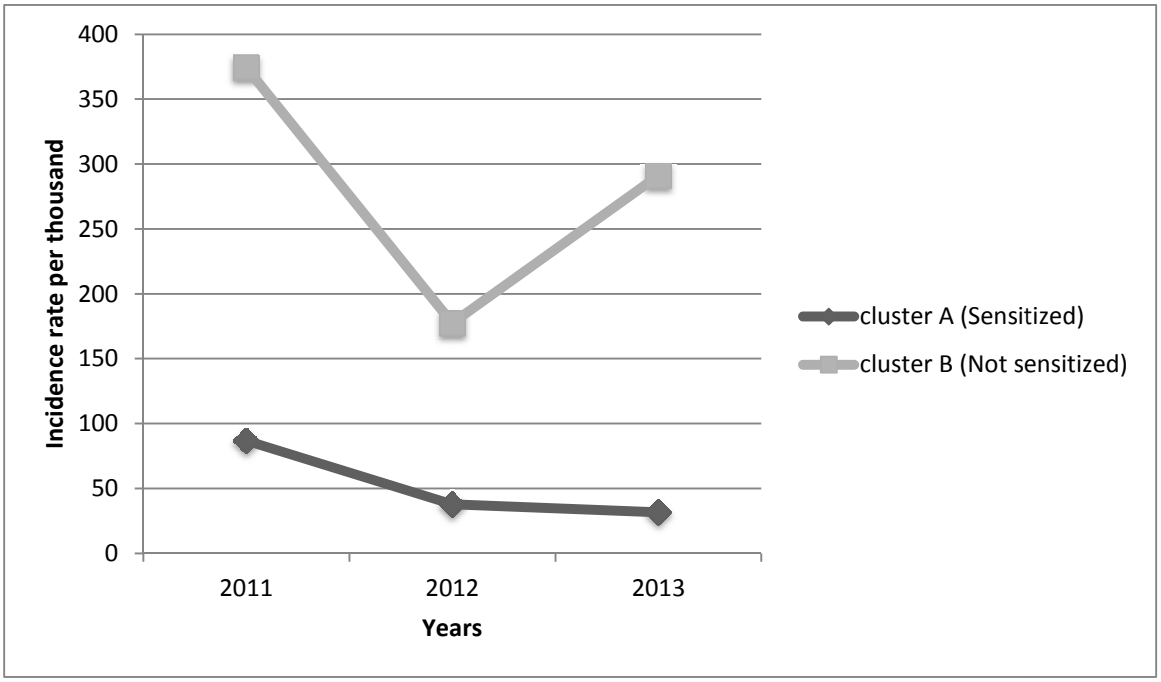

Figure 4: The trend of malaria incidence rate in the study areas.

CHAPTER FIVE

5.0 DISCUSSION

Although there are clear signs of improvement in malaria control interventions, malaria continues to be a major cause of morbidity and mortality in Zambia and control of the disease is one of the government's highest priorities. Indoor Residual Spraying has shown overwhelming evidence of it reducing malaria transmission and incidence, is one of the key preventive interventions used in the fight against malaria. Mpika is among the new districts which started implementing IRS in 2008 (Malaria Operational Plan, Zambia, 2010). Since the introduction of Indoor Residual Spraying in Zambia, a number of challenges have arisen on the efficient implementation of IRS program and Mpika is not an exception. Cardinal amongst these challenges has been the inadequate community sensitization, and lack of accurate information and education in the general community on the benefits of IRS. These challenges affect the outcome of indoor residual program.

Comparing IRS program outcome between sensitized and non-sensitized communities revealed that the proportions of structures sprayed in phase 1 were 98.1% and 33.8% for cluster A and cluster B respectively. In phase 2 the proportions of households that had structures sprayed in cluster A and cluster B were not significantly different. The results revealed that cluster A had more average proportion of 74.62% households who had their structures sprayed per spraying phase compared to cluster B which had 40.77% per spraying phase. Furthermore, the results on effect of community sensitization on IRS program outcome revealed that the odds of IRS program outcome were 4.23 times higher in sensitized community compared to non sensitized community on the IRS program. The differences were attributed to the sensitization of local people in a community in all stages (needs assessment, planning, mobilizing, training, implementing, and monitoring and evaluation) of IRS program in cluster A. These results are similar to those reported by World Health Organization: Indoor Residual Spraying Report, (2006) reported that there was documented evidence that Information, Education and Communication (IEC) and community participation increases acceptability of IRS activities among target populations by engaging them and encouraging their active participation in project

activities. Door-to-door sensitization is the key community mobilization strategy, supplemented by advocacy, mass media, and IEC materials.

In this study the data revealed that the average proportion of households who had their structures sprayed in both phases in cluster A was 74.6% and 40.8% for cluster B. Furthermore, between the factors (community sensitization and non sensitization) associated with IRS program outcome, only cluster A where local community was sensitized on IRS program had an association with IRS program outcome. However cluster A where local community was sensitized had more households who had their structures sprayed than cluster B where local people had not been sensitized. One could assert that in cluster A there was an overwhelming support from the local community. Similarly, to a Research Triangle Institute (RTI) report; Programs where RTI was mandated to conduct IEC and community mobilization were implemented successfully and with minimal challenges. RTI's strategy of using local people, such as local leaders, women's groups, school clubs, youth groups, and Community Health Workers (CHWs) to conduct community mobilization was effective in promoting the project's objectives and creating buy-in, which led to high acceptance of IRS among community members. The strategy was carried out using proper community entry processes, including respecting and observing all necessary protocols. Where this approach was used, a high acceptance of the IRS project was experienced with improved project outcome (RTI, 2011).

The response and acceptability of IRS program depends on the level of local community sensitization. The study which was done in Mozambique IRS was well received in most neighbourhoods. The overall coverage rates varied between 56% and 61% throughout the study period. The factors related to adherence to IRS were: immediate impact on insects in general, trust and obedience in the health authority, community leaders' influence and sensitization, and acquaintance with the sprayers (Khátia *et al.,* 2011)**.** Similarly, results for this study revealed that for cluster A where local people had been sensitized on IRS program had chance of getting positive responses to IRS program that were (0.24) 5 times larger than the chance of getting positive responses in cluster B where local people had not been sensitized on the program. Equivalently, the chances of response to IRS in cluster A were 24% greater than chances of response to IRS in cluster B. A similar study done by Khátia *et al* 2011, in Manhiça district, rural

Mozambique, on what drives community adherence to indoor residual spraying (IRS) against malaria found that non-adherence to the intervention was mainly due to the unavailability of local key householders, disagreement with the procedures, the perception that spraying increased the burden of insects and inadequate sensitization.

This study was initiated to analyze the effect of local community sensitization on the outcome of indoor residual spraying program against mosquitoes. During the study period, follow ups on focus group discussions were done in all study areas. The results showed that the best way to sensitize local community is to allow them to be involved in all stages of the IRS program starting from launching, training, actual implementation, monitoring and evaluation. About 80% (n = 10) and 88% (n=8) of participants were in favour of involving local community in all stages of IRS program from cluster A and cluster B respectively. This supports the assertion that one of the strengths of the program outcome is the community leaders' involvement in the sensitization, mobilization and implementation of IRS activities (Pool *et al*., 2006). Other participants also suggested that the local people could be left out in launching, training and actual implementation, but involving them in sensitization is a must because they know their respective places very well. This in turn can improve IRS program outcome. However, the findings revealed a low IRS program outcome among the Neighbourhood Health Committees (NHCs) where local community was not sensitized. From the data, the average proportion of 74.6% IRS program outcome per phase was recorded in cluster A (Boma catchment area) where local people had been sensitized in the program and 40.8% was recorded from cluster B (Mpumba catchment area) where local people had not been sensitized on the IRS program but they allowed the Sprayer Operators from Boma catchment area to spray in their structures. The low IRS program outcome in the cluster B was attributed to lack of sensitization of local people on the program. Similar to a study done by Nieto *et al* 2010, in urban area of Colombian Pacific, on knowledge, beliefs and practices relevant for malaria control in an endemic area, it was found that there was higher outcome of 67.1% in the area where people had been sensitized and had knowledge about malaria control method than in the area where sensitization was not done with outcome of 39.2%. Other reasons could be lack of accurate information and education in the general community on the benefits of IRS and also myths associated with IRS program. Similarly, Zambia Indoor Residual Spraying Communication Strategy report (2008) indicated, since the

introduction of IRS in Zambia, a number of challenges has arisen to the efficient implementation of the IRS program. Cardinal amongst these challenges has been the lack of accurate information and education in the general community on the benefits of IRS. This lack of information and education has resulted in myths, misconceptions and a number of community concerns such as skin and eye irritations, and the apparent increase in the number of cockroaches, fleas, bed bugs and other household insects that emerge after spraying. Another challenge has been the lack of adequate notice given to designated communities prior to the spraying campaign. This has caused low coverage in terms of structures sprayed during IRS exercise.

Focus group discussions conducted in early 2006 in the areas where spraying had never occurred revealed positive expectations in the sense that IRS would reduce the nuisance created by mosquitoes and other insects. These expectations were particularly strong in Ilha Josina, Palmeira, and Taninga (Straus *et al*, 2011). In this study, a total number of 18 people were interviewed during focus group discussions, including 55.56% and 44.4% from cluster A and cluster B respectively. The result from the discussions revealed that IRS reduced the existence of vectors and vermin namely bedbugs, cockroaches, and ticks within their infrastructures which were sprayed. It was further revealed that since the inception of IRS program in their respective areas, the population of mosquitoes had been reduced. Determining the actual number or percentage of mosquitoes reduced during IRS exercise in these clusters was beyond this study. Therefore, other perceived benefits accrued through the use of IRS such as reduced fever; reduced visits to health facility; reduced number of confirmed malaria cases and the overall reduction of deaths. The HMIS data collected at Mpika District Community Development Health Office showed that there was a general reduction in the incidence of confirmed malaria cases in study areas; with lesser incidence in cluster A than cluster B. Similarly, a study done by Zhou *et al* 2010, in Western Kenya Highland, on community-wide benefits of targeted indoor residual spray for malaria control the result of monthly parasitological surveys indicated that malaria prevalence in school children was reduced by 64.4% in the intervention (sensitized) valley area and by 46.3% in the intervention (sensitized) uphill area after 12 months of follow-ups in contrast to nonintervention (nonsensitized) areas (valley or uphill). The cohort study showed an average of 4.5% fewer new infections biweekly in the intervention valley compare to nonintervention valley and the relative reduction in incidence rate by week 14 was 65.4%. The

relative reduction in incidence rate in intervention uphill by week 14 was 46.4%. *Anopheles gambiae* densities were reduced by 96.8% and 51.6% in the intervention valley and intervention uphill, respectively, and *Anopheles funestus* densities were reduced by 85.3% and 69.2% in the intervention valley and intervention uphill, respectively.

This study had a few limitations, which were; the incompleteness or absence of data about the structures which were not part of household structure such as shops, school pit latrines, churches and pupils dormitories. Secondly, during focus group discussion some questions which needed to get consensus from all local community were restricted to the few individual who were present. Hence it was difficult to generalize the findings.

5.1 Conclusion

This study revealed the presence of a high coverage for households who had their structures sprayed in the community where sensitization on IRS program was done. Not only did the community where sensitization was done recorded a high coverage but also recorded chances of getting positive response to IRS program 5 times larger than chances of getting positive responses in the area where community sensitization. Thus, in order to achieve the desired outcome in IRS program, sensitization in the community must be done from the inception to the end of the program. Community sensitization on IRS program was the only factor associated with program outcome. The high outcome and responsiveness to IRS program was seen in the area where sensitization was done this supports the proposition that doing IEC in all stages of the program will result into improved outcome which further leads to positive anticipated impact. Hence, relevant IEC materials for IRS must be developed especially those targeting the myths and misconceptions surrounding IRS program. However, low outcome and responsiveness to the IRS program were observed where community sensitization was not done. Therefore, lack of community sensitization in IRS program was detected as a major drawback for high outcome, and intervention measures such as involving local people in all stages of IRS program and information campaigns should be reinforced.

5.2 Recommendations

From the study, the following recommendations are made: Firstly, there is a need for local people such as Malaria Control Agents (MCA), Safe Motherhood Action Group (SMAG), CHWs and NHCs to be involved in the sensitization campaign on IRS program for it to record successful outcome. Furthermore, research is needed to determine the factors that influence local people to accept the campaigning message on IRS program. Thirdly, this study was limited to two catchment areas and their populations. Larger population based studies are needed to analyze if community participation have effect on the outcome of IRS program in Zambia.

REFERENCES

Chanda E., Masaninga F., Coleman M., Sikaala C., Katebe C., MacDonald M., Baboo K. S., Govere J., Manga L., 2008. "Integrated vector management: the Zambian experience". Malar. J., 78, 164.

Chanda E., Hemingway J., Kleinschmidt I., Reman A., Ramdeen V., Phiri F.N., Coetzer S., Mthembu D., Shinondo C.J., Chizema-Kawesha E., Kamuliwo M., Mukonka V., Baboo K.S., Coleman M., 2011. "Insecticide resistance and the future of malaria control in Zambia". PLoS ONE, 6:e24336.

Chanda E., 2011. "Optimizing impact assessment of entomological intervention for malaria control in an operational setting in Zambia". PLoS ONE, 6:e34445

Chizema-Kawesha E., Miller J.M., Steketee R.W., Mukonka V.M., Mukuka C., Mohamed A.D., Miti S.K., Campbell C.C., 2010. "Scaling up malaria control in Zambia: progress and impact 2005–2008". Am J Trop Med Hyg, 83:480–488.

Delhi Malaria Research Centre, 2009. Field Evaluation of Conventional and New Insecticide: 25 Years of Malaria Research Centre. MRC Delhi.

Humphrey D. Masigo, Emmanuel Obasy, Wilhellmus Mauka, Paulina. 2010. "Knowledge, Attitudes, and Practices about Malaria and Its Control in Rural Northwest Tanzania", Malaria Research and Treatment Volume 10, Article ID 794261, 9 pages doi:10.4061/2010/794261.

Khátia M.**,** Robert P.**,** Catherine M.**,** Carlos B., 2011. "What drives community adherence to indoor residual spraying (IRS) against malaria in Manhiça district, rural Mozambique." *Malaria Journal* 2011*,* Volume 10:344.

Malaria Action Program. 22 Shamnath Marg., 2008. Delhi: Directorate of NVBDCP.

Malaria Operational Plan (MOP), President's Malaria Initiative, FY 2010. Zambia

Musawenkosi L., Mabaso M., Sharp B., Lengler C., 2004. "Historical review of malarial control in southern African with emphasis on the use of indoor residual house-spraying." Tropical Medicine International Health 9: 846-856.

Nieto T., Mendez F., Carrasquilla G., 2010. "Knowledge, beliefs and practices relevant for malaria control in an endemic urban area of the Colombian Pacific," Social Science and Medicine, vol. 49: 601–609.

Pfeiffer R .M., 2002. "Sample size calculations for population- and family-based case-control association studies on marker genotypes". PubMed., 12-19

Pool R, Munguambe K, Macete E, Aide P, Juma G, Alonso P, Menendez C., 2006. "Community response to intermittent preventive treatment delivered to infants (IPTi) through the EPI system in Manhica, Mozambique." Tropical Medicine International Health, Vol.11:1670–1678.

Research Triangle International, 2011. Information, Education, and Communication /Community Mobilization Lessons Learned and Best Practices Report Indoor Residual Spraying (IRS 2) Task Order One. NC 27709-2194.

Southern African Malaria Control, 2010. Malaria methods: towards better informed malaria control in Southern Africa. SAMC/WHO: Zimbabwe.

Straus L, Munguambe K, Bassat Q, Machevo S, Pell C, Roca A, Pool R., 2011. "Inherent illnesses and attacks: an ethnographic study of interpretations of childhood Acute Respiratory Infections (ARIs) in Manhica, southern Mozambique." BMC Public Health, Vol.11:556.

Vijayakumar K. N., Gunasekaran K., Sahu S. S., Jambulingam P., 2009. "Knowledge, attitude and practice on malaria: a study in a tribal belt of Orissa state, India with reference to use of long lasting treated mosquito nets," Acta Tropica, vol. 112: 137–142.

Vlahov D. and Galea S., 2003. “Urban health: a new discipline.” Lancet: 362:1091–1092.

World Health Organization, 2003. *Guidelines for Vector Control Needs Assessment.* WHO-AFRO: Harare, WHO Regional Office for Africa.

World Health Organization, 2006. Indoor residual spraying: Use of indoor residual spraying for scaling up World malaria report. Geneva.

World Health Organization; 2009. World malaria report. Geneva

World Health Organization, 2011. World Malaria Report 2011. Geneva: (ISBN 978 92 4 156440 1).

Zambia. Health Management Information System Report, 2008.

Zambia. Indoor Residual Communication Strategy for Zambia Report, 2008. National Malaria Control Centre. Lusaka.

Zambia. Ministry of Health, 2009. *Integrated Vector Management Orientation Workshop Report. Lusaka.*

Zambia. Ministry of Health, 2005. *Integrated Vector Management: Stakeholder Consensus Meeting on Vector Control Needs Assessment for Zambia.*

Zambia. Ministry of Health, 2012. Mpika District Health Action Plan.

Zambia. Ministry of Health, 2008. National Malaria Indicator Survey Report. Lusaka.

Zambia. Zambia Malaria National Control, 2011. Action Plan, Lusaka.

Zambia/USAID Fiscal Year, 2009. Malaria Operation Plan.

Zhou G., Githeko A., Minakawa N., Yan G.l., 2010. “Community-wide benefits of targeted indoor residual spray for malaria control in the Western Kenya Highland.” Malaria Journal 9: 67.

11.0 BUDGET

It is estimated that a total of K25, 000 will be spent on this study.

SN	Category	Activity	Unit	Rate	Number of units	Number of days	Total
1.	**Research Assistants**	Data collection	Month	3,000	3	90	9,000
2.	**FGDs**	Data collection, drinks	Days	50		30	1,500
3.	**Supplies**	A4 size paper, pads, pens	Reams of paper				3,000
4.	**Communication**	Phone, E-mail	PC				1,000
5.	**Transport**	Transportation	Fare, fuel				7,000
6.	**Report writing**	Typing	Report	500	4		2,000
7.	**Binding**	Final and draft	Report	100	5		500
8.	**Contingency**						1,000
	Total						**25,000**

Work Plan

Planned activity	**Implementation months in weeks**																															
	June 2013				**July 2013**				**Aug 2013**				**Sept 2013**				**Oct 2013**				**Nov 2013**				**Dec 2013**				**Jan 2014**			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Writing, making corrections, rewriting (preparation of research proposal)																																
Submission of proposal to Ethics committee																																
Obtaining approval and preparing for data collection																																
Data collection																																
Data analysis																																
Writing of findings, discussions and final draft																																
Presentation of draft to supervisor																																
Corrections and writing final research paper																																
Submission of final report to University of Zambia																																

Question Guide for Focus Group Discussion.

IDENTIFICATION		
1	Identification number:	☐☐☐
2	District:	_____
3	Cluster:	_____
5	Date of Interview:	_____
6	Name of interviewer:	☐☐/☐☐/☐☐

_____

NOTE TO INTERVIEWERS.

Remember to ask all questions unless the questionnaire tells you to skip questions or move to another section. All answers to pre-coded questions must be coded by circling the correct response. Where you see open-ended questions, you are required to write in the answer. Unless the instructions read so, do not prompt for answers. This questionnaire will be administered in local language with the help of interpreter.

No	Questions and filters	Responses	For official use only
SECTION A – LOCAL COMMUNITY INVOLVEMENT IN IRS PROGRAMME			
1	Have you ever heard of IRS programme in this community? **(If answer is Yes, go to question 2) (If answer is No, end interview)**	Yes…….....1 No…….....2 [ ]	
2	How did it happen?	..... [ ]	
3	Were you told that there would be IRS programme in this area before its inception?	Yes…….....1 No…….....2 [ ]	

4	Was any member of this community involved in planning? **(If answer is No, skip question 5)**	Yes…….....1 No…….....2 [ ]	
5	How was she/he involved in planning?	.....……..…..... [ ]	
6	Was any member of this community trained or oriented in IRS? **(If answer is No, skip question 7)**	Yes…….....1 No…….....2 [ ]	
7	How many people from this community were trained or oriented in IRS programme?	.....	
8	Were you involved in the actual spraying? **(If answer is No, skip question 9)**	Yes …….....……..1 No. …….....…..2 [ ]	
9	Was any member of this community involved in the counting of the number of households sprayed?	Yes…….....1 No…….....2 [ ]	
10	How many households do you have in this community?	.....	
11	How many households were sprayed?	.....	
12	How many households were not sprayed?	.....	
SECTION B – AVAILABILITY OF IRS SPRAYING SKILLS IN THE COMMUNIY			
13	Have you ever heard of any person who knows how to do indoor residual spraying in this community? (**If answer is No, skip question 15**)	Yes…….1 No……..2 [ ]	
14	How many people who know how to do IRS in this community?	.....	
15	Who trained them on how to do indoor residual spraying?	.....	
16	Are you satisfied with their IRS services?		

SECTION C – PERCEIVED BENEFITS OF IRS			
19	What have you benefitted from IRS programme?	.....	
20	What changes have you seen in terms of population of mosquitoes before and after IRS programme?	.....	
21	Do you have any complaint concerning IRS programme?	Yes…….1 No……..2 [ ]	
22	Mention some of the complaints/concerns of IRS programme?	....	
23	what do you think is the best way to do IRS?	....	

THANK YOU FOR YOUR TIME!

CHECKLIST FOR DATA COLLECTION AT MPIKA DISTRICT HEALTH OFFICE.

01	Name of the cluster		
02	Total population of the cluster		
03	Average number of people per house hold.		
04	Total number of targeted households in this cluster.		
05	Total number of households sprayed in this cluster.		
06	Total number of households not sprayed (missed/refused) in this cluster		
07	Total number of IRS supervisors trained/oriented in this cluster		
08	Total number of sprayer operators trained in this cluster		
09	Number of complaints received about IRS in this cluster after spraying exercise		
10	Nature/type of complaints received		

THANK YOU FOR YOUR TIME!