FACTORS INFLUENCING INDOOR RESIDUAL SPRAYING IN LUSAKA DISTRICT'S MTENDERE, KANYAMA AND MATERO COMPOUNDS

By

Annie Banda BSc

A dissertation submitted in partial fulfillment of the requirements of the degree of master of public health in the department of community medicine.

University of Zambia
August 2009

ABSTRACT

Monitoring and evaluation assessments of the IRS programmes reveal an inability to meet set IRS coverage targets. The purpose of this was to determine the factors that influence the low IRS coverage.

A cross sectional household study was carried out in Lusaka District's Mtendere, Kanyama and Matero Compounds. Data was collected from heads of households by an interactive method using a scheduled questionnaire.295 households were randomly selected. The sample size was calculated for the coverage rate of 78% plus or minus 5% and at 95% confidence interval. The 78% was derived from the IRS coverage of the 2006/2007 season during which 85% of eligible structures in Lusaka District were targeted

Using Epi Info Version 6.0 the Yates corrected P values were calculated using chi square and used to determine relationships and associations between variables.

The study established that IRS Coverage was 48.6% which was less than the targeted 85%. There was 36% coverage in Kanyama, 52.2% in Matero and 62% in Mtendere Compounds. Most of the houses (60%) were sprayed during the peak malaria season which is also the rainy season and that Willingness to have IRS had influence on IRS Coverage while community participation in IRS was nonexistent.

Significant relationships were found between IRS Coverage and study area (P value<0.001), knowledge of the institution that carried out IRS (P value <0.001) and access to IRS related IEC (P value 0.042). The study found a significant relationship between the respondent's willingness to have IRS: ability to remember what was heard and/or seen during IRS related IEC (P value 0.040), knowledge of the institution which sprayed (P value <0.001) and benefits anticipated from IRS (<0.001). 66.3% of the respondents own and use mosquito nets of which 45% were untreated, 20% were long lasting nets and 35% were locally treated nets. 62.3% of the respondents whose houses were not sprayed indicated that the sprayers did not come to their houses. Of the 143 houses that were sprayed 2.1% altered the walls after IRS, 34.3% reacted negatively to IRS, sprayers left pesticides on the floor in 7% of the houses there houses.

The Ministry of Health (MOH) and National Malaria Control Centre (NMCC) shall find these results useful in planning for the IRS as it highlights areas that need attention. The policy makers ought to continue informing the communities regarding IRS and involving them in IRS activities as well as to monitor the activities of the sprayers whilst carrying out IRS

NOTICE OF COPYRIGHT

DECLARATION

I declare that *Factors Influencing Low Indoor Residual Spraying Coverage In Lusaka's Mtendere, Matero And Kanyama Compounds* is my own work, that it has not been submitted for any degree or examination in any university, and that all the sources I have used or quoted have been indicated and acknowledged by complete references.

Student's full name.....

Signed.....

Date.....

Supervisor's full name.....

Signed.....

Date.....

Co Supervisor's full name.....

Signed.....

Date.....

CERTIFICATE OF APPROVAL

The University of Zambia approves this dissertation by ANNIE BANDA in partial fulfillment of the requirements of a Master of Public Heath by the University of Zambia

Head of Department

Name	Signature	Date
……	…….	……./……../……

Examiners

Name	Signature	Date
……	…….	……./……../……
……	…….	……./……../……
……	…….	……./……../……

DEDICATION

To Ulunji and Baruchi for all the times that my school work deprived you of tender loving care.

ACKNOWLEDGEMENTS

I am greatly indebted to the Ministry of Science and Technology for awarding me the scholarship for my MPH studies. I would like to thank my Supervisor Prof K. S. Baboo and Co-Supervisor Mr. John Miller for the guidance and direction from the moment the idea to consider the factors that influence low IRS coverage was conceived and Professor Siziya, for his guidance and statistical excellence.

My heartfelt gratitude to my Mom Ms. A. Mtengaponji for the motivation and for believing and continuously reminding me that I could do anything I set my mind to. I am thankful to staff, management and institutions that participated in this study especially during data collection. My heartfelt gratitude goes to the respondents who took time to give the valuable contributions to the study.

All the members of staff in the Department of Community Medicine thank you very much for being readily available to help. Dr. J.G.M. and Mooya may this be a motivation and a cheer for you to go for your dreams. To my brothers thanks for all you have been throughout the course of my MPH studies, financially and otherwise.

My heartfelt gratitude goes to my classmates, MPH class of 2005/2006 big-ups to all of you guys who responded to the name Dubos and to Rodwell, thank you for seeing that I am not your competition but your friend.

Last but not the least may the Lord God Almighty take all the glory for His ever present help

TABLE OF CONTENTS

ITEM **PAGE**

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

CBD	Central Business District
DDT	Dichlorodiphenyls – trichlorethane
FNDP	Fifth National Development Plan
GDP	Gross Domestic Product
GNDP	Gross National Development Product
HT	High Transmission
IRS	Indoor Residual Spraying
ITNs	Insecticide Treated mosquito Nets
ITP	Intermittent Preventive Therapy
KCM	Konkola Copper Mines
LCC	Lusaka City Council
LUDHMT	Lusaka Urban District Health Management Team
MACEPA	Malaria Control and Evaluation Partnership in Africa
MOH	Ministry of Health
NGOs	Non Governmental Organizations
NMCC	National Malaria Control Centre
NMSP	National Malaria Strategic Plan
RBM	Roll Back Malaria
RHS	Residual Household Spraying
SOPs	Standard Operating Procedures
WHO	World Health Organization

1. Introduction

1.1 Background

Malaria as a disease has left devastating consequences on the wellbeing of communities. It has no regard for boundaries in age, level of economic development, gender or ethnicity. When it strikes, it usually results in death. Several measures have been put in place to reverse this. These include transmission prevention (use of insecticide treated bed nets – ITNs, and Indoor residual spraying – IRS), quick and correct diagnosis and appropriate treatment.

Literature reveals that in Zambia, attempts to control malaria were made from as far back as the 1940s (NMCC. 1999). The methods employed included IRS. The operational principle of IRS is such that the inside walls of houses are sprayed with lethal dosages of chemicals such as Dichlorodiphenyl – trichlorethane (DDT) and pyrethroids. Mosquitoes that have just feasted on blood have a tendency of wanting to rest immediately after the meal. Once the mosquitoes rest on walls that have chemicals, they absorb lethal dosages of the chemical which eventually kills them before another bite and transmit malaria to the next victim.

The walls are sprayed with 0.2g/ m^2 of Dichlorodiphenyl – trichlorethane (DDT), and drugs such as coaterm and chloroquine were used to eliminate the plasmodium from a malaria patient. IRS with DDT was first adopted by the Rhodesia-Nyasaland Federation in the late 1950s when it was the responsibility

of the Federal Malaria Eradication Organization to develop programmes for its three member countries: Northern Rhodesia, Southern Rhodesia and Nyasaland. At the breakup of the Federation in 1963, the responsibility of IRS was returned to each country.

For the Northern Rhodesian Government, (present-day Zambia) this act of administrative convenience meant a significant loss of resources, equipment and qualified personnel from the more affluent Federation member states (Taylor and Mutambu, 1986; Wolfe, 1964). Northern Rhodesia instituted its own IRS programme which was administered by three independent authorities: Municipal councils were responsible for urban areas; the Ministry of Health (MOH) was responsible for rural areas, and mining companies or their contractors were responsible for mine compounds. Costs in mining areas were borne by the mining companies while Municipal Councils shared half of the urban costs with MOH.

Rural areas were considered unsuitable for IRS and were not included in the DDT- IRS programmes conducted in urban areas. Rural malaria prevention and control measures were generally restricted to curative services. Chemoprophylaxis with chloroquine was introduced in rural areas in 1975 for school children, children visiting under-five clinic and women visiting antenatal clinics (MOH. 1993). As a result of efforts in IRS and household sanitation, malaria in urban areas was kept to a minimum for at least three decades (from

1940-1970). During this period the disease was almost eliminated from the eight principal towns along the line of rail. While malaria became a notifiable illness in mining towns and urban centres; it continued to be a serious problem in rural areas; (NMCC. 1990).

The 1970s saw a fall in copper prices on the world market which resulted in the fall of Gross Domestic Product (GDP) and Gross National Development Product (GNDP). Consequently programmes funded from the copper proceeds no longer had the financial backing and were discontinued; the malaria control campaign was one of them. The discontinuation of the malaria control campaign resulted in increase in malaria incidences to the extent that it became a major contributor to poor birth outcomes, a leading cause of school and workplace absenteeism, and by far the leading cause of health facility attendance, and probably cost. The 2006-2010 strategic plan of the Ministry of Health reveals that in Zambia, malaria currently accounts for nearly 4 million clinically diagnosed cases per year, 45% of hospitalizations and outpatient department visits and an estimated 50,000 deaths per year (MOH/NMCC. 2006).

In 1998, the Roll Back Malaria Global Partnership brought to the forefront the importance of malaria control campaign and as one component toward malaria reduction Zambia reintroduced IRS programmes. IRS was first piloted in Konkola Copper Mine in Chingola. The Copperbelt Province reported a 50% reduction in malaria cases in the year 2000 and another 50% reduction the

following year. In 2003, NMCC piloted IRS in five districts: Kabwe, Kitwe, Livingstone, Lusaka and Ndola. To date, expansion to three more districts has increased coverage from 20% to 40% and scale up in 2005 hopes to meet coverage goals of 80% (www.malaria.org.zm)

Malaria control campaign has thus been identified as one of the main public health priorities. This is emphasized in both the Fifth National Development Plan(FNDP) 2006 – 2011 and the National Health Strategic Plan 2005 – 2009, and it led to the development of a National Malaria Strategic Plan 2006 – 2011 (MOH, 2006). The aim of the strategic plan is to significantly scale-up malaria control interventions towards the national vision of "a malaria free Zambia". It is hoped that by implementation of this strategy, there would be a reduction of malaria incidence by 75% and deaths due to malaria would be significantly reduced by the end of 2011, which shall translate into a 20% reduction of all causes of mortality in under 5 children (MOH. 2006).

Malaria cases generally increase in December, peak in February and May and decline rapidly thereafter. The malaria transmission season follows the very distinct rainfall pattern with rains starting in October/November and stopping in April, with the rainfall peak extending from December to March. IRS should, therefore ideally be carried out during October and November, preceding the peak seasonal increase in transmission. (Sharp et al. 2002)

Zambia is implementing a package of interventions to scale up reduction of malaria transmission. The package includes promoting the use of ITNs, an expanded and targeted application of IRS, Intermittent Preventive Therapy (IPT) to reduce the disease burden in pregnancy, and prompt and effective case management.

The coverage of interventions targeting Malaria reduction has generally increased across the country from the year 2000 to 2005. However, current coverage levels are still less than the targeted 60% level established in the previous period, 2000- 2005, (MOH/NMCC. 2006). Total malaria incidence dropped from 396/1000 in 2003 to 346/1000 in 2004 and the total number of under five reported mortality also dropped to its lowest level in six years from 4820 to 3654 in 1999 to 2004 respectively (MOH. 2006). The notable improvements are attributed to the interventions being implemented; it is necessary to find out if the components of the malaria integrated approach contribute equally to the improvements.

IRS is currently being carried out in 15 districts in Zambia representing mainly urban and peri-urban areas. These districts are Kabwe (Central province), Chililabombwe, Chingola, Kalulushi, Kitwe, Luanshya, Mufulira, Ndola, (Copperbelt Province), Chongwe, Kafue, Lusaka (Lusaka Province), Solwezi (North Western Province) Kazungula, Livingstone and Mazabuka (Southern Province).

The objective of 2006 Action Plan in support of the National Malaria Strategic Plan, 2006 to 2011 is to increase the coverage of IRS among eligible populations from 40% to 85% i.e. to have approximately 700,000 households sprayed in the 15 districts (MOH/NMCC. 2006).

1.2 Problem statement

IRS is primarily a community protection measure. A mass effect on vector populations requires a majority of dwellings to be sprayed (WHO. 2006b). IRS has potential to convey a reduction in malaria-related suffering provided financial support; political will; collaborative management and training, and community involvement are in place (Conteh et al. 2004).

Since its re-inception in 2000, the number of districts covered in the IRS programme has increased from 2 to 15. The most recent evaluation of IRS reveals the following shortcomings:

- Poorer households have fewer houses sprayed than richer households
- Ideally IRS should be administered before the onset of the rainy season in November and December but (for unknown reasons) the houses are sprayed during the rainy season
- Some people refuse to have their houses sprayed
- IRS coverage falls short of the targeted 85%, the 5 year strategic plan on the road map for impact on Malaria in Zambia further states that current

coverage levels of malaria interventions remain considerably lower than the targeted 60% levels established in the 2000-2005 action plan (MOH. 2006)

Table 1-1: IRS actual coverage and shortfall from the 85% target

Province covered	**Coverage (%)**	**Shortfall (%) from the 85% target**
Central	77.1	7.9
Copperbelt	40.1	44.9
Lusaka	11.6	73.4
Southern	25.9	59.1

The study that reported the above coverage for IRS further stated that a clear understanding of household level placement within spray areas is not well understood for all targeted IRS districts. The results were thus based on all households within the district if the district is known to conduct IRS campaigns (MOH et al. 2006).

- The extent of community participation in IRS was not established

1.3 Rationale

The success of IRS is embedded in the appropriateness of the chemical used and coverage. DDT is one of the chemicals being used; it is worth noting that DDT is a restricted chemical, it has the potential to adversely affect human life and the

environment. However, careful use by trained personnel can minimize the adverse effects of malaria. The Stockholm Convention which the Zambian Government ratified requires that DDT and related organophosphates be gradually phased out. Thus it is cardinal that where DDT is used anticipated results must be obtained. More often than not, low coverage entails minimal reductive effect on malaria and failure to meet intended targets.

The study outcome is fundamental to the stakeholders in Malaria Control as well as the Zambian people at large in their quest to have a malaria free Zambia. The findings will be useful in revising the plans and formulating policies related to malaria transmission reduction. It is hoped that the findings will be used by stakeholders:

- To devise policies aimed at increasing the IRS knowledge base of, and acceptance by the community.
- To ensure that information, education and communication materials are achieving the intended purpose
- To put in place measures that will result in an increase in IRS coverage and
- To plan for community participation in IRS programmes

2. Literature Review

Today malaria continues to be a devastating disease and leaves many communities overwhelmed. Malaria remains a major cause of poverty and underdevelopment. It is estimated that 3.2 billion people live at continuous risk of this disease. Each year, there are more than 350 million cases of malaria and more than a million deaths from the disease. More than two-thirds of malaria cases occur in Africa, as well as approximately 90% of deaths, which are mainly in children under five years of age (WHO. 2006a).

In Zambia, prevalence of malaria was very low from 1945-1983, in Lusaka and Copperbelt, it was a notifiable disease. The low malaria incidence was mainly achieved due to implementation of the Mosquito Extermination Act of 1944, good case management, and vector control using IRS, larviciding, surveillance, law enforcement and proper diagnosis. It should also be noted that all malaria cases presented for treatment were successfully treated using chloroquin. Chloroquin was also used for prophylaxis during pregnancy.

During the years when IRS using DDT was conducted, there was a notable decline in malaria incidences and malaria related mortality. Years following IRS stoppage coincided with increased malaria incidences as well as deaths resulting from malaria generally, the disease burden increased (Tren & Bate. 2004, Sharp et al. 2002, Lines & Nassor. 1991, *Curtis & Mnzava. 2000*)

Malaria incidence in health Centres in Lusaka's Matero, Mtendere and Kanyama Compounds was recorded as follows (table 2) for the years 2002, 2005 and 2006

Table 2-1: Malaria Incidence per 1000 at Lusaka's Matero Reference Centre, Mtendere and Kanyama Clinics

Health Centre	**Characteristic**	**2006**	**2005**	**2002**
Matero Refence Centre	Population	102,273	98,529	61,076
	Malaria Cases	26,362	25,194	17,561
	Incidence(1000)	258	256	288
Mtendere Clinic	Population	70,872	68,277	58,022
	Malaria Cases	5,428	8,533	11,709
	Incidence(1000)	77	125	202
Kanyama Clinic	Population	134487	129,563	114,398
	Malaria Cases	31343	36,048	29,186
	Incidence(1000)	233	278	255

Vital component of malaria control are IRS and use of ITNs which is basically vector control. Vector control targets prevention of malaria by killing mosquitoes carrying the plasmodium before they transmit the plasmodium to another person after they have rested on the walls sprayed with the insecticide; this in turn prevents contact between the vector and the human. In order for vector control to be successful, it has to be based on technical and operational feasibility,

resources and infrastructure and should emphasize the involvement of communities (WHO. 2006c).

The principle behind IRS is that it works like a buffer, the larger the coverage the more effective it is as a barrier against mosquitoes. A leading advocate for global malaria control efforts who is also a U.S. Senator Tom Coburn makes a synonym of IRS as providing a huge mosquito net over an entire household/community for around-the-clock protection," www.worldhealthorganisation/mediacentre. Scaling up access and achieving high coverage of these effective interventions, particularly to populations who are at the highest risk of malaria, and sustaining their implementation, remain major challenges for achieving current global malaria control goals (WHO. 2006a).

All pesticides are toxic to humans to some degree; however, the doses that are acutely toxic to humans are usually far higher than those required for killing vectors and pests. The key to safe use of pesticides is to reduce to a minimum the possibilities of unsafe exposure during handling of hazardous chemicals. Therefore, care in handling pesticides, particularly by spraying staff and persons living in sprayed houses should be a routine practice (WHO. 2006c). The dwindling arsenals of safe and cost-effective pesticides and of the increasing challenges faced with their management under decentralized health systems (WHO. 2003) increase the importance of management of pesticides. This is inadequate in most countries. Moreover, routine evaluation of pesticide

applications and insecticide resistance monitoring and management are often not carried out.

A basic premise of application technology is selectivity in the use of specific pesticides, so that the appropriate material is applied at the proper place and time, and in the prescribed manner, under the guidance of a certified supervisor. Public health pesticides should be used judiciously (WHO. 2003)

Many countries still rely on DDT for malaria control. This is because DDT is cheaper, easy to use and long lasting (Tren & Bate. 2004). Comparative studies carried out to assess suitability of IRS versus ITNs in vector control reveal that IRS is more suitable than ITNs *(Curtis & Mnzava. 2000;* WHO. 2006b*)*

The main driving force behind the cost of delivering RHS is twofold: the population covered and insecticide used (Conteh et al. 2004). The cost due to population is dependent on the size of the population covered. Small coverage results in smaller monetary cost but is less effective while large population coverage entails higher monetary cost but is more effective.

IRS requires a high level of coverage, in space and time, of all the surfaces where the vector is likely to rest, with an effective dose of insecticide (WHO. 2006b). The vectors carrying the plasmodium have to be endophilic for them to rest on the walls that have been sprayed with the insecticide. A project is much more likely to be sustainable if the community identifies with an initiative and feels that it is benefiting from its involvement and is seeing results. Long-standing

programmes have reported compliance problems. (Newberry & Jansen. 1986; Mnzava et al. 1998; Attanayake et al. 2000)

Apart from the element of cost, the decision to introduce or scale-up IRS is dependent on availability of sufficient capacity to: deliver the intervention effectively; prevent unauthorized and un-recommended use of public health pesticides; and manage insecticide resistance as well as to conduct intensified research to develop new insecticides; long-acting formulations and improved application technologies (WHO. 2006a).

Worrall devised a model with an ability to predict actual malaria cases (Worrall et al. 2007). The IRS simulation using the model shows that the marginal benefits of increasing IRS coverage are higher in high-transmission (HT) years relative to lower transmission years. The model also shows that earlier spraying is more effective in all years, especially in epidemic years and that IRS has limited impact if it is carried out too late in relation to peak transmission.

According to Sharp (2002), Programmes that have achieved almost 100% coverage were done with co-operation from the community. Intensive information dissemination was conducted by community members preceding the spraying campaign and community members were involved in the actual spraying. There is need for application of the correct dosages of insecticide on surfaces in order for mosquito resting on them to absorb lethal quantities. Also, houses should be sprayed before the onset of the peak malaria transmission

season (Booman et al. 2003) and residual activity of the insecticidal formulation should be throughout the transmission period (WHO. 2006c). In addition to high coverage and quality of spraying, ongoing monitoring of spraying operations is essential to assure optimal programme performance and early corrective action. (Booman et al. 2003)

Studies like the one done by Conteh et al in 2004 showed that there was a growing acceptance that the results of any malaria control programme exclusively in an area however successful will only reduce malaria to a certain point, beyond which a regional approach is necessary to achieve further gains (Conteh et al. 2004).

The World Health Organization (WHO) recommends the establishment of long-term strategies and effective approaches to educate the public and relevant parties and obtain their support for vector control programmes and pesticide management practices. Health education and communication should aim to create general public awareness and understanding and elicit support for safe and effective use of pesticides in public health (WHO. 2003)

The pervasive morbidity and high mortality of malaria lingers on because of failure of adequate contact between available preventive and curative health systems and those at risk of malaria transmission (WHO. 2006b). If good efficacy can collapse so easily to much diminished effectiveness because of health system

failings, clearly more attention needs to be paid to the health system environment that hosts the interventions.

Generally, the use of IRS has declined in recent years. This is due in part to lack of government commitment and financing to sustain efforts over the long term and to concerns about insecticide resistance and community acceptance. There are several reasons to which low IRS coverage in Zambia is attributed; among them are refusal of the people to allow the spraying especially when it is conducted in the rainy season, non availability of funds and lack of training for the sprayers. These reasons have also resulted in the programme not being completed in time. IEC has been attributed to low coverage in some districts. However, another important factor has been general disapproval of DDT use, due to fears of its harmful effects on the environment and on human health, fears which are unjustified when DDT is used appropriately for IRS (WHO. 2006a). It is with this back ground that a study to investigate low IRS coverage was proposed and carried out. The study critically looked at these factors and made necessary suggestions to ensure that targeted IRS coverage is achieved.

3. Research Objectives and methodology

3.1 Research Question

What factors influence Low IRS coverage?

3.2 General objective

To establish the factors leading to low IRS coverage in Lusaka's Kanyama, Mtendere and Matero Compounds

3.3 Specific objectives

1. To establish the level of IRS coverage among the targeted communities.
2. To establish whether seasonal variations over which IRS is carried out has an impact on coverage.
3. To determine the relationship between IRS knowledge and willingness to have houses sprayed.
4. To determine the extent of community involvement in IRS.
5. To come up with appropriate recommendations on formulation of strategies regarding management of malaria using IRS.

3.4 Methodology

A cross sectional study targeting households in Kanyama, Mtendere and Matero Compounds was carried out.

3.4.1 Sampling procedure

Samples were randomly selected from each of the study areas using systematic random sampling. The sample size was calculated for the coverage rate of 78% plus or minus 5% and at 95% confidence interval. The 78% was derived from the IRS coverage of the 2006/2007 season during which 85% of eligible structures in Lusaka District were targeted (IRHS Report. 2007). The following formulae was used to determine the sample size (n)

$$n = \frac{z^2PQ}{d^2}$$

Where z = 1.96, P=Prevalence/coverage, Q = 100 – P and d=5

Thus the total sample size was

$$n = \frac{1.96^{2*}78*22}{5^2} = 263.69$$

The sample size was taken to be **264**

Assuming a 90% response rate the sample size was

$$n = \frac{264}{0.9} = 293$$

The sample that was considered was **295**

In order to select equal proportions of the population from each compound, ratios of units from the target communities were selected as follows. The total number of households in the three areas was 35,825; Matero, Mtendere and Kanyama had 7,779, 12,271 and 15,775 households respectively. The following houses from the specific areas were included in the sample

Matero	7,779/35,825*295
	=64.05
	~64 household
Mtendere	12,271/35,825*295
	=101.04
	~101 households
Kanyama	15,775/35,825*295
	=129.9
	~130 households

3.4.2 Selection of households

The following steps were used to select the households

1. The sampling interval was calculated using the formulae

   i=H/h

   Where

   H ~ number of household in the area

   h ~ the number of households to be selected in that area
2. The first house was randomly selected and ascribed a number R
3. Then the next house to be selected was the R+i^{th} house
4. The interval was then added repeatedly until the desired sample was reached.

3.5 Description of the study areas

The target study areas were Kanyama, Mtendere and Matero Compounds. Kanyama and Matero Compounds are both located on the west of Lusaka Central Business District (CBD). Matero is located on the north of Lusaka's main industrial area. The Population of Matero was 41,405 and a total of 7,779 households. Kanyama is located on the south of Lusaka's main industrial area and has 15,775 households with a total population of 69,016. Mtendere is located on the east of Lusaka CBD it has 12,271 households and a total population of 61,691(CSO, 2003).

Unlike Kanyama and Mtendere, the houses in Matero, are mostly Council-built, identical and are arranged along designated streets. The study was conducted in the three compounds because they all feature on the malaria belt, they all fall in the target areas for IRS and IRS has been conducted in these areas in the previous seasons.

Additionally the following characteristics which make the areas prone to malaria characterized the target areas: large water bodies such as quarries; water pools created in a lot of places due to construction work; streams passing through the compounds and overgrown with grass and vegetation making water sluggish; large storm water drains which are neglected by local authorities and abandoned man made shallow wells and canals.

3.6 Data collection techniques

A structured questionnaire with both open ended and close ended questions was administered by face to face interaction. The target respondent was the head of the household. Where the head was not present, any adult member of the household was interviewed.

3.7 Plan for data processing and analysis

The collected data was categorized, coded and summarized on master sheets. Qualitative data was triangulated to quantitative data to enable statistical analysis. Using Epi Info Version 6.0, relationships and associations between variables were determined using chi-square. The Yates corrected P value was used to compare proportions and to determine relationships/associations between variables.

3.8 Ethical consideration

The protocol was submitted to the Graduate Studies Committee of the University of Zambia for approval. Final approval was sought from the research ethics committee of the University of Zambia. Permission was also sought from Lusaka Urban District Health Management Team (LUDHMT) and Lusaka City Council (LCC). The study had no major ethical aspects but the respondent were required to assent to being interviewed prior to administering the questionnaire and they were assured of confidentiality and anonymity of information given.

3.9 Staffing and work plan

The senior members of the exercise included the Supervisor and Co-Supervisor whose main responsibility was to provide technical guidance and ensure smooth running of the study. Technical input was sought from competent statisticians to provide the competency in data processing and analysis. Four research assistants were recruited and trained to assist with data collection.

3.10 Pre testing

The data collection instrument was pre tested to ensure that the questions were clear, concise and consistent. The pilot study was conducted in Lusaka's Chilenje Compound, a residential area different from the study area but with similar characteristics.

3.11 Quality control checks

At the end of each data collection day, the filled in questionnaires were checked to ensure that information was properly collected and recorded and for completeness and internal consistency.

3.12 Limitations

The major limitation that was faced when carrying out the study was refusal by respondents to take part in the study.

4. Results presentation

4.1 Introduction

This chapter presents the findings as obtained in the field. Characteristics from the three study areas namely Mtendere, Matero and Kanyama Compounds were analyzed and cross tabulated. Where the respondent did not give a response, it was assumed that the respondent did not know the answer to the question. At the time of data collection, IRS of the houses had come to a close for the 2007-2008 IRS Season.

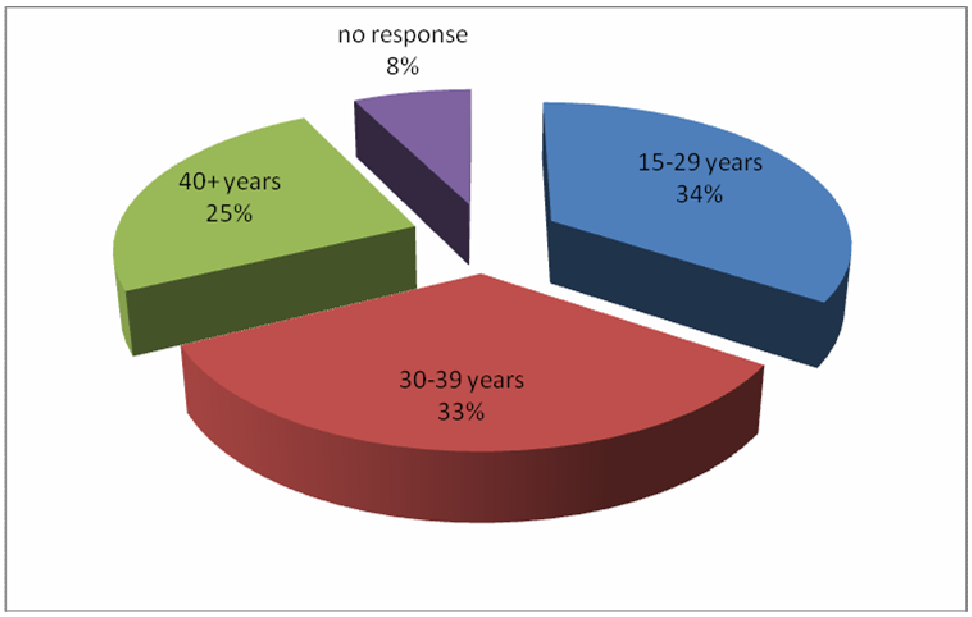
4.2 Sample Description

The sample size distribution by compounds was as follows; Kanyama 125(42.5%), Matero 69(23.5%) and Mtendere 100(34%). Out of the total sample of 294 respondents, 208(70.7%) were females while only 86 (29.3%) were males.

4.2.1 Sample distribution by age

A larger proportion (34%) of the sample was in the age range 30-39 years while the least proportion of the sample (8%) did not state their age. Figure 4.1 gives details of the distribution of the sample by age.

Figure 4-1: Distribution of the population by age



4.2.2 Age and Status of the respondent in the household

Table 4-1 below shows that the proportion of respondents that were heads of households was highest (44%) in the 30-39 years age group and the largest proportion (60%) of respondents that were not heads of households was in the 15-29 years age group.

Meanwhile, it was found that there was a significant relationship between age of respondent and status of the respondent in the household, (P value <0.001)

Table 4-1: Relationship between age and status of respondent in the household

Age(years)	Head of household (%)	Other (%)	P value
15-29	26(18)	75(60)	
30-39	64(44)	34(27)	
40+	56(38)	17(13)	
Totals	**146(100)**	**126(100)**	<0.001

4.2.3 Age of respondent and education status

A larger proportion of respondents (39%) that attended school were from the 15-29 years age group. 70% of respondents among those that never attended school were from the 40 years and above age group. table 4-2

There was a significant relationship between age and whether the respondent had been to school. (P value 0.009)

Table 4-2 : Relationship between age and education status

Age(years)	Attended school	Never attended school	P value
15-29	101(39)	0(0)	
30-39	93(36)	3(30)	
40+	66(25)	7(70)	
Totals	**260(100)**	**10(100)**	0.009

4.2.4 Age and area of residence

The largest proportions of respondents from Kanyama (38%) and Mtendere (38.4%) compounds were aged between 15-29 years while the largest proportion (42.4%) from Matero was aged between 30-39 years age group, Table 4-3. The

There is no significant relationship between age and area of residence (P Value 0.063)

Table 4-3: Relationship between age and area of residence

Age(years)	Kanyama n(%)	Matero n(%)	Mtendere n(%)	P value
15-29	46(38)	22(33.3)	33(38.4)	0.063
30-39	38(32)	28(42.4)	32(37.2)	
40+	36(30)	16(24.2)	21(24.4)	
Totals	120(100)	66(100)	86(100)	

4.3 IRS Coverage and general characteristics

4.3.1 IRS Coverage and Location/study area

The proportion of houses sprayed was largest (62%) in Mtendere, followed by Matero (52.2%) and then Kanyama (36%), Table 4-4. A significant relationship between IRS Coverage and location (P value <0.001) was revealed. Only 48.6% of the sampled population had IRS.

Table 4-4: Relationship between IRS coverage and location

Status	Kanyama n (%)		Matero n (%)	Mtendere n (%)	P value	Totals n (%)
Houses sprayed	45(36)		36(52.2)	62(62)	<0.001	**143(48.6)**
Houses not sprayed	80(64)		33(47.8)	38(38)		**151(51.4)**
Totals	**125(100)**		**69(100)**	**100(100)**		**294(100)**

4.3.2 IRS Coverage and Gender

Table 4-5 shows that a larger proportion (51.9%) of respondents whose houses were not sprayed was headed by females, while among male headed households, half (50%) of their houses were sprayed. There was no significant relationship between IRS Coverage and gender of the head of the household (P Value 0.764)

Table 4-5: Relationship between IRS Coverage and Gender

Status	Females n(%)	Males n(%)	P value
Houses sprayed	100(48.1)	43(50)	0.764
Houses not sprayed	108(51.9)	43(50)	
Totals	**208(100)**	**86(100)**	

4.3.3 IRS Coverage and age

40.5% of the respondents that agreed to IRS were aged between 30-39 years. The largest proportion (43.3%) that did not spray the houses was from the 15-29 years age group, Table 4-6.

The study revealed that there was no relationship between IRS Coverage and age. (P value 0.092)

Table 4-6: Relationship between IRS Coverage and age

Age(years)	agreed to IRS n (%)	Did not spray n (%)	P value
15-29	40(30.5)	61(43.3)	
30-39	53(40.5)	45(32.9)	
40+	38(29.0)	35(24.8)	
Totals	131(100.0)	141(100.0)	0.092

4.3.4 IRS Coverage and level of education attained

The largest proportion (60.1%) of respondents that agreed to IRS attained secondary school level of education. The study also showed that the largest proportion (55%) of respondents whose houses were not sprayed also attained secondary school level of education.

There was no significant relationship between IRS Coverage and level of education attained (P Value 0.583)

Table 4-7: Relationship between IRS Coverage and level of education attained

Education level	Agreed to IRS n (%)	Did not spray n (%)	P value
None	8(5.6)	7(4.6)	0.583
Primary	41(28.7)	47(31.1)	
Secondary	86(60.1)	83(55.0)	
Tertiary	8(5.6)	14(9.3)	
Totals	**143(100)**	**151(100)**	

4.3.5 IRS Coverage and number of people in the household

The study revealed that the larger proportions of those whose households were sprayed (51.7%) and those whose houses were not sprayed (51%) had between 4-6 people per household group.

There was no significant relationship between IRS Coverage and number of people per household (P Value 0.648)

Table 4-8: Relationship between agreeing to IRS Coverage and number of people in the household

Number of people per household	Agreed to IRS n (%)	Did not spray n (%)	P value
1 to 3	14(9.8)	20(13.2)	0.648
4 to 6	74(51.7)	77(51.0)	
7 and above	55(38.5)	54(35.8)	
Total	**143(100.0)**	**151(100.0)**	

4.4 IRS Coverage and knowledge

4.4.1 IRS Coverage and knowledge of entity that carried out IRS

Among those that agreed to IRS, the largest proportion (82.5%) stated that their houses were sprayed by either MOH or LCC. Of those whose houses were not sprayed, 96.0% were unable to state the institution that carried out IRS.

There was a significant relationship between knowledge of who sprayed the houses and agreeing to IRS (P value <0.001)

Table 4-9: Relationship between knowledge of who sprayed the houses and agreeing to have the house sprayed

Ability to state entity that carried out IRS	Agreed to spray house n(%)	house not sprayed n(%)	P value
Able to state the entity that carried out IRS(MOH/LCC)	118(82.5)	6(4.0)	
Unable to state the entity that carried out IRS	25(17.5)	145(96.0)	
Total	**143**	**151**	<0.001

4.4.2 IRS Coverage and knowledge of chemicals used in IRS

Despite not knowing the chemicals used in spraying respondents houses, 97.8% of the respondents agreed to have their houses sprayed, Table 4-10.

No relationship was revealed between knowledge of chemicals used in IRS and agreeing to IRS. (P value 1.000).

Table 4-10 : Relationship between knowledge of chemical used in spraying respondents house and agreeing to have house sprayed

Knowledge of chemical used in IRS	Agreed to spray house	house not sprayed	P value
	n(%)	n(%)	
Knows the chemical used	3(2.2)	0(0)	1.000
did not know the chemical used	136(97.8)	3(100)	
Total	**139(100)**	**3(100)**	

4.4.3 IRS Coverage and chemicals generally used in IRS

The proportions of respondents that agreed to IRS and those whose houses were not sprayed, 100% and 99.3% respectively did not know the chemicals generally used in IRS. Further, it came to light that only one respondent knew the chemicals used in IRS and that that particular respondent's house was not sprayed, table 4-11. There was no relationship between knowledge of chemicals used in IRS and IRS Coverage (P Value 1.000)

Table 4-11: Relationship between knowledge of chemical generally used in IRS and agreeing to have house sprayed

Knowledge of chemical used	Agreed to spray house	house not sprayed	p value
	n(%)	n(%)	
Respondent knew the chemical used	0(0.0)	1(0.7)	1.000
Respondent did not know the chemical used	143(100)	150(99.3)	
Total	**143(100)**	**151(100.0)**	

4.4.4 IRS Coverage and anticipated benefits

A larger proportion of those that agreed to spray the houses (62.9%) indicated that they expected to benefit from IRS. Similarly, a larger proportion (66.9%) of those whose houses were not sprayed expected to benefit from IRS, table 4-12. There was no significant relationship between anticipated benefits and agreeing to IRS (P value 0.557)

Table 4-12: Relationship between agreeing to spray house and anticipated benefits

Anticipated benefits	Agreed to spray house n(%)	house not sprayed n(%)	P value
Respondent expected to benefit from IRS	90(62.9)	101(66.9)	0.557
Respondent did not expect to benefit from IRS	53(37.1)	50(33.1)	
Totals	**143(100.0)**	**151(100.0)**	

4.4.5 IRS Coverage and knowledge of malaria symptoms

It was found that larger proportions of those that agreed to IRS (93.7%) and those whose houses were not sprayed (90.7%) were able to state the correct symptoms of malaria, table 4-13.

The study further showed that there was no significant relationship between IRS Coverage and knowledge of malaria symptoms (P Value 0.342)

Table 4-13: Relationship between agreeing to IRS and knowledge of malaria symptoms

Ability to state malaria symptoms	Agreed to IRS n(%)	Did not spray n(%)	P value
Unable to state malaria symptoms	9(6.3)	14(9.3)	
Able to state malaria symptoms	134(93.7)	137(90.7)	
Total	**143(100.0)**	**151(100.0)**	0.342

4.4.6 IRS Coverage and causes of malaria

A larger proportion of respondents (76.2%) among those who agreed to IRS were able to correctly state the cause of malaria. Similarly, a larger proportion (68.9%) of respondent among those whose houses were not sprayed was able to correctly state the cause of malaria, table 4-14.

The existed no significant relationship between knowledge of malaria causes and IRS Coverage. (P Value 0.201)

Table 4-14: Relationship between agreeing to IRS and knowledge of malaria causes

Knowledge of the causes of malaria	Agreed to IRS n(%)	Did not spray n(%)	P value
Able to state the correct cause of malaria	109(76.2)	104(68.9)	
Unable to state the cause of malaria	34(23.8)	47(31.1)	0.201
Total	**143(100.0)**	**151(100.0)**	

4.4.7 IRS Coverage and methods of protection against malaria

Larger proportions of respondents were able to correctly state the methods of protection against Malaria among those that agreed to IRS (90.2%) as well as those whose houses were not sprayed (86.1%), table 4-15.

There was no significant relationship between IRS Coverage and knowledge of methods of protection against malaria. (P Value 0.363)

Table 4-15: Relationship between agreeing to IRS and knowledge of methods of protection against malaria

Knowledge of the method of protection against malaria	Agreed to IRS n(%)	Did not spray n(%)	P value
Unable to state method of protection against malaria	14(9.8)	21(13.9)	
Able to state method of protection against malaria	129(90.2)	130(86.1)	
Total	**143(100.0)**	**151(100.0)**	**0.363**

4.4.8 IRS Coverage and danger signs/symptoms of malaria

The proportion of respondents that agreed to IRS was higher (78.3%) for those that were able to give to state the danger signs/symptoms of malaria. Similarly, a larger proportion of respondents whose houses were not sprayed (82.1%) were able to state the danger signs/symptoms of malaria, table 4-16.

No significant relationship was found between IRS Coverage and knowledge of danger signs/symptoms of malaria. (P Value 0.502)

Table4-16 : Relationship between agreeing to IRS and knowledge of the danger signs/symptoms of malaria

Knowledge of danger signs/symptoms of malaria	Agreed to IRS n(%)	Did not spray n(%)	P value
Unable to state danger signs/symptoms of malaria	31(21.7)	27(17.9)	
Able to state danger signs/symptoms of malaria	112(78.3)	124(82.1)	
Total	143(100.0)	151(100.0)	0.502

4.5 IRS Coverage and IEC Knowledge

4.5.1 IRS coverage and IEC on IRS

The proportions of respondents who agreed to IRS (51.0%) and those whose houses were not sprayed (63.5%) were larger for those that had heard or seen some information on IRS, table 4-17.

A significant relationship between having heard/seen some information/images regarding IRS during IRS related IEC and agreeing to IRS (P value 0.042) was found.

Table 4-17 : Relationship between agreeing to IRS and IEC knowledge

Knowledge of IEC activities	Agreed to IRS n(%)	Did not spray n(%)	P value
Heard about IRS	73(51.0)	94(63.5)	
Did not hear anything regards IRS	70(49.0)	54(36.5)	0.042
Total	143(100.0)	148(100.0)	

4.5.2 IRS Coverage and place where IEC was received

The study showed that a larger proportion (75.3%) of respondents that agreed to IRS received IEC within the neighbourhood. Similarly, among the respondents whose houses were not sprayed, a larger proportion (77.7%) received IEC within the neighbourhood, table 4-18.

There was no significant relationship between IRS Coverage and place where IRS related IEC was obtained from. (P Value 0.868)

Table 4-18 : Relationship between agreeing to have IRS and place where Information related to IRS was heard

Place where IRS related IEC was heard	Agreed to IRS	House not sprayed	P value
	n (%)	n(%)	
Heard about IRS elsewhere	18(24.7)	21(22.3)	0.868
Heard about IRS within neighbourhood	55(75.3)	73(77.7)	
Total	**73(100.0)**	**94(100.0)**	

4.5.3 IRS Coverage and what exactly was heard during IRS related IEC

The proportion of participants that agreed to IRS was larger (76.7%) among respondents that could remember hearing/seeing the community being alerted regards IRS. 56.4%of those that did not spray their houses could also remember hearing/seeing the community being alerted as regards IRS, table 4-19.

There was no significant relationship between remembering hearing/seeing the community being alerted regards IRS and IRS Coverage. (P Value 0.115)

Table 4-19 : Relationship between agreeing to IRS and remembering hearing/seeing the community being alerted regards IRS.

Ability to remember was seen/heard during IRS related IEC	Agreed to IRS	Did not spray	
	n(%)	n(%)	P value
Could remember	56(76.7)	82(87.3)	0.115
Could not remember	17(23.3)	12(12.8)	
Total	73(100.0)	94(100.0)	

4.6 Willingness to have IRS and knowledge

4.6.1 Willingness and ability to state main symptoms of malaria

The proportion that was willing to spray their houses was larger (92.4%) for those that correctly stated the main symptoms of malaria. Also, 96.8% of those whose houses were not sprayed correctly stated the main symptoms of malaria, table 4-20.

There was no significant relationship found between ability to correctly state the symptoms of malaria and willingness to have IRS (P Value 0.249)

Table 4-20 : Relationship between willingness to spray and ability to state the Main symptoms of malaria

Ability to state the main symptoms of malaria	**Willing to spray**	**Not willing to spray**	
	n(%)	**n(%)**	**P value**
Able to state the main symptoms of malaria	13(7.6)	3(3.2)	0.249
Unable to state the main symptoms of malaria	158(92.4)	90(96.8)	
Total	171(100.0)	93(100.0)	

4.6.2 Willingness and causes of malaria

70.8% of those that correctly stated the cause of malaria were willing to have IRS and 76.3% of those that were not willing to spray also correctly stated the cause of malaria, table 4-21.

There was no significant relationship established between ability to correctly state the cause of malaria and willingness to have IRS (P Value 0.407)

Table 4-21 : Relationship between willingness to spray and knowledge of malaria causes

Knowledge of the causes of malaria	Willing to spray n(%)	Not willing to spray n(%)	P value
Able to state the correct cause of malaria	121(70.8)	71(76.3)	0.407
Unable to state the cause of malaria	50(29.2)	22(23.7)	
Total	**171(100.0)**	**93(100.0)**	

4.6.3 Willingness and knowledge of methods of protection against malaria

The proportion that was willing to spray was larger (86%) for those that correctly stated the methods of protection against malaria. 91.4% of those that were not willing to spray also correctly stated the methods of protection against malaria, table 4-22.

There was no significant relationship between ability to correctly state the methods of protection against malaria and willingness to have houses sprayed (P Value 0.188)

Table 4-22: Relationship between willingness to spray and knowledge of methods of protection against malaria

Knowledge of methods of protection against malaria	Willing to spray n(%)	Not willing to spray n(%)	P value
Unable to state the main symptoms of malaria	24(14.0)	8(8.6)	
Able to state the main symptoms of malaria	147(86.0)	85(91.4)	
Total	171(100.0)	93(100.0)	0.188

6.4 Willingness and ability to state the danger signs/symptoms of malaria

A larger proportion of respondents among those that were willing to spray (80.7%) correctly stated the danger sign/symptoms of malaria. A larger proportion (80.6%) of those that were not willing to spray was also correctly stated danger sign/symptoms of malaria, table 4-23.

The study found that there was no significant relationship between ability to correctly state the danger signs/symptoms of malaria and willingness to have IRS (P Value 0.879)

Table 4-23 : Relationship between willingness to spray and ability to state the danger signs/symptoms of malaria

Knowledge of the danger signs/symptoms of malaria.	Willing to spray n(%)	Not willing to spray n(%)	P value
Unable to state the main symptoms of malaria	33(19.3)	18(19.4)	
Able to state the main symptoms of malaria	138(80.7)	75(80.6)	0.879
Total	171(100.0)	93(100.0)	

4.6.5 Willingness and IEC Knowledge

The proportion that was willing to spray was larger (55.6%) for those that had heard and/or seen some information about IRS. 59.1% of those that were not willing to spray had also heard and/or seen some information about IRS, table 4-24. The study established that there was no significant relationship between having heard/seen some information about IRS and willingness to have IRS (P Value 0.666)

Table 4-24: Relationship between willingness to have IRS and IEC knowledge

Access to IRS	Willing to spray n(%)	Not willing to spray n(%)	P value
Heard about IRS	95(55.6)	55(59.1)	0.666
Did not hear anything regards IRS	76(44.4)	38(40.9)	
Total	**170(100.0)**	**93(100.0)**	

4.6.6 Willingness and place where information about IEC was heard

The proportion that was willing to spray was larger (77.7%) for those that had heard/seen some information about IRS within their neighbourhood. A larger proportion (76.4%) of those that were not willing to spray had also heard/seen some information about IRS within their neighbourhood, table 4-25.

There was no significant relationship established between the place where some information about IRS was heard and/or seen and willingness to have IRS (P Value 0.984)

Table 4-25: Relationship between willingness to have IRS and place where Information related to IRS was heard

Place where IRS related IEC was heard	Willing to spray n (%)	Not willing to spray n(%)	P value
Heard about IRS elsewhere	21(33.3)	13(23.6)	0.984
Heard about IRS within neighbourhood	73(77.7)	42(76.4)	
Total	**73(100.0)**	**55(100.0)**	

4.6.7 Willingness to have IRS and Ability to remember hearing/seeing some information/images about IRS

Proportions of those that were willing to spray (87.2%) and those whose houses were not sprayed (70.9%) were larger among those that could remember hearing/seeing the community being alerted regards IRS, table 4-26.

The study brought to light a significant relationship between remembering hearing some information or seeing images put across during IRS related IEC and willingness to have IRS (P Value 0.040)

Table 4-26: Relationship between willingness to have IRS and what was heard or seen concerning IRS

Ability to remember some information/images from IRS related IEC	Willing to have IRS n(%)	Not willing to have IRS n(%)	P value
Could remember	81(87.2)	39(70.9)	0.040
Could not remember	13(13.8)	16(29.1)	
Total	**94(100.0)**	**55(100.0)**	

4.6.8 Willingness and knowledge of who sprayed

58.5% of those that were willing to spray and 79.6% of those that were not willing to spray cited other institutions than MOH/LCC as the ones that carried out IRS, table 4-27.

It came to light that there was a significant relationship between knowledge of who carried out IRS and willingness to have IRS (P Value <0.001)

Table 4-27: Relationship between knowledge of institution that sprayed and willingness to have the house sprayed

Entity that was said to have carried out IRS.	Willing to spray n(%)	Not willing to spray n(%)	P value
Respondent that cited LCC or MOH	71(41.5)	19(20.4)	
Respondents that cited others	100(58.5)	74(79.6)	
Total	**171(100.0)**	**93(100.0)**	<0.001

4.6.9 Knowledge of chemicals used in respondent's house and willingness

A larger proportion of those that were willing to spray (97.8%) and those that were not willing to spray (97.9%) revealed that they did not know the chemicals that were used to spray houses during IRS, table 4-28.

There was no significant relationship between knowledge of chemicals used to spray the respondent's house during IRS and willingness to have IRS (P Value 1.000)

Table 4-28: Relationship between knowledge of chemical used in spraying respondents house and willingness to have house sprayed

Knowledge of chemical used to spray respondent's house	Willing to spray	Not willing to spray	
	n(%)	n(%)	P value
Knows the chemicals used	2(2.2)	1(2.1)	1.000
did not know the chemicals used	88(97.8)	47(97.9)	
Total	**90(100)**	**48(100)**	

4.6.10 Willingness and anticipated benefits

Table 4-29 shows that a larger proportion (79.5%) of those that were anticipating some benefits was willing to have IRS; 69.9% of those that were not willing to spray their houses indicated that they were not expecting to benefit from IRS in any way. The study brought to light a significant relationship between anticipated benefits and willingness to have IRS (P Value <0.001)

Table 4-29: Relationship between willingness to spray house and anticipated benefits

Anticipated benefits	Willing to spray	Not willing to spray	
	n(%)	n(%)	p value
Respondent expected to benefit from IRS	136(79.5)	28(30.1)	<0.001
Respondent did not expect to benefit from IRS	35(20.5)	65(69.9)	
Totals	**171(100.0)**	**93(100.0)**	

4.7 Willingness to have IRS and actual IRS coverage

A larger proportion (64.3%) of respondents whose houses were sprayed were willing to have IRS. A larger proportion of respondents whose houses were not sprayed were also willing to have IRS. Table 4-30.

The study brought to light that there was no significant relationship between willingness to spray and actual spraying (P Value 0.963)

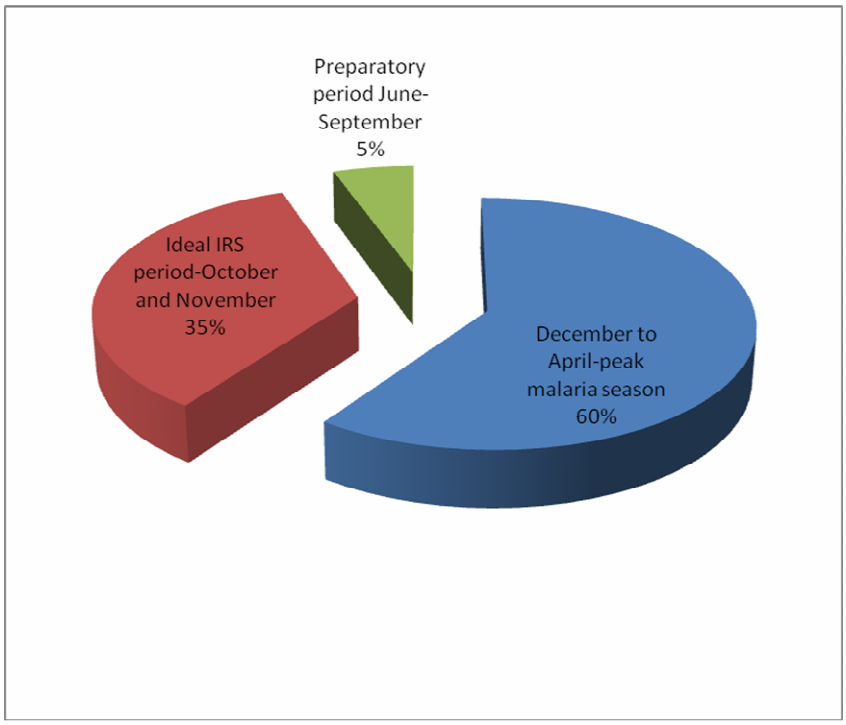
Table 4-30 : Relationship between willingness to spray and agreeing to actual IRS

Whether the house was sprayed	Houses sprayed	Houses not sprayed	P value
	n(%)	**n(%)**	
Willing to spray	90(64.3)	81(65.3)	
Not willing to spray	50(35.7)	43(34.8)	**0.963**
Totals	**140(100.00)**	**124(100.0)**	

4.8 IRS Coverage and season when IRS took place

60% of houses were sprayed during the peak malaria period i.e. from December to March followed by those that were sprayed during the ideal IRS period (35%) i.e. October and November. The least number (5%) were sprayed between April and September a period during which preparations for a successful IRS period should be carried out. Fig 4-2

Figure 4-2: Season during which IRS was carried out.



4.9 Community involvement in IRS

4.9.1 Knowledge of community based IRS activities

A larger proportion (91.8%) of respondents indicated that they were not aware of IRS activities taking place with community participation. Table 4-31 below summarizes the responses on knowledge of community based activities taking place in Matero, Mtendere and Kanyama.

Table 4-31: Distribution of respondents by Knowledge of IRS community based activities

Does the community engage in IRS activities	**n(%)**
Yes	24(8.2)
No	270(91.8)
Total	**294(100)**

4.9.2 IRS activities that are carried out in the communities

A larger proportion (46%) of those that were aware of IRS community activities cited door to door sensitization regarding IRS taking place in the community. Figure 4-3 summarizes the result of the exact community based IRS activities taking place in the study area. Only 1% of the respondents personally involved in community based IRS activities, Table 4-32.

Figure 4-3: Distribution of respondents by ability to state the community based activities taking place

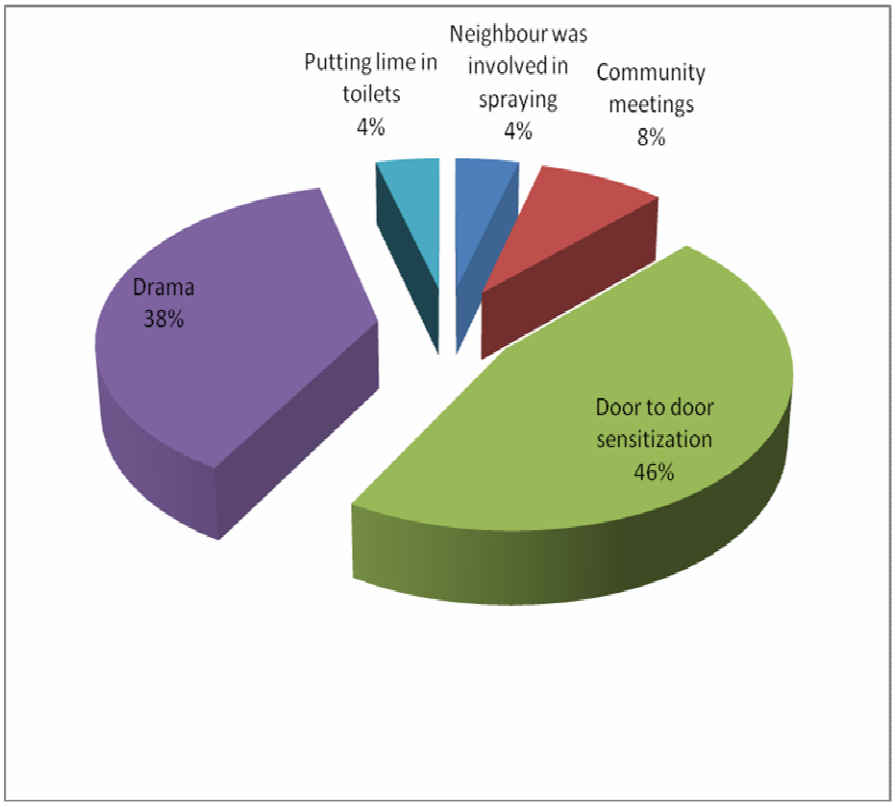


Table 4-32: Involvement in community based activities

Are you involved in IRS	n(%)
Yes	3
No	291
Total	**294**

4.10 Other Interventions

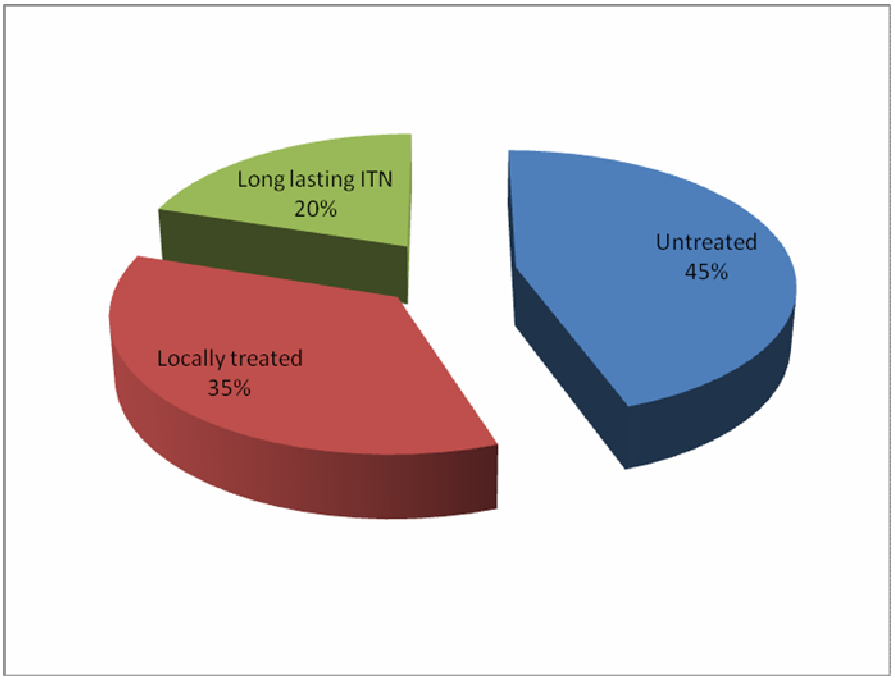
4.10.1 Ownership and use of Insecticide treated mosquito nets (ITNs)

The study ascertained ownership and use of ITNs, another vector control intervention put in place by the Zambian government to combat the problem of malaria in Zambia. It came to the fore that 66.3% of the respondents own and use mosquito nets (table 4-34), of which 35.4% own untreated nets, Figure 4-4.

Table 4-33: Ownership and use of mosquito nets

Do you own/use mosquito nets	n(%)
Yes	195(66.3)
No	97(33.7)
Total	**294(100)**

Figure 4-4: Type of mosquito nets owned/used



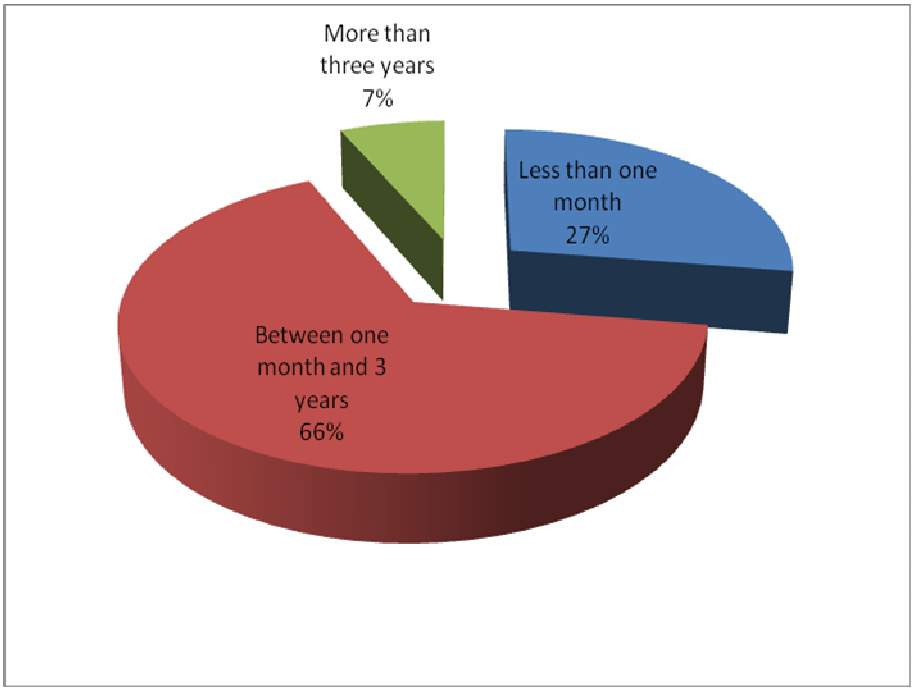
4.10. 2 Re-treatment of nets

45.6% of the respondents table 4-35, own/use nets that have been retreated either by themselves or at the local clinic. It was noted that the proportion (54.4%) of respondents whose nets were not treated included those who owned permanents which does not require retreating. A very small proportion of the respondents treated the nets more than three years from the date of data collection. Figure 4-5

Table 4-34: Distribution of respondents by re-treatment of nets

Has the net been re treated	N(%)
Yes	89(45.6)
No	106(54.4)
Total	**195(100.0)**

Figure 4-5: Distribution of respondents by time lapse between re treatment of net and time of data collection

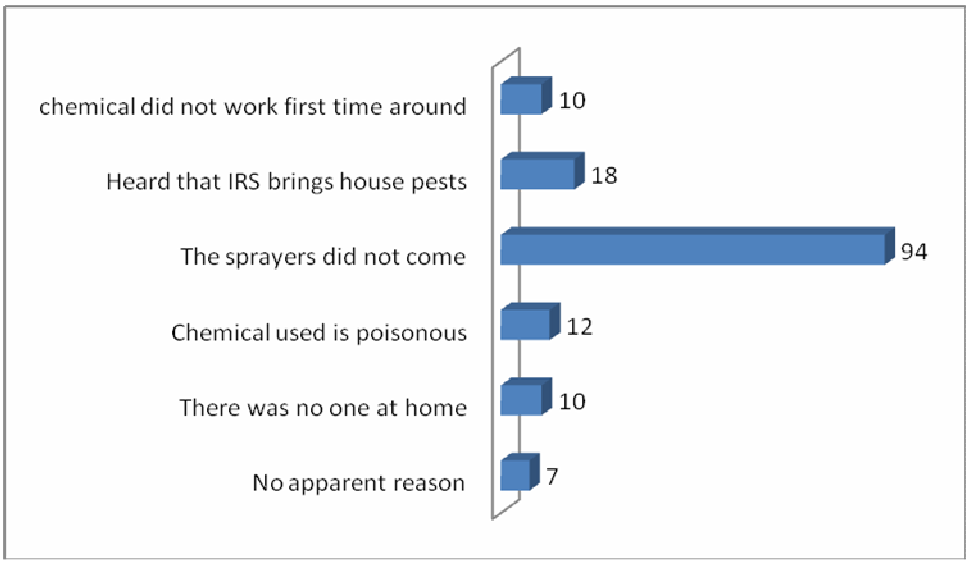


4.11 Other aspects of IRS

4.11.1 Reasons for not spraying the house

The study found that a larger number of respondents, 94 (62.3%) houses were not sprayed because the sprayers did not come. Figure 4-6 gives the details why the respondents did not have IRS.

Figure 4-6: Distribution of respondents by reason why the house was not sprayed



4.11.2 Alterations made on the walls after IRS

Chemicals used in IRS are effective over a long period of time (more than six months); it is therefore recommended that walls that have been sprayed should not be altered during the entire period when the chemical is effective. A small proportion (2.1%) of respondents altered the walls by either painting or plastering. Table 4-36 and Table 4-37.

Table 4-36: Distribution of respondents by Alterations made on the walls after IRS

Was the wall altered	**n(%)**
Yes	3(2.1)
No	140(97.9)
Total	**143(100)**

Table 4-37: Distribution of respondents by type of alterations made on the wall

Alteration	**n(%)**
Painting	2(66.7)
Plastering	1(33.3)
Total	**3(100)**

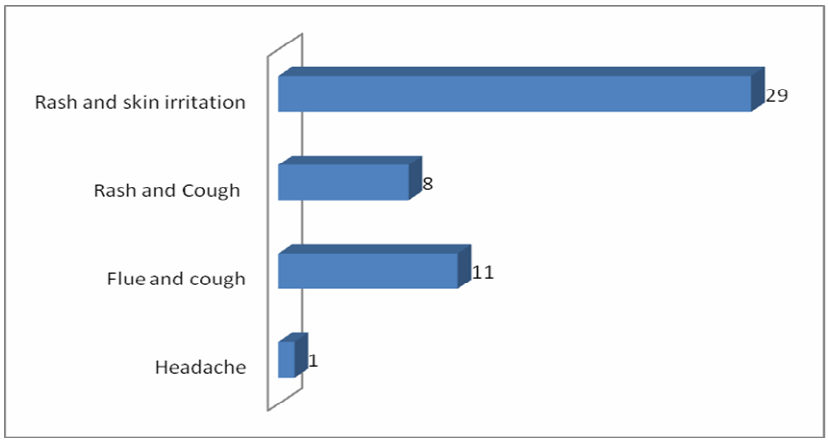
4.12.3 Reaction to IRS

A larger proportion of respondents that agreed to IRS did not react negatively to the chemicals used in IRS (65.7%), Table 4-38. A larger proportion developed rash and skin irritation, Figure 4-7.

Table 4-38: Distribution of respondents by reaction to spraying

Did anyone react to IRS	n(%)
Yes	49(34.3)
No	94(65.7)
Total	**143(100)**

Figure 4-7: Distribution of respondents by specific reaction to IRS



4.12.4 Liquid chemicals left on the floor after IRS

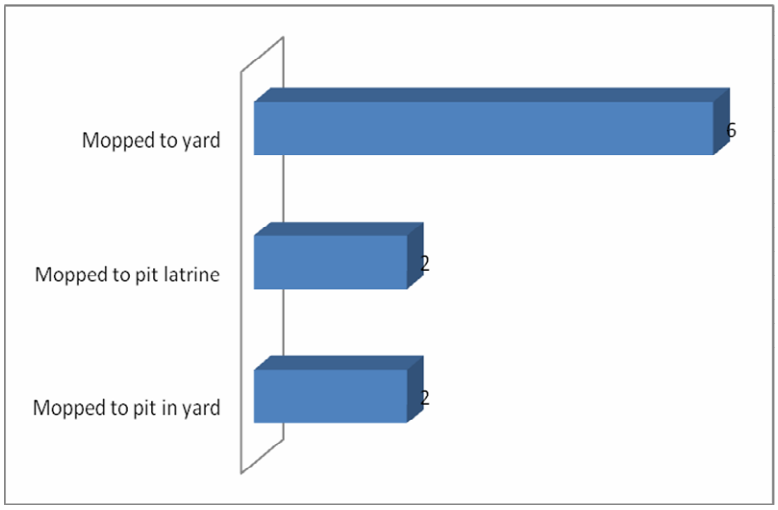
During the intensive training that sprayers undergo prior to undertaking IRS it is emphasized that there should be adherence to pesticide management i.e. no chemicals should be left on the floor after IRS. The study, table 4-39 revealed that about 7% of the respondents reported that some pesticide was left on the floor

after IRS. Figure 4-8 indicates the methods that were engaged in the disposal of the pesticide left on the floor.

Table 4-39: Distribution of respondents by chemical left on the floor after IRS

Was there liquid left on the floor after IRS	**n(%)**
Yes	10(7)
No	133(93)
Total	**143(100)**

Figure 4-8: Distribution of respondents by method employed to dispose the chemical



5. DISCUSSION OF FINDINGS

5.1Age

The significant relationship between age and status of an individual in the household (P value<0.001) could be due to the fact that most of the houses were headed by younger individuals (aged 30–39), additionally the alternative respondents were also mostly young (60%). The significant relationship (P value 0.009) between age and whether one has been to school is consistent with the successes scored in the implementation of the National Development Plan as well as the Millennium Development Goals which advocate for education for all. It was found that all respondents aged 15-29 attended school almost all those aged 30-39 attended school. A bigger proportion of those that never attended school were aged 40+ years which has a larger proportion (70%) that had never been to school. Due to the high level of educational status of the respondents, it follows suit that the ability to grasp IEC is high. There was no significant relationship between age and area where one resided (P value 0.63).

5.2IRS Coverage and general characteristics

Area of residence had a bearing on IRS Coverage (P value <0.001); this could be attributed differences in malaria incidence experienced in the study areas, see table 2-1. This phenomenon was the basis upon which the malaria belt for Lusaka was devised. The malaria belt is made up of areas that record the highest

incidences of malaria in Lusaka. It serves as starting point for prioritizing implementation of malaria intervention measures. The study showed that gender (P value 0.764), age (P value 0.092), level of education attained (P value 0.583) and number of people per household (P value 0.648) had no bearing on IRS coverage. This is rather strange as it is generally assumed that; gender is likely to influence IRS because women being the ones that care for the sick should agree to IRS to an extent of influencing IRS coverage; level of education attained entails level of ability to grasp issues including malaria knowledge, thus it is expected that level of education must influence coverage as most respondents attended school. Number of people per household would be expected to have a bearing on IRS Coverage from the assumption than that the more people there are in a household, the more likely they are to put in place protective measures as disease can be easily transmitted from one person to another.

5.3IRS Coverage and knowledge

There were significant relationships between IRS Coverage and the following: knowledge of the institution that carried out IRS (P value <0.001) and access to IRS related IEC (P value 0.042). The relationship between knowledge of the entity that conducted IRS could be due to the confidence placed in the efficiency of services offered by established institutions such as MOH. It is a generally

accepted norm that established institutions are more likely to render a good service than otherwise.

There were no relationships between IRS Coverage and: knowledge of chemicals used in IRS (P value 1.000); Knowledge of chemicals generally used in IRS (P value 1.000); anticipating benefits from IRS (P value 0.557); knowledge of malaria symptoms (P value 0.342); knowledge of causes of malaria (P value 0.201); knowledge of protection against malaria (p value 0.363), and knowledge of danger signs/symptoms of malaria (P value 0.502). The lack of relationship between knowledge related factors and IRS Coverage, could be attributed to the following: lack of knowledge of the chemicals used in IRS, only one (1) respondent was able to correctly state the chemical used in IRS and this particular respondent did not agree to IRS (table 4-11) also, there were a lot of misconceptions regarding chemicals used in IRS, see figure 4-6. Large proportions of respondents were knowledgeable of IRS but their houses were not sprayed (see section 4.4), this could also be attributed to people's wrong attitude of not practicing what they know.

5.4IRS Coverage and IEC knowledge

The study found that there was no relationship between IEC related factors as follows: place where IRS related IEC was heard and/or seen (p value 0.868); and

ability to remember hearing/seeing the community being alerted regards IRS (p value 0.115)

This could be attributed to the enthusiasm to act on recently acquired information; it could also be as a result of the clarity message that was contained in the IEC materials i.e. that some sprayers from MOH would be carrying out door to door spraying of houses against malaria.

Being expectant to benefit had a bearing on IRS coverage simply because people wanted to be partakers of that which they expect to receive as a result of IRS rather than let the benefit of not suffering from malaria pass them by.

5.5Willingness to have IRS and knowledge

The significant relationship between the respondent's willingness to have IRS and the following: ability to remember what was heard and/or seen during IRS related IEC (P value 0.040), knowledge of the institution which sprayed (P value <0.001) and benefits anticipated from IRS (<0.001), entail an effectiveness of the IEC Programme. The relationship between anticipated benefits and willingness to have IRS could be attributed to the confidence that the respondents have in the sureness of benefits to be received, the institution that carried out IRS and the positive nature of the information/images disseminated during IRS.

It was demonstrated that there was no relationship between willingness to spray and the following factors related to knowledge: main symptoms of malaria (p

value 0.249), causes of malaria (p value 0.407); methods of protection against malaria (p value 0.188); danger signs/symptoms of malaria (p value 0.879); chemicals used to spray respondent's house (p value 1.000). The study found that there was no relationship between willingness to spray and the following IEC related factors: IEC knowledge (p value 0.666) and place where IEC was heard (p value 0.984). The lack of influence of some knowledge related factors on willingness to spray could be attributed to people's attitude of failing to implement that which would put into effect what they know. Additionally this result could be attributed to the fact that a lot of houses were not visited by the sprayers during IRS see figure 4-6.

5.6Willingness and actual coverage

The demonstration that there was no relationship between IRS coverage and willingness to have IRS (P value0.963) was not consistent with the assumption that where there is willingness then it follows suit that people will do that which they willing to do. The large number of respondents that were willing to have IRS but their houses were not sprayed(table 4-30) could be attributed to the fact that sprayers missed out houses that they should have sprayed see figure 4-6. On the other hand this result may be explained by the fact that IRS is conducted with the consent of the respondents, where the respondents do not consent, they are left alone no matter what they seem to know.

5.7Coverage and seasonal variation

A large proportion of houses, 60% was sprayed during the peak malaria transmission season i.e. December through to May and the least proportion, 5% was sprayed between June and September. Only 35% of the houses were sprayed during the ideal spraying period, (See figure 4-2). Malaria generally increases in December and peaks in February and May; this is consistent with the distinct Zambian rainfall pattern. In Zambia, the rainy season is from October and/or November to April. Peak rainfall is from December to March. IRS should thus be conducted before the onset of the rains and should be completed by the time the rainfall peaks. The fact that IRS was conducted in the rainy season could be contributed to low IRS coverage as it has the potency of causing people to refuse putting their property and keeping it in the rain while awaiting the sprayers to spray. The study however found that there is no relationship between the period when IRS took place and agreeing to IRS.

5.8Community involvement in IRS

Community participation in IRS was almost non-existent, only about 1% of the respondents were personally involved in IRS, 8.2% of the respondents were aware of some IRS related activities taking place in their communities. Studies have shown that most of the programmes that do not involve the community tend to fail (Sharp, 2002). The cited reason was that when the community is not

involved from the onset of a programme, they feel that the services provided are imposed. The communities feel they don't 'own' the activities consequently tend to shun such programmes. This could in part explain the large number of houses that were not sprayed. A study by Newberry and Jansen (1986) found that a project is much more likely to be sustainable if the community identifies with an initiative and feels that it is benefiting from its involvement and is seeing results.

5.9Other malaria interventions

66.3% of the respondents own and use mosquito nets of which 45% were untreated, 20% were long lasting nets and 35% were locally treated nets. This finding is consistent with the finding that larger proportions of the respondents are aware of an illness called malaria and are trying to do something to prevent them from getting ill from malaria. This finding is also consistent with the larger proportions of respondents that use treated nets. (See table 4-34).

5.10 Other aspects of IRS

62.3% 0f the respondents whose houses were not sprayed indicated that the sprayers did not come to their houses. Of the 143 houses that were sprayed 2.1% altered the walls after IRS, 34.3% reacted negatively to IRS, sprayers left pesticides on the floor in 7% of the houses that were sprayed.

It is extremely important that all houses in target areas be visited by the sprayers; all households must have an equal opportunity to receive the IRS service, only

those that do not consent should be left out. Findings such as the large proportion (62.3%) of respondents in figure 4-6 whose houses were not sprayed because the sprayers did not come needs to be reversed promptly. The small proportion of respondent that altered their walls after IRS is consistent with the assumption that respondents that agreed to IRS are determined to benefit from IRS. A substantial proportion of respondents (34.3%) reported that they reacted negatively to IRS. There are several reasons that could be attributed to the negative reaction to IRS, among them could be lack of adherence to the instructions that respondents are given. It is mandatory that respondents should be warned against entering the sprayed houses within three(3) hours from the time of spraying and that they should avoid touching the walls.

There were a small proportion of sprayers (7%) that left pesticides on the floor, this was despite the intensive training that they underwent prior to IRS. This could be attributed to carelessness by the sprayers' hence poor management of the pesticides or it could simply be accidental. There is need to closely monitor the work of the sprayers to prevent such lapses.

6. Conclusion and Recommendations

6.1Conclusion

IRS Coverage for the 2007/2008 IRS Season was 36% in Kanyama, 52.2% in Matero and 62% in Mtendere, while the total coverage in the study areas was 48.6% (Table 4-4) This finding was not consistent with the claims by NMCC/MOH that IRS Coverage was 90% and 100% in some areas. The study demonstrated that even the 85% target coverage for the year was not met.

A large proportion of houses (60%) were sprayed during the peak malaria season i.e. from December to May. Only 35% of the houses were sprayed in the ideal IRS period. This period coincides with the rainy season and has inherent potential to influence IRS coverage. Respondents would not be willing to keep some of their properties in the rain to pave way for spraying.

There was no relationship between IRS coverage and willingness to have houses sprayed (P value 0.963).

The factors that were found to influence IRS Coverage included: Location of the specific study area (P value <0.001); knowledge of the institution that carried out IRS (P value <0.001) and access to IEC regarding IRS (P value 0.042). The other factors that had a significant influence on willingness to have IRS were: ability to remember what was heard or seen during IRS related IEC (P value 0.040),

knowledge of the institution that carried out IRS (P value <0.001) and having anticipated benefits from IRS (P value <0.001).

Community participation in IRS is almost nonexistent, despite the community being the recipients of the service. Only 8.2% of the respondents were aware of the community getting involved IRS related activities and 1% was personally involved in the activities.

66.3% of the respondents own and use mosquito nets of which 45% were untreated, 20% were long lasting nets and 35% were locally treated nets.

62.3% of the respondents whose houses were not sprayed indicated that the sprayers did not come to their houses. Of the 143 houses that were sprayed 2.1% altered the walls after IRS, 34.3% reacted negatively to IRS, sprayers left pesticides on the floor in 7% of the houses there houses. This shows that there is to some extent, poor pesticide management, which is not acceptable and is worrisome. The intensive training conducted for sprayers is so as to avoid disposal of the chemicals used in IRS in the environment. Chemicals like DDT although allowed in malaria transmission control, have a lot of negative effects if they find their way in the food chain. It is imperative that poor pest management be avoided at all costs.

6.2Recommendations

It is recommended that for the government to meet its intended target of total IRS coverage by the year 2011, the sprayers should be closely monitored. A surveillance study should be conducted to assess the information sprayers give the IRS exercise recipients after the exercise. This is so as to rule out the possibility that the sprayers could be giving out incorrect information to the community.

IRS should be carried out before the onset of the rains or just after the onset of the rains but before the malaria transmission period i.e. before November/December and after May. Emphasis should be placed on the importance of sprayers visiting all houses in target areas. A penalty of some sort should be slapped on those that deliberately do not visit all houses in their jurisdiction.

The communities should be given correct information regarding the chemicals used in IRS and IEC activities should be encouraged. Campaigns should be mounted in the communities to encourage people to retreat their nets. Some community members should be trained in malariology and be given the mandate to spearhead malaria related activities in the communities.

Bibliography

Attanayake N., Fox-Rushby J. & Mills A. (2000) *Household costs of 'malaria' morbidity: a study in Matale district, Sri Lanka* in Tropical Medicine and International Health 5, pp595–606.6

Booman M., Sharp B. L., Martin C. L., Manjate B., Grange J. J. & Durrheim D. N. (2003) *Enhancing malaria control using a computerized management system in southern Africa***.** http://www.malariajournal.com/content/2/1/13 Bulletin of the World Health Organization, 2000

Conteh L., Sharp B. L., Streat E., Barreto A. & Konar S. (2004) *The cost and cost-effectiveness of malaria vector control by residual insecticide house-spraying in southern Mozambique: a rural and urban analysis* in the Tropical Medicine and International Health volume 9 no 1 pp 125–132 . World Health Organization, Geneva

CSO (2003) *Summary Report for the 2000 Census of Population and Housing*.pp29 Desktop Publishing Unit, CSO – Lusaka .Zambia

Curtis C. F. & Mnzava A. E. P. (2000) *Comparison of house spraying and insecticide treated nets for malaria control* in Bulletin of the World Health Organization, 2000, 78 (12) pp1389-1400

Lines J. D. & Nassor N.S. (1991*) DDT* resistance *in Anopheles gambiae declines with mosquito age* in Medical and Veterinary Entomology, 5: pp261–265

Mnzava A. E. P., Ntuli M., Ngxongo S., le Sueur D. & Sharp B. (1998) *House re-plastering as a reason to shift from DDT spraying to synthetic pyrethroids in KwaZulu-Natal*. South African Medical Journal of Public Health 88, pp 1024–1028

MOH (2006) A *road map for impact on malaria, a 5-year strategic plan* 2006-2010 p5-10

MOH et al (2006) *National Malaria indicator Survey*, Lusaka, pp1,17-18

MOH/NMCC (2006) *National malaria strategic plan* 2006-2011: Lusaka pp5-10

Newberry K. & Jansen E. J. (1986) *The common bedbug Cimex lectularius in African huts*. Transactions of the Royal Society Tropical Medicine Hygiene 80, pp653–658

NMCC (1999) *Situational analysis of malaria control in Zambia*: Lusaka

Park K. (2005) *Park's text book of preventive and social medicine.* 18th Edition. Bhanot: India. pp201

Sharp B., Van Wyk P., Sikasote J. B., Banda P.& Kleinschmidt I. (2002) *Malaria control by residual insecticide spraying in Chingola and Chililabombwe, Copperbelt Province, Zambia* in Tropical Medicine and International Health volume 7 no 9 pp 732–736

Snow R. W., Craig M., Deichmann U. & Marsh K. (1999*) Estimating mortality, morbidity and disability due to malaria among Africa's non-pregnant population***.** Bulletin of the World Health Organization 77, pp624–640.

Tren R. & Bate R. (2004) *South Africa's War against Malaria Lessons for the Developing World*, Policy analysis No. 513

Utzinger J., Tozan Y., Doumani F. & Singer B. H. (2002) *The economic payoffs of integrated malaria control in the Zambian Copperbelt between 1930 and 1950 in* Tropical Medicine and International Health volume 7 no 8 pp657–677

Volovskaya M. L. (1990) *Epidemilogy and fundamentals of infectious diseases*. Mir Publishers: Moscow pp238-240

WHO (2000) *WHO Expert Committee on Malaria, Twentieth Report*. World Health Organization: Geneva. Pp 1-9

WHO (2001) The World Health Report 2001: Mental Health –New Understanding New Hope. World Health Organization: Geneva.

WHO (2003) *Interre*gional Consultation Report 25–28 February 2003 Chiang Mai, Thailand*: Guidelines on the management of public health pesticides.* World Health Organization: Geneva p3-31

WHO (2006a) *Indoor residual spraying: Use of indoor residual spraying for scaling up global malaria control and elimination.* Global Malaria Programme, World Health Organization: Geneva pp1-5

WHO (2006b) Report of a WHO Study Group: *Malaria vector control and personal protection* WHO Technical Report Series 936 World Health Organization: Geneva pp3-46

WHO (2006c) *Pesticides and their application for the control of vectors and pests of public health importance*. Sixth edition, WHO/CDS/NTD/WHOPES/GCDPP/2006.1 World Health Organization: Geneva pp11-36

Worrall E., Connor S. J. & Thomson M. C. (2007) *A model to simulate the impact of timing, coverage and transmission intensity on the effectiveness of indoor residual spraying (IRS) for malaria control* in Tropical Medicine and International Health volume 12 no 1 pp 75–88

www.malaria.org.zm/IRS visited on August 21, 2007

www.worldhealthorganisation/mediacentre Visited on September 17, 2007

Appendix 1: Budget

Item	Quantity	Unit cost(average)	Total cost
1. Stationary			
A4 paper	10 reams	K30, 000	K300, 000.00
Pens	10	K1, 000	K10, 000.00
Pencils	10	K200	K2, 000.00
Rubbers	5	K600	K3, 000.00
Tippex	3	K10, 000	K30, 000.00
Files	5	K10, 000	K50, 000.00
Flash disks	2	K150, 000.00	K300, 000.00
Markers	5	K10,000.00	K50,000.00
Back packs	5	K50,000	K250,000.00
Sub total			**K995, 000.00**
2. Literature review			
Text books	3	K375,000.00	K1,125,000.00
Journals	5	K85,000.00	K425,000.00
Sub total			**K1, 550,000.00**
3. Services			
Printing proposal	20*15copies	K2,500	937,500.00
Binding proposal	15 copies	K12,000	K180,000.00
Printing questionnaire	5	K2500	K25,000.00
Photocopying questionnaires	5*420	K250	K525,000.00
Data entry	1	K300, 000	K300, 000.00
Data analysis	1 day	K1,500, 000	K1,500, 000.00
Printing final report	55*10copies	K2500	K1,375,000.00
Binding final report	10 copies	K50, 000	K500, 000.00
Sub total			**K5, 317,500.00**
4.training of research assistants			
Facilitator	1*5days	K50,000	K250 000.00
Transport refunds	4*5days	K10,000	K200,000.00
Beverages/lunch	6*5days	K20,000	K600,000.00
Sub total			**K1,050,000.00**
5. Personnel			
Research assistants			
Transport	4	K10, 000* 40 days	K1, 600,000.00
Lunch	4	K15,000*40days	K2, 400,000.00
Allowance	4	K400,000*2months	K3, 200,000.00
Principal researcher			
Transport	1	K10 000* 40 days	k400,000.00
Lunch	1	K15,000*40days	K600,000.00
Sub total			**K8, 200, 000.00**
Total			K17,137,500.00
Contingency 10%			K 1, 713,750.00
Grand total			**K18,851,250.00**

Appendix 2: Consent Form

INFORMATION SHEET/RESEARCH CONSENT FORM

Title: "factors influencing low in-door residual spraying (IRS) coverage in Lusaka's Kanyama, Mtendere and Matero Compounds"

This is to inform you that this study is being carried out by Annie Banda, a Masters of Public Health student in the Department of Community Medicine. University of Zambia

As you may be aware the National Malaria Control Centre in an attempt to reduce the prevalence of malaria is carrying out Indoor Residual Spray (IRS). This activity has been going on for some time now. Despite this, we are still observing large numbers of malaria cases in our clinics. Also there are complaints from communities that there are too many mosquitoes. The study is therefore trying to find out reasons or factors which could be contributing to the prevalence of malaria in your area despite Indoor Residual Spraying.

The study outcome is cardinal to the stakeholders in Malaria Control as well as the Zambian people at large in their quest to have a malaria free Zambia. The findings will be useful in revising the plans and formulating policies related to malaria transmission reduction. It is hoped that the findings will be used by stakeholders to:

- Devise policies aimed at increasing the IRS knowledge base of, and acceptance by the community.
- Ensure that information, education and communication materials are achieving the intended purpose
- Put in place measures that will result in an increase in IRS coverage and
- Plan for community participation in IRS programmes

You will therefore be asked some questions regarding malaria and Indoor Residual Spraying. The researcher hopes that the information that will be collected by this study will help improve the quality of the IRS and eventually contribute to reducing malaria in children and adults in your compound in the future.

Confidentiality

All the information collected from you will be confidential and will not be use openly. Your name and address will not be recorded to protect your privacy.

Risk and Benefits

By answering these questions, there are no direct benefits to you. Besides answering questions, you will not be subjected to any test or procedure. One of the benefits of this study will be to identify the weaknesses of the spraying campaign and strengthen it so that malaria is further reduced. Besides this, there is no direct benefit to you.

Participation

Your participation in this study is voluntary. If you have not understood or would not consent to it, you are free to refuse or withdraw. You have the right to clarification and to ask as many questions as you may wish to.

By signing below or imprinting your thumb print, you confirm that you have been informed about the study on Indoor residual spraying. You voluntarily agree to participate and that you also understand that you may withdraw from the study if you may so wish.

If there is any part of this explanation that you do not understand, you should ask the investigator before signing or contact the addresses below.

Name …… Sign …… Date ……

Thumb print 

Witness (in case of thumb print)…… Sign …… Date ……

For Ethical Queries please contact
The Secretary, Research Ethics Committee on the following Address
Telephone: 260-1-256067
Telegrams: UNZA, LUSAKA
Telex: UNZALU ZA 44370
Fax: + 260-1-250753
E-mail: unzarec@zamtel.zm

Ridgeway Campus
P.O. Box 50110
Lusaka, Zambia

For any queries please contact
Annie Banda
Plot 365/16
Off Umzilikazi Road Kizito
Cell: 0979 400 771
E-mail: Chandipo_ane@yahoo.com

Box 330051,
Matero Lusaka

Appendix 3: Data collection tool

QUESTIONNAIRE

Research Topic

FACTORS INFLUENCING LOW IN-DOOR RESIDUAL SPRAYING (IRS) COVERAGE IN LUSAKA'S KANYAMA, MTENDERE AND MATERO COMPOUNDS

QUESTIONNAIRE NUMBER __ __ __ __ __ __

DATE OF INTERVIEW _____/_____/ _____

COMPOUND/AREA ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ____

INTERVIEWER __ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

SECTION 1: Respondent's Details

1. Gender Male ☐ Female ☐
2. When were you born? Year…….. Month……
3. Are you the head of the household? Yes ☐ No ☐
4. If not, what is your relationship to the head of the household?
   ……

SECTION 2: DEMOGRAPHY

1 Have you ever attended school? Yes ☐ No ☐

2 If yes, what is the highest level of school you attended?

- Primary
- Secondary
- Higher

3 What is the highest (grade/form/year) you completed at that level?
……

4 How many people live in this household? .....

5 What is the main source of drinking water for members of your household?

- Piped water
  - Piped into dwelling
  - Piped into yard/plot
  - Public tap/standpipe
- Tube well or borehole
- Dug well
- Bottled water

- Other (specify)
  …….....

6 How long does a trip to collect water usually take?
- <30 minutes
- 30-<40 minutes
- 40-90 minutes
- >90 minutes

7 What kind of toilet facilities does your household use?
- Pit Latrine (no cement slab)
- Pit Latrine with Slab
- Pit Latrine with Cement Slab and Vent Pipe
- Flush or pour toilet
- Flush to septic tank
- Flush to piped sewer system
- No Facility/Bush/Field

8 Does your household have any of the following?

- Electricity?
- A radio?
- A television?
- A telephone?
- A refrigerator?

SECTION 3: SPRAYING

1. How many rooms does the household have?

2. Room Roaster

Room	Material of		Room used for sleeping? If yes, # of sleeping spaces	Was it sprayed against mosquitoes	How long ago	Have walls since been Plastered
	Walls	floor				
1.						
2.						
3.						

3. Do you like having your house sprayed? Yes ☐ No ☐

4. If yes, why?

……

5. If not, why not
   ……

6. The last time the spraying was done; did anyone in your household have a bad/negative reaction to the spray? Yes ☐ No ☐

7. If yes, please tell me what happened?
   ……..……
   ……..

8. The last time the walls in this room were sprayed, was there any spray liquid left afterwards? Yes ☐ No ☐

9. If yes, how was the extra liquid disposed of?
   ……
   ……..

SECTION 4: OTHER INTERVENTIONS

1 Are there mosquito nets used in this house? Yes ☐ No ☐
(If yes, proceed to the next question. If no proceed to section 4)

2 What type of nets do you have?
- Untreated Net
- Locally Treated Net (ITN)
- Long-Lasting Insecticide Treated Net (LLIN)
- Don't Know

3 Has the net/nets been treated with chemicals to kill mosquitoes?
- Yes
- No
- Don't know

4 When were nets treated?

- <1 month
- >3 years
- Don't know

SECTION 5: KNOWLEDGE

(a) Malaria knowledge

1 Have you ever heard of an illness called malaria?

Yes ☐ No ☐

2 Can you tell me the main signs or symptoms of malaria?

Multiple responses, Probe once (Anything else?)

- Fever
- Feeling cold
- Headache
- Nausea and vomiting
- Diarrhea
- Dizziness
- Loss of appetite
- Body ache or joint pain
- Pale eyes
- Salty tasting palms
- Body weakness
- Refusing to eat or drink
- Other (specify)

  …….

  ……
- Don't know

3 In your opinion, what causes malaria?

Multiple responses, Probe once (Anything else?)

- Mosquito bites
- Eating immature sugarcane
- Eating cold nshima
- Eating other dirty food
- Drinking dirty water

- Getting soaked with rain
- Cold or changing weather
- Witchcraft
- Other (specify)

  …….
- Don't know

4 How can someone protect themselves against malaria?

Multiple responses, Probe once (Anything else?)

- Sleep under a mosquito net
- Sleep under a insecticide treated mosquito net
- Use mosquito repellant
- Avoid mosquito bites
- Take preventive medication
- Spray house with insecticide
- Use mosquito coils
- Cut the grass around the house
- Fill in puddles (stagnant water)
- Keep house surroundings clean
- Burn leaves
- Don't drink dirty water
- Don't eat bad food (immature sugarcane/leftover food)
- Put mosquito screens on the windows
- Don't get soaked with rain
- Other(specify)

  …….

- Don't know

5 What are the danger signs and symptoms of malaria?

Multiple responses, Probe once (Anything else?)

- Seizure / convulsions
- Goes unconscious
- Any fever
- Very high fever
- Stiff neck
- Weakness
- Not active
- Chills/shivering
- Vomiting

- Fainting
- Crying all the time
- Restless, won't stay still
- Diarrhoea
- Other (specify)
  …….

- Don't know

(b) IRS knowledge

1 The last time your house was sprayed, who did the spraying?
……

2 Do you know what chemical was used? Yes ☐ No ☐

3 If yes, what was the chemical used?

……...……

4 What chemicals are used in IRS?
……
……

5 What are the benefits of IRS?
……
……

(c) IEC knowledge

1 In the <u>last 12 months (year)</u> have you seen or heard anything about IRS? Yes ☐ No ☐

2 If yes, where did you see or hear this information in the last 12 months?
……..

……

3 What are the words, images, and ideas that you remember from what you saw or heard in the last 12 months about IRS

……
……

SECTION 6: COMMUNITY PARTICIPATION

1 Are you aware of any community activities that are conducted related to indoor residual spraying? Yes ☐ No ☐

2 If yes, please list the activities
……
……

3 Are you involved in any of the listed activities?

Yes ☐ No ☐

4 If yes which one?
……..

5 In what ways are you involved in IRS?
……..

SECTION 7: CONCLUSION

Thank you for taking part in the research, please know that the responses that you have given are highly appreciated and you have contributed tremendously to finding the solution to the problem of low coverage of IRS.

END

Appendix 4: Approval from the Research Ethics Committee

THE UNIVERSITY OF ZAMBIA

BIOMEDICAL RESEARCH ETHICS COMMITTEE

Telephone: 260-1-256067
Telegrams: UNZA, LUSAKA
Telex: UNZALU ZA 44370
Fax: + 260-1-250753
E-mail: unzarec@zamtel.zm
Assurance No. FWA00000338
IRB00001131 of IORG0000774

Ridgeway Campus
P.O. Box 50110
Lusaka, Zambia

22 February, 2008
Ref.: 012-01-08

Ms Annie Banda
Department of Community Medicine
School of Medicine
University of Zambia
LUSAKA

Dear Ms Annie Banda,

RE: RESEARCH PROPOSAL: **"FACTORS INFLUENCING LOW INDOOR RESIDUAL SPRAYING (IRS) COVERAGE IN LUSAKA'S MTENDERE, MATERO AND KANYAMA COMPOUNDS"**

The above research proposal was presented to the Research Ethics Committee Secretariat meeting held on 21 January, 2008, where changes were recommended. We would like to acknowledge receipt of the corrected version with clarifications. The proposal has now been approved.

CONDITIONS:

- This approval is based strictly on your submitted proposal. Should there be need for you to modify or change the study design or methodology, you will need to seek clearance from the Research Ethics Committee.
- If you have need for further clarification please consult this office. Please note that it is mandatory that you submit a detailed progress report of your study to this Committee every six months and a final copy of your report at the end of the study.
- Any serious adverse events must be reported at once to this Committee.

Yours sincerely,

Dr E. Munalula Nkandu, BSc (Hons), MSc, PgD R/Ethics, PhD
CHAIRPERSON

Date of approval: **22 February, 2008** Date of expiry: **21 February, 2009**

Appendix 5: Permission from LUDHMT to collect data from the Health Centres and their coverage areas

P.O. Box 50827
Lusaka
Tel: +260-1-235554
Fax: +260-1-236429

In reply please quote
No.....

Republic of Zambia

MINISTRY OF HEALTH
LUSAKA DISTRICT HEALTH MANAGEMENT TEAM

28 December 2007

Ms A Banda
Department of Community Medicine
School of Medicine
P O Box 50110
LUSAKA

Dear Ms Banda

RE: REQUEST TO CONDUCT STUDY ON "FACTORS INFLUENCING LOW INDOOR RESIDUAL SPRAYING COVERAGE IN LUSAKA'S MTENDERE, KANYAMA AND MATERO COMPOUNDS"

I wish to acknowledge with thanks receipt of your letter seeking permission to conduct the above stated study as well as the summary of your proposed study.

Management has approved your request. You are advised to report to Mtendere, Kanyama and Matero Reference who will link you up with the Neighbourhood Health committee Chairpersons. These are our link persons with Community and hence should be able to assist you accordingly. Lusaka DHMT will also expect a copy of your findings once your study is completed

Wishing you luck.

Thank you.

Yours faithfully

DR C MBWILI-MULEYA
MANAGER PLANNING AND DEVELOPMENT
for/DISTRICT DIRECTOR OF HEALTH