ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES

Assessment of community response to indoor residual spraying for malaria prevention and factors influencing its acceptance in Lume District, East Shewa zone of Oromia Region:

A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES OF ADDIS ABABA UNIVERSITY IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF PUBLIC HEALTH

BY

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Abbreviations

AAU.....Addis Ababa University

AOR.....Adjusted Odds Ratio

asl.....above sea level

CDC.....Center for Disease prevention and Control

CI.....Confidence Interval

DDT.....Diethyl Dimethyl Trichloro-ethane

Epi-info.....Epidemiological information

FGD.....Focus Group Discussion

GFATM.....Global Fund to fight AIDS, TB and Malaria

IEC.....Information Education and Communication

IRS.....Indoor Residual Spraying

ITNs.....Insecticide Treated Nets

LLINs.....Long Lasting Insecticidal Nets

OR.....Odds Ratio

PMI.....President's Malaria Initiative

RBM.....Roll Back Malaria

RTI.....Research Triangle Institute

SNNPR.....Southern Nations, Nationalities and People's Region

SPSS.....Statistical Package for Social Science

WHO.....World Health Organization

Abstract

Background: Indoor residual spraying was a long standing malaria prevention and control strategy in the world. In Ethiopia, it was initiated in 1959 with the global malaria eradication campaign. This intervention is still one of the pillar malaria prevention and control strategies in the country. However, the acceptance of the intervention by the community is becoming a challenge.

Objectives: The aims of this study were to assess the knowledge and perception of the community about malaria in general and vector control methods focusing on indoor residual spraying in particular, factors that affect its acceptance by the community, and finally to determine re-plastering rate after IRS.

Methods: A community-based cross-sectional study was conducted using interviewer-administered questionnaire. The study was conducted during March-April 2010 in Lume district, Oromia region central eastern part of Ethiopia. 807 house holds were selected from these 6 kebeles by systematic random sampling technique using proportional allocation to size. Focus group discussions (FGDs) and in-depth interviews were also held to supplement the quantitative data. The quantitative data was managed by Epi-info version 6 and SPSS version 11 statistical softwares.

Results: From 776 respondents, 87% of them have at least heard about malaria (called “busa” in their local language. One of the typical sign of malaria i.e. “Fever” was mentioned as sign of malaria by only 41% of the respondents. Mosquito bite was mentioned as a factor for malaria transmission by about 80% of the respondents. Respondents who can read and write including those attended formal education were found 1.65 times more likely of making their house to be sprayed than those who can’t read and write [AOR=1.62, 95% CI: (1.05-2.49)]. Households that have heard the announcement were found six times more likely of making their house to be sprayed than those who don’t [AOR=6.5, 95% CI: (2.92-14.46)]. Households that perceived increment of nuisance annoyance were found five times more likely of re-plastering the sprayed wall than those who perceived the decrement [AOR=4.98, 95% CI: (1.97-12.62)]. In general, of the 100% targeted households, more than 16% were left unsprayed; among the sprayed ones about 7% were not willing; and more than 20% have re-plastered the sprayed walls with in few days of spray.

Conclusions: This study revealed that there is lack of knowledge on malaria prevention and control in the community. Communicating the community about what is going to be done in certain period regarding the intervention was seen to have an impact on the performance. The study also indicated that there is a serious concern regarding the side action of the chemical particularly DDT on house nuisances that the hard science should address besides to checking its efficacy on mosquito.

1. Introduction

1.1. Background

Malaria is a major public health problem, killing at least one million people each year, mostly in Sub-Saharan Africa (SSA) (1). Ethiopia, being part of the Sub-Saharan Africa region, shares substantial burden of the disease. About 75% of the landmass of the country is suitable for malaria transmission and more than 68% of the population resides in these areas. In non-epidemic years, about 4 to 5 million malaria cases are seen annually. The transmission pattern of the disease in Ethiopia is unstable and varies from season to season and characterized by frequent and often large-scale epidemics occurring every five to eight years (2).

The malaria control strategies in Ethiopia comprise early diagnosis and prompt treatment, selective vector control, and epidemic prevention and control. Indoor residual spraying (IRS) is one of the major vector control strategies designed to fight against malaria (3). This intervention was the pillar of the previous malaria eradication and control attempt; it had substantially contributed in the reduction of malaria burden in many Western countries. Ethiopia has more than four decades experience of using IRS for malaria prevention and still using this intervention as a major tool for malaria epidemic prevention and control. According to the National Strategic Plan(2006-10) , each year, more than 1 million houses are being sprayed in about 5,000 malarious localities in the country protecting more than five million people against malaria epidemics (2).

In Ethiopia, the IRS coverage attained up to the year 2007 was less than 30% (4). Because of the support from the President's Malaria Initiative (PMI), it has been scaled up to 60 % (5). A study that evaluates the efficacy of DDT on mosquito was done at national level and came up with a shocking result. Though the result was not published and disseminated, the preliminary results showed that mosquitoes have developed an absolute resistance to DDT (6). Though there was an indication of deltamethrine resistance in the above mentioned study, this chemical is decided to be the major insecticide to be used for the next spray season. Challenges and limitations to IRS identified in the national strategic plan include the timing and quality of IRS, development of resistance in vector populations, limited funds for insecticides, pumps and spare parts, vehicles and operational funds, refusal, low acceptance of the intervention by the community, and environmental compliance (2) .

In line with the scale up of anti-malarial interventions at global and national levels, malaria in Africa and Ethiopia is anticipated to be eliminated by the year 2020.

The World Health Organization (WHO) in 2008 has communicated the reconsideration of malaria elimination issue 40 years after the cease of malaria eradication attempt (7). The organization also stated that IRS remains useful in the control and prevention of epidemics, for limited periods provided that it can be applied at the right time and its effectiveness can be maintained.

1.2. Rationale of the Study

The primary purposes of IRS towards curtailing malaria transmission are: i) to reduce the life span of vector mosquitoes so that they can no longer transmit malaria parasites from one person to another, and ii) to reduce the density of the vector mosquitoes. To be effective as a community control measure IRS requires coverage of at least 80% of houses so that the majority of mosquitoes are exposed to the insecticide(8).

Community acceptance is key in ensuring high coverage with IRS. Repeated spraying of houses commonly generates fatigue and refusal by householders. Reduced acceptability has been an impediment to effective IRS implementation in various parts of the world. Malaria control programmes have been compromised in a number of countries when the insecticide used is not acceptable to the householders because of unsightly insecticide deposit on walls or furnishings or because of unpleasant odour. Sometimes householders clean unsightly insecticide deposits from the walls after spraying and thus seriously impair the effectiveness of the vector control program (9).

Control of nuisance household pests is an additional important factor in achieving the spray coverage necessary to control malaria. Refusal of householders to accept spraying is common where the insecticide used for control of malaria vector is not effective against pests which are more noticeable to the householders, and perceived to be more important than mosquitoes, such as cockroaches and more especially bedbugs (9).

The rise of public refusal to IRS using DDT is the major reason of the initiation of the study (4). Although there are few studies that tried to address IRS while assessing community knowledge, attitude and practice with regard to malaria prevention and control, there has been no focused study to measure the level of acceptability of this particular intervention by the community and factors influencing it. Factors that affect its acceptance must be identified so that interventions preferred by

the community are planned and implemented. The findings are useful for monitoring and evaluation of the continued use of IRS.

2. Literature review

2.1. Malaria burden and the control program

According to the World Health Organization (WHO) 2008 report, malaria is endemic in 109 countries in tropical and sub-tropical countries spanning around all continents except Antarctica and Australia with a varying degree of intensity from place to place and from time to time (10). Each year the global incidence of malaria is estimated at 350-500 million clinical cases and malaria mortality ranges between 1.5 and 3 million (11).

The effect of malaria is predominantly pronounced in poorer countries especially SSA which accounts for 80% of today's global malaria (12). The rise in the global burden of malaria particularly in Africa has been attributed to several causes. Resistance of the parasite to the anti-malarial drugs and of the vector to the insecticide has played significant role in African region (13).

In Ethiopia, malaria transmission is generally determined by altitude and climate. Consequently, the country is stratified in to four major eco-epidemiological divisions. The first stratum encompasses areas above 2500 meters above sea levels (asl) that are free of malaria. Areas between 1500m and 2500m asl form the second stratum and are described as highland fringe areas that frequently face malaria epidemics. Seasonal pattern of malaria that often occurs in lowland areas below 1500m asl forms the third stratum. The fourth eco-epidemiological category of malaria in relation to altitude is stable malaria areas characterized by all year round transmission confined to areas like Gambela region (13).

Plasmodium falciparum is the dominant parasite species (60%) in Ethiopia. Although there is a problem of keeping a record to have a comprehensive morbidity and mortality data, two and three years before, malaria was the first cause of health center and hospital admission and death (14). Community-based studies also showed the presence of high proportion of death attributed to malaria (15). The 2007 report of the Ministry of Health indicated malaria to be on the 6^{th} rank of out patient consultations (16).

Apart from its health impact, malaria has got an implication on the socioeconomic development of the country. Since its major transmission period coincides with peak agricultural activities such as

harvesting and ploughing, malaria plays a negative role on productivity. Furthermore, as the major malaria transmission season of Ethiopia overlap with the students' enrolment to school, malaria has considerable role of increasing absenteeism from school especially when it occurs in epidemic forms.

Ethiopia was part of the malaria eradication program of the 1950's, the control program of the 1970's and the country is still striving to combat the disease through international initiatives like Roll Back Malaria (RBM), Global Fund to fight AIDS, TB and Malaria (GFATM) and President's Malaria Initiative (PMI), by using the prevention and control strategies discussed below.

Early diagnosis and prompt treatment

Early diagnosis and prompt treatment with effective antimalarials has been a cornerstone for malaria control in Ethiopia. Prompt and effective treatment of malaria saves lives through reducing the duration of the disease and its harmful effects on human life (13). Especially after the introduction of arthemeter-lumefantrine in 2004, a drug that has potential of clearing gamete stage ***Plasmodium falciparum*** parasites from circulating blood, this strategy is playing a very important role of blocking further transmission in addition to treatment of sick persons. The WHO recommends malaria cases to be diagnosed and treated with in 24 hours after onset of fever (17). In Ethiopia, the deployment of health extension workers at kebele level with supporting diagnostic tools such as rapid diagnostic tool (RDT), and effective antimalarial drugs has contributed in reducing morbidity and mortality due to malaria.

Prevention and control of malaria epidemics

Because of the unstable nature of malaria transmission in Ethiopia, many parts of the country have been frequently affected by malaria epidemics. Most of malaria transmission in Ethiopia occurs between September and December after the main rainy season from June to August. Certain areas, largely in the eastern part of the country including parts of Oromia region experience a second transmission period from April to May following a short rainy season from February to March. The western, central and eastern highlands, as well as highland-fringe areas along the rift valley are especially vulnerable to epidemic out breaks. In the past two decades, about 48 'epidemic episodes' occurred between 1986 and 1993 with sever outbreaks occurring in 1988,1991,1992,1998,2003, 2004 and 2005 (5).

Environmental management

Environmental management involves the modification of the environment to make it unfavorable for the vectors to breed. Implementation of this strategy through community participation has been found to be effective vector control in areas of defined breeding sites particularly in urban and semi-urban areas, development project, camps and aggregated communities. Clearing water bodies, filling and leveling burrow pits, abandoning undesired materials that could contain water are some of the activities performed in Ethiopia. This strategy is advantageous due to the fact that it is generally easy to apply and can be done by the communities themselves, it can be applied anywhere, where breeding sites are well defined, limited in number and accessible (18). However, this component of this component of vector control strategy has been minimized after the advent of ITNs (13).

Insecticide treated nets (ITNs)

Since 2005, approximately 20 million long-lasting insecticidal nets (LLINs) have been distributed to about 10 million households nationwide with a support from the GFATM, including 6.5 million LLINs in Oromia. A Malaria Indicator Survey (MIS) in 2007 indicated that the distribution of LLINs since 2005 significantly increased LLIN coverage in Ethiopia (5). In just three years, Ethiopia went from a household ITN coverage of less than 6% to almost 70% in intervention-targeted, malarious areas, a coverage figure only surpassed by Togo and Sierra Leone in sub-Saharan Africa (5).

The efficacy and effectiveness of LLINs to prevent malaria depends on their appropriate utilization than possession. While the rapid scale-up in LLIN distribution has been impressive, Ethiopia does not have a tradition of net use. A comprehensive IEC/BCC approach is required to improve and maintain appropriate use. The 2007 MIS showed moderate utilization of LLINs at altitudes <2000m asl, 60.1% of children in houses that owned at least one ITN slept under one the previous night; similarly, at altitudes <2000m, 65.7% of pregnant women in houses that owned at least one ITN slept under one the previous night (19). To date, efforts to improve usage have employed a mix of communication channels including mass communications (particularly radio), print media, inter-personal and participatory communication methods (5).

Indoor residual spraying

IRS using DDT has been one of the main malaria vector control options in Ethiopia. Its application has significantly reduced the incidence of malaria to near zero in regions where malaria was endemic (20); for instance, many European countries and North America eliminated malaria during the 1950's malaria eradication campaign; and the intervention is still playing a major role in controlling malaria (4).

DDT was preferred for malaria control than other insecticides because of its reasonable cost, longer persistency on the sprayed wall, and safety. Nevertheless, there were groups that complain about its use from environmental protection point of view. The WHO in 2006 revealed its stand that DDT to be the better available insecticide for malaria control (21, 22). DDT was introduced to the country during the malaria eradication attempt of the 1950's (4); and it is still under usage.

However, in Ethiopia, there are issues being raised with regard to the application of IRS in general and the use of DDT for spraying in particular (22). As mentioned on the national vector control guideline, there are concerns in relation to insecticide resistance, low coverage of the targeted areas and the decline of the acceptance of the IRS by the community (2). The challenges mentioned in the national strategic plan holds true in Oromia region as well. Although many of the problems related to IRS application are related to scarcity of resources , ensuring the community acceptance of the intervention even after strong Information Education and Communication has remained a challenge (5).

Pertaining to the insecticide resistance in Ethiopia, a study showed DDT resistance to be within the range of 20-30% (6). The results from the MIS showed the IRS coverage for the targeted areas to be less than 30 % (19). According to the recommendation of the WHO, if the spray coverage falls below 80% in a certain targeted locality, not only the householders in the unsprayed houses but also those in the sprayed ones will be at risk of malaria infection (22). CDC also recommends a minimum spraying coverage of 70% (23).

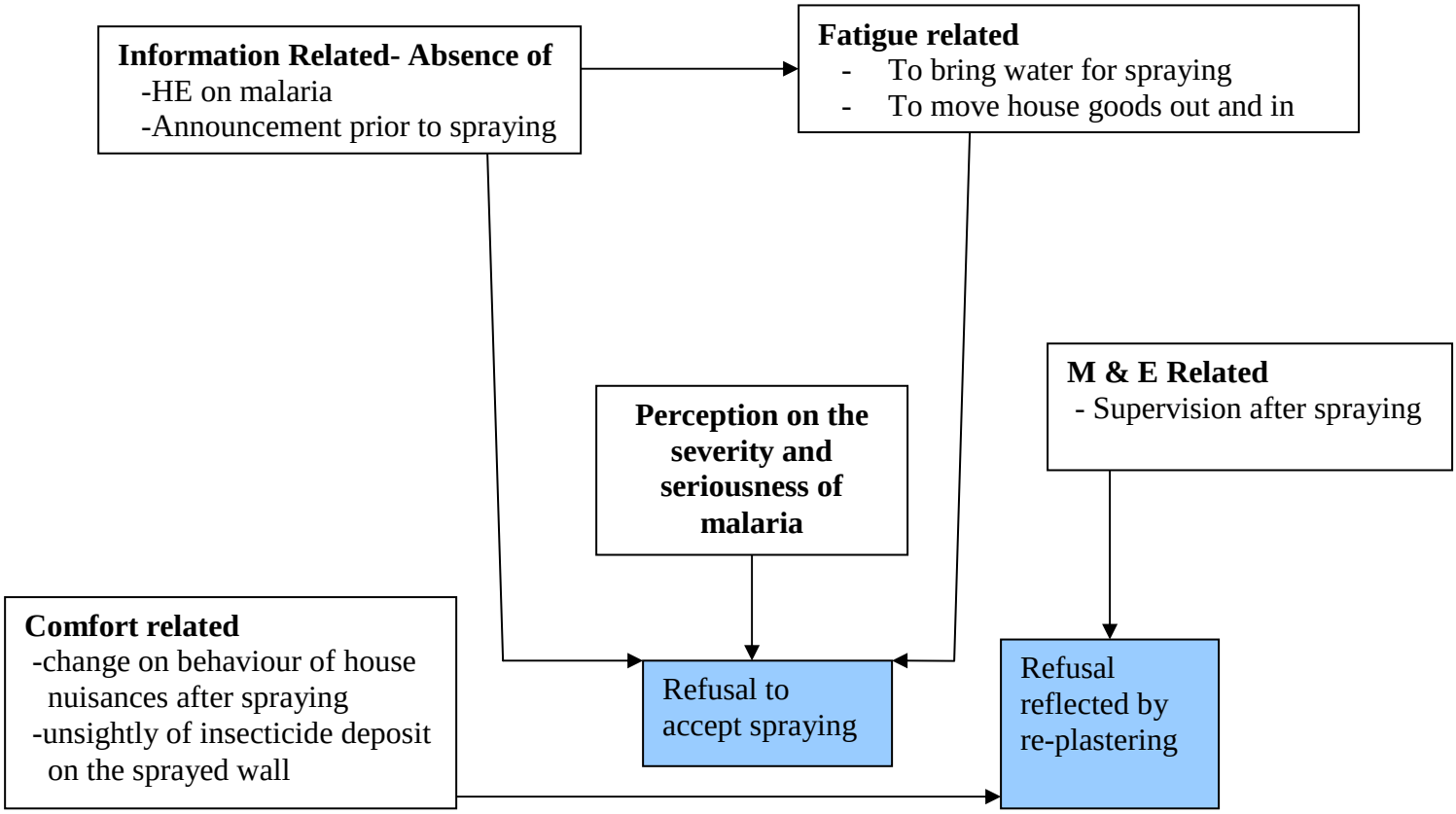
Though we don't have a study directly done to measure the community acceptance of IRS, the Ethiopian Demographic and Health Survey (DHS)-2005 has tried to address the issue by taking re-plastering rate as a proxy indicator (24). The result from this survey indicated the presence of high

re-plastering rate. Among houses found in areas less than 2000 meter above sea level, which are likely to be malarious and IRS targeted, less than 20% of them had a white powder on their walls that show staining of DDT. The survey also tried to compare the four big regions Tigray, Amhara, SNNPR and Oromia. The results of the comparison revealed Oromiya region to have the lowest (about 15%) DDT stained houses than other regions (24).

Re-plastering was a challenge even during the eradication campaign. People were doing so because of the reason that DDT irritates other house nuisances like bed bugs and flees but do not kill them (25). A study done in south Africa also identified problems related to the use of IRS (26).

Therefore, low acceptance of IRS by the community which is being reflected by high rates of refusals during the spray period and re-plastering soon after the spraying should not be overlooked. A lot of studies have been done to ensure community involvement with regard to malaria prevention and control (27). We know that IRS is mainly for prevention. Prevention interventions by their nature are not so impressive to be enacted. In our community, not only prevention, treatment seeking after sickness by it self is a challenge (28).

Conceptual framework



3. Objectives

3.1. General Objective

To assess the knowledge, attitude and practice of the community on malaria prevention interventions particularly on IRS and identify factors that influence the community's acceptance of indoor house spraying.

3.2. Specific Objectives

1. To describe attitudes and practices of the community towards the use of vector control measures particularly IRS
2. To assess the knowledge and perception of the community about malaria and its prevention
3. To identify factors that influence the acceptance and use of IRS by the community
4. To determine re-plastering rates after implementation of IRS

4. Methods

4.1. Study area

This study was conducted in Lume district of East Shewa zone in Oromia region. Oromia region accounts for one-third of the landmass and population size of Ethiopia. Because of its location in the Great Rift Valley of Ethiopia, East Shewa zone contributes the highest malaria burden than all zones in Oromia region. Lume is one of the 12 districts in the zone. The administrative town of the district, Mojo, is located at about 70 km east of Addis Ababa. According to the 2007 national population census, the total population of the district is 116,501; with 51% males and 49% females (29). There are 3 health centers including nucleus health centers, 1 health station, 36 health posts, and more than 6 private clinics making the potential health service coverage of the district to be nearly 90.4 % in 2007/08.

Malaria is the major public health problem in the district. Among 38 kebeles in the district, 28 are endemic for malaria transmission and 18 are targeted for IRS. In non epidemic years, the malaria proportion among the total disease burden ranges between 10 to 15% but during malaria epidemic years, the malaria burden reaches up to 25% of the district's disease burden.

From the total of 12 districts in East Shewa zone, Lume district has the highest refusal rate (35%) in the last two fiscal year performance of DDT spraying (30). Because of the well organized IEC/BCC activity, sufficient fund and facility for the spraying, Zones that are under the USAID/PMI project are expected to cover high proportion of the IRS targeted households than other government fund dependent ones. Despite all the assistance, the anticipated coverage was not achieved because of high community resistance of DDT spraying (30). This was the reason that impressed the researcher to conduct this study in this particular district.

4.2. Source population

Households in malarias area that live in IRS targeted kebeles of Lume District.

4.3. Study population

The study population included all selected households in the six kebeles that are randomly selected out of eighteen IRS targeted kebeles.

4.4. Study design

This study used a community-based cross-sectional design with both quantitative and qualitative research methods from April to May 2010.

4.5. Sample size calculations

Using the formula of single population proportion, the total sample size required for the study was calculated as

$$n = \frac{(z_{\alpha/2})^2 \cdot pq}{d^2}$$

Where ***n*****=** the sample size $Z^{\alpha 1}/2 = 1.96$

P= estimated proportion of households that at least accept and utilize indoor residual spraying=50% (assumed)

q=estimated proportion of the avoiders of the intervention=50%

d=margin of error=5%

Therefore $n = \frac{(1.96)^2 x 0.5 x 0.5}{(0.05)^2} = 384$

However, the study used multi-stage sampling and the design effect of this sampling technique was taken in to account by multiplying the calculated sample size by a factor of two. Furthermore, 5% was added for the assumed non-response.

Finally, the total sample size required for the quantitative part of the study was found to be

$= (384x2) + ((0.05)(384x2))$

$= 807$

To complement this study with qualitative research method, that may help to reveal any ambiguities, 3FGDs, and two key informant interviews were conducted with program coordinators, senior malaria resource persons and community leaders.

4.6. Sampling procedures

From the 18 total targeted kebeles for IRS by the District Health Office, six kebeles were randomly selected to be included in the study. The number of study kebeles was limited to six just to save resource. Then, the total sample size was allocated to the selected kebeles proportional to their household size**.** Finally, households in the respective selected kebeles were selected by systematic random sampling. The first household was selected by lottery method from the result obtained by the division of the total households in the selected kebeles by the share of the kebeles. The head of the households or their representatives were interviewed for knowledge, attitude and practice of prevention and control of malaria. Household heads and/or representatives were involved in two focus group discussions (FGDs) to share their perception on malaria prevention. Senior malaria experts were also involved in the third focus group discussion. Two in-depth interviews were also conducted with malaria focal persons of Lume district and East Shewa zone. The schematic representation of the sampling techniques is presented in Figure1.

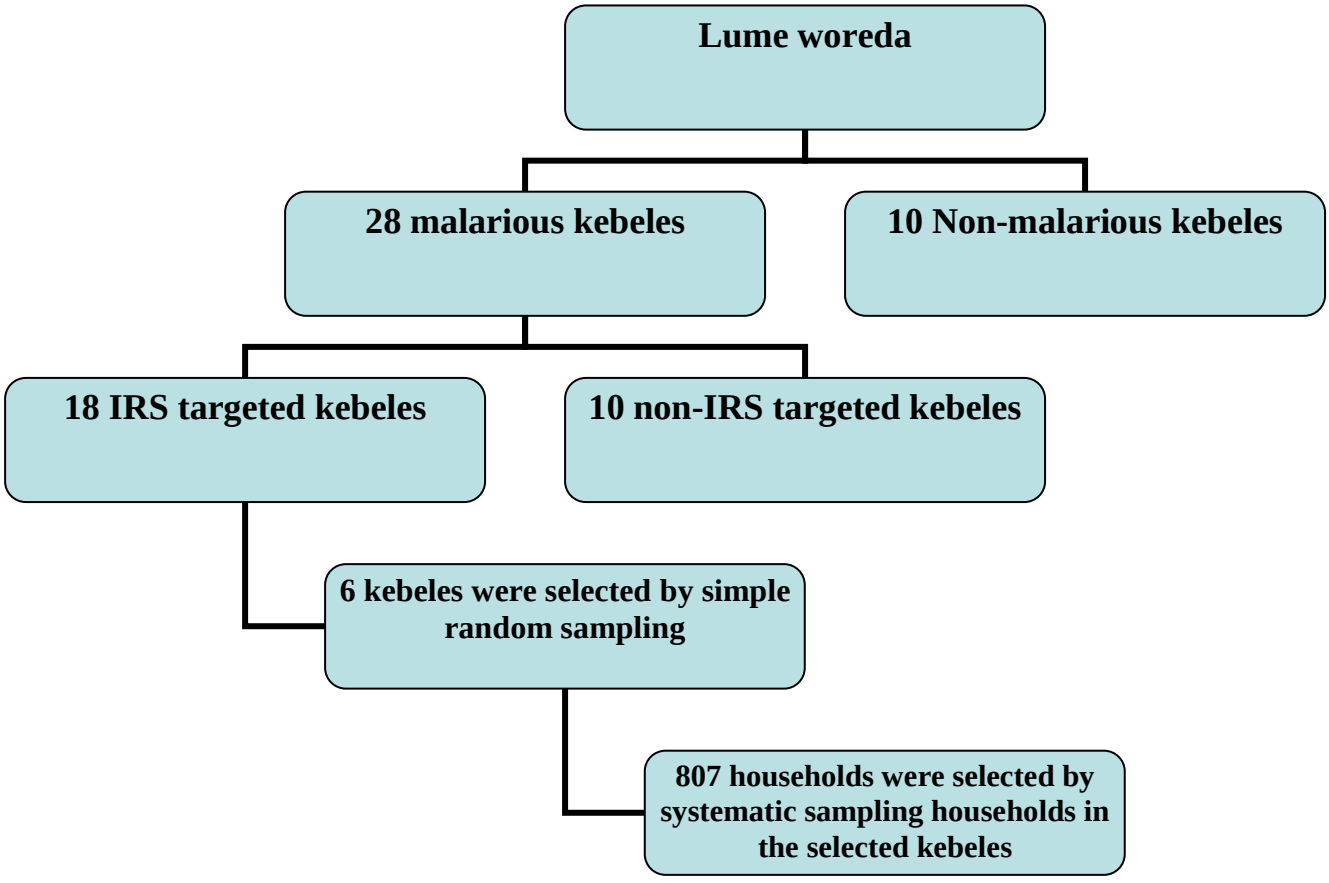


Fig 1. Schematic presentation of sampling procedure Lume District, Oromia region, 2010

4.7. Data collection

For the quantitative part of the study, structured questionnaire was prepared first in English and then translated into Afan Oromo. The latter version was back translated to English, to ensure its consistency. Both versions of the questionnaire are annexed (An. III and IV). The main section of the questionnaire is the one that directly focused on IRS (part IV). Twelve's-grade complete data collectors were recruited from the respective selected kebeles and received two days training on the questionnaires, interviewing techniques, household and the right respondent identification. The training included lectures, demonstrations and role-plays. Then, the questionnaire was pre-tested in another similar kebele using 5% of the sample size and questions that were difficult to respond were rephrased. The pre-testing also helped to identify inconsistencies, ambiguities and exhaustiveness about the questionnaire. All interviews were done in Afan Oromo. The data was collected on first week of April 2010.

4.7.1. Variables:

. Dependent Variables

- Spray status of the house
    - Sprayed or not
    - Re-plastered or not

. Independent Variables

- Socio-demographic and economic characteristics
    - Age and Sex of the respondent
    - Educational status
    - Religion
    - Ethnic group
    - Marital status
    - Occupation and estimated income
- Health Information
    - Knowledge about malaria and its prevention
    - Experience of the family in one month regarding malaria
    - Experience of IEC in relation to malaria particularly IRS
    - Insecticide preference of the family
    - Presence of supervision after the spraying operation.

4.7.2 Inclusion / exclusion criteria

- >18 years old respondents were considered for the study.
- Candidates were exempted for any one or more of the following reasons:
    - Unwillingness to participate in the study,
    - Serious medical condition at the time of survey.

4.7.3. Operational Definitions

Indoor Residual Spraying- is the application of long-acting chemical insecticides with a residual effect on the walls and roofs of all houses and domestic animal shelters in a given area, in order to kill the adult vector mosquitoes that land and rest on these surfaces.

Re-plastering- is the act of covering insecticide sprayed walls with mud, dung or paint by householders before the end of malaria transmission season for different reasons, like to avoid perceived increment of house nuisances, to redecorate their houses for holydays or remove the unsightly deposited insecticide on the walls.

Insecticide spraying season: is a time assigned for insecticide spraying ahead of the arrival of malaria transmission season, but calculated to maintain the efficacy of the insecticide sprayed up to the end of malaria transmission season of that particular place.

Kebele: The lowest administrative government structure, that ideally comprise of about five hundred to one thousand households, in Ethiopia.

4.8. Data Quality Management

Two supervisors including the principal investigator were involved in the overall coordination, supervision and maintain the data quality. Completeness, accuracy and consistency of the collected data were checked and corrected on daily bases by supervisors. With regard to the qualitative method, unstructured discussion guide was developed containing important points to explore the perception of the people towards malaria control in general and indoor residual spraying in particular (Annex-III). An in-depth interview was also conducted with the malaria team in the Woreda Heath Office, and Zonal Health Department.

4.9. Data processing and analysis

Epi-info version 6 and SPSS 11.0 windows statistical software applications were used for data entry and analysis, respectively. Data were cleaned, edited and coded before data entry and then decoded after analysis for interpretation. Descriptive statistics (frequency tables, median, range...) and for the comparison and analysis of categorical variables, Chi-Squared tests have been used. Odds ratio for different characteristics for the two anticipated groups; i.e. those who welcomingly utilize IRS and those who resist was calculated. Logistic regression was used to control confounders and see the net effect of the intended variable. Findings at P value of 5% and confidence interval at 95% were accepted as statistically significant.

4.10. Ethical considerations

Ethical approval and clearance for this study was obtained from the Institutional Review Board of the Faculty of Medicine at Addis Ababa University. By presenting this clearance, permission was obtained from Oromia Regional Health Bureau, East Shewa Zonal Health Department and Lume District Health Office. Authorized letter was also written from the District Health Office to the respective study kebeles for their co-operation. Information sheet that briefly describe the objective of the study and consent form was prepared in English and translated to Afan Oromo (An. I and II). The interviewers have already been trained on the way of approaching the respondents respectfully and treat in ethically sound manner whether they want to involve or not. This information was read to the heads of the household or their representatives in Afan Oromo by the data collectors and verbal consent was obtained from each respondent before data collection was started. Information obtained from individual respondents was anonymous to keep confidentiality and used only for the analysis of this particular study.

4.11. Dissemination of results

The results of the study will be publicly defended at the School of Public Health at Addis Ababa University. Copies of the thesis will be distributed to Lume District Health Office, and Oromia Regional Health Bureau. The findings will also be communicated on different opportunities that will be created at National and International conferences and finally published on national and international journals.

5. Results

5.1 Quantitative method

5.1.1 Socio-demographic characteristics of the respondents

A total of 807 households were visited through house-to-house visits in 6 kebeles. However, 15 (1.86%) houses were locked, and there were no eligible respondents in 12 (1.49%) houses and 4 (0.5%) householders refused to participate in the study. Overall, 776 households participated in the study representing a response rate of 96%. From the total households surveyed, 37 (4.8%) pregnant mothers were found. Table 1 summarizes the socio-demographic characteristics of the study participants by sex. About 44% of the respondents were females. The mean (± SD) age of the respondents was 35.6 ±15.1 years. The median age of the respondents was 32 years, ranging from 18 to 82. About 40 % of the respondents were heads of the households. Majority of the respondents were married (70%). The predominant religion of the respondents was Orthodox Christian (83.1%); followed by *Wakefeta* (10%). Oromo is the dominant ethnic group among the respondents constituting about 81%). Regarding educational status, more than half of the respondents (57.1%) can at least read and write during the survey period. About 66% of the respondents were farmers (Table 1).

Table 1: Socio-demographic profile of the survey participants, Lume District, Oromia, April 2010

Characteristics		Sex					
		Female, n (%)		Male, n (%)		Total, n (%)	
Age in years							
	18-25	122	(35.47)	146	(33.80)	268	(34.54)
	26-35	81	(23.55)	103	(23.84)	184	(23.71)
	36-45	65	(18.90)	78	(18.06)	143	(18.43)
	46-65	63	(18.31)	87	(20.14)	150	(19.33)
	>66	13	(3.78)	18	(4.17)	31	(3.99)
Ethnicity							
	Oromo	269	(78.20)	363	(84.03)	632	(81.44)
	Amhara	71	(20.64)	66	(15.28)	137	(17.65)
	Gurage	3	(0.87)	2	(0.46)	5	(0.64)
	Tigre	1	(0.29)	1	(0.23)	2	(0.26)
Educational status							
	Can't read and write	192	(55.81)	141	(32.64)	333	(42.91)
	Can read and write	27	(7.85)	61	(14.12)	88	(11.34)
	Grade 1-4	35	(10.17)	66	(15.28)	101	(13.02)
	Grade 5-8	50	(14.53)	79	(18.29)	129	(16.62)
	Grade9-12	36	(10.47)	75	(17.36)	111	(14.30)
	+12 and certificate	2	(0.58)	3	(0.69)	5	(0.64)
	Diploma and above	2	(0.58)	7	(1.62)	9	(1.16)
Marital status							
	Married	234	(68.02)	305	(70.60)	539	(69.46)
	Single	52	(15.12)	116	(26.85)	168	(21.65)
	Divorced	12	(3.49)	2	(0.46)	14	(1.80)
	Widowed	42	(12.21)	8	(1.85)	50	(6.44)
	Separated	4	(1.16)	1	(0.23)	5	(0.64)
Occupation							
	Farmer	226	(65.70)	285	(65.97)	511	(65.85)
	Merchant	24	(6.98)	7	(1.62)	31	(3.99)
	Government employee	5	(1.45)	20	(4.63)	25	(3.22)
	Housewife	24	(6.98)	1	(0.23)	25	(3.22)
	Student	24	(6.98)	57	(13.19)	81	(10.44)
	Daily laborer	30	(8.72)	48	(11.11)	78	(10.05)
	Unemployed	4	(1.16)	8	(1.85)	12	(1.55)
	Other	7	(2.03)	6	(1.39)	13	(1.68)
Status in the household							
	Husband	0	(0)	313	(72.45)	313	(40.34)
	Wife	290	(84.30)	0	(0)	290	(37.37)
	Representative	54	(15.70)	119	(27.55)	173	(22.29)
Religion							
	Orthodox	271	(78.78)	374	(86.57)	645	(83.12)
	Protestant	21	(6.10)	26	(6.02)	47	(6.06)
	Catholic	0	(0)	1	(0.23)	1	(0.13)
	Islam	3	(0.87)	2	(0.46)	5	(0.64)
	Wakefata	49	(14.24)	29	(6.71)	78	(10.05)
N		344	(100)	432	(100)	776	(100)

5.1.2 Knowledge and perception about malaria

About 87% of the respondents have at least heard about the disease malaria (called “Busa” in local language). For those who have heard about malaria, different questions that may help to assess their knowledge and perception about the disease were posed. As it is presented in Table 2, among those who heard about the disease, less than half of the respondents (41.0%) have mentioned “fever and headache” as a sign of malaria. The most frequently mentioned symptom of malaria was shivering and chills (58.5%). Sweating, loss of appetite and vomiting were mentioned as sign and symptoms of malaria by about 33%, 31% and 26% of the respondents, respectively. Less than 1% of the respondents among who heard about malaria answered “don’t know” regarding the sign and symptoms (Table 2).

Table 2: Frequency of signs and symptoms of malaria mentioned by respondents, Lume District, Oromia, April 2010

Sign and Symptoms of Malaria(n*=667)	Frequency	Percentage
Fever	318	41.0
Sweating	253	32.6
Chills and shivering	454	58.5
Headache	318	41.0
Vomiting	201	25.9
Loss of appetite	243	31.3
Feel thrust	200	25.8
Don’t know	20	0.8

n* number of respondents who have ever heard about malaria during the survey

- Multiple responses were possible

In response to the question related to the cause of malaria, more than 80% of the respondents mentioned mosquito bite as a factor; and less than 1% replied as “don’t know”. But significant number of respondents has additionally mentioned cold, hunger and eating of maize as a cause for malaria; which are misconceptions. With regard to knowledge of the vulnerable group, about 48% of the respondents mentioned pregnant mothers and under 5 years children to be the most vulnerable ones. Others around 28% mentioned “all” to be at equal chance of being affected.

For the question that asks about whether they have heard malaria related education in the last 12 months, about 42% of the respondents answered “yes” indicating the source as “health extension workers” and “radio” each about 24%, public meeting 16% and school 5%. Table 3 shows the answers those respondents who gained malaria related education in the last 12 months replied on ways to prevent malaria.

Table 3. Frequency of response for ways of malaria prevention by study participants in Lume District, Oromia, April 2010

Ways of malaria prevention (n*=329)	Frequency	Percent
ITNs	261	79.3
Spraying the wall by insecticide	215	65.3
Taking alcoholic drinks	193	58.7
Environmental management	162	49.2
I do not know how	32	9.7
Chemoprophylaxis	15	4.6

n* respondents who have been educated on malaria in the last 12 months

Although the majority of the respondents mentioned the main vector control options as mechanism of malaria prevention i.e. use of ITNs (79.3%) and spraying the wall by insecticide (65.3%), about 10% of the respondents could not mention any malaria prevention method. The other serious matter is the misconception observed that more than half of the respondents (58.7%) believed that malaria could be prevented by taking alcoholic drinks. About half of the respondents mentioned environmental management as a prevention mechanism. (Table 3)

As to the breeding site, most of the respondents (86.1%) mentioned rivers to be the main breading site for the mosquito. 33.6% and 15.5% of the respondents mentioned springs and lakes as breading sites respectively. Only 9% of the respondents replied “any stagnant water” as breading site for malaria transmitting mosquitoes. Perception of the respondents on seasons in a year that mosquito density increment been seen was assessed. About 70% of the respondents mentioned mosquito density to be the same throughout the year. Thirty percent of the respondents mentioned seasons following the major rainy period to be the high time of mosquito increment. A question that tries to measure perception in relation to peak biting hour of mosquitoes in a day was posed and, 68.2% of the respondents replied “sleeping hour” i.e. 10 to11PM to be the peak biting hour.

Acceptance and practice of different vector control options was asked and the response rate is presented in Table 4. The most frequently accepted vector option was found to be the use of insecticide treated nets (76.5%) and spraying the wall by insecticides (IRS) was the second most accepted strategy (72.7%). Other vector control options were mentioned with relatively low frequency; these included environmental management (44.6%), closing door and windows during evenings (33.0%), and burning cow dung and leaves to produce smoke and get rid of mosquitoes (17.8%).

Table 4. Frequency of strategies practiced by the respondents to prevent malaria transmitting mosquitoes in Lume District, Oromia, April 2010.

Methods attempted to prevent malaria (n=776)	Frequency	Percent
Use Insecticide treated net	594	76.5
Use indoor residual spraying	564	72.7
Drain stagnant water near hose	346	44.6
close door and windows during evening	256	33.0
Burn dung and leaves to smoke the house	138	17.8

As mentioned above, Bika and Ejersa Joro kebeles had chance to be sprayed two times in a single transmission season by two different kinds of insecticides; first by DDT then by Deltametrine. Taking the advantage of this missed opportunity, we have asked one direct question that may help us the community preference between these two chemicals. The result is presented in the following Figure. (Fig. 3)

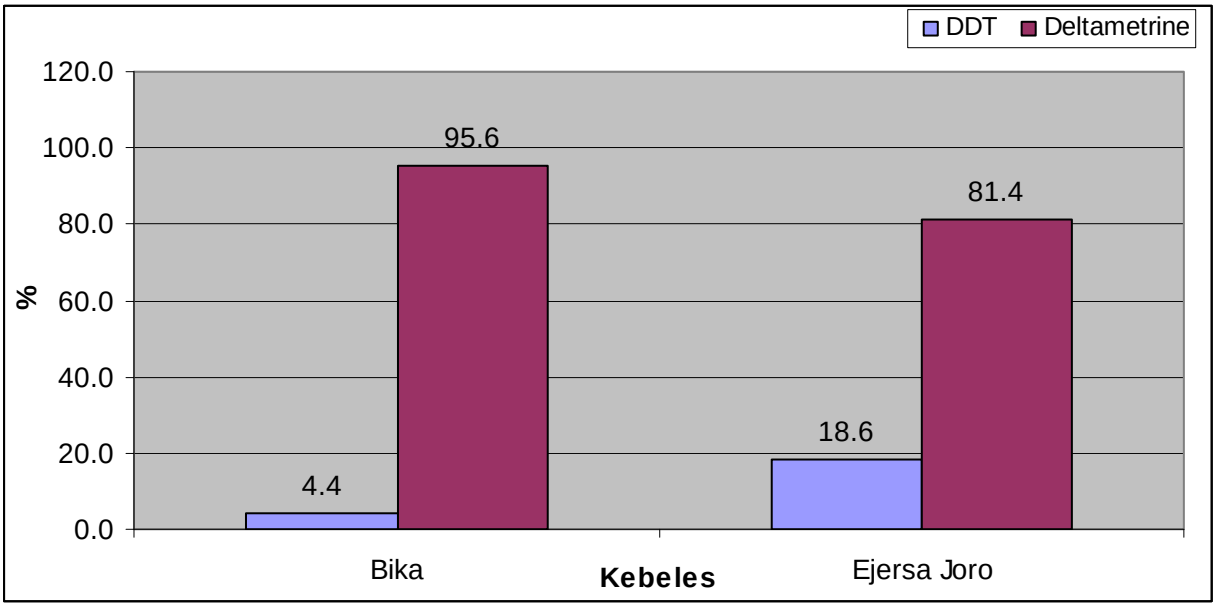


Fig. 2 Percentage of insecticide preference between DDT and Deltametrine in two kebeles of Lume District, Oromia, April 2010

More than 95% of respondents in Bika kebele and majority of the respondents (more than 80%) in Ejersa Joro kebele preferred Delthametrine more than DDT. The reason may be associated with the better perception of decrement of house nuisances after Deltametrine spraying than DDT.

In Table 5 below, questions that try to look at the services provided to the community in relation to indoor residual spraying and the feelings and practices that the community exercised were mentioned. About 16% of the respondents' houses were totally or partly unsprayed in the previous spraying season. Among respondents whose houses were sprayed, about 7 % of them were not willing; but they made their house to be sprayed to obey the law. Of areas left unsprayed in the partly sprayed houses, 38% of areas left unsprayed are walls around sleeping areas.

Table 5: Response of participants on their practice related to IRS for malaria prevention and control, Lume District, Oromia, April 2010

Characteristics	Frequency	Percent
Was your house sprayed in the last six months?(n=776)		
Yes	650	(83.8)
Partly	23	(3.0)
No	103	(13.3)
Were you willing to make your house sprayed?(n=673)		
Yes I was willing	626	(93.0)
No; I made it to obey the law	47	(7.0)
What motivated you to made your house sprayed willingly?(n=589)		
Health education I get on malaria	261	(44.3)
Experience on the disease	299	(50.8)
Other reasons	29	(4.9)
Which areas you left unsprayed?(n=52)		
Sleeping areas unsprayed	20	(38.5)
eves unsprayed	14	(26.9)
store unsprayed	10	(19.2)
animal house unsprayed	8	(15.4)
Did you re-plaster before the time you have been told ?(n=673)		
Yes	138	(20.5)
No	535	(79.5)
Was there announcement few days prior to spray date?(n= 776)		
Yes	259	(33.4)
No	499	(64.3)
Don't know	18	(2.3)
Was there health education on the spray date?(776)		
Yes	357	(46.0)
No	396	(51.0)
Don't know	23	(3.0)
Change on behavior of house nuisances after DDT spraying? (n=673)		
Yes	624	(92.7)
No	49	(7.3)
What change you noticed on disturbance level after DDT spraying?(n=624)		
Increased	491	(78.7)
Decreased	133	(21.3)
***Any change on house nuisances after deltametrine spraying? (n=195)**		
Yes	145	(74.4)
No	50	(25.6)
***What change you noticed after deltametrine spraying? (n=145)**		
Disturbance increased	3	(2.1)
Disturbance decreased	142	(97.9)
Did any body supervised the sprayed house after the operation?(n=556)		
Yes	85	(15.3)
No	471	(84.7)

* These delthametrine related questions were raised only on two kebeles that experienced it. (Bika and Ejersa joro)

About 21% of the sprayed houses were re-plastered before the completion of the transmission season. Majority (64.3%) of the households were not informed about the spraying few days prior to the operation. About half (51%) of the respondents mentioned that there was no health education provided during the spraying date. 92.7% of the respondents mentioned that there is a change on the behavior of house nuisances (like flees and bed bugs) few days after the spraying. Among participants who perceived change on house nuisances following DDT spraying, about 80% of the respondents perceived that the annoyance of such insects increased. For the question posed to know whether there was supervision made after spraying or not, 84.7% of the respondents mentioned that nobody had come to their home to see the status of the sprayed house.

Perception on disturbance level of house nuisances after deltametrine spraying was one of the questions posed to the residents in Bika and Ejersa Joro kebele. About three-fourth of the respondents noticed that there was a change on disturbance level of house nuisances; and among these almost all (97.9%) perceived that there was a decrement of the annoyance.

ITNs possession and utilization was the last question presented for the respondents. About 72% of the respondents possessed at least one ITN during the study period. However, about half of the respondents who possessed the net mentioned that nobody slept under the net on the previous night of the survey period. (Table 6)

Table 6:Frequency of ITNs possession and utilization in East Shewa zone of Lume District, Oromia, April 2010

	Frequency	Percentage
Possession of at least one ITNs during the study period		
Yes	554	71.9
No	217	28.1
Who slept under the net last night of the survey day?		
All family members	119	21.5
Father and/or mother	114	20.6
Small Children	50	9.0
Nobody	271	48.9
Color preference of ITNs		
Blue	409	54.8
Green	214	28.7
White	123	16.5
Shape preference of ITNs		
Conical	185	25.2
Rectangular	550	74.8

Respondents were also asked to mention their preference regarding color and shape of ITNs. Blue color ITNs was preferred by the majority (54.8%) of the respondents. Pertaining to the shape, rectangular ITNs was preferred by about three-fourth of the respondents.

5.1.3 Logistic regression analysis for determinants of indoor residual spraying

Bivariate analysis was done for some anticipated factors versus indoor residual spraying coverage after adjusting them with socio-demographic factors particularly by sex of the respondents. Regarding educational level, those respondents who could read and write including those attended formal education were more likely to make their house sprayed than those who couldn't read and write [Adj.OR=1.62 at 95% CI(1.05,2.49)] (Table 7)

Table 7: Comparison of different characteristics, that determine House spraying made to prevent Malaria Lume District, Oromia, April 2010

	House spray status		Crude OR (95%CI)	Adjusted OR (95%CI)
Characteristics	**Yes**	**No**		
Educational status of the respondent				
Can't read and write	268	65	1.00	1.00
Can read and write +formal education	382	61	1.52(1.04, 2.23)	1.62(1.05, 2.49)*
Health education on malaria in the last 12 months				
Yes	297	32	2.32(1.48, 3.64)	2.36(1.41,3.94)*
No	276	69	1.00	1.00
Announcement heard few days prior to spraying date				
Yes	168	7	6.0(2.76,13.52)	6.50(2.92,14.46)*
No	322	82	1.00	1.00
Walking distance to fetch water for spraying?				
Less than 15 minutes	209	27	2.22(1.33,3.72)	2.23(1.33, 3.73)*
More than 15 minutes	167	48	1.00	1.00
Perception about house nuisances following DDT spraying				
Nuisances increase	491	79	0.56(0.30,1.10)	0.52((0.26,1.05)
Nuisances decrease	133	12	1.00	1.00

* P-value for all was considered <0.05 for significance.

The second anticipated factor was provision of health education on malaria or not. Respondents who received health education on malaria in the last 12 months were more likely to have their houses sprayed than those lacking the service [Adj. OR=2.36 at 95% CI = (1.41, 3.94)]. Making an announcement few days before the spraying date was seen to increase the spray coverage many folds. Households that heard the announcement made their houses to be sprayed six times more likely of making their house to be sprayed than those who missed the announcement [Adj.OR=6.50at 95% CI= (2.92, 14.4.6)]. Households that can bring water for the spray purpose with in short distance (<15 minutes) were found to be [Adj.OR=2.23at 95% CI (1.33, 3.73)] times likely of making their house to be sprayed than those requiring longer period (>15 minutes). Although households that perceived DDT spraying to increase annoyance of house nuisances seem to make their houses sprayed in about 50% lower attempt than those who perceived decrease of annoyance, the result was not found to be statistically significant [Adj.OR=0.52 at 95% CI (0.26, 1.05)] .

Re-plastering of the sprayed house wall before malaria transmission season was considered as one of the negative responses of the community towards the intervention. Anticipated factors that might have an effect on re-plastering rate were analyzed using bivariate analysis. (Table 8)

Table 8.Comparison of different characteristics, that determine re-plastering of houses Lume District, Oromia, April 2010

	House Re-plastering Status after spraying		**Crude OR (95%CI)**	**Adjusted OR (95%CI)**
Characteristics	**Yes**	**No**		
Educational status of the respondent (n=673)				
Can't read and write	80	239	1.00	1.00
Can read and write +formal education	58	365	2.04 (1.29,2.48)	1.81(1.16,2.83)*
Education on malaria in the last 12 months (n=648)				
Yes	48	271	0.66(0.44,0.98)	0.71(0.44,1.17)
No	70	259	1.00	1.00
Perception after DDT spraying (n=673)				
House nuisances increased	102	428	4.02(1.84,9.16)	4.98(1.97,12.62)*
House nuisances decrease	8	135	1.00	1.00
Presence of supervision after spraying (n=556)				
Yes	6	79	0.32(0.12,0.78)	0.32(0.13,0.76)*
No	91	380	1.00	1.00

*P-value for all was considered <0.05 for significance.

Educational level was the first variable assessed. Unlike the better motivation that educated groups have shown in making their house to be sprayed, these groups were found to re-plaster the sprayed walls by about 1.8 times more than those who can't read and write; 1.81(1.16,2.83) [Adj.OR=1.81 at 95% CI (1.16, 2.83)]. Regarding evaluation of the re-plastering rate in relation to getting malaria related education in one year, the crude odds shows that those who received health education were likely been seen of re-plastering by about 0.66 times less practice; but the result was found to be statistically non-significant when adjusted for some other variables [Adj.OR=0.71 at 95% CI, (0.44, 1.17)]. Perception on change of nuisances' behavior after the spraying operation was another variable examined against re-plastering rate. Households that thought increment of nuisances following spraying operation were likely been seen to re-plaster the sprayed walls about five times more of re-plastering than those who perceived decrement of nuisances disturbance [Adj. OR=4.98 at 95% CI, (1.97, 12.62]. Households that have been supervised after the spray operation were found about 30% less likely of re-plastering their house than those not been supervised [Adj. OR=0.32 at 95% CI, (0.13, 0.76)].

5.2 Qualitative findings

Two FGDs in two kebeles were conducted and about 17 household heads were participated on the two sessions. The third FGD was made with senior malaria technicians who worked for more than 30 years on malaria prevention and control. In-depth interviews were made with the malaria program coordinators of the East Shewa Zone and Lume district.

5.2.1 Focus group discussions

The discussants of the first two FGDs were residents of Bika and Ejersa- Jorroo kebeles. These two kebeles were sprayed DDT and deltametrine in the last spray season. All discussants were males and some of them were committee members who worked on community-based health activities. Participants of both kebeles recognized malarias as the major health problem of the community. Their knowledge regarding cause and way of transmission of malaria was quite good. In contrast to the result seen in the quantitative part, there was no misconception on ways of malaria prevention and control strategies. They mentioned the available vector control options like environmental management, use of ITNs and IRS as major tools of prevention and control of malaria. Questions that reminded the discussants that their district was the highest by the number of households that refused to make their house sprayed in the last spray season was posed and the reasons were discussed.

In both groups, the main reasons for the refusal were mentioned to be increment of house nuisances' disturbance and effect of DDT on beauty of the wall. One of the discussant said that,

> *Our kebele was one of the most spraying refusal centers. I was a member of the health committee in our kebele, hence I was responsible to convince the community for the spraying. Let me tell you what the community was mentioning "We know that the government is working for us; we also know that malaria is a killer; we are not being requested to pay; but we have a doubt that the chemical is killing mosquito rather it is increasing flees and bed bugs."*

The point mentioned was also raised by the third group discussants that comprise senior malaria technicians. They mentioned that DDT has lost its efficacy not only on the house nuisances but also

on the mosquitoes too. One of the most senior experts among the discussants elaborated the issue as follows,

> *I remember that DDT was efficacious on mosquitoes as well on some other nuisances at the beginning. This case is not true now. We have to remember the issue of resistance. We have been using this insecticide for the last 40 years. We have to hear peoples complain. We should not force them.*

On the other hand the discussants were appreciating the efficacy of deltametrine on other house nuisances. Many of them have mentioned that the "new chemical" i.e deltametrine was effective in killing even cockroaches.

5.2.2 In-depth interviews

The interviews were made for malaria prevention and control focal persons at Lume district health office and East Shewa zonal health department. The first question was about the current public health importance of malaria among the total morbidity and its trend in general. The respondent at the zonal level said that malaria is still a major health problem though its trend seems to decline from time to time in the past six years. Malaria cases are declining by an average of about 500 each year in Lume district. The aggressive application of malaria control interventions government and non-governmental organizations took could explain the result.

Both respondents mentioned that, among the malaria control interventions, indoor residual spraying is the one underway; but its acceptance by the community has encountered a challenge. The problem was much higher in Lume district last year. The spray coverage achievement was the least among districts in the zone. The respondents mentioned that there was an attempt to convince the community through health education; but they couldn't succeed much. (NB the achievement displayed below did not include the later made spraying by deltametrine.) The reason for the refusal was the repeatedly said hatred to the insecticide- DDT in relation to its poor efficacy to the mosquitoes, effect on the beauty of the wall and perception of provoking the house nuisances.

6. Discussion

The study indicated that there is a knowledge gap in the community regarding malaria prevention and control methods. Though “fever” is one of the typical symptoms of malaria, only 41% of the respondents mentioned it as one of the sign of malaria. This result is far below the result obtained from similar studies done in Sebeta Awas district in South-west Shewa zone of Oromia 91.6%, and Khafta-Humera district of Tigray region 89.6% (31, 32). This lack of knowledge may delay patients in malarious areas from early treatment while they have the sign from the disease and predispose them for severity. It was ‘shivering’ that most of the respondents (58.5%) describe as sign of malaria. Similar trend was revealed in another study done in Alaba district of Southern Nations, Nationalities and Peoples Region (78.1% shivering and 59.3% fever)(33).

Majority (80%) of the respondents knew that malaria could be transmitted by mosquitoes; but significant number of respondents had misconceptions that malaria could be prevented by taking alcoholic drinks. Another misconception revealed was that many people in the study area believed that eating maize could bring malaria. Similar finding was revealed in the study of project assessment made in January 2010 in east Shewa zone and another study done in Adami Tulu district in 2004 (34). The coverage of houses sprayed (84%) seems on a better percentage than the performance report communicated at the end of the last regular spraying operation by the implementers;65%(30).The improvement seen may be attributed to the use of deltamethrine spraying that has better acceptance than DDT, in the later emergency spraying. The other point may be attributed to the limitation of this particular study that it lacks observation of the sprayed houses that consequently liable the result for reported recall bias.

Preference and acceptance among different vector control options was posed as a question and majority (76.5%) of the respondents have chosen ITNs and then IRS on the latter level. This can be explained by the perception that the community had, that IRS has a role of provoking the disturbance of house nuisances. The other explanation may be by fact that IRS is relatively laborious than ITNs since it requires availing water for the spraying, moving household goods to the out and inside of the house during the spraying. Similar sequence of preference was seen in different similar studies like the one done in Sebeta-Awas and Farta district of Amhara regional State(31, 35).

As to the breeding site of malaria transmitting mosquitoes, majority of the respondents have mentioned the bigger water bodies like rivers, springs and lakes as common breeding habitats. However, less than 10% of the respondents mentioned “any stagnant water bodies” to be breeding sites of mosquitoes. Lack of knowledge with this regard may hinder the community from doing environmental management interventions on small water bodies in the surrounding. A study done in Wonago district of SNNP region has presented 21% of the participants associated living near stagnant water as a cause of malaria transmission (36).

Deltamethrine than DDT was preferred by high proportion of the residents in the two kebeles that experienced the two chemicals. The reason for this could be explained by the condition that the former insecticide was perceived more to act on house nuisances than the later. Attempt to avoid annoyance of insects was mentioned as a primary reason of insecticide spraying by significant study participants (22%) on a study made in all districts of East- Shewa Zone(34).

Pertaining to re-plastering rate of the sprayed houses about 21% of them have been reported to be re-plastered before the time they should stay untouched. Quite higher (53%) re-plastering rate was revealed on the study made at East Shewa Zone level assessment (34). The difference of these results could be because of the difference in methodology in that the study made at the zonal level had observation part that avoid recall biases. However, this 21% re-plastering by it self is not small. The WHO recommends that there should be at least 80% coverage of sprayed and maintained houses to get advantage of malaria prevention and control from indoor residual spraying. We have seen that at least 16% of the targeted houses were left unsprayed; and here 21% were re-plastered resulting in a total loss of 37 % (22).

Anticipated factors that may have a role of influencing house spraying coverage and re-plastering were tested in the study. Different socio-demographic characters and other interventions were entered to regression model and the results are found as in Table 7 and 8. Though we faced a challenge of finding similar researches for comparison and validation, the results obtained were found interesting. Better educational level of the respondents, time to fetch water in short period for the spraying and having malaria related education in the year, each were found two times more likely increasing spray coverage than having no education, long time of fetching water and missing malaria related education in the year. Furthermore, getting an announcement on spaying few days

before the intervention was found six times more likely of making people to make their house to be sprayed than those who did not get the message. This can be explained by the fact that indoor residual spraying is a bit laborious for the householders that pre-informed ones will get ready of availing water, moving house materials to the out side and facilitate the spraying than those suddenly communicated just on the date of the spraying operation.

In the quantitative analysis one of the anticipated factor i.e. perception of the respondents on effect of insecticide spraying was not seen to determine the spraying coverage in statistical significance level. However in the qualitative study part, discussants and interviewees did mentioned that people refuse their house from spraying for the perception they have on the insecticide particularly DDT may increase house nuisances.

Regarding re-plastering rate, unlike their better acceptance of making their house to be sprayed, educated groups have shown two times more attempt of re-plastering the sprayed walls than their counter parts. Other factors, like perception on behavior of house nuisances following spraying, education on malaria in the last one year, message prior to the spraying operation and presence of supervision after the intervention have been seen to affect the result in the direction that they are expected to act. .i.e. Those who perceived nuisance increment, missed the message before the spraying, missed the supervision after the spraying have re-plastered their sprayed houses in more percentage of varying degree than their counter parts. The results of the qualitative studies are also in agreement with the findings of the quantitative part.

7. Strength and Limitations of the study

Strength

- Such focused researches on indoor residual spraying were not very much exercised in Ethiopia.

Limitations

-This study might be subjected to recall biases as it is also true to all cross sectional surveys.

-The study was done late by more than eight months after the spraying operation; hence the sprayed wall status observation was not possible to assess issues related to re-plastering.

8. Conclusion and Recommendations

8.1. Conclusions:

- The study revealed that there are some knowledge gaps on malaria prevention and control particularly on important symptoms of malaria; and mosquito related issues. Further more there are serious misconceptions on malaria causation and prevention.

- The study also indicated that there is a serious concern regarding the side action of the chemical particularly DDT on house nuisances that the hard science should address besides to checking its efficacy on mosquito.

- Substantial number of houses left unsprayed while they were targeted for the intervention. The most important factor that affected the performance of IRS coverage was lack of social mobilization and announcement regarding IRS few days before the operation.

- IRS operation that used Deltametrine was seen to be more accepted than the one by DDT.

- Considerable proportions of houses were re-plastered in short period after the spraying operation. Perception of the community on the house nuisances, like flees and bedbugs, following IRS operation, was seen to be the most important factor for re-plastering the sprayed houses. Presence of supervision was also seen to play important role in determining re-plastering rate.

8.2. Recommendations:

-Strengthen health education to fill the knowledge gap observed on malaria prevention and control and correct the misconceptions

- When an insecticide is selected for IRS, besides to checking its efficacy to the targeted mosquito, its suitability for the community life-style should also be considered.

- Pre-spraying social mobilization have been seen to increase IRS coverage; therefore, announcing about the work few days before the operation, so that the community could prepare water for the spraying and arrange materials will be helpful to increase spraying performance.

- Further study with a better design (analytic than descriptive) is recommended to identify further factors that influence IRS and validate the already highlighted factors in this study.

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Annexes

Annex-I: Information sheet and informed consent form

SER. NUMBER_____ Rural/KEBELE/Camp_____

Addis Ababa University, Faculty of Medicine, Department of community Health Questionnaire prepared to Assess the knowledge Attitude and Practice of the community to Indoor Residual Spraying in Lume Woreda

I. Information Sheet:-

"First, identify the presence of any household member who is eligible for the study and present the following information."

Good Morning/Afternoon, My name is _____. I am working in the research team of AAU of medical faculty, Department of community health. Currently, the group is conducting a research on community response to indoor residual spraying being applied to control and prevent malaria. The purpose of this interview is to have your opinion and practice with regard to the intervention and related issues. Your kebele and your house are simply selected as a matter of chance; and nothing is specially attached to it.

If you participate in the study, I can assure you that there will not be any harm on you or your family because of your participation in the study. The interview takes 20 minutes. The information you provide will not be used for another purpose than this study. There will not be an immediate benefit in terms of money; rather you may be morally satisfied for you contribute to the community welfare that may be attained from the result of the study. You can leave any questions unanswered or withdraw from responding for any reasons you may not need to mention.

If you have any question you can contact the principal investigator at any time convenient for you using the following address:

Name of the Principal Investigator – Dawit Teshome Akako

Address Addis Ababa Ethiopia

Phone Number 0911 89 27 58 E-mail dawiteshome@yahoo.com

II Consent form

I, the selected participant heard the information in the consent sheet and understood what is required from me and what will happen to me if I take part in the study. I understand that the information I give will be kept confidentially and will not be used for other purpose other than this study. I can also understand that I can withdraw at any time without giving a reason and without me or my family's routine service utilization being affected for my refusal to participate.

Now, please tell me if you agree to participate in the interview.

The participant:

1. Agree ☐

2. Did not agree ☐ → End the interview and thank the respondent.

Interviewer agreement

I certify that I have taken written consent from the respondent that He/She has agreed to participate in the study and I have confirmed the agreement is correct.

Interviewer name:_____ Signature_____

_____/_____/_____

Date Month Year

Supervisor name: _____ Signature_____

_____ /_____/_____

Date Month Year

Annex-II: Oromiffaa version of the information sheet and consent

Gabatee Odeeffannoo fii Uunkaa Waliigaltee **Lakkoofsa tartiibaa_____**

Ganda_____

I. Gabatee Odeeffannoo

"Duraan dursa miseensa manaa keessaa deebii guutuu kennuuf gahaa kan ta'e jiraachuu isaa addaan baafadhuu tii odeeffannoo armaan gadii ibsiif."

Akkam bultan/ ooltan. Maqaan kiyya _____ jedhamaa. Garee Univarsiitii Finfinnee mana barumsaa fayyaa uummataa wajjiin hojjachaa jiraa. Yeroo ammaa gareen kun yeroo ammaa dhimma dhibee busaa kessumattuu fudhatama biffaa keemikaala farra bookee busaa ittiisaaf to'annoo busaatiif oolaa jiru irrattii qo'annoo gaggeessaa jiraa. Kaayyoon gaaffilee armaan booda isiniif dhiheessuu yaadaa fii gocha uummataa tarsiimoo ittisa busaa kanaa fii kan biro irrattii beekuuf kan nugargaaruudhaa. Gandiifii mannii kessaan kan filatame akka carraatiin qofaa malee omaanuyyuu kan walqabatee miti.

Qo'annoo Kana keessatti hirmaachuu keessan irraa kan ka'e midhaan isin yookiin warraa kessan irraa gahuu tokkoollee akka hin jirree isiniif ibsaa. Gaffilee kana deebisuuf daqiiqaa 20 fudhataa. Ragaan isiin nuuf kennitan xanxala qo'annoo kanaatiif qofa oolaa. Hirmaannaa kanaan walqabatee battalattii bu'aa haala qarshiitiin isiniif kaffalamu kan hinjirree ta'uus bu'aa yeroo dheeraatiif qo'annoo kana irraa aragamuu maluu irrattii hirmaachuun uummataaf gumaacha ooluu keessaniin sammuudhaan akka gammaddan abdadhaa. Gaffiilee irratti deebii kennuu hinbarbaadin irra darbuu ni dandessu.

Gaaffii yoo qabattan dursaa qo'annoo kanaa yeroo isiniif mijaawaa ta'e hunda tesoo armaan gadiitiin gaafachii ni dandeessuu.

Maqaa dursaa Qo'annichaa – Daawit Tashoomaa Akaakoo

Teessoo Finfinnee-Itoophiyaa

Lakk Bilbila Mobaaylii 0911 89 27 58 E-mail dawiteshome@yahoo.com

II. Uunkaa Waliigaltee

”Anii, filatamaan qo’annoo kanaa, qabxileen gabatee odeeffannoo irrattii hirmannaa qo’annoo ilaalchisee waan narraa eegamu fii waan narra gahuu malu hubadheeraa. Odeeffannoon ani kennus hiccitiin akka qabamuuf qo’annoo kanaan aala akka hin fayyadamne hubadheeraa. Akkasumas yeroo fedhee irrattii qo’annoo kanaan aala ta’u akkan danda’u; kana irraa kan ka’ees midhaan anaaf warra kiyyaa irraa gahu akka hin jirree naaf hubadheeraa.”

Amma, qo’annoo kana irratti hirmaachuuf fedhii keessan osoo naaf ibsitan.

Hirmaataa

1. Eeyyen hirmaachuuf waliigaleeraa ☐

2. Lakki hin fedhu ☐ → Galateeffadhuu gaaffii dhaabi.

Waliigaltee gaffii dhiheessaa

Anii gaffii dhiheesaan qo’annoo kanaa fedhii hirmaataa/hirmaattuu qo’annoo kanaa argachuu kiyya nan mirkaneessaa.

Maqaa gaafataa:_____ Mallattoo_____

_____/_____/_____

Guyyaa Ji’a Waggaa

Maqaa to’ataa: _____ Mallattoo_____

_____ /_____/_____

Guyyaa Ji’a Waggaa

Annex-III: Household Survey Questionnaire for research on "Acceptance of indoor residual spraying for malaria prevention and factors that influence its acceptance in Lume district, East shewa zone Oromia Region", 2002E.C

Kebele _____ Village/Gott_____ Questionnaire No _____

Name of interviewer _____ Date of Interview _____/_____/_____

Hello dear, my name is _____ I belongs to the team that undergo survey on malaria and malaria related interventions. I will present you some questions related to malaria in general and indoor residual spraying in particular. i.e. how the preventive strategy being applied as per your demand and factors related to it. Please feel free and try to share me the reality with regard to the issue. The information being collected will help to improve the quality of the interventions. Your name will not be noted and the information you give me will be kept confidential.

S.No	**Question**	**Response categories**	**SKIP to**
101	Age	_____years	
102	Sex	Female----------1 Male---------- 2	
103	To which ethnic group do you belong?	Oromo----------1 Amhara----------2 Gurage----------3 Tigre----------4 Other (specify)_____ ----------9	
104	Educational Status	Unable to read or write----------1 Can read and write----------2 Elementary (grade 1-4)----------3 Junior (5-8)----------4 Secondary (9-12)----------5 12th complete plus certificate----------6 Diploma or above----------7	

105	Marital Status	Married----------1 Single----------2 Widowed----------3 Divorced----------4 Separated----------5	
106	Occupation	Farmer----------1 Merchant----------2 Government employee----------3 House wife----------4 Student----------5 Daily laborer----------6 Job less----------7 Other(Specify)_____----------9	
107	Status /responsibility/ of the respondent	Husband----------1 Wife----------2 Son/daughter----------3 Other (specify)_____ ----------9	
108	Religion	Orthodox Christian----------1 Protestant Christian----------2 Catholic Christian----------3 Muslim----------4 Other (Specify) _____----------9	
109	Total Number of family members: <5 years of age	Female____----------1 Male_____ ----------2	
110	Total Number of family members:>5 five years of age	Female____----------1 Male_____----------2	
111	Is there a pregnant woman in this household?	Yes---------- (If yes how many?)_____ 1 No----------2	
112	Estimated monthly income	-----ETB 1 I can't estimate 8	

Part II-Questions to assess the respondent perception towards malaria

S. No	Questions	Answers/ possible choices	SKIP To
201	Have you heard of malaria (in the local language)?	Yes----------1 No----------2	→ 301
202	What are the symptoms of malaria you know? (More than one answer is possible- don't read the choices but probe by saying 'what else?')	Fever ----------1 Sweating----------2 Chills----------3 Rigor----------4 Headache----------5 Vomiting----------6 Loss of appetite----------7 Thirsty ----------8 Others(specify)_____----------9 Don't know----------88	
203	How far is the distance of the nearest health institution from your home?	<5km----------1 5-10km----------2 >10km----------3 Don't Know----------8	
204	What do you think is the cause of malaria? (more than one answer is possible)	Yes No By the bite of mosquito----------1 2 From getting cold----------1 2 From eating maize----------1 2 By being hungry----------1 2 Other (specify)_____----------9 I Don't Know----------8	
205	Which group of the community is most affected by malaria? (more than one answer is possible)	Adults----------1 Pregnant Women----------2 Children under the age of five----------3 Elders ----------4 All age groups are equally affected----------5 I don't know----------8	
206	Have you heard malaria education	Yes----------1	

	message in the last one year?	No----------2	→ 209
207	If yes, how did you get this education message? (more than one answer is possible)	Health workers----------1 Radio----------2 Schools----------3 Public meetings----------4 Other(specify)_____----------9	
208	What is/are the ways to prevent from getting malaria?	Spraying the house with DDT----------1 Sleeping under ITNs----------2 Keep the surrounding clean----------3 Drinking hard liquor----------4 Taking prophylactic drugs----------5 Don't know----------8 Other(specify)_____----------9	
209	Was there any illness believed to be malaria in the family during the last ONE year?	Yes----------1 No----------2 →	301
210	If yes where did you go for treatment?	Health post----------1 Drug vendor----------2 Health center----------3 Hospital----------4 Traditional healers----------5 Managed at home---------- 6 Other (Specify)_____ ----------9	

Part III-Mosquito related questions

S. No	Questions	Response categories	Skip To
301	Have you heard about malaria transmitting mosquito?	Yes----------1 No----------2	→ 401
302	Where do you think mosquitoes could breed? (more than one answer is possible)	Rivers----------1 Ponds----------2 Springs----------3 Any stagnant water bodies----------4 I don't Know----------8 Other(specify)_____ ----------9	
303	Do mosquitoes caused any trouble to you in the last 1 year?	Yes ----------1 No ----------2 →	305

304	If yes, what problem cause up on you? (more than one answer is possible)	Biting ----------1 They transmit malaria----------2 Their noise disturb sleeping----------3 Other(specify) _____ ----------9	
305	During what season do mosquito trouble increases? (more than one answer is possible)	Yes No During dry season----------1 2 Following rainy season-------1 2 All year round----------1 2 Do not know----------8 Other(specify)_____ ----------9	
306	At what time do mosquito's biting increases? (more than one answer is possible)	Yes No In the morning ----------1 2 In the afternoon---------- 1 2 In the evening----------1 2 At night in bed----------1 2 All day----------1 2 Do not know----------8	
307	Do you protect yourself from mosquito biting?	Yes----------1 No----------2	→ 309
308	If yes, how do you protect yourself from mosquitoes biting? (more than one answer is possible)	Yes No Use ITNs----------1 2 Use residual house spray----------1 2 Clean the environment----------1 2 Close windows and doors----------1 2 Light the fire in the house ----------1 2 Use traditional plant ----------1 2 Other(specify)_____ ---------9	
309	Why don't protect yourself from mosquitoes bite? (more than one answer is possible)	I don't know how to ----------1 I don't have time----------2 I don't have any of the protection mechanism----------3 I don't like the available	

		Interventions----------4 I don't bother ----------5 Other (specify)_____ -------9	
* If the response for question number 309 is choice, "4" ask question 310 other wise → to 401			
310	Which of the interventions you don't like to use as prevention for malaria?	Yes No Use of ITNs ----------1 2 Indoor residual spraying----------1 2 Environmental management ------1 2 The treatment ----------1 2	

Part IV-Questions related to Indoor Residual Spraying and ITNs

S. No	**Questions**	**Response categories**	**Skip to**
401	Did you made your house to be sprayed in the last 12 months?	Yes ----------1 Partly ----------2 No----------3	→ 409
402	What was the type of chemical used for the spraying?	DDT----------1 Deltamethrin----------2 Don't know----------8	
403	Which chemical do you prefer to be sprayed?	DDT----------1 Deltamethrin----------2 Don't know----------8	
404	Why you preferred such chemical?	It is effective in avoiding mosquitoes ----------1 It is safe to health----------2 It kills other house nuisances ----------3 Other (specify)_____----------9	
405	If you made your house to be sprayed fully or partly, were you willingly did it or any other legal obedience	I voluntarily did it----------1 Legal obedience----------2	→ 407
406	If you voluntarily made your house to	The malaria education message----------1	

	be sprayed, what are the predisposing conditions?	The experience I felt on the disease malaria----------2 Other (specify)_____ ----------3	
*407	CHECK QUESTION No 401 IF THE ANSWER IS "Partly" " No " → 409 "Yes" → 412		
407	If you made your house partly sprayed, which part of the unit structures you left unsprayed? (more than one answer is possible)	Yes No Sleeping Areas----------1 2 The main house part----------1 2 The eve----------1 2 The grain storage area----------1 2 The cattle house----------1 2 Other (specify)_____ ----------9	
408	What is the reason that you left the above mentioned part of your house unsprayed? (more than one answer is possible)	To keep the beauty of the wall----------1 To protect Hive of the bee----------2 To avoid bite of house nuisances----------3 Because there was a person slept there ----------4 Because it was locked----------5 It was under construction----------6 Other (specify) _____----------9	
409	If you didn't made your house to be sprayed in the last one year, which of the following was/were reasons for that?	Yes No I don't think malaria is a problem ----------1 2 I do have other preventive tool e.g. ITNs --------1 2 DDT has health effect----------1 2 DDT bait affect the beauty of the wall----------1 2 DDT will increase bed bugs ----------1 2 DDT will increase flees----------1 2 Difficulty to avail water for the spraying----------1 2 Inconveniency of moving house utensils ----------1 2	

		Other (specify)_____ ----------9	
410	Is there any Indoor residual Spraying related educational message prior to the actual spraying operation?	Yes----------1 No----------2	→ 412
411	If yes, what messages do you remember? (More than one answer is possible)	DDT spraying will help to kill mosquitoes----------1 DDT do not increase house nuisances----------2 Clean your house----------3 Fill the crack of the wall before spraying----------4 Don't enter to house before some time----------5 Other (specify)_____ ----------9	
412	Did the spray operators give you educational message on the use of IRS and precautions you need to take on the date of spraying?	Yes----------1 No----------3	→ 414
413	If yes, what messages do you remember?	The spray is for mosquito not for other nuisances----------1 Leave the house closed up to some----------2 Clean the floor and bury the waste----------3 Not to re-plaster the wall up to 6 months ----------4 Other (specify)_____ ----------9	
414	How long does it take to fetch water you use for the spraying? (time for round trip on foot)	_____ minutes I do not know----------2	
415	Have you re-plastered any part of the sprayed unit structures after spraying?	Yes ----------1 No----------2	→ 419

416	If yes, which part did you re-plastered? (more than one answer is possible)	Yes No Sleeping areas----------1 2 The main house part----------1 2 The eve----------1 2 The grain storage area----------1 2 The cattle house----------1 2 Other(specify)_____ 9	
417	What is/are the reason for re-plastering (With mud, paint or any other covering) before the time you are told to wait? More than one answer is possible	I don't think malaria is a problem then ----------1 I do have other preventive tool e.g. ITNs ----------2 To decorate my house for the holiday ----------3 DDT bait affect the beauty of the wall----------4 DDT has increased house nuisances ----------5 The spray has affected my bees----------6 Other(specify)_____ ----------9	
418	Do You have any notice that DDT spraying has relation with other house nuisances like bed bugs and flees?	Yes ----------1 No----------2	→ 421
419	What does the spraying of the chemical /DDT/ do on the annoyance level of the other house nuisances?	It increases their annoyance----------2 It decreases their annoyance----------1→	421
420	If there is a notice of house nuisance increment in relation to DDT spraying, what do you think to be the reason?	DDT itself has the nuisances in it----------1 DDT help nuisances as food ----------2 DDT will make nuisances more productive----------3 DDT will irritate but do not kill nuisances----------4 I don't know----------8 Other(specify)_____ ----------9	
421	Do You have any notice that Delthamethrin spraying has relation with other house nuisances like bed	Yes ----------1 No ----------2→	423

	bugs and flees?		
422	What does the spraying of the chemical /Deltametrine/ do on the annoyance level of the nuisances?	It increases their annoyance----------1 It decreases their annoyance----------2	
423	How long did you left the sprayed wall untouched from spray date to re-plastering	_____months I did not touch it yet----------2	
424	Was there any supervision concerning Indoor Residual Spraying in the last 12 months?	Yes----------1 No----------→2	426
425	Who did the supervision?	Health Extension Worker----------1 Woreda health office----------2 Don't know----------8 Other (specify)_____ ----------9	
426	How many ITNs do you have at home?	_____ I don't have any----------2	
427	How many of them are you using now?	_____ (if it is less than the number in on Qn No 427, ask about the rest.)	
428	When was the last time you have been provided with ITNs?	_____ months	
429	(If there is any ITNs being used), Who slept under the net the previous night?	_____	
430	With regard to shape, there are different kinds of net on market. If you have given a chance to select, which one do you prefer? (please read them the choices)	Conical----------1 Rectangular----------2	
431	With regard to color, there are different kinds of net on market. If you have given a chance to select, which one do you prefer? (please read them the choices)	Blue Green White Other (specify)	
432	If you have any idea with regard to malaria prevention and control, you are welcome:-		

Annex-IV:Gaaffilee Qo'annoo mana manaa mata duree"Acceptance of indoor residual spraying for malaria prevention and factors that influence its acceptance in Lume district, East shewa zone Oromia Region", 2002E.C

Ganda_____ Gooxii_____ Lakk.Gaaffii _____

Maqaa gaaffi dhiheessaa _____ Guyyaa _____/_____/_____

Akkam bultan/ooltan? Maqaan kiyya _____ jedhamaa .Garee qo'annoo dhimma dhibee busaa fii dhimmoota isaan walqabatan irraatti hojjatu waliinan socho'aa jira. Amma dhimmoota dhibee busaa waliin walqabatan irrattii gaaffilee tokko tokko isiniif dhiheessaa. Jechuuniis akkaataa dhibeen kun to'atamaa jiruu fii raawwannaa tarsiimolee adda addaa jiran irrattii yaada keessan nuuf ibsitu. Bilisa taatanii waan beektanii fii wanta isinittii dhagahame naaf ibsitu. Ragaan guuramu kun hojiilee kanaan booda hojjataman akka sirraa'an gargaara. Maqaan kessan hin barreeffamu ; yaadnii isin kennitaniis hiccitiin isaa eegamee xinxala qo'annoo kanaatiif qofa oolaa.

Kutaa I- Dhimmoota Hawaasummaa fii Diinagdee

Lakk	**Gaaffii**	**Carraalee Deebii**	**Gara darbii**
101	Umurii	Waggaa_____	
102	Saala	Dubartii----------1 Dhiira---------- 2	
103	Saba/sablamiin keessan maalii?	Oromoo----------1 Amaara----------2 Guraage----------3 Tigree----------4 Kan biro(ibsii)_____ ----------9	
104	Sadarkaa barumsa keessanii	Dubbisuu /barreessuu hindanda'u----------1 Dubbissuuf barreessuu nan danda'aa----------2 Marsaa tokkoffaa (grade 1-4)----------3 Marsaa lammaffaa(5-8)----------4 Sadarkaa lammaffaa (9-12)----------5 Kutaa 12n ol fii sartafikeetii----------6 Diiploomaa fii isaa ol----------7	

105	Haala fuudhaaf heerumaa	Kan fuudhee/heerume----------1 Kan hinfuudhiin/hinheerumiin----------2 Kan wal hiikan----------3 Kan jalaa du'e/duute----------4 Kan addaan bahan----------5	
106	Hojii ittiin bulan	Qotee bulaa----------1 Daldaalaa----------2 Hojjataa mootummaa----------3 Bulchituu manaa----------4 Barataa/barattuu----------5 Hojjataa umnaa----------6 Hojii dhabeessa----------7 Kan biroo(Ibsii)_____----------9	
107	Status /responsibility/ of the respondent Eenyumma debii kenna	Abbaa warraa----------1 Haadha warraa----------2 Ilma/Intala----------3 Kan biroo (Ibsii)_____ ----------9	
108	Amantaa	Kiristaana Orthodoksii ----------1 Kiristaana Protestaantii----------2 Kiristaana Kaatolikii----------3 Musliima----------4 Kan biroo (Ibsi) _____----------9	
109	Miseensota manaa waliigala uumrii shanii gadi:	Dubara____----------1 Dhiira_____ ----------2	

110	Miseensota manaa waliigala uumrii shanii ol:	Dubara____----------1 Dhiira_____ ----------2	
111	Mana kana keessa dubartiin ulfa taate jirtii?	Eeyyeen---------- (Meeqaa?)_____ 1 Lakki----------2	
112	Estimated monthly income of the f Tilmaamnii galii ji'a tokkoon argatan meeqa ta'a?	Birrii_____ Hinbeeku	

KutaaII- Gaffilee yaada debi kennaan dhibee Busaa irratti qabu

Lakk	**Gaaffii**	**Carraalee Deebii**	**Gara darbii**
201	Waa'ee dhibee busaa dhageessanii beektu?	Eeyyen----------1 Lakki----------2	→ 301
202	Mallattoon dhibee busaa maalii? (Deebiin tokko ol nidanda'amaa; filannoolee jiran hindubbisiin;garuu "kan biraa'oo" jechuun gaafadhu?	Hoo'a qaamaa----------1 Dafqisiisuu----------2 Qorrisiisuu----------3 Ollachiisuu----------4 Bowwoo----------5 Hoqisiisuu----------6 Nyaata jibbisiisuu----------7 Dhebochiisuu----------8 Kan biroo(Ibsi)_____----------9 Hinbeeku----------88	
203	Mannii keessan dhaabbata fayyaa isinittii dhihoo jiru irraa hagam fagaataa?	<5km----------1 5-10km----------2 >10km----------3 Hin beeku----------8	
204	Dhibeen busaa maal irraa ka'aa? Filannoolee Jiran dubbisiif tii "Eyyen" YKN "Lakkii jechuun	<u>Eeyyee</u> <u>Lakki</u> Ciniinnaa bookee busaarra-----1 2	

	haafilatan”	Qorra irraa----------1 2 Boqqoolloo nyaachuurraa--------1 2 Beela irraa----------1 2 Kan biroo (Ibsii)_____----------9 Hin beeku----------8	
205	Kutaan uummata irra caala dhibee busaatiin miidhmu kamii? (deebiin tokkoo ol deebii’uu ni danda’a)	Namoota gudgoddoo----------1 Dubartoota ulfa ta’an----------2 Dubartootaa ulfaa fii daa’imman waggaa shanii gadi----------3 Namoota umuriin dullooman----------4 Namoonnii hunduu qixxee miidhamu-------5 Hin beeku----------8	
206	Ji’oota 12n darban keessaa darumsa dhibee busaa irrattii xiyyeeffate dhageessanii beektuu?	Eeyyen----------1 Lakki----------2	⟶ 209
207	If yes, how did you get this education message? (more than one answer is possible) Eyyeen yoojettan eenyurraa ykn eessaa dhageessan?	Hojjatoota eksteenshinii fayyaairraa---------1 Raadiyoorraa----------2 Mana barumsaatti----------3 Walgahii uummattaa irraa----------4 Kan biroo(ibsii)_____----------9	
208	Mallii dhibee busaa of irraa ittisan maal fa’ii?	Manaa DDTii dhaan biifsisuu----------1 Saaphana Siree jala ciisuun----------2 Naanno qulqulleessuun----------3 Dhugaatii cimaa ittii dhuguu----------4 Qoricha busaa dursanii liqimsuu----------5 Hin beeku----------8	

		Kan biroo(Ibsi)_____----------9	
209	Ji'oota 12n darban keessa mana keessaanirraa namii dukkuba busaatiin dhukkubsate jiraa?	Eeyyee----------1 Lakki----------2 →	301
210	Namni dhukkubsate yoo jiraate eessattii yaalamee?	Keellaa fayyaatti----------1 Mana qorichaatti----------2 Buufata fayyaattii----------3 Hospitaalatti----------4 Mana yaalaa aadaatti----------5 Manumatti yaalame---------- 6 Kan biroo (ibsii)_____ ----------9	

KutaaIII-Gaaffiilee bookee busaatiin walqabatan

Lakk	**Gaaffii**	**Carraalee Deebii**	**Gara _darbii**
301	Waa'ee bookee dhibee busaa dabarsitu dhageessanii beektuu?	Eeyyen----------1 Lakki----------2	→ 401
302	Bookeen busaa eessatti walhortii? (Deebiin tokkoon ol kennamuu nidanda'a)	Lagatti----------1 Haroottii----------2 Burqaatti----------3 Bishaan cisaa hundarratti----------4 Hin beeku----------8 Kan biroo(ibsi)_____ ----------9	
303	Ji'oota 12n darban keessa bookeen busaa isin rakkistee beektii?	Eeyyen----------1 Lakki----------2 →	305
304	Haala kamiin rakkoo isinitti fiddee? (Deebiin tokkoon ol kennamuu nidanda'a)	Nahidduudhaan----------1 Dhibee busaa dabarsuun----------2 Yeroo ciisichaa nattii iyyuun----------3 Kan biroo(Ibsii) _____ ----------9	

305	Rakkoon bookee busaa fidduu waggaa keessattiyeroo kam dabalaa? (Deebiin tokkoon ol kennamuu nidanda'a)	Eeyyen Lakki Yeroo qooraa----------1 2 Roobaan booda----------1 2 Waggaa guu----------1 2 Hinbeeku----------8 Kan biroo(Ibsi)_____ ---------9	
306	Guyyaa keessatti ciniinnaan bookee yeroo kam dabalaa? (Deebiin tokkoon ol kennamuu nidanda'a)	Eeyyen Lakki Ganama subii--- ----------1 2 Guyyaa Sa'aa booda---------- 1 2 Alkan walakkaa----------1 2 Yeroo ciisan----------1 2 Guyyaa guutuu----------1 2 Hinbeeku----------8	
307	Isiin bookeen akka isin hin ciniinnee waanti godhaa jirtan jiraa jiraa?	Eeyyen----------1 Lakki----------2	→ 309
308	Bookeen akka isin hin hiddine waanti godhaa jirtan maalii? (Deebiin tokkoon ol kennamuu nidanda'a)	Eeyyen Lakki Saapahna siree----------1 2 Mana keemikaalaan bifsisuu--------1 2 Naannoo qulqulleessuu----------1 2 Balbalaaf foddaa yeroon cufuu------1 2 Ibidda mana keessattii qabsiisuu----1 2 Biqiltoota aadaa fayyadamuu--------1 2 Kan biroo(Ibsi)_____ --------9	
309	Bookee ittisuuf kan hin carraaqne yoo ta'e maaliif?	Akka itti ittisan hin beeku----------1 Yeroo hin qabu----------2	

	(Deebiin tokkoon ol kennamuu nidanda'a)	Tarsiimolee ittiin ittisan hinqabu----------3 Tarsiimoolee ittin ittisan hinjaaladhu--------4 Waanti nacinqu hinjiru----------5 Kan biroo(Ibsi)_____ -------9	
*Deebiin gaaffii lakk 309tiif kenname "4" yoo ta'e gaaffii 310 gaafadhuu sanaan ala → lakka 401ttii darbi			
310	Tarsiimoolee bussaa ittiisuuf oolaa jiran keessaa kamtu isinittii hin mijoofnee?	Eeyyee Lakki Saaphana siree----------1 2 Biiffaa DDTii----------1 2 Naannoo qulqulleessuu------ ------1 2 Yaalchisuu--- ----------1 2	

Kutaa IV- Gaaggilee Biffaa keemikaala farra bookee busaa fii Saaphana Siree

Lakk	**Gaaffii**	**Carraalee Deebii**	**Gara_darbii**
401	Mana keessan ji'oota 12n darban keessa keemikaala farra bookee busaatiin biifsiiftaniiraa?	Eeyyen----------1 Gartokkee qofa----------2 Lakki----------3	→ 409
402	Keemikaallii itti sinii biifame maal turee?	DDTii----------1 Deltamethrinii----------2 Hin beeku----------8	
403	Keemikaalota armaan gadittii caqafaman keessaa kam filattuu?	DDTii----------1 Deltamethrinii----------2 Hin beeku----------8	

404	Maaliif keemikaala kana filattan?	Bookee busaa haalaan waan ajjeesuuf----------1 Fayyaa namaa waan hin miineef----------2 Nyaattuu mana keessaa waan ajjeesuuf----------3 Kan biroo (Ibsi)_____----------9	
405	Mana keessaan biifsiistan yoo ta'e kan biifsiftan fedhii keessanii ammoo dirqamaan turee?	Fedhii kiyyaan----------1 Seeraan dirqamamee----------2	→ 407
406	Feedhii keessaniin kan biifsifattan yoo ta'e kana gochuuf kan isin kakaase maalii?	Barumsa fayyaa busaa irrattii naaf kenname----------1 Miidhaa busaa muuxannoo kiyya irraa waan beekuuf------2 Kan biroo (Ibsi)_____ ----------3	
*407	Gaaffii 401 ilaalii deebiin kenname "Gar tokkee" " Lakkii " → 409 "Eeyyen" → 412		
407	Mana keessan kan biifsifattan gartokkee qofa yoo ta'e, iddowwan kamitu osoo hin biifamiin haafan? (Filannoota kennaman dubbisiif)	Eyyen Lakki Bakka ciisichaa----------1 2 Mana guddaa----------1 2 Mana jala----------1 2 Bakka kuusaa midhaanii----------1 2 Mana loonii----------1 2 Kan biroo (Ibsi)_____ ----------9	

408	Iddoowwan armaan ol osoo hiinbiifsisiin dhiiftan osoo hinbiifsisin kan dhiiftan maaliifii? (Deebiin tokkoo ol nidanda'amaa)	Midhaginnii gidgiddaa akka nujalaa hin banne----------1 Gaagura kanniisaa ittisuuf----------2 Nyaattuun mana keessaa akka nutti hinbaay'anneef---------3 Bakka sana namnii cisee waan tureef-- ----------4 Kutaan sun waan cufaa tureef----------5 Ijaarsa irra waan tureef----------6 Kan biro (Ibsii) _____----------9	
409	Mana keessan ji'oota darban 12n keessattii osoo hin biifsisin kan turtan yoo ta'e sababnii isaa maaliif turee? (Deebiin tokkoo ol nidanda'amaa)	Eeyyen Lakki Busaan rakkoo waan hintaaneef----------1 2 Tarsiimoo biraa waanan qabuuf----------1 2 DDTiin miidhaa waan qabuuf----------1 2 DDTiin gidgiddaa waan balleessuuf----------1 2 DDTiin nyaattuu waan dabaluuf----------1 2 Bishaan fiduun waan rakkisuuf----------1 2 Meeshaa manaa baasuun waan rakkisuuf ----1 2 Kan biroo (Ibsi)_____ ----------9	
411	Guyyaa biffaa gaggeffamuuf karoorfame dura barumsii biffaa ilaalchisee kenname jiraayyuu?	Eeyyen----------1 Lakki----------2	→ 414
412	Yoo kan jiru turee, ergaa yaadattan keessaa mee nattii himaa? (Deebiin tokkoo ol nidanda'amaa)	Biiffaan DDTii kangargaaru bookee busaa ajjeesuufii------1 DDTiin nyaattuu hin dabalu----------2 Mana keessan qulqulleessaa----------3 Uraa gidgidda dursaatii cufaa/lassanaa----------4 Biiffaadhaan booda yeroo muraasaaf aala turaa----------5	

		Kan biroo (Ibsi)_____ ----------9	
413	Naamoonnii biifaa gaggeessan guyyaa biifan sana gorsa isiniif kennanii turanii?	Eeyyen----------1 Lakki----------3	→ 416
414	Kennanii yoo turan mee waan yaadatta nattii himaa?	Biiffaan gaggeeffame kun Bookee busaa ajjeesuuf qofa---1 Yeroo murtaaeef mana kessa bahaa----------2 Mana qulqqulleessatii kosii isaa awwaalaa----------3 Haanga ji'a 6tii gidgiddaa hin dibinaa/hinlassaniinaa-------4 Kan biroo (Ibsi)_____ ----------9	
415	Bishaan biiffaa keemikaalaatif oolu fiduuf yeroo hagam fudhataa? Dhaqaa galaaf	Daqiiqaa_____	
416	Iddoowwan biifaman keessaa kan deebistanii dibdan/lassantan jiraa?	Eeyyen ----------1 Lakki----------2	→ 420
417	Iddoon deebistanii dibdan yoo jiraate isaan kamii? (Deebiin tokkoo ol nidanda'amaa-Dubbiisiif)	Eeyyen Lakki Bakka cisichaa----------1 2 Mana guddaa----------1 2 Mana jala----------1 2 Mana kuusaa midhaanii----------1 2 Mana loonii----------1 2 Kan biroo(Ibsi)_____--- 9	

418	Yeroo eegaa jedhameen dura gidgiddaa keessan dibdan/lassantan yoo ta'e sababnii isaa inni maalii? (Deebiin tokkoo ol nidanda'amaa)	Yeroo rakkoon busaa waan darbeef---- ----------1 Mala ittisa biraa waan qabuuf---------- ----------2 Mana kiyya ayyaanaaf midhagsuuf---- ----------3 DDTiin midhagina gidgidda waan balleesseef----------4 DDTiin nyaattuu waan dabaleef----- ----------5 Keemikaallii kanniisa waan midheef----------6 Kan biroo(Ibsi)_____ ----------9	
419	Biiffaa DDTii waliin qabatee jijjiramnii amala nyaattuu mana keessaa kan akka bacoo fii tafkii irratti hubattan jiraa?	Eeyyeen----------1 Lakki----------2	→ 422
420	Jijjiramnii biffaa DDTii dhaan booda nyaattuu manaa irratti hubattan maalii?	Jeequmsii nyaattuu mana keessaa ni dabalaa----------2 → Jeequmsii nyaattuu ni xiqqaataa----------1	422
421	Jeequmsii nyaattuu mana keessaa biffaa DDTiin booda kan dabalu yoo ta'e sababnii isaa maalii jettanii yaadduu?	DDTiin nyaattuu of keessaa qabaa----------1 DDTiin nyaata ta'ee isaan gargaaraa----------2 DDTiin nyaattuun akka walhortu gargaaraa----------3 DDTiin nyaattuu kan hin ajjeefne gubee kakaasaa--------4 Kan biroo(ibsi_----------9	
422	Biiffaa Deltametriinii ii waliin qabatee jijjiramnii amala nyaattuu mana keessaa kan akka bacoo fii tafkii irratti hubattan jiraa?	Eyyee----------1 Lakki----------2 →	424
423	Jijjiramni biffaa deltametriiniin booda nyaattii manaa irratti hubattan maalii?	Jeequmsii nyaattuu mana keessaa ni dabalaa----------2 → Jeequmsii nyaattuu ni xiqqaataa----------1	422
424	Mana keessan erga biifamee kaasee hagam turtaniit dibdanii/lassantanii?	Ji'a_____	
425	Was there any supervision concerning Indoor Residual Spraying in the last 12 months? Ji'oota 12 darban keessa qaamnii haala mana biifame to'achuuf dhufe jiraa?	Eeyyen----------1 Lakki----------2 →	427

426	Qaamnii kuun eenyuudhaa ykn eessarraa dhufe?	Hojjattoota eksteenshinii fayyaa----------1 Hojjattoota fayyaa Aanaa----------2 Hin beeku----------8 Kan biroo (Ibsi)_____ ----------9	
427	Saaphanaa siree meeqa manaa qabduu?	_____ Hin qabu----------2	
428	Aamma ittifayyadamaa kan jirtan meeqaa?	_____ (bayyinnii kan armaan oliitiin gadi yoo ta'e kan hafe sababnii itti hin fayyadamnee maal akka ta'e gaafadhu.)	
429	Yeroo dhumaatiif Saaphannii siree kan isiniif kenname yoomii?	Ji'a_____ n dura.	
430	(Saaphannii siree ittiifayyadamaa jiran yoo jiraate ---) Alkan kaleessaa eennyyutu saapana jala bulee?	_____	
431	Saaphannii bookee halluu adda addaatu jiraa isin kam filattuu?	Cuquliisa----------1 Magariisoo----------2 Aadii----------3 Kan biroo ibsi_____	
432	Saaphana bookee haala akkamiin hodhamee jaalattuu?	Bakka tokkottii qofa kan hidhamee fannifamu----------1 Bakka afurittii hidhamee kan fannifamu----------2	
Yaada dabalataa biroo _____ _____			

Annex-V:Guide lines for the focus group discussion

1. Is malaria a major public health problem in your locality? Why?

   -how do you prevent malaria?
   -which malaria prevention measures are practiced in the area?

2. How do you see Indoor residual spraying as an intervention of malaria?

   What does the community feel about DDT spraying?
   Is there any complain about DDT spraying?
   What are these complains?
   What do you think are sources of this complain?

   How does the community respond to DDT spraying?

3. What do you think is the solution to alleviate this problem?

Annex-VI:Qajeelfama marii Namoota Filatamanii

3. Dhibeen busaa rakkoo uummata naannoo kanaatii? Maaliif?

   -Dhibee Busaa akkamitti offirraa ittistuu?
   - Hojiileen ittisa dhibee busaa naannoo kanatti hojjataman maalii?

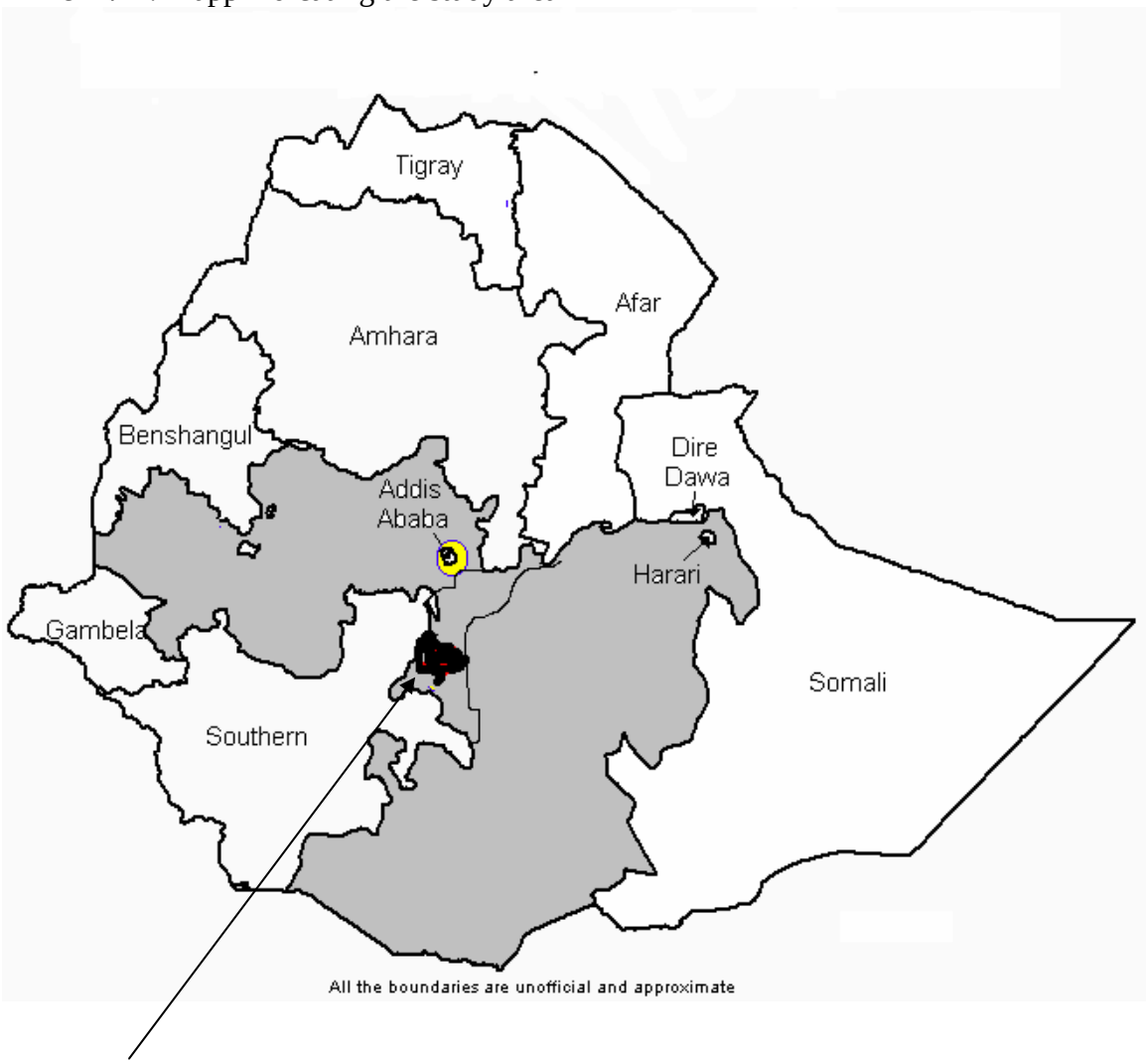
4. Hojii ittisa busaa ilaalchisee gaggeeffamaa jiru keessaa biffaa keemikaala farra bookee busaatiif biifamu akkamitti madaaltuu?

   Biiffa kana ilaalchisee uummanni maal yaadaa?
   Bifaa kana ilaalchisee komiin ka'e beekaa?
   Komiilee kun maal fa'ii?
   Maddi komiilee kanaa maalii?

   Hojii kana ilaalchisee uummanni maal gochaat jira?

5. Rakkoo kana furuuf maaltu godhamuu qaba jettanii yaadduu?

Annex-VII: Mapp indicating the study area



Lume Woreda
(The Study area)

Declaration

I, the undersigned, declare that this is my original work, has not been presented for a degree in this or another university and that all sources of materials used for this thesis have been fully acknowledged.

Name: **DAWIT TESHOME**

Signature:_____

Date:_____

This thesis work has been submitted for examination with my approval as university advisor.

Name: **Dr. WAKGARI DERESSA (PhD)**

Signature:_____

Date: _____