

Malaria control in benin: vector control strategies research paper

[Sociology](#), [Community](#)



1. 0 Introduction

Malaria is a devastating public health problem in Benin and is the principal cause of mortality and morbidity among children under five. The annual malaria mortality in Benin is more than 1000. In addition, it is an enormous economic burden to households in Benin with many households spending up to 25% of their income on prevention and treatment of the disease. Given that in Benin, a person can contract the disease an average of 3-6 times every year, the direct and indirect economic implication of malaria is enormous. As matter of fact, Malaria is endemic in Benin and thus almost the entire population in Benin is at risk of contracting the disease. The disease is responsible for 34-44% outpatient consultation and 20-40% hospital admissions in Benin.

The adverse impact of Malaria on the public health and economy of Benin thus justifies the myriad of collaborative research on the situation with an aim of developing effective and long-term mitigating strategies. One of the greatest collaborative efforts in the fight against malaria is the President's Malaria Initiative (PMI) that funds antimalaria strategies in 19 African malaria endemic countries. The U. S. Agency administers this initiative for International Development under the Centers for Disease Control and Prevention. PMI with different local and global partners such as the Ministry of Health through the National Malaria Control Program, WHO, the Global Funds to Fight AIDS, Tuberculosis and Malaria, the World Bank and several Nongovernmental Organizations. Another collaborative effort is by Plan Benin, which brings together the USAID, University Researchers and communities in Benin Malaria prone areas. These collaborative efforts,

among others, support four strategies: indoor residual spraying (IRS), insecticide-treated mosquito nets (ITNs), timely diagnosis and ACT treatment and intermittent preventive treatment for pregnant women with sulfadoxine-pyrimethane.

2. 0 Background Information on the collaborative research

The antimalaria efforts are broadly categorized into those targeting the causative agent (parasite) and those targeting the vector (the female *Anopheles gambiae* mosquito). Targeting the vector has been found to be the most effective strategy in the fight against Malaria and accounts for more than 50% of the antimalaria expenditure. Targeting the mosquito depends on the use of insecticides either through indoor residual spraying, insecticide-treated bed nets and outdoor spraying (on breeding grounds such as treating stagnant waters). However, the development and multi-insecticide resistant mosquitoes threatens the effectiveness of the vector control strategy. Mutations that confer resistance to pyrethroids, DDT, carbamates and organophosphates have been identified. In addition, multiple resistance mechanisms in mosquitoes have been identified.

poly(oxy-1, 2-ethanediyl) [2P283] . The present study seeks to evaluate the use and the efficacy of the microbial insecticides vis-à-vis the chemical insecticides in Benin. The collaborative study will involve several institutions that will play different roles.

3. 0 Identifying collaborations and processes

The London School of Hygiene and Tropical Medicine (LSHTM) will provide the necessary funding for the study and some of the samples will be analyzed at their labs. Centre de Recherché Entomologique has several

experimental huts in regions of Benin that experience floods and where rice is grown by irrigation. The regions mentioned are good breeding grounds for mosquitoes and thus they are good sites for the research. In addition, Centre de Recherché Entomologique has staff in the experimental huts that will collect the mosquitoes for analysis. Another collaborating partner is University of Abomey-Calavi, Cotonou, Benin which. Researchers from the institution have done extensive research on insecticide resistance in Benin and will provide valuable guidance as well as determination of the most suitable sites for the study. In addition, some of the samples and data will be analyzed in the university.

The study will also engage the community members. The study will be carried out in villages, with preliminary studies involving the determination of malaria in the villages through interviews and checking medical records as well as inquiries from traditional medicine men. Given the possibility of language barrier to impede the community participation and accurate data collection, it is necessary to incorporate literate members of the community in the research team. These members of the community will not only act as guides but will translate the language. The community members to be part of the research team would be possibly those affiliated to University of Abomey-Calavi in one way or the other. There is also a possibility that some villages may not have one of their own in the university and in such cases the researchers will, in consultation with the local authorities, pick opinion/community leaders to assist in communication. The translators/community leaders help in getting information from the community because they are known by the people and hence more easily trusted. In addition, the

inclusion of community members/leaders in research team eases the tension as the community feel that their interests are well represented.

The first step towards getting the input of the community is getting the community to understand the research. Often the fear of the unknown impedes community participation, especially in Africa where communities are superstitious and thus look at foreigners and researchers with a skeptical view. It is practically impossible for the community to trust researchers and thus be willing to provide information when the community does not understand what the study is all about and how it will benefit them.

Therefore, to build trust there is need to make the community aware of the objectives of the study and more so how the outcomes of the study will benefit the community. Suffice to say, the best point to start is with meeting with the community/opinion leaders to explain to them the intended study. Once the leaders buy in to it, it is much easier to use the leaders to spread the word to the community. With the information first getting to the community from their leaders, whom they already trust, the community is less skeptical and more receptive. In addition, the leaders would feel acknowledged and thus hopefully give the study their much-needed support. Since the community, leaders speak the language of the community, then the community would easily listen to their leaders. It is also important to note that the community leaders need to give their approval and official authorization for the study to proceed smoothly.

Armed with the leader authorization and approval the next step would to start preliminary campaigns to create awareness about the intended study.

Where possible it is vital to have the leaders help with the forums for

creating awareness. It is also critical to make use of already established networks to get the message across. For instance in this case, Centre de Recherché Entomologique and University of Abomey-Calavi, Cotonou have been collaborating with the community in the fight against malaria for decades and thus have established a rapport with the community. These two institutions therefore are a vital bridge to the community and rather than go to the community directly, it would be prudent to go through them. This strategy has the potential to reduce the introduction formalities as well as the cost of giving incentives to entice the community. It is fair to assume that since these institutions have been on the ground for long the communities have enjoyed the benefits of studies carried by these organizations. Thus, already these institutions have the community's goodwill. Never the less, peradventure the institutions have a bad image in the eyes of the community then they would ruin the process of getting the community's input and thus would rather be dropped or remain in the background and not at the forefront.

Once the community is aware of the intended study (in terms of objectives, benefits and possible risks) and accept to participate then it is easier to get their input. The first means of getting information on the insecticides used in mosquito control and their impact is by talking to community leaders. It is vital to talk to leaders in the health sector (for instance doctors, hospital administrators and traditional healers) involved in the antimalaria fight. Interviewing such leaders would provide a lot of insight on how effective the vector control strategies have been. Hospital administrators would provide statistics on the hospital visits and admissions occasioned by malaria before

the intervention measures and after and whether over time, there are significant fluctuations in the effect. Traditional healers would provide information on whether the mosquito control strategies have affected their businesses.

Another way to get community input on the impact of the vector control strategies is through questionnaires to enlightened community members. For instance, questionnaires to households that use insecticide treated bed nets, those that spray their walls with insecticides, those who use insecticides on stagnant waters and those who do not employ any of the mentioned strategies would provide very valuable information. In as much as these questionnaires may help get information they have a shortcoming in that often if they are distributed randomly there some respondents who just fill the questions mechanically and thus give inaccurate data. It is therefore to integrate different ways of getting the community's input. Another important means of getting the community to contribute is through open forums (community meetings). The community needs to be informed of the benefits of the study and be given a form of incentive to participate. The incentive need not be necessarily in monetary form but could be inform of free treatment, free outdoor insecticides and free insecticide treated bed nets. The process of calling a community can be complex in scarcely populated or closed communities. It all begins with getting a permit (authorization) for the meeting from the local authorities who have been made aware of the intended study and bought into it. Once the local authorities have given a green light for the community meeting, the researchers need to advertise the meeting. In remote villages this can be challenging but the local

institutions such as churches, mosques and schools can help. Sending letters to publicize the meeting in churches and mosques is a very effective means of communicating about the meeting. Where print and/or electronic media is available and widely used, advertisement can be placed through the media. It is important for the research team to offer facilitation such as transportation to the venue of the meeting and a meal, for instance lunch, or refreshment during the period of the meeting.

Different organizations have their own process of appointing a leader to report health incidents to data collectors. The two major collaborators in this study, Centre de Recherché Entomologique and University of Abomey-Calavi, Cotonou, appoint the leaders based on competence, academic qualification and experience in the area of study. Having been involved in extensive malaria research in Benin, the institutions have established a pool of resource people in different specialties such as entomology, clinical trials, epidemiology, public health and other fields. As such, the institutions would naturally pick leaders with the relevant competences and experience to report the health outcomes. These leaders would collect data from the community and report the same to the principal investigators. Below is a chart of the interpersonal communication in the study:

Science communities through journal publications funding institution

Principal investigators (PIs)

Leaders of the collaborating institutions lab technologists

Staff of the collaborating institutions at the study sites

Community leaders

Community members

4. 0 Implementation

In order to articulate how the collaboration will be carried out, it is important to discuss the study design. The study will be carried out in 4 villages; one where bed nets treated with chemical insecticides (pyrethroid based) will be used in experimental huts owned by Centre de Recherche Entomologique. The entomopathogenic fungus *Beauveria bassiana* will also be used to treat bed nets in used in experimental huts in one of the villages. There will be untreated control huts (without any treated nets) in each of the sites. There will also be some huts that will have the walls sprayed with chemical insecticides, some with DDT and others pyrethroids. Centre de Recherche Entomologique has employed some staff (sleepers) who sleep in the huts to collect the dead mosquitoes every morning and record this vis-à-vis the dead mosquitoes in the control huts. The sleepers and other participants will be given chemoprophylaxis before the commencement of the experiments. The population of the dead mosquitoes in the experimental huts will be compared with the population of the dead mosquitoes in the control huts. Genomic studies will also be conducted at the Laboratories at University of Abomey-Calavi and the lab at LSHTM will act as the reference lab. The remaining two villages will be sites for the experiments with Bs and Bti respectively. In these villages, the microbial insecticides will be applied on stagnant water, which are breeding grounds for the mosquitoes. The staff on the ground, from the two mentioned institutions, will collect the data regarding the reduction of mosquitoes and the subsequent reduction malaria incidences from the community leaders and healthcare leaders respectively

and the PIs will analyze the data and present the data. The collaborative research approach has the potential to achieve excellent research outcomes within a short period of time and at a lower cost. In addition to cutting cost, the collaboration has enormous benefits on research.

One of the benefits of the collaboration is it provides the necessary funding. As earlier mentioned, LSHTM, which is a member of the Gates Malaria partnership, will provide the funding required for the research. LSHTM collaborates with many other institutions to expand the available funds to support antimalaria research based initiatives. In addition, to finances there are other resources required that would cost a lot of money and time to establish. Centre de Recherche Entomologique, has already constructed experimental huts that have been used for other related research for years and these huts will be of great benefit to the research. University of Abomey-Calavi, has been carrying out malaria research in Benin for decades and has established a rapport that will help the team reach out to the community. The two latter institutions have also mapped out malaria endemic villages and thus they will be very helpful in determining the most suitable study sites. The two universities will also provide laboratory facilities to do the necessary test as well as the technical knowledge for the study. LSHTM will particularly provide a reference lab that is necessary for validation/confirmation of results using state of the art technologies.

Collaborative research helps in transfer of technologies and knowledge thus enrich the research in terms of relevance, significance and quality. The research will also benefit from the knowledge and experience of researchers from the two universities and Centre de Recherché Entomologique. The

collaboration will also help build research capacity in Benin.

The main objective of the study is to evaluate the efficacy of the various vector control strategies in reducing the mosquito population and subsequently in reducing malaria incidences. Given that vector control is a key component in the fight against malaria, it is vital to conduct monitoring and evaluation programs that determine the impact of this component. With the rampant development and spread of insecticide resistant mosquitoes it is vital to develop novel environmental friendly insecticides and to diversify the range of insecticides as a means of preventing the development of resistance. The findings of this study will help the community and the local authorities choose insecticides that are more effective and thus avoid waste of limited resources on ineffective insecticides. The overall and eventual goal of the study is to reduce malaria incidences, mortality and morbidity. My role in the attainment of the goal begins with writing letters to request for collaboration with the mentioned institutions and writing of a proposal to the for funding by LSHTM and the other collaborators. The next step is seeking ethical approval and authorization from the local authorities in the study sites. After all the administrative issues have been taken care of, I will set up the research team with leaders chosen by the collaborating institution and to carry out the actual research.

In addition to the finances required to conduct the research, the team will need staff and volunteers on the ground to help with the data collection. The research will also need vehicles to travel from one village to another. For data analysis, the research requires computers with the relevant statistical programs. The research also requires well-equipped labs (which have been

mentioned earlier) for the genomic analysis to determine the presence of insecticide resistant mosquito strains.

The appropriate research strategies for planning, implementation, evaluation and revision of the interventions will be based on consultation with the Centre de Recherché Entomologique and University of Abomey-Calavi. The institutions have been on the ground doing various antimalaria studies and thus are uniquely placed to help in the planning and implementation of the project. The research team will first carry out preliminary research and visit the selected villages before embarking on the actual research work. The reconnaissance will inform the planning phase in terms of the resources required. The implementation of the study has been extensively discussed in the study design.

5. 0 Reflection

Given that the government and other stake holders in the antimalaria war in Benin have been spending billions to distribute ITN and buy insecticides for IRS; it is necessary to evaluate whether these strategies have been effective in reducing malaria incidences. Getting rid of ineffective insecticides and diversifying the range of insecticides used in mosquito control would go a long way in reducing the prevalence of malaria in Benin. The changing of insecticides used in vector control should be informed by research data establishing that the insecticide presently in use is ineffective or has significantly lost effectiveness. It is hoped that this research will inform the change from using chemical insecticides to using microbial and other environmental friendly insecticides, if they are found to be more effective and this will hopefully reduce the malaria prevalence, reduced the economic

burden of malaria and reduced the morbidity and mortality associated with malaria.

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