

# Tackling malaria, village by village: a report on a concerted information intervention by medical students and the community in Mifumi, Eastern Uganda

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## Abstract

**Background:** Can an information intervention facilitated by information technology and carried out by an interdisciplinary team comprising medical students, technical experts, and the community itself make a positive contribution in reducing the burden of malaria at the village level?

In Mifumi village in Eastern Uganda, MIFUMI Project, Makerere University College of Health Sciences Community Based Education and Service program (COBES), and the U.S. National Library of Medicine carried out a series of activities between 2007 and 2010.

**Methods:** The team surveyed the community's knowledge of malaria prevention and treatment; implemented a health information intervention using tutorials in a variety of media; and observed the community's use of previously distributed insecticide treated nets (ITNs) using a digital pen application.

**Results:** As a result of concerted education and outreach, the village residents have a good understanding of malaria prevention and treatment seeking behaviors. Leveraging the power of information technology and interdisciplinary teamwork, medical students and the denizens of a rural community were able to engage in an interactive experience of health education and promotion.

**Conclusion:** Preliminary observations suggest that a health information intervention in concert with a collaborative community effort of education and prevention can build capacity within a community to take control of its own health.

**Keywords:** rural health education, malaria, informatics

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## Introduction

### Background

"In 2010, there were 106 malaria-endemic countries and approximately 3.3 billion people at risk of infection, worldwide. The same year, there were an estimated 216 million episodes of malaria and some 655,000 malaria deaths – of which 91 percent were in the African region."<sup>20</sup> Malaria is the leading cause of morbidity and mortality in Uganda, the country bearing the third largest burden of the disease in Africa. In Uganda, it is estimated that malaria kills 70,000 to 100,000 people every year, the majority being children under the age of five.<sup>13</sup> Interventions for addressing malaria focus on preventing infection and illness; promoting effective

diagnosis and treatment and responding to the emergence and spread of drug-resistant malaria; protecting women through a combination of intermittent preventative treatment (IPT); the use of long lasting insecticide treated nets (LLINs) and developing new tools.<sup>4</sup>

The apparent perpetuity of the malaria burden is alarming in the face of existing and often available prevention and treatment interventions. Strategies that have proven successful often suffer from resource constraints, affordability, delivery and accessibility across local settings, and utilization or acceptance by end users.<sup>11,18</sup> Local perceptions of the disease clearly have an impact on prevention and treatment seeking behaviors.<sup>17,8</sup>

### Purpose

This report examines how the residents of Mifumi, a remote village in Eastern Uganda, are taking control of their own health with the support of strategic health and information technology partners. The particular focus is on malaria prevention and treatment seeking behaviors in response to concerted information interventions. The overall narrative illustrates how an information intervention, when embraced by the whole community, can make a difference in health at the grass

roots level.

If people in the village were part of an information campaign on prevention and treatment of malaria, would they be able to use this information to take actions to prevent malaria?

## The Partners

Three strategic partners -- The MIFUMI Project through Mifumi Health Center (MHC), the COBES program of the Faculty of Medicine at Makerere University, and the U.S. National Library of Medicine (NLM) -- began engaging the community of Mifumi village in November 2007. Using educational information intervention tools, the partners collaborated with community members to address problems of malaria prevention and timely treatment from 2007 to 2010.

The MIFUMI Project is an international aid agency founded in 1989. Their mission is to reduce the burden of poverty by securing basic rights for people living in remote communities in Uganda.<sup>21</sup> The Mifumi Health Center (MHC), the only health center in Mifumi village, was set up by The MIFUMI Project and opened in 2001. The unit provides maternity services, including antenatal, delivery and postnatal care; primary health care and laboratory services, as well as health information and community outreach services.<sup>14</sup> By 2010, MHC had attended to over 80,000 patients, mostly residents of Mifumi village.

Makerere University developed the COBES program for health sciences students in 2003 to better prepare medical students for work in rural settings, while building the capacity of rural communities to promote health and prevent disease through self-reliant approaches. At the end of 2007, MHC became a COBES site, and medical students from Makerere University's Faculty of Medicine began going to Mifumi village bi-annually and working directly under the mentorship of the Nurse-in-charge and her staff.

The U.S. National Library of Medicine (NLM) is committed to reaching the consumer or end user with electronic information resources on a wide range of health topics (National Library of Medicine). NLM<sup>15</sup> has conducted research projects in Uganda, bringing together interdisciplinary teams to assess the difference that information technology (IT) interventions can make in mortality and morbidity.<sup>19</sup>

## Methods

Mifumi is a remote village located 35 kilometers from Tororo town in Eastern Uganda, with a little over 800 residents. Prior to support from the MIFUMI Project, which began in 1989, Mifumi village had no roads, electricity or adequate sources of clean drinking water<sup>14</sup> and was no exception to the malaria scourge.

Between November 2007 and 2010, the partners developed and implemented culturally sensitive programs for preventing malaria and promoting treatment seeking behaviors among the Mifumi residents. The program comprised: a baseline survey conducted by COBES students in November 2007 using a closed-ended questionnaire; promotion of the use of ITNs; community sensitization on malaria by medical students working with the MHC staff and using audio and visual tutorials they had developed with their faculty and NLM; and a post-intervention observational study on the use of ITNs in Mifumi community. The latter was carried out by COBES students posted to MHC in 2010 in collaboration with NLM and The Mifumi Project, using digital pen technology. The digital pen application includes a pen equipped with a tiny camera, smart paper for data collection, and a computer program for receiving, storing, and collating data.<sup>10</sup> This digital pen application, originally developed at NLM for disaster preparedness, allows a researcher to capture data electronically while filling in survey forms, and then automatically exports data to a database on a computer for analysis. The application promotes efficiency in data collection and minimizes errors which can occur during manual data entry. All activities were carried out in collaboration with the Nurse-in-charge and her staff at MHC.

Specifically the partners were interested in whether an information intervention can have an impact on the behavior of residents with regard to malaria prevention, in particular with regard to use of ITNs and whether combined interventions, both live and in a variety of media, can contribute to a reduction in malaria morbidity and mortality. There were no interventions of ethical concern.

This section presents a résumé of these interventions.

### The distribution of mosquito nets

Between June 2006 and June 2007, MIFUMI Project through MHC distributed over 300 ITNs to the 170 households to promote malaria prevention. In order to

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gauge the level of interest and importance attached to the use of mosquito nets by the population, MIFUMI Project sold the nets to people in the village at a subsidized price, based on their ability to purchase.

### The baseline survey

In November 2007, COBES students, in collaboration with the MHC staff and as part of their posting at MHC, conducted a baseline survey to determine malaria prevention and treatment seeking behaviors of the residents of Mifumi village. The interviews comprised open-ended questions on the following thematic topics:

- Disease burden in Mifumi village
- Knowledge of village residents about malaria disease causation
- Treatment seeking behaviors
- Common malaria prevention practices in the community
- Common sources of health information.

### Health information intervention

Beginning in January of 2008, the COBES team and the staff of MHC implemented a series of health information interventions focusing on malaria. The COBES students used a tutorial on malaria prevention and treatment created by a collaboration of Makerere University (MU) medical students and Ugandan artists and translators working with NLM.<sup>16</sup> The tutorial, which was eventually translated into five local Ugandan languages, including 'adhola', the local language spoken in Mifumi village, was distributed in print as booklets and posters; as audio on the radio and in CD formats; and online as part of NLM's MedlinePlus African Tutorials. The posters were displayed at different strategic spots in the village. At the health center, the booklet and CD versions of the tutorial continue to be played in 2013 to sensitize patients on malaria prevention and treatment.

### Outreach by COBES students

In Mifumi village, COBES students worked with the school, youth groups, women's groups, and patients at the health center. They visited people in their homes and in trading centers. They discussed prevention of malaria with village community workers and continued to remind people of the most effective ways to prevent the disease. The Nurse-in-charge at the health center played and continues to play an indispensable role in mentoring and advising students, educating patients, and ultimately assessing, through her reports to the district health office, whether the information intervention

continues to support malaria prevention and treatment behaviors and contribute toward a positive difference in the morbidity and mortality of malaria in the village.

### Post-intervention observational study on the use of mosquito nets

In the period April – September 2010, the collaborators conducted an observational study on the use of ITNs in Mifumi village, using a digital pen technology application developed by NLM for disaster preparedness in the U.S. Fieldwork was carried out from 17th April to 11th May 2010 by a team of seven COBES students reaching 170 households that had previously received ITNs.

The purpose of this study was to observe the use of ITNs and to collect and collate data using the digital pen application. Through their participation, medical students were exposed to certain aspects of the research process and understood first hand how IT can be leveraged for the promotion of health research in a resource poor setting.

The digital pen and forms were prepared by the NLM team in Bethesda, Maryland, and shipped to Uganda for the observational study. The NLM team carried out training of the COBES students by telephone in preparation for the observational study. Before the observational study began, village residents were thoroughly briefed on the project by the Nurse-in-charge of MHC. Equipped with head lamps, digital pens, and "smart" paper forms, the COBES student team visited Mifumi village households at dusk when residents were preparing for bed and thus using or not using their nets and when mosquito prevalence and malaria transmission are high.<sup>23</sup>

### Results

#### Results of the baseline

In the baseline survey, a convenience sample of 98 residents of Mifumi village was interviewed.

Of these, 30 were male and 68 female, with 9 (9.18%) aged between 15-20 years, 56 (57%) of the respondents aged between 21 – 40 years and 33 (33.67%) aged 40+ years. While 31(32%) of the respondents were illiterate, 55 (56%) had attained primary education and 12 (12%) had attained secondary education.

With regard to disease burden, 86% of the respondents think that malaria is the disease that residents suffer from most; 5% think it is HIV/AIDS; 6% think it is cough; and 2% think it is diarrhea. Regarding the cause

of malaria, 63% think that malaria is caused by mosquitoes; 18% admit that they do not know; 19% attribute malaria to bad food, dirty water, moon shift, poor environment and coldness. 96% think that malaria can be prevented, especially by using mosquito nets. At the time of the baseline, 44% of the respondents used mosquito nets to prevent malaria, and 23% cut bushes growing around their houses. Other interventions included closing doors and windows early in the evening (19%) and getting rid of stagnant water (10%). 86% of the respondents had not heard about DDT (dichlorodiphenyl-trichloroethane) which has been used to kill mosquitoes in Uganda.<sup>9</sup> Regarding treatment seeking behaviors, 57% go to the clinic for treatment; 18% go to the drug shop; and 3% visit the herbalist. 27% of respondents obtain information from the Mifumi Health Center, 22% from health workers, 20% from radio, and 16% from friends. The interviewers noted that respondents to the survey expressed strong faith in MHC to provide information and treatment.

With regard to their behavior change as a result of having access to information, the respondents interviewed during the baseline survey had a general perception that friends, health center and radio "always say the truth." Also acknowledged were: family "because of trust;" health worker because "health worker knows it all;" and the Nurse-in-charge- simply because information comes from a Nurse-in-charge, the respondents believe it without question. The following remarks from the survey participants illustrate willingness to make behavioral changes, whether or not the information is accurate: "When he was told to remove the stagnant water around his home, he did so;" "when they told her that coldness causes malaria, she started putting on heavy coats."

#### Results on health information intervention

According to Sr. Goretti Athieno, the Nurse-in-charge at MHC and supervisor of the COBES teams, the health information intervention is having a positive impact on the behavior of the village community regarding malaria prevention and treatment: "When we played the CD for them, after that we actually stopped and asked them, have you got any message from what you have just heard? They really say yes; and at the same time they are practicing what they are actually listening to and then whatever was not said from the CD, they request to know from us in detail. They [the patients] were proud that they were learning to do something, and they were very happy with what was produced from

the screen. A poster they also see and learn from, but from the screen as they were pressing [the arrows to move from screen to screen], they felt that they were doing it themselves. It is possible that you can change a life. You can make that change to have a better healthy life."<sup>3</sup>

As the medical students field tested the tutorial they created on malaria, they witnessed tangible results of their success through the integration of the messages of the tutorial with the life of the village; for example, residents cleaning up areas of their yards which had previously been breeding grounds for mosquitoes. The field testing, in turn, increased the desire of medical students to work in the field as agents of change in rural settings.

#### Results of the post-intervention observational study on the use of ITNs

All 170 households of Mifumi village who received mosquito nets granted access to medical students to observe their use of bed nets, an activity that was carried out after 8:00 pm over six days of a three week residency by the COBES students. Interest on the part of village residents was high with a response rate of 100%. The team observed that 46% (78/170) of the households, a relatively high number, were still surrounded by environments with thick shrubs and undergrowth conducive to mosquito breeding. A few water traps such as broken pots and plastics were observed in 17% (29/170) of the households.

In almost all households, 99%(168/170), ITNs were available, with majority in active use (92%, 156/170). However, very few households(16%,28/170) had a mosquito net for each member (a 2006 population count by The MIFUMI Project showed that Mifumi village had 4.9 residents per household.) In almost all households, 99% (168/170), ITNs were available, with a majority in active use (92%, 156/170). However, very few households (16%, 28/170) had a mosquito net for each member. By 2006, Mifumi had 4.9 residents per household (839/170). In more than half the households (55%, 94/170) more than one mosquito net was in use, with priority given to adults in some households. Several households (42%, 71/170) had mosquito nets with damages. Most household members sleep on papyrus mats; mothers and children sometimes sleep on the floor, using their clothes as sheets and blankets. Mosquito nets were spread in only 44.7% (76/170) households by dusk, The female anopheles mosquito,

the malaria vector, is 'a dusk-to-dawn' mosquito, meaning it only comes out at night, which is why people in warm climates are encouraged to use sleeping nets.<sup>25</sup>

### The general trend of malaria morbidity

From a compilation of MHC statistics on patient encounters collated and transmitted to the Ministry of Health (MoH) Uganda as part of the routine reporting requirements, MHC observed the following trend in malaria morbidity and mortality from 2008 to 2010 (Table 1 below):

**Table 1: Malaria morbidity and mortality at Mifumi Health Center, 2008 – 2010**

Year	Base population <sup>a</sup>	Malaria morbidity		Malaria mortality	
		No. affected	Percentage	No. affected	Percentage% age
2008	24,994	4402	18%	303	1.21%
2009	25,794	3618	14%	118	0.46%
2010	26,619	2951	11%	10	0.04%

The population of MHC catchment areas, i.e. the sub-county of Kirewa in West Budama County based on the National Population Census of 2002<sup>22</sup> was used, corrected upwards by the annual population growth rate of 3.2% (Uganda Bureau of Statistics, 2009). MHC is one of two health centers in Kirewa sub-county.

### Discussion

This observation study demonstrates that the health information intervention helped the community to begin taking control of their own health with regard to tackling malaria. The provision of high quality malaria information and treatment is associated with increased malaria knowledge and a higher likelihood that patients will go to trained providers for fevers.<sup>12</sup> Specifically, it was noted that more households used ITNs (99% in post-intervention versus 44% in baseline). Qualitatively, there was evidence of more residents cleaning potential breeding places for mosquitoes around their homes. A general trend in reduction of malaria morbidity and mortality was noted over the intervention period. This observation is synonymous with similar studies that have demonstrated that "malaria control can be significantly improved in rural areas, if caregivers are adequately empowered through appropriate health education intervention"<sup>2</sup>; however, change in attitude requires a longer period to realise.<sup>2,6</sup>

The downward trend in malaria morbidity and mortality based on records at MHC could be evidence of the community's engagement in taking control of their health, as also noted by Gosh et al.<sup>6</sup> However, given that the intervention programs were not specifically designed to rigorously assess impact on morbidity and

mortality in a research context, it cannot be generalized that this trend is a direct result of the interventions. However, the combined interventions could provide tools and motivation for change at the community level.

The community could continue to be sensitized on the correct usage of mosquito nets. Furthermore, monitoring the sustainability of these interventions in Mifumi village over time, could assist in defining approaches that work in facilitating community ownership and engagement in prevention and treatment, an aspect noted as relevant by other authors.<sup>7</sup>

The components of this program were not designed as a rigorous research undertaking. The series of activities described in this report offered opportunities for participating teams of COBES students to understand the beliefs and behaviors of people in a village setting as they treated patients while carrying out a health information intervention. The project placed these medical students, many from urban backgrounds, in a challenging and engaging environment where they tested their clinical abilities and learned communication, education, and research skills. The main challenge experienced by the students was that of not knowing the local language; to remedy this, local interpreters were engaged. Furthermore, the students were taking care of patients at MHC as well as carrying out the information intervention and bed net observation activities. Future initiative should consider taking issues of time management into consideration.

The objective of the collaborative effort -- to encourage community ownership and welcome the thoughts

and ideas of the community as critical to the research process was embraced by the local population and all the partners. Positive experiences and lessons learnt from this project could be strengthened or replicated at COBES sites across the country.

### Conclusion

This iterative process between the partners and the community over three years has produced both unique teaching tools as well as potentially life changing experiences. The combination of clinical work in a rural environment, hands on development and implementation of communication/education tools, and engagement in an observational study using a new information technology application teaching basic research skills. It has enhanced the experience of future doctors, whose backgrounds have been limited by the walls and wires of urban environments, to include the wealth of learning available through outreach in a rural community and to participatory engagements leveraged by the power of information technology. Observations over the three years reflect an interest by the local people in taking control of their own health and modest positive health outcomes.

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### Conflict of interest

None of the authors has potential conflict of interest.

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