

**Factors affecting the acceptance and usage of insecticide
impregnated bed nets to control malaria:
Current knowledge and plans for research
in Bagamoyo District, Tanzania.**

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Introduction

In Tanzania malaria is the leading cause of outpatient hospital attendances, often the leading cause of hospital admissions, and one of the top causes of mortality in hospitals¹. Malaria control programmes in the country have, unfortunately, encountered serious setbacks in recent years. Resistance to chloroquine, the drug most suitable for the treatment and prophylaxis of malaria in primary health care programmes, has become widespread². The spraying of houses with residually acting insecticides, although it can be a highly effective means of control, has proven difficult to implement due to organizational problems and the high cost of insecticides and equipment³.

Given this situation, a significant effort has been put into investigating the efficacy of, and the operational problems associated with, insecticide impregnated bed nets (IBNs) in Tanzania. A three year trial has been conducted in Muheza District, Tanga by investigators from the Amani Medical Research Centre of the National Institute for Medical Research and the London School of Hygiene and Tropical Medicine⁴ which compared the effect of bednets impregnated with permethrin, bednets impregnated with lambda-cyhalothrin and residual spraying with DDT, and examined the acceptability and operational difficulties associated with the implementation of this type of intervention at the community level. The same group collaborated with the Tropical Pesticides Research Institute (TPRI) to conduct experimental hut trials to examine the effect of treated nets and curtains on mosquito house-entering and feeding behaviour⁵. A trial of IBNs has also been conducted by the TPRI at the Usa River settlement in Arusha⁶. A group at the Swiss Tropical Institute Field Laboratory (STIFL) in Ifakara is in the early stages of a further trial of IBNs. In addition, the UNICEF/WHO Joint Nutrition Support Programme (JNSP) has been distributing impregnated bednets for use by pregnant mothers and young children in Zanzibar, and there are plans to extend this programme to Pawaga District, Iringa.

From the perspective of the programme planner, IBNs are attractive for several reasons. First, it is an intervention which corresponds to a felt need of many Tanzanians, that of protection from biting insects. Secondly, the technology used is much less complex than that required for the spraying of houses with insecticides. Much of the responsibility for distribution of the nets and their reimpregnation could conceivably be transferred to community organizations or village health workers. Finally, there is the potential for cost recovery through the

sale of the nets and insecticides.

There are, however, several disadvantages to the use of IBNs which may limit their effectiveness. Although vector control experts have not yet arrived at specific recommendations, it is felt that a high rate of usage may be necessary for IBNs to have significant impact on transmission. In other words, instead of some people using nets some of the time, it may be necessary for most people to use IBNs most of the time for an effect to be seen on malaria morbidity and mortality. This is particularly true in sub-Saharan Africa where the principal vector of malaria is Anopheles gambiae s.l. Species in this complex, because of their biting and resting behaviour, life expectancy and efficiency in acquiring and transmitting the parasites which cause malaria, may continue to transmit malaria even after measures are taken which often eliminate malaria transmission in Latin America or Asia where others species of Anopheles are found. For example, in the Garki project in northern Nigeria, even the combination of mass drug administration and residual spraying, implemented under optimal administrative conditions, failed to interrupt transmission for any length of time, although there was a significant decrease in the prevalence of parasitemia⁷. Establishing and maintaining a high rate of usage of IBNs may be difficult. In addition, there are a number of operational details related to the importation and/or local production of nets and insecticides and the distribution and reimpregnation of the nets and community participation which, if not attended to, could make the difference between programme success and failure.

This paper will attempt to review the social, cultural, economic and organizational factors which will need to be considered both for the design and implementation of the trial of IBNs planned for Bagamoyo District and for future malaria control programmes of the Ministry of Health of Tanzania. This review is in no way complete. It is hoped that participants in the workshop will point out important factors which are not mentioned here. The topics to be covered are shown schematically in figure one.

Part I: Perceived benefits of the use of bed nets: The role of local models of health and illness and disease transmission by insects.

The effects of local or folk explanatory models of health and illness on acceptance of IBNs can be very important, but often go unnoticed. Operational problems such as a non-functional distribution system for nets lead to direct and obvious results: no nets are present. On the other hand, most people have difficulty articulating the models they use to explain the occurrence, causes and recommended treatments for different illnesses. When these models clash with biomedical

explanations of disease and disease transmission, the effects are most often indirect. For example, a patient may state that he or she does not want to take a prescribed drug because it is too expensive, rather than stating that he or she does not feel the drug will attack 'the real cause' of the illness.

The effects of these different explanatory models may not be apparent during the lifetime of a well-funded project as the cost and inconvenience of using IBNs is minimized. When the project ends, however, people weigh the benefits of investment of time and money in using IBNs against their other priorities. The assessment of what these benefits are is based on the models they use to explain health and illness, the perceived severity of the problem (malaria or mosquitoes) and the perceived benefits of the IBNs. It is at this point that usage of IBNs may show a significant drop.

Perception of the types of malaria and their causes

Both entomologists and parasitologists who study malaria and the people who suffer from malaria have had to develop complex models to explain why, on the one hand, there seems to be a relationship between mosquitoes and malaria and yet, on the other hand, one can not predict based on the mere presence or absence of mosquitoes when clinical cases of malaria will occur. In the biomedical model, distinctions are made between the causative agents of malaria which are the four species of Plasmodium parasites, the vectors of malaria which are various species of Anopheles mosquitoes and factors which affect the dynamics of transmission. The latter include humidity and high temperature which increase mosquito longevity and the immunity the human population has to malaria as a result of previous exposure and current nutritional status.

People living in malarious areas often have noticed that more cases of malaria occur for example when there is high humidity or heavy rain, when people are weak from hard work and insufficient food or when there are large numbers of mosquitoes present. The usual result of such observations is that humidity, rain, hard work and malnutrition, instead of being seen as factors which modify the dynamics of transmission, are seen as distinct causes of malaria. Further explanations are invoked to explain the cases that seem to occur 'for no other reason'.

Helitzer-Allen in Malawi⁸ examined factors affecting the use of prophylactic chloroquine among pregnant women in Malawi. The term malungo which literally means fever and represents the concept of malaria was found to have seven separate subcategories, each with its own etiology, symptoms and treatment. They included, by etiology, malungo due to mosquitoes, contamination of food by flies or coughing, rain and weather changes, hard work, spirits or witchcraft, dirty water or

food, and kulipuka, a form of malungo in children associated with blisters. An important feature of this classification is that only malungo caused by mosquitoes or contamination of food by flies or the cough of malaria patients was thought to be treatable with chloroquine, and this was one factor which lessened compliance with regimes of prophylactic chloroquine. Similarly Fivawo⁹, in a study of the social and cultural aspects of malaria in Muheza District, Tanga, found that people could name eight distinct causes of homa ya mbu.

The significance of classifications of malaria and malaria-like illnesses such as those found by Fivawo and Helitzer-Allen is that IBNs may only be thought to useful for preventing one 'type' of malaria. Therefore, even if people recognize that malaria is caused by mosquitoes, and that IBNs will prevent exposure to mosquitoes, they may not feel that malaria is preventable as exposure to other causes of malaria such as rain is inevitable. In the study of Helitzer-Allen, a subsequent health education intervention stressed that chloroquine is beneficial for all forms of malungo, not just those attributable to mosquitoes, contamination of food by flies or the cough of malaria patients, resulting in a statistically significant increase in compliance with an antenatal prophylactic chloroquine regimen.

Recognition of different types of insects and their role in transmission

When health professionals design health education messages they often assume that, once people are told what the dominant mode of transmission of a given disease is, they will realize automatically that other modes of transmission are unimportant. For example, in education about mosquito-borne diseases, people are usually expected to assume without being told that they are not transmitted sexually or by the faecal-oral route. Folk understandings of transmission, however, usually do not assume that, because one mode of transmission is dominant, others are insignificant. This point was illustrated in a recent study by Mzirarubi *et al.*¹⁰ of knowledge and practices with respect to AIDS among truck drivers in Tanzania. Although almost every person interviewed stated correctly that AIDS is sexually transmitted, 61% of the women and 53% of the men interviewed stated that AIDS can also be transmitted by mosquitoes. The point here is not that people fail to distinguish between diseases such as AIDS and malaria, which is probably a rare occurrence. This example is meant to illustrate that 1) information about the transmission and prevention of one communicable disease may be thought to be relevant to other communicable diseases; and 2) people think communicable diseases can have many different modes of transmission. This may lead them to conclude that control measures are inefficacious, because they only aim to block one mode of transmission.

The perceived relationship between different categories of insects by the community may be different from that of the entomologist. In Mexico, we have found that although flies and mosquitoes are clearly recognized as distinct entities, they are often thought of as the male and female of the same species (like bull and cow) rather than as two distinct species¹¹. Health education messages about the transmission of typhoid fever by flies were thought to apply to mosquitoes, and messages about the transmission of malaria and dengue by mosquitoes were thought to apply to flies. Preventive measures directed only against mosquitoes were thought by some people, accordingly, to be unlikely to completely eliminate the transmission of malaria and dengue.

The role mosquitoes play in causing malaria may be explained in a number of ways. In Honduras it was found that there were at least five explanatory models¹². In the 'fly model', mosquitoes are seen as carrying microbes or germs mechanically from contaminated water. This is reinforced by the fact that Anopheles mosquitoes commonly breed in swamps which are considered to be full of 'germs'. In the 'bee model', mosquitoes cause illness by injecting venom. In the 'trigger model', the causative agents of malaria are always in the body. Mosquito bites are seen as 'activating' these dormant microbes.

In the 'debilitation model', anaemia results from the cumulative effect of hundreds of mosquito bites. The body is in a weakened state which leaves the person susceptible to malaria. Some people feel that the causative agents of malaria are always in the body, and that it is only when one is debilitated that illness appears. This model appears to be common, and is supported by the fact that people often receive a diagnosis of anaemia and malaria at the same time in the clinic.

Finally, in the 'mosquito model', mosquitoes are seen as extracting microbes from one person and passing them on to another. The significance of these different ways of understanding transmission is that, according to some, the volume of bites received will determine the risk of disease while, according to others, even one bite can cause disease. The perceived efficacy of IBNs, which will decrease may not eliminate mosquito biting, may be affected by how people understand the role of the mosquito.

Perceived benefits of using bednets

A large number of factors will affect the assessment people make of the benefits of using bednets. It is important to examine not only whether they are considered to be beneficial or not, but exactly how beneficial they are compared to other

methods of treatment and prevention. As mentioned above, some people may feel that they are not effective against all the causes of malaria, or do not prevent some forms of transmission. The perceived benefits will also be affected by how serious an illness malaria is thought to be and the amount of annoyance caused by mosquitoes. Adults often have enough immunity that attacks of malaria are mild and rare. In this case the benefits of IBNs for their children might need to be stressed. In addition, some individuals do not seem to be bothered much by mosquitoes, while others are unable to sleep if mosquitoes are present.

Several investigators have noted that IBNs also provide protection from cockroaches, bedbugs and rodents^{13,14}. People may notice dead cockroaches and bedbugs in the vicinity of the nets, providing direct proof of their efficacy. It has been suggested that this effect of the IBNs be stressed when their use is being promoted. A possible disadvantage of this approach could appear if cockroaches and or/bedbugs become resistant to the insecticide, but mosquitoes are still susceptible. Seeing cockroaches and bed bugs once again flourishing, people may conclude that the IBNs have lost much of their efficacy.

In summary, people are likely to conclude that IBNs are an efficacious technology, based on the fact that they provide a barrier from mosquitoes, cockroaches, bedbugs and rodents. Local explanatory models about the causes, transmission and prevention of malaria and other communicable illnesses may lead people to conclude that their efficacy as a malaria prevention measure is limited, and to underestimate the potential benefits of using IBNs. Prevention of malaria is not usually mentioned as a benefit of using IBNs. For example, the following reasons for the purchase of nets were given in The Gambia, in descending order of preference: protection from mosquitoes and other biting insects; protection from rats, lizards and their droppings; gives privacy in bed and protection from dust¹⁵. Somewhat different results were obtained by Alilio¹⁶ in a survey in Pawaga Region, Iringa. Of those who used nets, 69% stated that they used them to decrease malaria, 30% for protection from mosquitoes and .5% for protection from other biting arthropods.

Part II: Acceptability and Proper Usage of Impregnated Bed Nets

In this section we will review issues of acceptability and proper usage of IBNs, as well as ways in which an assessment can be made of the level of usage in the community.

Acceptability of IBNs

The major factors affecting acceptability of IBNs are migration patterns, beliefs about and practices in relation to

bed nets or similar-looking objects, design (shape, size and material) of the nets and side effects (lack of ventilation, symptoms from exposure to insecticides).

Differences between ethnic groups in migration patterns and beliefs about bed nets are well documented. Bradley *et al.*¹⁷ report that, in the Farafenni area of The Gambia, 99% of the Mandinka, 64% of the Wolof and 58% of the Fula use bed nets. This data was confirmed by MacCormack and Snow. They found that the reasons for these differences were more cultural than economic, including "Mandinka sleeping habits and the need for privacy, the provision by Mandinka husbands of bed linen including a net as part of marriage exchanges, and Fula preferences for being unencumbered with goods so that they might move with their herds whenever necessary"¹⁸. It has been reported that some coastal peoples in Tanzania feel that bed nets are similar to shrouds used to cover dead people, and that they, therefore, are not willing to use them.

In Bagamoyo District, those who grow rice typically spend part of the months of April, May and June in their fields protecting the growing plants from birds. It will be important to find out both how much exposure they have to mosquitoes during this time, and whether they would be willing to take IBNs with them to the fields.

There are many issues to be considered in the actual design of bed nets. Njunwa *et al.*¹⁹ found that nylon nets were too flimsy, and soon developed holes. After six months many had to be replaced. They were, however, easier to reimpregnate because they could be wrung out. Polyethylene fibre nets were very durable and only slightly more expensive, but had to be left to drip instead of wrung out during impregnation. Both kinds were found to burn slowly when they caught fire. Cotton nets have been found to be more flammable and to absorb more insecticide (making higher doses necessary for reimpregnation) than nets made of artificial materials²⁰. The shape and size of the nets should be adapted to local needs, as determined during the baseline research.

The major side effects of using bed nets reported in Tanzania are lack of ventilation and cold-like symptoms from the insecticide. Alilio²¹ in his study in Pawaga District, Iringa, found that 62% of the people interviewed never use bed nets, 16% sometimes used them, 21% always used them. Of those who sometimes used them, all did not use them in the hot, dry season before the long rains, and all did use them during the 'mosquito season'. Such a variation in usage will probably also occur in Bagamoyo District. Entomological studies will need to address whether we should encourage people to use nets every month of the year, or whether the risk of transmission is low enough during the hot, dry season that suspension of the use of nets during

this period does not jeopardize the control of malaria.

Njunwa et al.²² found that several members of the impregnation team experienced running eyes and noses and, in two cases swollen faces, when impregnation was carried out with lambda-cyhalothrin. Members of the community also experienced these symptoms during the first few days after they received their nets. There were preliminary indications that hanging a net for a few days after impregnation to dry would eliminate this problem. This would be feasible when new nets are being given out, but inconvenient for reimpregnation.

Proper Usage of Bed Nets

Rozendaal²³ lists the following factors to consider in the evaluation of whether bed nets are being properly used:

1. Time spent at night per age group: (a) outdoors; (b) indoors for other purposes than sleeping; (c) sleeping. Patterns of nighttime activity can have a large impact on the efficacy of IBNs. Leake and Hii²⁴ in East Malaysia found that many adults watched battery-operated televisions until late at night, at a time when feeding by malaria vectors was at a maximum. This was thought to be one of the main reasons why, in a previous trial of IBNs, prolonged suppression of malaria transmission had not been achieved.

2. Proper use of the mosquito net before sleeping: tucking in under a mattress or sleeping mat to close all openings. When people sleep on bamboo floors or in beds with string mattresses, special mats should be used to prevent mosquitoes from entering the net or feeding from beneath. For non-impregnated bed nets whose efficacy is based solely on their ability to function as a barrier to mosquitoes, proper use of the net before sleeping is very important. For IBNs this will be less important, and a decision will have to be made about whether it needs to be stressed. Lines, Myamba and Curtis²⁵ found that an IBN in which holes had been cut, to simulate a torn net, reduced the number of mosquitoes which fed and survived approximately as well as an intact IBN.

3. How many people sleep under one net and what is the relation between occupancy rate and proper use of nets.

4. What happens to the nets at daytime, are they rolled up or left hanging down?

An additional aspect of proper usage which needs to be examined in trials of IBNs is whether people are washing their nets. Njunwa et al.²⁶ in their trial of IBNs in Muheza District, Tanga, marked nets with both an indelible marker and a washable marker. Disappearance of the latter was evidence that the net

had been washed. Washing of permethrin-treated nets at a dose of .2g/m² was found to greatly decrease the mortality of mosquitoes exposed to the net, while 100% kill of mosquitoes exposed to nets impregnated with lambda-cyhalothrin at a dosage of 30 mg/m² was obtained even when the nets had been washed.

Measurement of Usage of IBNs

If malaria transmission is not suppressed in a trial of IBNs, there are several possible explanations: 1) transmission is so intense that IBNs alone can not significantly decrease it; 2) due to characteristics (e.g. feeding before people go to bed) of the local malaria vector(s), IBNs are not an appropriate method of control in this setting; or 3) too few people are using the nets, or they are being used improperly. The first two explanations can be explored through entomological and malariometric studies.

There are four ways in which levels of usage of IBNs can be assessed: (Sample data collection forms are shown in figures 2 & 3)

1) SURVEYS WITH CLOSED-ENDED QUESTIONS. Questions about whether a household owns bed nets, whether they are being used and whether they are being washed can be included in multi-purpose surveys, or in surveys which only examine usage of IBNs. The validity of this method may be low if the communities have been exposed to health education messages and, therefore, know that they are supposed to be using IBNs. A good example of this is described by Leake and Hii in two villages in East Malaysia²⁷. In one village (Telupid) where health education had recently been carried out, 31.4% of people were found to be using nets by direct observation, compared to 47.4% who stated that they had used nets on the previous night in a survey conducted the next morning. This difference was statistically significant. In another village (Kudat) where no health education had been carried out, 52.5% of people were found to be using nets by direct observation, compared to 58.1% who reported that they had used nets in a survey conducted the next morning. This difference was not statistically significant. Despite the limited validity that this method can have, it is the most common method for assessing bed net usage because it is easy to conduct and leads to less resistance from the community than more intrusive observational methods.

2) DAYTIME OBSERVATIONS. In this method, houses are visited during the day. All nets are examined, and their serial number, condition (presence of holes, presence of washable ink indicating that they have not been washed) and position (beside bed, over bed, elsewhere) are noted. Questions are then asked about how many people slept under each net on the previous night and how many

people did not sleep under any net. These observations were included in the survey instrument administered used by Leake and Hii in East Malaysia. This method does provide direct confirmation of whether nets are present, but still does not provide direct evidence of the actual usage of the nets. It is the best way to determine how often nets are being washed. These observations might be conducted periodically by mabalozi or community health workers.

3) NIGHTTIME OBSERVATIONS. Observations are not made when everyone is in bed, as this is too intrusive. Leake and Hii made observations between 9 pm and 12 pm, when all children and some adults had gone to bed. Observations could also be made in the early morning, when women are up fetching water or preparing food but men and children are still in bed. Observations are quick and consist of counting the number of nets in use, the number of people sleeping in them and the number of people awake outside of the nets. If necessary, the procedure can be simplified so that only a count of the number of nets in use is made. This is obviously the most intrusive method. During the pre-intervention research, an assessment will need to be made as to whether this method is acceptable to the community, and if so, when observations could be made.

4) INFORMAL CONVERSATIONS AND OBSERVATIONS. This method is an adjunct to, but not a replacement for, the above methods. As a result of daily contact with community members, project staff should be able to get an impression of whether most people are using the nets or not. This method will be more valid (less likely to yield wrong results), but less precise than the above methods. For example, if through informal contacts it appears that nobody is using the nets, but direct observation reveals a high rate of usage, it may be that people are using their nets much more when they know that the evaluation team will be in the village.

Part III: Cost recovery

Despite Tanzania's goal of self-reliance as stated in the Arusha Declaration, the health sector is heavily dependent on foreign aid both for the establishment of new facilities and programmes, and also for long-term recurring costs²⁸. This has been particularly the case for vector control programmes, since necessary insecticides and equipment mostly have to be imported. Many vector-control programmes end as soon as funding stops. Furthermore, as many of the insecticides are manufactured from petroleum by-products, their cost can be expected to rise when petroleum prices rise, in other words at a time when the country is already short of foreign currency.

It seems unlikely that the Ministry of Health of Tanzania

could cover much of the costs of an IBN programme. Current spending has been estimated to be less than US \$2 per annum²⁹. As there appears, nevertheless, to be a strong demand for bed nets already among Tanzanians, a malaria control programme based on IBNs has the potential to include a cost recovery component. In Pawaga District, Iringa, Alilio³⁰ found that of those who owned bed nets already, 42% had paid from 100 to 1000 Tanzanian Shillings, 35% had paid from 1001 to 2000 and 24% had paid more than 2001. When respondents were asked whether they would purchase nets if the government were to supply them at a price of 1000 Tanzanian Shillings, 55% of all the people (current users and non-users) said they would buy one, 28% said no and 17% said maybe. If taxes on imported bed nets are waived, their market price will probably still be more than 1000 Shillings.

A key question must be whether coverage of 55 +/- 17% of the population would be sufficient to have any effect on malaria. It is also crucial to know whether the 28% who said that they would not buy a net are in fact those at greatest risk of malaria due to their low economic status and sub-standard housing. In Muheza District, Tanga, an attempt is being made to set up a revolving fund administered by the wenyekiti (village chairmen). Token payments collected for the nets are going to be used to pay for the replacement of damaged nets³¹.

Another concern is seasonal availability of the nets. In Bagamoyo District the highest mortality every year occurs during the months of April to June³². These are the months of heavy rain, food shortage as it is just before the rice harvest, and shortage of money. This is also a time when many people are living in the fields to protect the rice crop from birds. It is, accordingly, the time when there is perhaps the greatest need for IBNs, and yet people have the least capacity to purchase them. In addition, their distribution during this season would be very difficult due to the bad condition of the roads. A successful malaria control programme based on IBNs would need to have the nets available for distribution in August and September when people have spending money available from their harvest. This would be less important for those people who make their living through fishing or growing coconuts, as the income from these activities is more evenly spread throughout the year.

MacCormack, Snow and Greenwood³³ review the economic aspects of the use of IBNs in primary health care in The Gambia, and conclude that, given the high cost of imported nets and problems in distribution, the best chance for a successful programme lies in local production of the nets. They see it as an income-generating activity involving the grass roots of the rural economy. They state their case as follows: "Tailors, responding to consumers' preferences, are providing the kind of nets people want to buy, including those that will fit the different sizes and shapes of beds in use. However, primary health care workers

have a role in advising villagers on such matters as ensuring sufficient overlap on the net's opening side, and adequate length to allow the net to be tucked under the mattress. Permethrin treatment of nets can also be done locally, with primary health care workers assisting village women."

Part IV: Implementation at the community level

Communities need to be involved in the distribution and regular reimpregnation of IBN so that the intervention is acceptable and locally sustainable with minimum input from government agencies. This entails issues of relations between project staff and community, community participation, information, education and communication (IEC) and supervision and monitoring.

Relations between project staff and communities

Although the project will bring many benefits to the community, many of the activities may be perceived as time-wasting or annoying. Collection of insects will take place in and around people's houses, repeated blood samples will be taken from children, children may have to take curative doses of malaria medication even if they do not feel sick and people will be asked many questions. Time will need to be invested in the establishment of solid contacts with communities at the outset. An honest appraisal should be given of the advantages and inconveniences which will result from the project.

Community Participation

Active community participation in the design and implementation of health and development programmes is crucial to their success. Communities are rarely involved in real decision-making, and therefore feel they have little stake in programme outcome. Nichter³⁴ points out that assumptions regarding what a community wants, needs, or will support, are usually made by programme planners rather than the community. Rajagopalan and Panicker³⁵ state that "Many times such plans are forced upon the villagers and the latter acquiesce passively to their implementation, without participating in them. Their acquiescence is often mistaken for cooperation/participation." The fact that the initiative for the use of impregnated bed nets has not originated among the people of Bagamoyo District already raises some controversial issues. On one hand important decisions have already been made without the input of the people the programme is meant to benefit which may make community participation more difficult to achieve. On the other hand, if no intervention is specified, it is impossible to draw up a budget and difficult to obtain funding from governments or aid agencies. Ways to involve the community actively in other aspects of the planning, implementation and evaluation of the

project need to be pursued vigorously.

The role of Community Health Workers (CHWs), which have been the backbone of rural health services in Tanzania, must be well thought out. A number of difficulties have been identified with the current CHW programme^{36,37}, many of which are related to their job descriptions. It is anticipated that the addition of this intervention (distribution of nets, reimpregnation) to their responsibilities has the potential to strengthen and further define their roles. It may, on the other hand, be one more responsibility for which they have neither the time, nor training, nor administrative support necessary for it to be carried out well.

Alternatives to the involvement of CHWs include the involvement of mabalozi (10-cell leaders), wenyekiti (village chairmen), religious officials or even special purpose workers. In the IBN study in Muheza District, wenyekiti distributed the nets, had people sign for them, and are collecting the token payments which are going to be used to start a revolving fund to replace damaged nets. In the Kongwa Trachoma Project³⁸, a special class of worker was created. For the application of tetracycline ointment daily to the eyes of children, Village Treatment Assistants (VTAs) were nominated, each of whom was responsible for the administration of the ointment in five households, or to about 25 children. The system apparently worked very well. Good records were kept, and the VTAs were enthusiastic about their work. Creation of a special class of worker rather than using existing resources usually makes programmes less sustainable due to higher staff costs and duplication of resources.

Information, Education and Communication (IEC)

Nguma³⁹ reviews the current status of IEC for behaviour change in health in Tanzania. He notes that many of the difficulties of the Health Education Unit (HEU) of the Ministry of Health have much to do with problems of organisation, coordination and planning. These problems are not well recognised, as attention is usually focussed on the content of the messages and the medium used to convey them to their target audience. Nguma notes that there are a large number of organisations producing health education materials, and little coordination of the wide variety of messages which are being propagated.

I mentioned in part I that people may apply information about the transmission and prevention of one communicable disease to communicable diseases in general. This means that there should be a coordination of health education materials among past, present and future communicable disease programmes in any

given country. If terminology used in the different programmes overlaps, as is common with communicable disease, the problems are even greater.

An example of the consequences of lack of coordination was encountered recently in a dengue haemorrhagic fever control programme in Honduras⁴⁰. The Spanish word bicho can refer to bacteria, intestinal worms, insects and even spirit companions of men and animals. As a result of health education campaigns promoting the use of oral rehydration solution (ORS) in the early 1980s, bichos came to be associated by many people with diarrhoeal diseases. In a community-based dengue control programme that started in 1988 which attempted to encourage people to control the breeding sites of the larvae of the mosquito Aedes aegypti, the larvae were commonly identified as the cause of diarrhoea. A great deal of difficulty was encountered in trying to convince people there there is a connection between mosquito larvae and adult mosquitoes, and that controlling the former would have an effect on the latter.

In kiswahili many words have a wide range of meanings. Health educators, in attempting to use the most understandable language, often use the most simple and common words, which may also have the most potential for ambiguity. As noted earlier, a recent study among truck drivers in Tanzania found that the majority thought that AIDS could be transmitted by mosquitoes. One reason for this may be the use of words such as mdudu which has a range of meanings similar to bicho. For example, I observed that following message on an AIDS prevention poster on display at the Tanzania Public Health Association conference:

"Tusaidiane kujikinga na mdudu kiini cha ukimwi"
(Let us help each other to protect ourselves from the AIDS virus)

Health personnel quickly recognise that mdudu kiini means AIDS virus. It may be however that ordinary people reading this think that there is some relation between the mdudu kiini cha ukimwi and wadudu like flies and mosquitoes which transmit diseases, wadudu which cause intestinal infections and wadudu which make their cattle sick. In addition, the verb kukinga is likely to be used in explaining how bed nets work or why they should be used. In view of the fact that IEC about both AIDS and malaria is likely to intensify in the coming years, it would make sense to make sure that the messages are mutually reinforcing.

Another issue will be the delivery of the health education. Nguma points out that there is a severe shortage of health educators in the country, and that there is also the belief that 'anyone can do health education'. The choice of who will deliver the education and when it will be delivered is an important one. If people who already have other roles such as CHWs or wenyekiti are used, the programme should be more sustainable. These

people, however, are more likely to stick to previously memorized messages instead of entering into a real dialogue with the community about their concerns about the nets. The use of fewer, more highly trained health education personnel, on the other hand, may lead to a more expensive programme with less frequent health education. A key factor in the decision will be training of those who will do the education: how it is done, who does it and who gets it. One outcome of this research project should be the production of a training manual for use in health education in IBN programmes.

Finally, Nguma points out that the audience must be in a receptive mood for the education they are going to get. He gives the example of ten minutes of health education that is done every morning in health centres in Tanzania. The topic to be covered is determined by the health workers, not by the current concerns of the patients. The talk may be on malaria even if all the patients have diarrhoea that day. In a IBN intervention, seasonal variation in work schedules will be important. If everybody is out in the fields protecting the rice from birds or harvesting rice they will probably not be in the mood for a talk on how to reimpregnate bed nets. Baseline research should look at when people are most likely to be receptive to educational activities.

Supervision and Monitoring

Finally, an IBN intervention may fail because of lack of supervision and monitoring. MacCormack and Lwihula⁴¹ showed how a programme aimed at controlling malaria in children through the use of prophylactic chloroquine failed because attention was not paid to a wide variety of small problems which arose. These included the exclusion of socially marginal families from programmes and irregular supplies at the local level. Each of these 'details' was small in itself, but the accumulation of many of them threatened the success of an otherwise sound programme. This study should determine what type of long-term supervision is necessary for the programme to function effectively.

Conclusions

This paper is an attempt to summarize the social, cultural and economic issues which will be relevant to the development of an IBN intervention in Bagamoyo District, Tanzania. Any comments, criticisms or additions are more than welcome.

Figure One:
Factors affecting acceptance and usage of insecticide impregnated bed nets to control malaria.

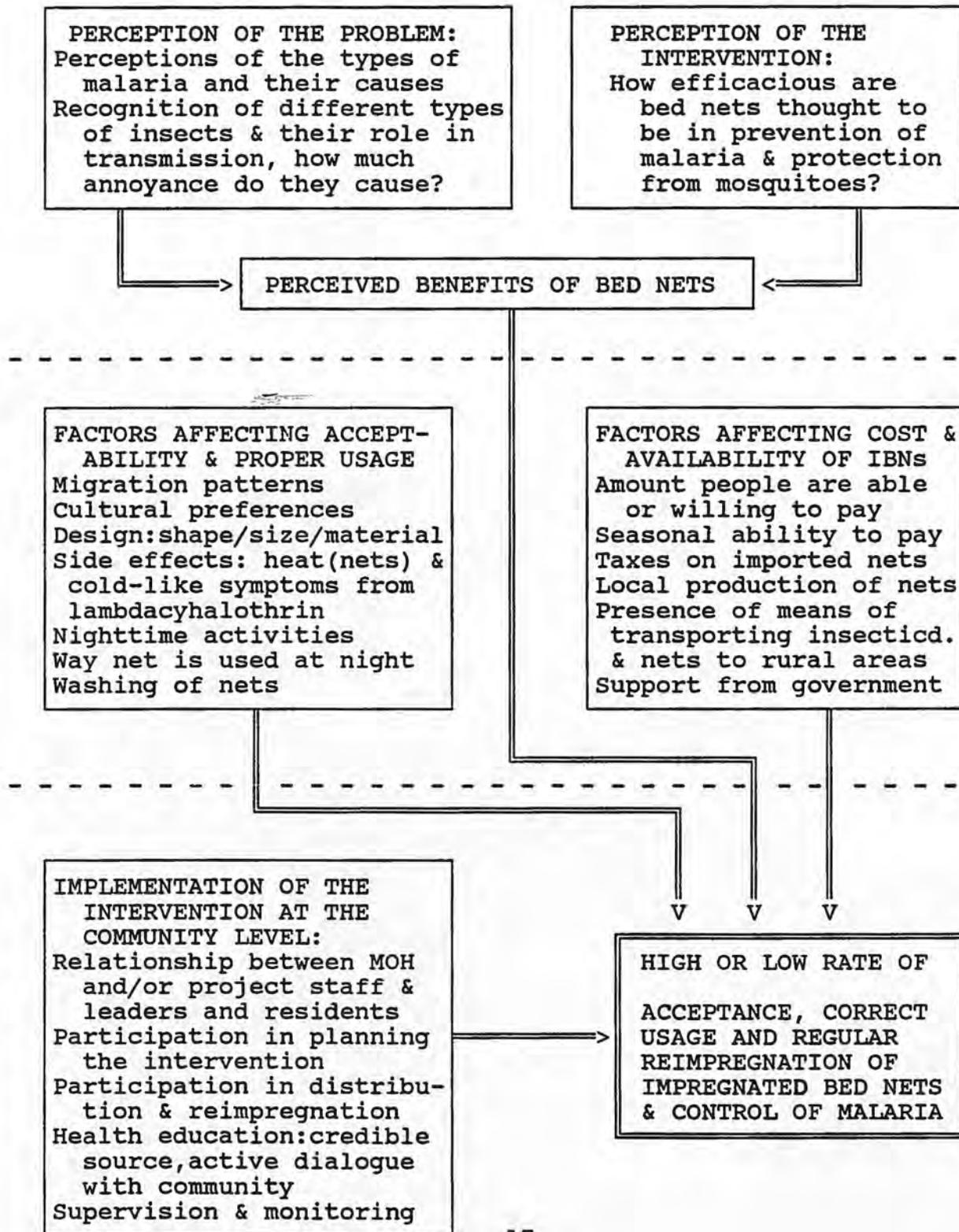


Figure Two:

Example of a form that might be used to collect data on use on IBNs
(Similar to form used by Leake and Hii)

Form 1: Daytime Visit

Date: _____ Time: _____

Community: _____ House number: _____

Interviewer: _____ Person interviewed: _____

Does your family have any mosquito nets? []yes []no

If 'yes', who used them last night? (Specify number of people and bed net condition and serial number)

Serial number of net	Type of net: M=med, L=lg	# child. using last ngt	# adults using last ngt	Condition		Position	
				Holes	No holes	Over bed	Elsewhere

Comments: _____

No. of people not using a net last night: _____ children; _____ adults

Reasons for not using net:

1. [] Net was sold 2. [] It was too hot 3. [] Came back late

4. [] Other (specify): _____

Figure Three:

Example of a form that might be used to collect data on use on IBNs
Form 2: Nighttime visit

Date: _____ Time: _____
Community: _____ House number: _____
Interviewer: _____ Person interviewed: _____

	Adults	Children
Number asleep or in bed		
Number under nets		
Number not under nets		
Number awake and out of bed		

Activities of adults who are out of bed: _____

Activities of children who are out of bed: _____

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