A stitch in time saves lives. A community intervention in The Gambia

Heather Lomas

A Stitch in Time Saves Lives

A Community Intervention in The Gambia

Heather Lomas
November 2005
University of Durham

Submitted in fulfilment of the Masters of Science in Medical Anthropology

Abstract

Malaria is a major cause of infant and child mortality in Africa. Bednets are currently the best means of protection, especially those treated with insecticide. However, untreated bednets offer no protection if they have five or more finger-sized holes, are not long enough to be tucked in under the mattress or are badly torn. Despite the long tradition of using bednets in The Gambia, around 42% of nets in rural Gambia are in poor condition or used incorrectly (Clarke et al, 2001). This six month study (July to December 2002) set out to examine whether villagers could be encouraged to change their behaviour and repair holes in and use their bednets correctly through an intervention developed through community participation.

Through focus group discussions and interviews, *culturally compelling* interventions developed were health education songs composed and sung by the villagers with complementary posters displayed in the two study villages. The songs were recorded on cassette tapes and were sung at formal and informal village gatherings. The success of this intervention was quantified by bednet surveys, where the condition of 554 nets was recorded before and after the intervention. To measure the impact of people's behaviour, mosquitoes were collected from under bednets, pre and post intervention, and general mosquito levels were monitored throughout the study using light traps.

Data analysis showed a significant increase in the proportion of repairs post intervention compared to pre-intervention (paired T-Test, $P=<0.001$). However, the overall number of holes remained the same due to constant wear and tear of the bednets and so there was not a significant reduction in exposure to mosquitoes. Nevertheless, these results show encouraging signs of enabling a behaviour change towards improving existing bednets using participatory methods.

Contents

Acknowledgements

This project was funded by Gates Malaria Programme

The following all played an important part in the project's journey from conception to fruition. My thanks go to:

GAMBIA

The residents of Konteh Kunda Niji and Konteh Kunda Sukoto; study team: Kulaymata Badjie, Ebrima Busso, Tomaring Jadama and Ebrima Manneh; temporary study team: Sulayman Bah, Lamin Jaiteh, Isatou Jammeh and Bakary Manneh; Dr Roz Coleman; Lesong Conteh; Dr Musa Jawara; Dr Yaya Kassé; Dr Katie Paine; Dr Margaret Pinder; Dr Gijs Walraven; all MRC personnel in Fajara and Farafenni; and the Manjang family with whom I lived for three months.

ENGLAND

Dr Siân Clarke; Professor Steve Lindsay; Dr Catherine Panter-Brick; and my friends and family.

Transcription Codes

Word	Emphasis placed on the word spoken
...	Part of transcription not included
[word]	Word(s) inserted to give clearer grammatical meaning
_____	Space where the name of a person has been omitted

Chapter 1 - Introduction

The source of material for this thesis arose from a research project that took place in two Gambian villages, Konteh Kunda Niji and Konteh Kunda Sukoto, between July and December 2002. It was a collaborative piece of work within the fields of anthropology, disease ecology and epidemiology, with each speciality making their particular mark on various characteristics of the research. The structure of the research project was multifaceted due to its multidisciplinary nature but the primary focus that this thesis takes is on behaviour change, which is the realm of health promotion. John Hubley works in health education and promotion and this thesis uses his behaviour change framework as its foundation (Hubley, 1993).

The aim of this project was to develop a community-led intervention that would persuade participants to repair any holes or tears in their bednets with needle and thread and also to tuck their bednet under the mattress. The implication of encouraging people to sleep under bednets that were in good condition (i.e. were intact) and tucked under the mattress was the protection against mosquito bites resulting in a reduction of malaria morbidity and mortality, an issue of paramount importance to public health.

Malaria, Mosquitoes and Bednets

Malaria is a major cause of childhood mortality in Africa with approximately 3,000 children under the age of five dying each day (World Health Organisation, 2003). More specifically, as this thesis is the result of research in The Gambia, statistics for childhood malaria mortality rates in The Gambia in 2001 were 126 per 1,000 (see table 1). The reason that malaria kills so many children is due to the nature of the disease. In countries where malaria is endemic, children are born with a level of passive immunity. This protects them for the first few months of their life but after this children tend to suffer from repeated attacks of malaria until the age of five or six years by which time they have developed considerable immunity. The problem is that many children do not survive long enough to benefit from this high level of immunity (Bell, 1995). The figures table 1 below show how crucial it is to find a way of tackling the disease.

Table 1 - Gambia Mortality Statistics

Data	Number	Date
Total population size (x1000)	1,337	2001
Life expectancy at birth male/female (years)	56.2/61	2001
Child mortality male/female (per 1000)	121/108	2001
Infant mortality rate (per 1000)	73	2000
Under 5 years malaria mortality rate (per 1000)	126	2001
Maternal mortality ratio (per 100 000)	1,100	1999

(World Health Organisation, 2003)

Transmission of malaria in The Gambia occurs mainly during the rainy season, from June to October each year, with the female *Anopheles gambiae* being the dominant malaria vector (Thomson et al, 1994). There is still the risk of contracting malaria during the dry season due to the introduction of irrigation rice farming in the 1970s, which has resulted in an increase in mosquitoes year round (Greenwood and Pickering, 1993). However, Lindsay et al (cited in Greenwood and Pickering, 1993) found that there was no associated rise in malaria transmission amongst children possibly due to the fact that conditions prevented mosquitoes from maturing sufficiently.

Studies to find ways to reduce malaria mortality and morbidity have formed the career backbone of many scientists throughout the world. The approaches to controlling the number of cases of malaria fall into three general categories: altering the environment so that mosquitoes have no place to reproduce or live (clearing inhabited areas of rubbish, vegetation and standing water); forming a barrier between humans and mosquitoes (bednets, screens or curtains on doors or windows, clothing); and chemically induced therapeutic methods (chemoprophylaxis) (Russell, 2000). Despite ongoing efforts to create a vaccine, the first two categories mentioned above remain the current primary public health interventions used to reduce the incidence of malaria for those people living in endemic areas, as they offer more sustainable and economically viable methods of protection (Agyepong and Manderson, 1999).

Greenwood and Mutabingwa (2002) agree, as "the burden of malaria is increasing...because of drug resistance and insecticide resistance and social and environmental changes."

Interestingly, Aikens et al (1993) noted that the Mandinka, an ethnic group within The Gambia, were the only people with a name for malaria that linked it with mosquitoes: *susula kurango* (literal translation: mosquito disease). They noted that of the 86% of Gambian people who used bednets, just 28% recognised that mosquitoes transmitted malaria. Frequently, linking causation to a particular disease in a biomedical manner is rare and indigenous people commonly have an alternative method of classification (Baume et al, 2000). This was also shown in Marsh et al's (1996) Kenyan study where low levels of comprehension of the connection of mosquitoes to malaria led the researchers to omit the word 'malaria' from health messages when promoting insecticide-treated bednets. However, the study showed that over 90% of Kenyan mothers did understand the role bednets played in protection against malaria.

There are a multitude of different reasons as to why people use bednets. Learned behaviour through the example of parents was highlighted as a key factor in Aikens et al's study (1993) into rural Gambian patterns of bednet use. They found that 98% of bednet users interviewed had parents that also used bednets. As children these interviewees had grown up seeing their parents use bednets and had subsequently followed this example into adulthood by using bednets themselves.

Many people living in sub-Saharan African tend to use their bednets only during the rainy season, prompted by the nuisance factor of biting mosquitoes (Okrah et al, 2002; Agyepong and Manderson, 1999; Thomson et al; 1996; D'Alessandro et al, 1994; Thomson et al, 1994) but MacCormack and Snow's (1986) Gambian study found that 58% of people used bednets for privacy as much as for protection from mosquitoes compared with 8% in Burkina Faso (Okrah et al, 2002). This shows that ethnic variation inevitably plays a major part in why people use bednets. In The Gambia, the ethnic group most likely to advocate the use of bednets are the Mandinka, with the other groups, such as Fula and Wollof, less likely to use them

(MacCormack and Snow, 1986). Approximately 240,000 people out of a total population of 1 million use a bednet in The Gambia (Cham et al, 1997).

MacCormack and Snow's (1986) trial into bednet use in The Gambia was based in a Mandinka village where privacy is important with this ethnic group, as co-wives and fellow kinswomen frequently sleep in one room. The Mandinka people's preference for a bednet made from opaque material rather than transparent mesh was also deemed more protective against other insects apart from mosquitoes and from dust dropping from the ceiling as well as being more robust against the rough play of children (ibid). Use of opaque cloth was also perceived to prolong the life of the bednet, which various studies have found ranges from three to six years (Lines, 1996; Aikens et al, 1993; MacCormack and Snow, 1989; MacCormack and Snow, 1986).

There are no generic patterns of which gender or whether any particular age group is more likely to use a bednet. Discrepancies arise between African countries, indeed within the same country, concerning the use of bednets. Aikens et al (1993) stated that older people in The Gambia, particularly women, were more likely to use bednets. D'Alessandro et al (1994) disagreed and found that infants, children and pregnant women were more likely to use them. In Burkina Faso, adult males were identified by Okrah et al (2002) as the most common bednet users, whilst in Benin the elderly were the regular users (Rashed et al, 1997). Agyepong and Manderson (1999) found that Ghanaian families living in rural areas were more likely to use bednets and where not all members of the household had a net, 50% were utilised by women and children.

Ownership of bednets in sub-Saharan Africa is dictated by the people's financial situation in spite of the recognised economic benefits of possessing a bednet described by Nuwaha (2002) and Okrah et al (2002). They found that people using bednets were less likely to contract malaria and so could work efficiently throughout the malaria transmission season. In The Gambia, money is more readily available in the post-harvest dry season, although this is when the mosquito nuisance factor for stimulating use of bednets is lacking (Okrah et al, 2002; Lines, 1996; MacCormack and Snow, 1989). The price of bednets is also known to rise just prior to the beginning of the rainy season, when people start to think about purchasing them, creating problems for those families who have not planned for such an eventuality (Aikens et al, 1993).

There is undisputed evidence that bednets treated with insecticide offer significant protection from malaria (Miller et al, 1999; Thomson et al, 1999; D'Alessandro et al, 1995; Greenwood and Pickering, 1993; MacCormack and Snow, 1989). Nevertheless, the strategy of promoting insecticide-treated nets offers acknowledged problems. In 1993 permethrin was distributed free of charge, a strategy that resulted in a 77% uptake in Cham et al's (1997) Gambian study. However, only 14% of people re-treated their bednets when nominal charges were introduced in 1994, despite the fact that the Gambians from the village acknowledged the benefits of impregnating their bednets. This raises questions of sustainability of such a programme and so far the only country where an insecticide delivery scheme has been maintained is in China (Lines, 1996). Gifts are often treated differently to bought items and encourage passivity on the part of the receiver (Rashed et al, 1997). Furthermore, the distribution, dilution and method of treating bednets with insecticide are all potential problems to overcome (D'Alessandro et al, 1995), although greater acceptability is now being found with research into using tablet form rather than liquid insecticide (Bhatt et al, 2005; Sharma et al, 2005).

Another difficulty with using impregnated bednets elicited during MacCormack and Snow's (1986) pilot study was highlighted when Gambian women complained that they could not wash their insecticide-treated bednets. On average, washing of bednets was found to be something which Gambian women would normally do at least twice per month (Cham et al, 1997). This problem was also encountered in Tanzania when Miller et al (1999: 167) found "dirty nets were regarded as unhealthy and socially unacceptable." However, partial protection against mosquitoes remained even with low levels of insecticide concentration after repeated washes in Erlanger et al's (2004) Tanzanian research. In a trial in India washing noticeably reduced the insecticidal action on bednets by 65-78% after 2 washes but still offered some protection (Bhatt et al, 2005).

To counteract the negative effect of washing bednets, research has been done on introducing a long-lasting insecticidal bednet where the idea is that the level of insecticide remains efficacious despite repeated washes (Graham et al, 2005; Lindblade et al, 2005; Yates et al, 2005). Comparisons have predominantly found that the long-lasting treated bednets maintained a higher level of insecticide than bednets

treated in the traditional manner. Yates et al (2005) found that efficacy remained after 30 washes with long-lasting insecticide treated bednets (PermaNet) compared with fewer than 10 washes when conventional bednets were treated.

However, caution is advised in claiming this as an undisputed success in reducing malaria morbidity long term before more field work is carried out on the cultural variations in washing habits. Whilst acknowledging the benefits of using long-lasting insecticidal bednets, Graham et al's (2005) work in Pakistan, Iran and Tanzania and Lindblade et al's (2005) tests in Western Kenya found that some conventionally treated bednets were as tolerant of washing procedures as those that were long-lasting in maintaining a protective level of insecticide.

Thomson et al (1999) advocated programmes that increased the use of untreated bednets rather than rely on the sometimes erratic distribution of insecticide. Untreated bednets do offer protection from mosquitoes (Thomas and Lindsay, 2000), particularly if they are in good condition. Clarke et al's (2001) Gambian study showed that untreated bednets protected young children from infection with malaria parasites (protective efficacy 51%, 95% Confidence Intervals 34-64%), although it was found that there was no protection if the bednet was in poor condition. A bednet that has five or more finger-sized holes, is not long enough to be tucked in under the mattress or is badly torn is classed as being in a poor condition. As around 42% of bednets in rural Gambia are in poor condition or used inappropriately, this defence is a poor barrier against blood-seeking mosquitoes. Entomologists found that, on average, every other bednet searched during the malaria-transmission season contained at least one *Anopheles* mosquito. The structure of the room where the bed is located also has an impact on the probability of exposure to mosquitoes. Open eaves, no ceiling, sleeping next to a storeroom and close proximity to breeding sites all increase the likelihood of exposure to mosquitoes (Lindsay et al, 1995).

The protective effect of a bednet with few or no holes was found to be greatest amongst the poorest villagers (Clarke et al, 2001). These poorest households, who could least afford to replace nets as they deteriorated, would therefore be the beneficiaries from a low-cost intervention to improve existing bednets by sewing holes with needle and thread (Guyatt and Snow, 2002). This piece of research was

developed as a possible additional strategy for malaria control in The Gambia and in other parts of the tropics where people use bednets but insecticide re-treatment rates are low; the point being that it was potentially effective at reducing malaria morbidity, extremely cheap and hopefully likely to be sustainable.

Community Participation

The term *community participation* is a "bottom-up approach" to the process of decision-making (Hubley, 1993: 112). Rather than being told what to do from visiting professionals, decisions that affect and therefore are relevant to the community members are made at grass roots level. The amount of *community participation* can vary from minimal to total control of all factors, from financial to administrative matters. In the case of this research the concept of sewing bednets to reduce exposure to mosquitoes had already been developed by the research collaborators prior to the fieldwork. What the communities involved in this project did was participate fully in the development of how to convey the message about bednets in order to execute the intervention.

For any intervention to be successful, the targeted people must feel "vulnerable or at risk" (Willms and Sewankambo cited in Higginbotham, et al, 2001: 60) in order to change their behaviour. *Culturally appropriate* interventions are "sensitive to the language, idioms, expressions and nuances of meaning" (Willms et al, 2001: 163) to the people undertaking the intervention but this may still not be enough to invoke them to alter their actions. The targeted people must identify that there is a problem and then feel strongly enough about it in order to bring a sense of ownership and empowerment to the community for them to take action to address the problem.

Despite some plans being *culturally sensitive* or *culturally appropriate*, terms congruent with the social and cultural belief systems of the recipients, Willms and Sewankambo (cited in Higginbotham et al, 2001) felt that interventions should also be *culturally compelling* to induce people to change their behaviour. *Culturally compelling* interventions tend to work as they are designed in association with the community, stimulating changed beliefs and behavioural patterns. In a nutshell, it can be described as the motivational factor that mobilises communities into changing their behaviour. Thus, Rubardt et al's (1999) project in Malawi was seen as successful in

encouraging people to use impregnated curtains as a barrier to mosquitoes entering their houses due to the involvement of the village health workers and the village headmen, trusted and important members of the community respectively. Additionally, the intervention was appealing, acceptable and compatible with the Malawian culture.

One *culturally compelling* approach developed in health education projects has been the appliance of media, especially music, to disseminate messages to those targeted. The educational focus has tended to be on HIV/AIDS messages, perhaps because the younger targeted age group is more likely to listen to this medium. Music in particular is increasingly being seen as a powerful and *compelling* way to bring about knowledge and behavioural change. Stephens et al (1998) developed a successful model to educate African-American adolescents about the behavioural risks that could potentially lead to HIV/AIDS. His use of hip-hop music as a preventative counselling practice for the youths was proven to be a *culturally sensitive, appropriate* and *compelling* approach to encouraging behaviour change.

Aside from HIV/AIDS, Ogede (1993), a Nigerian poet, uses song to educate local people of the damage a violent society causes. He promotes the value of peaceful communities by encouraging people to see how real strength comes from working together towards a common goal. His songs are played on local radio and people sing them at social gatherings and whilst working and are an integral part of Nigerian culture. Another study was an impact assessment on various ways to send out messages regarding prevention of violence in American adolescents. It showed that aural and visual means worked best when encouraging youths to change to a less violent way of life. Verbal means that were tested at the same time were less effective than music or pictures. The study concluded that using a combination of methods was most successful when putting a point across (Tucker et al, 1999).

Sustainability of any participatory project relies on community-wide recognition of the importance of the threat being addressed and cultural acceptability of an intervention that is within the financial capability of the group (Rashed et al, 1997). Care should be taken not to assume that what is acceptable for one area would be appropriate in another (Winch et al, 1994). Comprehensive community-based data

collection is necessary whenever interventions connected with behavioural change are planned (Agyepong and Manderson, 1999). Gender differences in societies also need to be addressed, as it is often the women who are sensitive to the benefits of a study and as such should be involved in any intervention, as verified by Rashed et al's Benin study (1997). One factor to bear in mind with any participatory programme is the timescale required to achieve sustainable results. Sufficient time is needed in order to plan the strategy, establish a trusting relationship with the community, set up the process and evaluate the outcome (Hubley, 1993).

One of the benefits of community participation, noted by Rashed et al (1997) in Benin, is that it motivates those targeted, as there tends to be more of a sense of pride in and ownership towards the programme being instigated. Miller and Rollnick (2002: 10) describe motivation as being "ready, willing and able," where readiness is prioritising the change; willingness is recognition of the importance of change; and being able is having the confidence to change. They feel that motivation is "fundamental to change," (ibid) so once these three elements are in place, then people are more likely to change their behaviour.

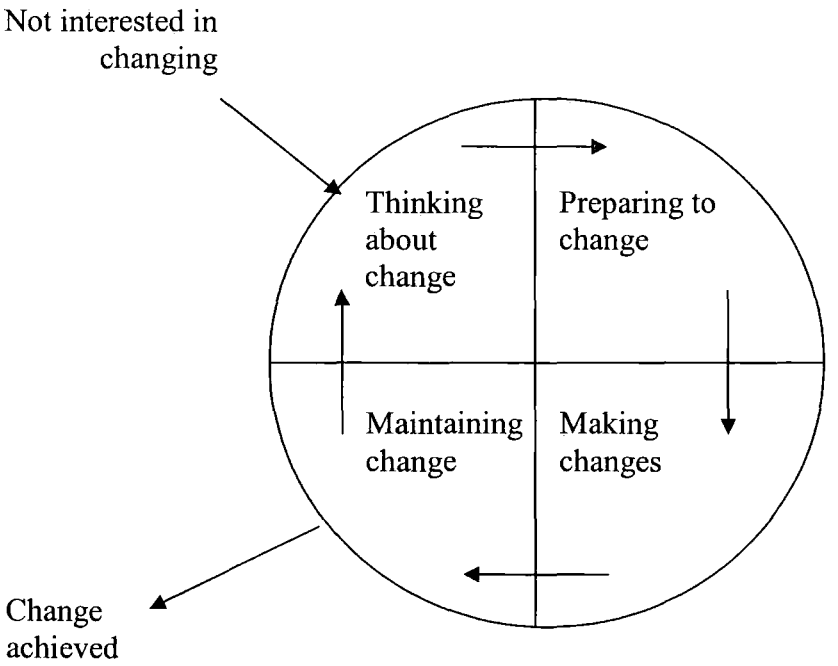
Behaviour Change

Behaviour is undisputedly influenced by one's inherent culture and can be either an individual or a group occurrence (Hubley, 1993). Jones and Williams (2002) acknowledged the important role social science has to play in the development of strategies attempting to change behaviour. The whole process of behavioural change is relevant in all cultures (DiClemente and Velasquez, 2002) and several models for the processes have been developed, especially in the field of health education and promotion. Whilst these models are accepted steps in the actual process of change, it must be remembered that there are numerous determinants of behaviour.

One commonly used model is the "Transtheoretical Model of Intentional Human Behaviour Change" (DiClemente and Velasquez, 2002: 201), or cycle of change, first developed by Prochaska in 1981 for use in drug rehabilitation (see figure 1). The stages of change identified are: thinking about change; preparing to change; making changes; and maintaining changes (DiClemente and Velasquez, 2002; Marshall, 2002). According to DiClemente and Velasquez (2002), building on previous

experiences and awareness of what the change entails is central to the early stages of change, whereas the actual behavioural changes take place in the latter stages.

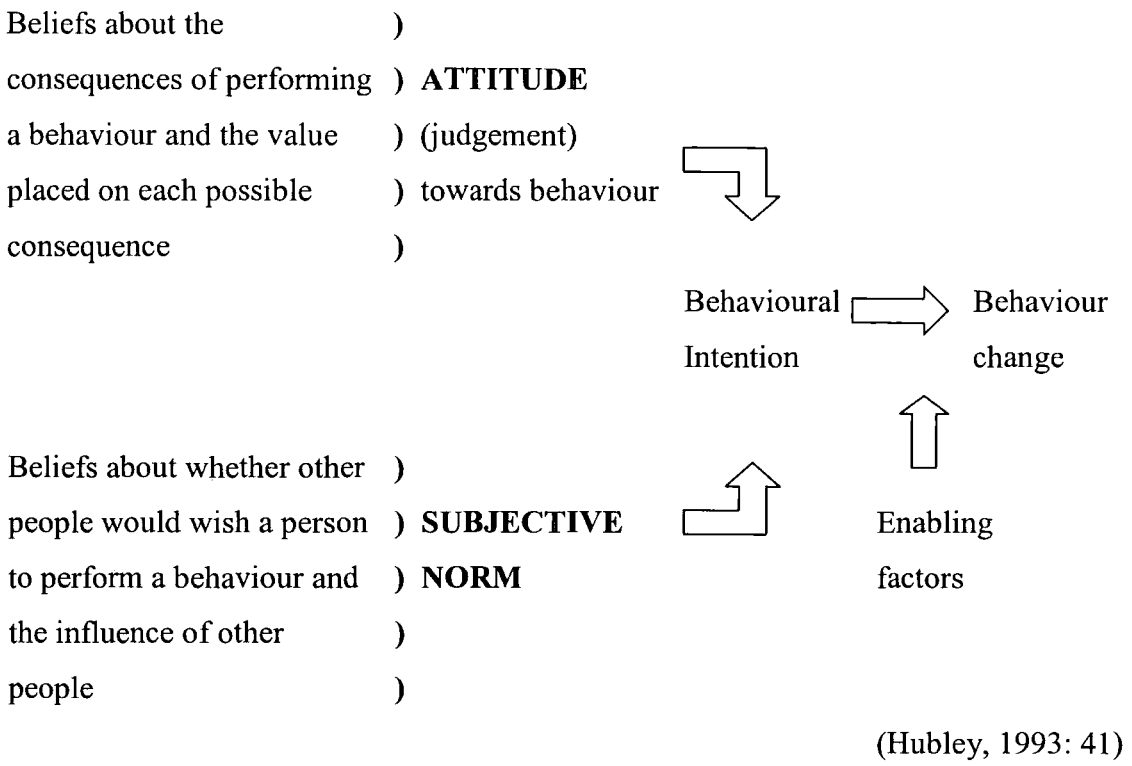
Figure 1 - The Stages in the Cycle of Change



(Marshall, 2002)

The principles of Prochaska's cycle have been further developed by Hubley (1993) into the BASNEF (Belief, Attitude, Subjective Norm, and Enabling Factor) model (see figure 2). Belief and attitude are commonly combined under the umbrella term 'attitude' but the segregation here follows the work of the psychologist Fishbein who felt that whilst people may have the same attitude towards something they might differ in their belief about it. For example, two people may have the same positive attitude towards bednets but each might believe bednets work in different ways. The things that influence a person's attitudes are "culture, values, traditions, mass media, education and experiences" (Hubley, 1993: 44). The strategy proven to deal with these influences is a communication plan that will revise those attitudes held within a community or by an individual.

Figure 2 - BASNEF Model for Understanding Behaviour



(Hubley, 1993: 41)

The influences on a person's subjective norm lie within the structure of the community. The organisation of the family and the society, its hierarchy and social network along with cultural background all have some bearing on whether a person is able or likely to change their behaviour. Action needed to manage this is communication with people of social standing or respect within the household or community. Once these people change their subjective norm then others are more likely to follow their lead, as it becomes acceptable for all to change.

Hubley's (ibid) enabling factors can be intrinsic, which comes from within the affected person, or extrinsic, which is from an outside force. Both factors need to be understood and identified, as one without the other may result in status quo rather than behaviour change. Constraints on enabling factors can include, amongst others, the position of women in society, poverty or livelihood. For example, if people know that a bednet will help prevent malaria but they are unable to afford a bednet, then that issue has to be addressed. Programmes that tackle poverty by introducing new methods of earning a living can enable a behaviour changing action.

Box 1 – The Six Steps to Enabling Behaviour Change

Step 1 - Ensure the change in behaviour will result in improvement in health.

There is little point in devoting time to encouraging behavioural change if an improvement is not evident to the targeted.

Step 2 - Ensure the change required is realistic.

The change should be culturally acceptable, within the capabilities of the community members, preferably low cost and take up little of their limited free time.

Step 3 - Provision of enabling factors.

If the targeted do not have the enabling factors, such as access to materials or to any training necessary in order to change their behaviour, then the intervention is pointless.

Step 4 - Consideration of any family or community influences.

Social pressure (Subjective Norm) has an enormous influence on a person's behaviour and is often a barrier to change. Persuading influential people within the community to change their behaviour may be a way of encouraging others to change. Peer pressure is another method to encourage change.

Step 5 – Identify any indigenous beliefs.

Inherent beliefs, for example the causes of certain diseases (in this case, malaria) can affect a person's attitude to change. Individual beliefs rather than those held by the whole community tend to be easier to address and influence.

Step 6 - Find out the level at which behavioural influences operate.

Influences can function at individual, household, village, and even national or international levels. Targeting behavioural change at the wrong level can often result in a failed programme. Participation produces empowerment through which change is more likely to occur.

Hubley's (1993) BASNEF model advocates the consideration of six steps to enable change in human behaviour with relation to the improvement of health (box 1). This model for understanding the actions of a community is an interesting way of

objectively examining the processes that can influence a person's behaviour. This process involves understanding things from the perspective of the participant(s) prior to tackling any kind of intervention within that society and as such was a useful model to apply to the community participatory approach envisaged for this study.

Aims and Objectives of the Study

1. Explore the beliefs and attitudes of Gambian villagers with regard to the repair and tucking in of untreated bednets. Establish whether these correspond with indigenous practices or whether barriers exist that prevent the means of accessing any enabling factors using Hubley's (1993) BASNEF as the underlying model.
   - Determine perceptions of the value of a bednet, how it works, how it is repaired and used, and any problems associated with using them effectively.
   - Explore the life of a bednet, its change in condition with time, whether and how it changes hands, and who sleeps under it at different periods.
   - Discover whether bednet use changes through a person's life, from infancy to the grave.

2. Develop a community-led intervention to encourage the repair and correct use of bednets.
   - Identify the most appropriate mechanism for repairing bednets and encouraging correct use of bednets for effective mosquito protection.
   - Identify which individuals are best placed to repair and promote correct use of bednets.

3. Evaluate the intervention.
   - Measure the success of this intervention by recording the proportion of bednets repaired, comparing pre and post-intervention.
   - Identify reasons people did or did not repair their bednets.
   - Explore the acceptability of this intervention.
   - Assess the potential sustainability and expansion of this intervention.

These three aims with their objectives are addressed in chapters 3 and 6; 4; and 5, 6 and 7 respectively.

Chapter 2 - Methodology

Ethical Considerations for the Research

As this was a collaborative piece of research, ethical approval had to be sought from various sources. The authorisation for this research was successfully obtained from the joint Gambian Government and Medical Research Council Ethics Committee, the University of Durham's Ethics Advisory Committee and the London School of Hygiene and Tropical Medicine.

The Association of Social Anthropologist's (ASA, 1999) ethical guidelines state that any research involving human beings should be gathered through informed consent and should be confidential, unobtrusive and sensitive to any potential consequences resulting from the data. Due consideration was given to these guidelines, which were an integral part of the research, from the planning stages to the conclusion of the study and beyond.

Emphasis was placed on the fact that any participation in the study was voluntary and that withdrawal of consent was possible at any time without repercussions to that individual. In accordance with ASA guidelines (ibid), endeavours were made to ensure that the research was undertaken in a way that prevented harm to the community as well as to individuals. The nature of the project was not invasive in the physical sense of performing procedures on people but it did involve entering their homes, which is a form of intrusion or invasion of privacy. All working members connected with the study ensured that permission to enter property was always obtained from the owner or their representative and that behaviour was sensitive to the householder; for example, shoes were removed when appropriate and female translators were used if there was potential to offend with a male interpreter.

Participants in each facet of this study were assured of confidentiality. A field worker read out an information sheet (copy in appendices) to each person, or group of people in the case of the focus group discussions, to explain the background of the study, what was expected of them and what would subsequently happen to the data collected. If anyone had further questions following this introduction they were

addressed immediately. Any queries raised later were answered as they occurred. A positive working relationship developed between the research staff and the village participants over the period of investigation. The open and honest policy adopted endorsed a continuing confidence in the Medical Research Council institution ensuring permission for "future access by other researchers" (ASA, 1999: 1).

Setting the Scene

The West African country of The Gambia is a narrow strip of land split by the River Gambia and almost completely surrounded by Senegal (see map below). The climate is typical for the sub-Sahel region, with a rainy season from July to October and a dry season from November to June (Lindsay et al, 1993). The ethnic groups indigenous to The Gambia are: Mandinka (42%); Fula (18%); Wolof (15%); Serahuli (9%); and Jola (9%) (Brown et al, 2002). Approximately 75% of the population subsists on agriculture with rice, sorghum and millet as staples and groundnuts as the main cash crop (CIA, 2003; Greenwood and Pickering, 1993). This study took place in two villages, Konteh Kunda Niji and Konteh Kunda Sukoto, which are located to the west of Farafenni (see map). Both villages consist wholly of people of Mandinka ethnicity with the exception of one Fula household in Konteh Kunda Niji.

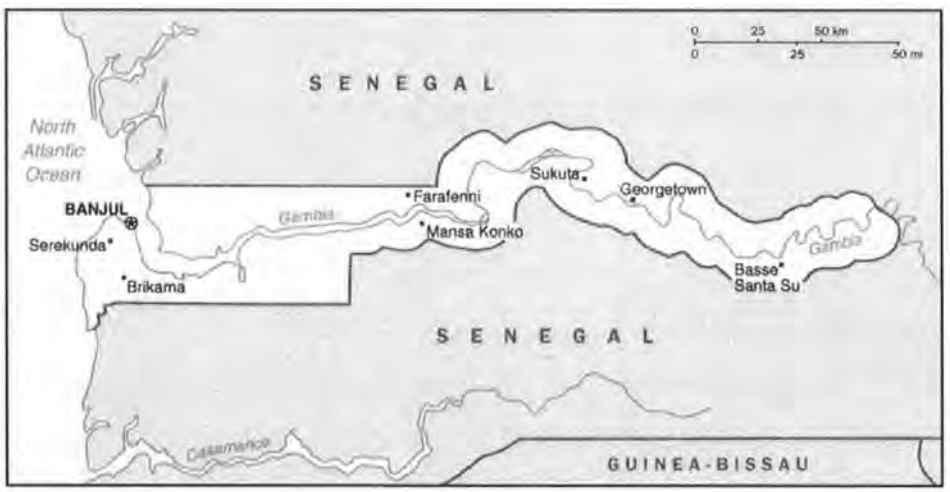
Although there are recognised authorities within villages, such as *alkalos*[1] and *Imams*[2], Gambian villages are not socially cohesive units but tend to consist of autonomous patrilocal, mainly polygamous households linked together as a village through their history or kinship. Whilst *alkalos* and *Imams* have a degree of control over the village and "represent the village to outsiders" (Brown et al, 2002: 45), each household largely controls their own social and economic lives, which can differ greatly from neighbouring households. Teachers, dispensers and moneylenders also have a level of influence in Gambian villages, although how much power they exert on the people varies from village to village and family to family (Brown et al, 2002).

An intermediate structure between authorities and households does exist in The Gambia. Groups of households often, although not exclusively linked by kinship or descent, have an element of co-operation generally not found in the whole village.

[1] Village leader
[2] Religious leader

This is particularly so in Mandinka villages, where these 'wards' or *kabilos,* tend to have a founding family who lead in arranging marriages, organising naming ceremonies and managing land. The lack of a uniform composition to a Gambian village means that it is difficult to define what constitutes a community. Many people have varying degrees of power within a village, ward and household. Whereas one family may be influenced by the *alkalo*, another may take advice from the local teacher. All this is relevant when considering community-based programmes, as those in positions of authority within a village may not have the expected influence that can be found in communities with a recognised controlling body (Brown et al, 2002).

Map of The Gambia



(Gambia Gateway, 2003)

The Study Villages

The research for this study took place between July and December 2002 and involved two villages in rural Gambia. The villages were chosen by me in collaboration with Dr Gijs Walraven, the Medical Research Council Farafenni Field Station manager, and with agreement from Dr Siân Clarke and Professor Steve Lindsay, principal investigators based in UK, because of their long-term experience of working in The Gambia. Initially, several villages within a one hour drive of Farafenni were visited to assess the possibility of carrying out a study. It was felt that a wider search for the participating villages was unnecessary and would have reduced the time spent in the

villages. The condition of the roads deteriorates during the rainy season, resulting in longer and more hazardous journeys and so this had to be taken into consideration.

The resulting villages, Konteh Kunda Niji and Konteh Kunda Sukoto, were selected for their size, proximity to mosquito breeding sites, variety in the condition of bednets, lack of other studies in the area which could have impacted on the project and, most importantly, community willingness to participate in the project. These villages were representative of most rural Gambian villages in this area, as livelihood was primarily agricultural with some fishing. The socio-economic data collected during this study found that the occupations of the study village households were: farming, 69.6%; business ventures, 17.4%; fishing, 8.7%; herdsmen, 3.5%; and others, 0.9%.

Konteh Kunda Niji and Konteh Kunda Sukoto, are situated in the North Bank Division of The Gambia placed between the market towns of Farafenni and Kerewan. Both are sited near to the Bao Bolong, a tributary of the River Gambia, with Konteh Kunda Niji at 1.5 km and Konteh Kunda Sukoto at 3.5 km distance from the tributary. Each is a similar size, covering an area of 1 km^2, with Konteh Kunda Niji having a slightly larger population of 674 against Konteh Kunda Sukoto's 634.

There is a history of Mandinka people separating from a founding village to form a new settlement (Brown et al, 2002). This was true for the two study villages, which until 80 years ago was one community located where Konteh Kunda Sukoto is still sited[3]. The caste system of the Mandinka consists of 'royals' or high class people (*forolu*) and 'slaves' or classless people (*jongol*). Due to a disagreement between the castes over the inheritance of the position of *alkalo*, who was always *forolu*, two groups of *jongol* broke away and formed their own villages, one of which was named Konteh Kunda Niji. This village now elects the eldest man to be their *alkalo*, thus avoiding perceived favouritism.

Over the years there have been land disputes between these two villages, resulting in two fatalities. The wrangle between the villages may have been an issue for this

[3] This village history was researched by field worker Ebrima Manneh.

project but relations have now improved with some intermarrying and so it was judged safe to continue the study with these chosen communities. There may even have been some advantages, as a sense of competition arose between the two villages that may not have occurred if different villages had participated.

Preparation for the Intervention

Before any intervention could be developed background information regarding local knowledge and beliefs about malaria, mosquitoes, the use of bednets, attitudes towards sewing and the way each interacted with the other was sought in the form of key informant interviews and focus group discussions. Some issues to consider were:

- What were the study participants beliefs and attitudes towards bednets?
- Why did people use bednets in poor condition?
- Why did people not repair holes in their bednets?
- Why did people not tuck their bednets under the mattress?
- How did people usually repair their bednets?
- What type of intervention would encourage people to repair holes and use bednets correctly?
- Who was the best person to encourage people to repair holes and use bednets correctly?
- Was the intervention acceptable to the participants?
- Was the intervention sustainable and expandable?

Additionally, during the study, patterns of bednet use in a family were explored. Answers to questions regarding bednet use were sought, such as:

- Was there a hierarchy of bednet use within a family?
- Were bednets swapped or exchanged between families and when?
- Where did children sleep and with whom?
- Did children move beds at certain times and for what reason?
- Were there barriers to some people owning a bednet?

It was hoped that the information gathered during these interviews would reveal patterns of when there was an increased risk of malaria transmission and who or

which age group was perceived to be at highest risk from contracting malaria and should therefore be offered optimum protection.

The intervention itself was formulated through the focus group discussions that took place in both study villages. The aim was to find out who would be the best person or people to inform others about the value of repairing holes in a bednet and to create an appropriate method of informing people of the value of maintaining their bednets in good condition and using them properly. Levels of mosquitoes were monitored through light trap collections in both villages throughout the study period to see if high levels of mosquitoes motivated people into repairing holes in their bednets.

Effectiveness of the intervention was quantified in numerous ways:

- Counting the number of holes in bednets pre and post intervention
- Counting the number of repairs to holes in bednets by either sewing with needle and thread or patching pre and post intervention
- Noting whether the bednets were long enough to be tucked under the mattress pre and post intervention
- Counting mosquitoes collected from inside bednets pre and post intervention

Ideally, it was hoped that improving existing bednets by repairing holes and using them correctly would prove to be a culturally acceptable, cost effective and sustainable method of reducing malaria morbidity and mortality.

Consent

Permission to embark on all activities necessary for the project was obtained initially from the appropriate village *alkalo* in acknowledgment of his authority within the community. This was a preliminary form of obtaining group consent to carry out various activities within the villages and it should be noted that further consent was obtained on an individual basis for each aspect of the study (Standard Operating Procedures, 2002).

Prior to acquiring consent, the participants were informed that the study was being conducted to understand more about mosquitoes connected with the sewing practices

and the use of bednets in Gambian villages. They were reassured that there would be no invasive procedures or sampling involved and that anything said would be treated confidentially. All participants were told that they could withdraw consent from all or part of the study at any time with no repercussions.

Signed consent, through signature or cross, was obtained from each pre-intervention key informant or individual interviewee, as well as those whose rooms were used for light trap collections (copy of key informant consent in appendices). Verbal consent was obtained for the focus group discussants and for the post intervention interview participants. Consent for the school children to participate in the drawing exercise was sought from the parents. No schooling was missed, as the schools were closed for the summer break.

Informed verbal consent was gained from both the head of the compound and the head of each household prior to undertaking any part of the study where entry to compounds was needed. Permission to access rooms in order to carry out the bednet surveys and the mosquito collections from under the bednets was obtained by each occupant or their representative every time a member of the research party needed to gain admittance.

Field Worker Training

Three field workers were involved in the project and received initial training at Medical Research Council's Farafenni Field Station. One had previous experience of fieldwork, whilst the other two were new employees. As this study was comprised of a mix of qualitative and quantitative methods, training had to incorporate many elements. Interview techniques, focus group discussions and completing questionnaires were topics covered by the in-house field worker training officer, Mafugi Dibba, with extra training provided by myself and the visiting principal investigators, Dr Catherine Panter-Brick and Dr Siân Clarke. The resident entomologist, Dr Musa Jawara and Professor Steve Lindsay, principal investigator, provided training in the use of pooters and light traps as well as mosquito identification.

All aspects of the methodologies used were practised prior to collecting actual data from the study villages. Time was allowed for team discussion and any uncertainties or problems were addressed following the practise sessions. Roles for each team member were identified according to the strengths of each individual. Strategies and subject matter were agreed before going into the field to avoid confusion once the real activities were underway. During the project, the field team debriefed and reflected on positive and negative elements; a strategy suggested by Dawson et al (1993) in order to encourage self development help move the study forward.

Methodologies

To gain a clear vision of the design of the research with regards to the timescale and which methods were active at what time, table 2 and figure 3 are on the following pages. Table 2 outlines the range of methods used in this project and the purpose of each. Figure 3 shows the timeline for each aspect of the study in relation to the intervention. This section will look at all the methodologies in turn, covering sampling, protocols and logistics.

Pre-intervention

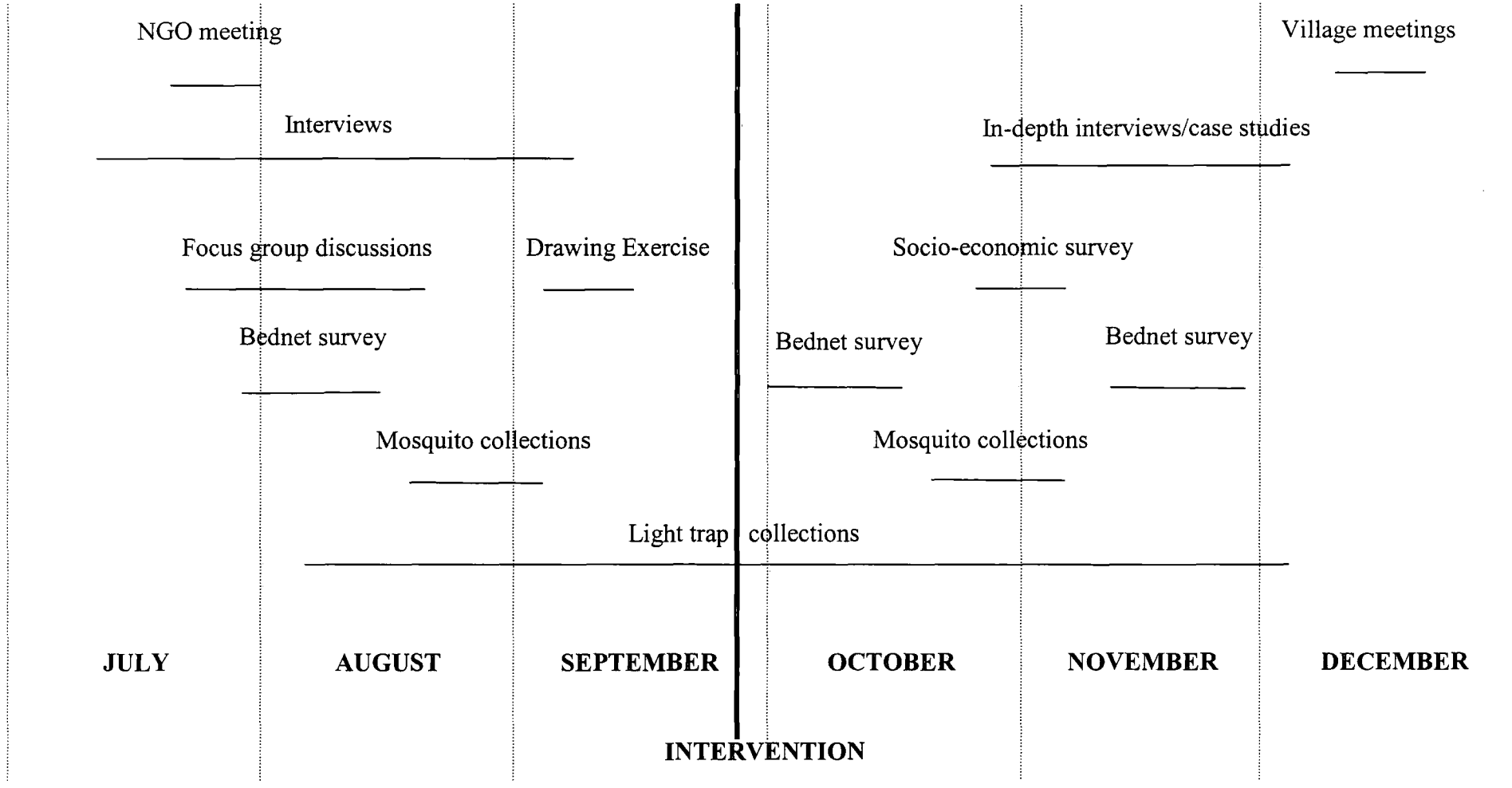
Key Informant Interviews

For this part of the project, key informant interviewees were chosen from the town of Farafenni, the study villages Konteh Kunda Niji and Konteh Kunda Sukoto, and from villages between Farafenni and the study villages, which were approximately 45 minutes drive away. Participants for these pre-intervention interviews were firstly chosen in adherence to the inherent village hierarchy. Thus, the *alkalo* and the *Imam* were the first people to be invited to become key informants of the project. This had the advantage of ensuring that the study and the field workers were recognised as bona fide and meant that the rest of the villagers were more likely to accept the project and the workers connected with it.

Table 2 - Range of Methods and Their Purpose

Time frame	Method	Number	Purpose
Pre-intervention (June – September)	Key informant interviews	39	To establish the general attitudes and practices of sewing and bednet use in and around the study villages.
Pre-intervention (July – September)	Focus Group Discussions	6 groups of 6-8	To obtain information on priority, repair and motivational aspects of bednets.
Pre-intervention (September)	School Children's Drawing Exercise	1 group of 12	To produce pictorial support to the intervention and to involve the younger element of the study villages.
Post intervention (November – December)	In-depth interviews	8	To establish reasons for using and repairing bednets or otherwise.
Post intervention (October, November)	Case Studies	4	To gather more information on behavioural practices and beliefs about protection from mosquitoes.
Pre and post intervention (August, October and November)	Bednet Surveys	772	To monitor changes in individual bednets throughout the study period.
Throughout study	Light Trap Collections	6	To assess the numbers of mosquitoes in the region throughout the study period.
Pre and post intervention (August and November)	Mosquito Collections	729	To assess the number of mosquitoes entering bednets of differing states of repair.
Post intervention (October and November)	Socio-economic Questionnaire	137 household heads	To ascertain socio-economic levels in the study villages.
Post intervention (December)	Village meetings	2	To encourage feedback on the intervention.

Figure 3 - Timeline Showing all Components of Research



Other informants were targeted because of their standing and influence in the community, such as traditional birth attendants, village health workers and teachers, or they were chosen for their perceived knowledge of bednets and sewing, so tailors and fishermen were included. Additionally, other people (household heads, students and housewives) were interviewed in order to gather data from 'ordinary' members of the community. Table 3 below shows the composition of the interviewees.

Table 3 – Key Informant Interview Composition

	Alkalo	*Imam*	Health worker	Tailor or Fisherman	Teacher	Others	**Total**
Male	2	3	6	5	3	8	**27**
Female	0	0	4	0	0	8	**12**
Total	**2**	**3**	**10**	**5**	**3**	**16**	**39**

For the interviews, the individual's village, ethnicity, sex, age and occupation were noted and an identity number was allocated. The interviews took place mostly in the interviewee's home, although some were undertaken at a workplace, such as a tailor's shop. They took an average of 30 minutes and were transcribed by hand directly into English by the field worker conducting the interview. The field workers used the questions listed in box 2 as prompts, whilst additionally allowing the interviewee to expand on any points if necessary.

The Focus Group Participants

The aim of the focus group discussions was to develop an acceptable and sustainable intervention that would encourage people to repair bednets and use them correctly. The points covered during the discussions were:

- Malaria, mosquitoes and bednets
- What would motivate people to change their behaviour?
- How would you motivate people to change their behaviour?
- Who would motivate people to change their behaviour?

Box 2 – Pre-intervention Questions

Background information regarding repairing:

- What happens when clothing is worn or torn? Are they repaired? How are they repaired? Who repairs them?
- What happens when a bednet is worn or torn? Are they repaired? How are they repaired? Who repairs them?

Personal information regarding bednet use:

- What does a bednet do?
- Do you use a bednet? Have you ever used one? How long have you used one?
- Who else in your compound uses one?
- When you get into bed, what do you do with the net?

Perceptions of other people's behaviour:

- Why do some people not tuck their bednet under the mattress at night?
- Why do people have nets with holes?

Problems with bednets and suggestions for solutions:

- Do holes in bednets matter? Do holes the size of your finger damage a bednet? How many holes would damage a bednet?
- Who would be the best person to repair a bednet?
- How much does it cost to repair a hole the size of your finger in a net? If you had to pay how much would you pay?
- Who would be responsible for finding the money to repair a bednet?
- Is time or money the main problem when it comes to sewing up nets?
- How would you encourage people to fix holes or tuck bednets under the mattress?
- If a net is repaired, when in the year would it be repaired?
- Where do people get needles and thread? Does everyone have them?

All the focus group participants lived in the study villages. The prerequisites for selecting members for each focus group discussion were given to the *alkalo* for those involving the men and to the traditional birth attendant for those involving women. The prerequisites were that they should be within the age range specified for the men's groups or be breastfeeding for the women's groups; no member of the same focus group should be related by blood or marriage; they should be willing to take part; and they should be comfortable with speaking in a group.

Each *alkalo* chose the location for the discussions after being informed that the site should be as private as possible, quiet and large enough for all the participants to be comfortable. The choice for Konteh Kunda Niji was a room within the *alkalo's* own compound whilst Konteh Kunda Sukoto's *alkalo* chose a community building where all village gatherings usually took place. The sessions were arranged up to a week beforehand, with the participants selecting the most favourable day and time that would cause least disruption to their daily activities. A reminder of each forthcoming discussion was given by the project team the day before to minimise the chances of people forgetting the event, a step recommended by Dawson et al (1993).

The *alkalo*'s role in the focus group discussions, as well as choosing the location and finding suitable people to participate in the discussions, was to disseminate information regarding focus group discussions and what would be expected. They were told that the aim was to gather willing people that would represent a cross section of the community. This was to try to avoid them choosing family members or friends. After one focus group it was discovered that two of the women participating were co-wives, so the selection process was reiterated once more to the organisers to avoid this happening again. Although it did mean that one person did not participate much during that discussion, the quality of information collected during that focus group did not seem to be affected.

Three focus group discussions were held in each village, using the same criteria to select the groups so that, as far as possible, the dynamics were duplicated in each case. The three groups were: married men aged 25–40 years; older men aged over 70 years; and breastfeeding women. The aim was to gain the views of a representative sample of the community (Tashakkori and Teddlie, 1998), as it was impossible to

question every village member. These particular groups were chosen either for their influential status in the village (older men), because they were the decision makers within the household (younger men), or because of their personal interest in reducing exposure to mosquitoes (breastfeeding women). There was no older women's focus group due to time restrictions of the research. This is perhaps something that could be addressed should other research take place in the future.

The number of participants varied from six to eight (see table 4); a range most manuals agree is the optimum number from which to gain most information (Bloor et al 2001; Morgan, 1997; Dawson et al, 1993).

Table 4 - Focus Group Discussion Composition

Konteh Kunda Niji	Number of Participants
Older men aged over 70 years	7
Breastfeeding women	6
Men aged 25 – 40 years	8
Konteh Kunda Sukoto	
Older men aged over 70 years	8
Breastfeeding women	8
Men aged 25 – 40 years	7

The length of the focus group discussions was limited to 90 minutes, with an average of 60 minutes. Bloor et al (2001: 53) states that a longer discussion is "discourteous" to the participants, as they have given up valuable time to attend the group and should be allowed to return to their tasks. Breast-feeding women brought their babies with them, which resulted in a relaxed atmosphere. Each discussion was recorded using a tape recorder fitted with an external omni-directional microphone that was placed in the centre of the room (Dawson et al, 1993). New batteries for the tape machine were used each time and the security tags were removed from the tape upon completion of each session to prevent loss of data through the taping over of a meeting. Prior to

starting the tape machine the facilitator informed the participants that the resulting tape would only be used for the purposes of analysis and that no-one outside the study would have access to it (Morgan, 1997). They were asked to speak freely, to respect what others within the group had to say and to give everyone a chance to talk.

The research team carrying out the focus groups comprised of a facilitator, observer and one or two note takers depending on the number of field workers available. A member of the village was allocated to stand outside the room where the discussion was taking place in order to minimise the disturbances. Inevitably, there was great deal of interest in what was happening and by the end of each session people had gathered around the doorway or at the unglazed windows to the rooms. Noise was kept to a minimum by the allotted supervisor so that it was not detrimental to the quality of the tape recordings. The focus group discussions were held in the villagers' native language, Mandinka, whilst notes were written down by the field workers in English. This enabled me to follow the proceedings and interject whenever necessary. Whenever I asked a question, the field workers translated and documented the responses.

Four of the focus groups were given pieces of netting with holes of varying size and number along with pieces of material for patching and needles and thread during their focus group. They were asked to repair the holes, as they would normally do so at home. Both men's and women's groups participated in this activity with the aim to discover if there was a gender differentiation with regards to sewing achievements.

At the end of each focus group meeting those villagers who taken part or had helped in some way by either keeping people not participating as quiet as possible or by taking messages to participants were each given a gift of a can of carbonated drink in appreciation for the contribution they had made and for giving up their valuable time.

The quotes used in this thesis from both the interviews and the focus group discussions are written directly from the field workers' translations with only occasional minor grammatical alterations to ensure the message is clear. These alterations are marked by brackets: [_____].

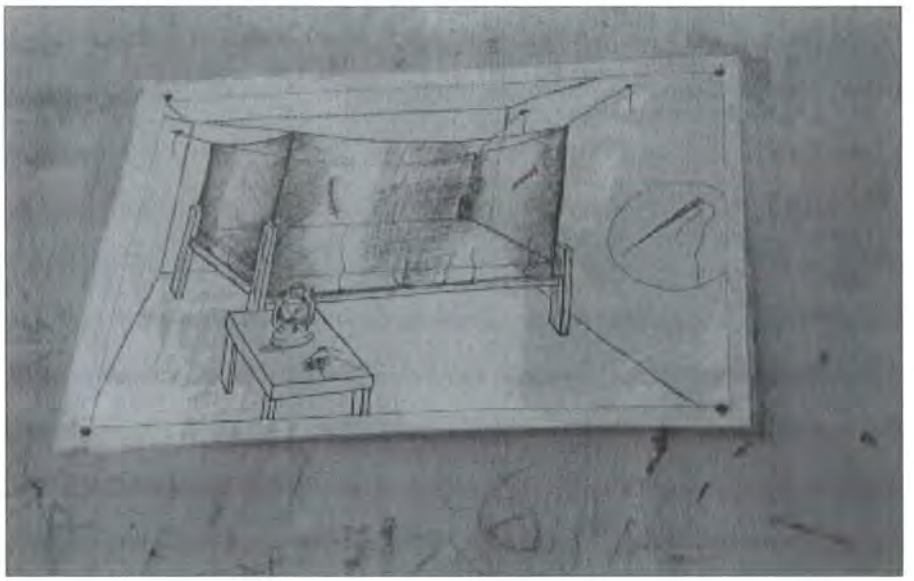
Participants for the Drawing Exercise

In addition to the six adult focus group discussions a drawing exercise was carried out for twelve school children, three girls and nine boys aged between 10 and 16 years. The *alkalo's* son from Konteh Kunda Niji and a teacher from Konteh Kunda Sukoto each selected six children from their village simply using the criteria that they enjoyed drawing and their parents had agreed to their participation.

The school children who took part in the drawing exercise were gathered at the community building in Konteh Kunda Sukoto with the children from Konteh Kunda Niji being transported by the study vehicle. One field worker, who had previous experience of teaching, acted as facilitator and organised the children into three groups of four. After five minutes spent introducing themselves in a familiarising exercise, the children were asked to think about mosquitoes, malaria and the use of bednets and transfer it into a poster that would send out a message to those who looked at it. Paper and coloured pens were provided and the three groups were given 30 minutes to produce a pictorial interpretation of their ideas. Each group then explained their picture for the benefit of the other children. Note pads and pencils were distributed to each schoolchild at the end as a mark of thanks for their contribution to the drawing exercise.

Plans to use the pictures drawn by the school children from their participatory exercise were not successful. Whilst it showed that the children had understanding of the breeding places of a mosquito with drawings of pools of water with mosquitoes around them and the work of tailors who were shown machine-sewing a bednet, this was not the message the project was trying to get across to the villagers. The posters were meant to reinforce the message of hand sewing holes in bednets and tucking the material under the mattress and these children's pictures did not do that. Consequently, an artist that had been employed by the Medical Research Council previously for another initiative designed three different posters. The posters are shown in this thesis (pp 30, 68, 70). Once they had been designed, the posters were shown to a random selection of villagers who were asked what the message of each was. These villagers were able to explain appropriately. Additionally, the traditional birth attendants and village health workers were fully involved in ensuring people understood the messages of the intervention and this is further discussed in chapter 4.

Poster 1



Pre and Post Intervention

Bednet Surveys

Three bednet surveys (August, October and November) were carried out in both study villages. Every room with a bednet whose owner had given permission was involved. The beds had to be those that were slept in at night and did not include beds where the villagers rested during the day. Information collected is shown in box 3.

For the bednet surveys a numbering system was devised to ensure that the same bednet could be identified for each census. On entering each compound the first occupied building on the left was counted as 1, the next after that was 2, then 3 until all the occupied buildings had been numbered. Every door of each occupied building was given a sequential letter of the alphabet, A, B, C etc. A marker pen was used to write the number and the letter on the outer aspect of the door. This enabled quick identification of each occupied building from the outside. On entering a room, the first bed on the left was numbered 1 and so forth until all the beds in that room had been enumerated. So, a bed identified as 1A1 was in the first occupied building on the left as you entered the compound, the first door of that building and the first bed to the left of the room. Each bednet was numbered sequentially from 001 in the top right hand corner with a permanent marker pen.

Box 3 - Bednet Survey Information

- Does the room have closed eaves?
- Does the room have a ceiling?
- Does the bednet have a door/opening?
- What material is the bednet made from? (Opaque, semi-transparent, transparent)
- Is the bednet long enough to tuck under the mattress?
- Has this bednet been treated with insecticide this rainy season?
- How many holes/tears are bigger than your index finger?
- How many holes/tears have been sewn with needle and thread?
- How many holes/tears have been mended with a patch?
- Who sleeps under the bednet? (Name, age, sex, pregnancy status)

Three male teenagers in Konteh Kunda Niji refused to participate in the bednet census and a family in the same village refused entry to one room as they stated that a "lunatic" slept there and would be disturbed by strangers. Some people had travelled to other parts of The Gambia for work or visiting of relatives and so access was not always possible for the census. If they returned during the study period their bednet was assessed in the same manner as the others. If there was no access because the occupant was working in the field that day, the field workers returned at an appropriate time to assess the bednet.

Only those beds that someone slept in at night were included in the census. Gambians frequently use a separate bed to rest on during the day. Those who slept on a bed without a bednet were included in the census in order to monitor whether they used a bednet later in the study. The numbering of the bednets with a permanent marker was necessary as many bednets were washed frequently due to an accumulation of dust and insect droppings. Despite this some markings sometimes washed off, perhaps due to the erosive type of washing powder used. When this happened, careful questioning ensured that the bednet previously assessed was that which was hanging presently and the same number was re-written on the bednet as before.

Each village and compound already had an individual identification number following an ongoing demographic surveillance and this was incorporated into the bednet census form for further confirmation that the same bednets were assessed at each survey. On completion of the project two sacks of sugar and five of rice were given to each village *alkalo* for distribution to all villagers as recognition of the participation of everyone and a thank you for the welcome into their homes that was given to the research team for the duration of the study.

Mosquito Collections

Two mosquito collections (August and November) were carried out in both villages during the project. The idea was to monitor the number of mosquitoes under the bednets before and after the intervention so comparisons could be made and the effectiveness of the intervention could be measured if the number of mosquitoes had dropped significantly, although it was also necessary to take into consideration the natural drop in mosquito numbers at the end of the rainy season (October) compared with the higher numbers at the beginning of the rainy season (July). Chapter 5 shows how the number of mosquitoes collected was measured against the number of holes and repairs to holes in the bednets to see if there was a link with mosquitoes and repairs to holes.

Collections were made using pooters and commenced between 06.30 and 07.00 hours and were completed by 09.00 hours at the latest. This meant that the villagers were still in their houses or compounds and the mosquitoes were still dormant. Plastic pots were used to keep any captured mosquitoes in and these were numbered. A hole had been cut into the lid previously and blocked off with a ball of cotton wool to allow the tip of the pooter to be put into the pot, the mosquitoes to be discharged into the pot and the cotton wool to be replaced. Once a bednet had been searched, the date, bednet number and pot number were marked on a pre-printed form. The pots were transported in a cool box to the Medical Research Council field station at the end of the collection where they were frozen and counted in the same manner as those collected in the light traps (Standard Operating Procedures, 2002).

To remind people to leave their bednets down each morning during the mosquito collections a piece of ribbon was attached to the bednet with a safety pin, either at the door flap or in a place chosen by the occupant. The day before the first collection was due to take place, the ribbons were fastened to the bednets with instructions to leave the bednet hanging for the next three mornings rather than tying it up, which is the normal pattern of behaviour. Once three days of collections had taken place then the people were informed that they could take down the ribbons for their own use if they wished. Another ribbon, of differing colour, was used for the post intervention mosquito collection.

Collecting Mosquitoes Using a Pooter

If access was not possible when attaching ribbons to bednets in preparation for the mosquito collections then that person's family were asked to pass the message to the appropriate person and a piece of ribbon and a safety pin were given to be attached to their bednet later. This method worked for the majority of the time, although some did forget. In this case, during the first morning collections the field workers reminded the relevant villager to leave the bednet down the next day. With the number of bednets in each village and four workers collecting, it was not possible to collect from every bednet daily and so the villages were split into two. One half of the village

participated from day one to three and the remaining households were involved from day four to six.

Different field workers were used for the second mosquito collections, in order to eliminate potential bias. It was thought that the original field workers, understanding the reasons for collecting mosquitoes to be the monitoring of the effectiveness of sewing up bednets, may have been tempted to search sewn bednets less avidly than those that had not been sewn in order to prove that mosquito numbers were reduced when there were fewer or no holes in bednets and thus that the project had been successful. The alternative field workers were accustomed to the use of pooters but were given training to familiarise themselves with the bednet numbering system and the layout of the villages prior to the collections.

Light Trap Collections

For the light trap mosquito collections three rooms were chosen from each village, making a total of six devices. The criteria for the room selections were: a building on the outer aspect of the village; each trap had to be at different corners of the village if possible; a single occupancy room; open eaves; and no ceiling (Standard Operating Procedures, 2002).

Miniature CDC light traps were used to monitor the number of mosquitoes (*Anopheles gambiae*, other *Anopheles* and Culicines) throughout the study period. The light trap was hung approximately one metre above the floor at either the head or foot of the bed, dependent on where one could best attach the rope to the roof. The neck of the trap pot was tied before being detached and the pot was placed in a cool box for transit. These pots were then put in a freezer on arrival at the Medical Research Council field station for at least one hour until the mosquitoes were all dead (Standard Operating Procedures, 2002). Microscopes were used to identify and count the sex and type of mosquitoes trapped. Any moths or other insects trapped were all discarded.

A fully charged battery provided power for the fan, which was checked for its downward flow whenever connected by the two leads. These batteries were removed

and recharged daily, then replaced with another charged battery. Connection was at 19.00 hours and disconnection was at 07.00 hours the next day (Standard Operating Procedures, 2002).

The light traps were left in each room for the whole period of the project but were tied up out of the way when not in use to avoid unnecessary disturbance for the occupant. The residents were asked to sleep with their bednet down each night the trap was operational. Collections were concurrent with the pre and post intervention mosquito collections from under the bednets in the corresponding village, and for two nights each week in between the bednet collections from both villages. Gifts of a bag of sugar were given to each participant on completion of the light trap collections to thank them for any disturbance or inconvenience they had encountered.

CDC Light Trap in Situ

Each morning the batteries for the light traps were checked for viability and on two occasions the batteries had not functioned for the whole night. These were subsequently discounted from the data set. One day the collections were delayed until lunchtime due to vehicle breakdown, although the participants had disconnected one lead from the battery terminal, as previously instructed, on waking at approximately 07.00 hours.

One youth from Konteh Kunda Niji did rescind his consent at the end of the first week of light trap collections. An alternative room was located and used until completion of the collections. An elderly gentleman from the other village asked for his light trap to be removed in the final week of collections, as he was unwell and felt unable to cope with the disturbance each morning. Again an alternative location was found and used for the last two collections.

Post Intervention

In-depth interviews

Eight individuals were selected for interview in order to establish reasons for using and repairing bednets or otherwise (see box 4). Some were because they either had (N=4) or had not (N=2) repaired their bednet during the study. It was hoped that these interviews would perhaps highlight why some people had been motivated to change their behaviour whilst others had not.

Two other people were interviewed to find out their views regarding alternative methods of keeping mosquitoes away from rooms, whether natural or chemical. This was to try and find out the reason why other methods were preferred by some people and the results from these two interviews can be found in chapter 3, as they focus more on beliefs and attitudes rather than behaviour regarding bednets.

Case studies

Additionally, to try to elicit information regarding behavioural practices concerning use of bednets and beliefs about protection from mosquitoes, four case studies were carried out. Two families, one co-operative and the other non co-operative were interviewed. The definition of family in this case was the husband and his two wives.

The non co-operative household was identified when one of the wives required medical attention for an infected finger. She was unable to travel to the medical facility before she had made alternative arrangements for her children, as she could not rely on her co-wife to look after them in her absence.

The co-operative household was identified during one of the focus group discussions, where two co-wives were participating. The second younger wife showed her respect for the senior first wife by refusing to be drawn into a free discussion with the other ladies, as her viewpoints may have opposed those of her co-wife, thus showing disrespect. This did not harm the group discussion, although it resulted in a lot of mutual joking on the part of the other participating women. Subsequent casual conversations with the co-wives ensured that there had been no problem, personally or publicly, to either party.

Box 4 - Post-intervention Topics

- The life history of nets within a family
- Changes in condition of bednets over time
- Change of ownership of bednets
- Changes to individuals sleeping under a bednet at different periods
- Whether children moved between nets
- With whom children slept as they grew
- New mother's perspectives on bednet use
- Why some villagers repair their bednets
- Why some villagers did not repair their bednets
- Why some villagers did not use bednets
- Knowledge of alternative mosquito repellents, natural and artificial

Two women were interviewed because they had become new mothers during the project and these interviews were to find out if behavioural patterns had changed for these families since the birth of their child. Both the household studies and the new mothers' studies are detailed in chapter 6.

All these studies took place post intervention due to lack of time pre-intervention and are not to be seen as a reflection of whether or not the intervention influenced behaviour. They are additional to the information gathered during the interviews and focus group discussions and give an extra dimension to the research.

Socio-economic Questionnaire

In addition to interviews, a socio-economic questionnaire based on that used previously by Clarke et al (2001) was completed by each household head (see box 5). The head of the households were targeted because of their responsibilities and authority over fellow members of the household. Data were collected in order to gather background information on the socio-economic status and composition of the study villages.

Whenever the household head was not available when the field workers called to complete the socio-economic questionnaire, a repeat visit was organised at a convenient time expressed by the person found in the household. If the head was still unavailable, then the representative was asked for the information required. This was usually the household head's wife or mother.

Box 5 - Socio-economic Data

- Age
- Type of school attended (English, Koranic, none)
- Grade of schooling achieved
- Number of wives and children
- Main occupation
- Main source of income
- Type of housing: walls (cement, mud, mud bricks)
  roof (corrugated iron, thatch)
  cooking (inside, outside)
  fuel (collected firewood, bought firewood, charcoal)
- Ownership of goods (watch, radio/cassette player, bed, farm implements and animals, bicycle, motorbike, car)

Village Meetings

Two meetings, one in each village, were held in December when all the data collection had been completed. It was an opportunity to thank the villagers for their assistance in the study and also to gather their comments about the impact of the intervention and the research process as a whole. People were invited to a public area on a day and time chosen by each village *alkalo*. Notification of the meetings were verbally spread through the *Imam* and *alkalo*. In Konteh Kunda Niji approximately 30 people attended and in Konteh Kunda Sukoto around 15 people attended.

Each meeting was opened with a prayer and then a nominated field worker gave thanks to the villagers for their participation in the project and that the field work was now completed. They were informed that the field workers would return the following year to give feedback on the results of the study. The attendees were then invited to speak openly about their feelings with regards to the project and to offer any constructive comments. One field worker transcribed the discussion whilst another moderated the meeting. As per the focus group discussions, the meetings were held in Mandinka whilst the notes were written down in English.

Details of those present at the meetings were not taken, so it was not possible to categorically identify whether these villagers were the ones that had taken part in the interviews or focus group discussions, although some of them were recognised by the field team as having done so and from the feedback described in chapter 7, it is clear that the female singer from Konteh Kunda Sukoto and the male composer of the Konteh Kunda Niji song were present at their particular village meeting.

Data Analysis

Tape recordings from the focus group discussions were transcribed first manually and then word processed in The Gambia and transported back to England for final analysis. Notes taken during the interviews and ethnographic case studies were word processed and again brought back to England for analysis. The interview and the focus group discussion transcriptions were coded and indexed according to collective themes for analysis (Bloor et al, 2001; Morgan, 1997; Dawson et al, 1993).

Data from the bednet surveys, light trap collections, mosquito collections and socio-economic questionnaires were entered into Epi-Info at Farafenni Field Station and then transferred into Statistical Package for Social Sciences 11.0 for Windows on return to England for analysis.

All quantitative and qualitative data for this project were collected simultaneously in a "parallel mixed method design", and as such were analysed in a "complementary manner" (Tashakkori and Teddlie, 1998: 47).

Chapter 3 – Beliefs and Attitudes towards Bednets.

The purpose of the pre-intervention stage of the research was to establish baseline data on the beliefs and attitudes towards the use and maintenance of bednets. Data from 39 interviews and six focus group discussions were collected (see methodology for details of their composition). Answers were sought for why some people used a bednet whilst others did not and why some used them incorrectly or left them in a state of poor repair. Additionally, it was hoped to find out who had responsibility for the provision and maintenance of bednets: someone at village, compound, household or individual level; male or female.

Common themes emerged from the interviews and focus group discussions and these are discussed in this chapter. As the interviews progressed repetition in answers became apparent and so rather than utilise every key informant's remarks, six people were chosen as representative for everyone because they covered all the themes and their comments reflected those of the other participants. The six people were an *alkalo*, a tailor, a fisherman, a traditional birth attendant, the head of a compound and a pregnant woman. The interviews section focuses on the reasons why people used a bednet; the details of when and how to repair holes or tears in bednets as well as who was the best person to carry out the repair. Two in-depth interviews about personal beliefs on the alternative methods of protection used to repel mosquitoes were carried out post intervention with other villagers and are included in this section.

The focus group discussions section examines who was identified as having priority for use of a bednet; who had responsibility for bednets, whether it was for provision, maintenance, care or correct use; and environmental factors that would reduce the number of mosquitoes present. The data were essential in order to find the best way to augment a change in behaviour towards maintenance and use of bednets. Summaries of the findings can be found at the end of each section in boxes 6 and 7.

Key Informant Interviews

Bednet Use

"Bednets give you a nice sleep at night and also prevent you from mosquito bites and keep you healthy from diseases and mosquitoes and other insects as well" (tailor, male, 42 years). These words from a tailor who worked in Farafenni illustrate the main theme to come out of all the interviews, which was the fact that a bednet acted as a barrier between the person under the bednet and undesirable things such as mosquitoes, other insects and dust. Primarily people focused on either the prevention of disease or the maintenance of health when they explained the benefits of using a bednet. It was widely recognised that the physical barrier of the bednet stopped mosquitoes entering the bed area at night. This barrier prevented the person being bitten which resulted in a lower chance of contracting malaria.

The tailor's words, "[b]ednets give you a nice sleep at night," also emphasised the auxiliary bonus of using a bednet aside from the protection against mosquito bites or other insects. A peaceful night's sleep undisturbed by insects was an additional benefit reiterated by several of those interviewed, so it seems that disturbance acted as motivation for people to use bednets, as well as using them for protection against bites and malaria.

The rainy season is a labour intensive time, especially for farmers and adequate sleep as well as absence of illness was seen as vital to be able to maintain the intensive work pattern required during the summer months. Anyone who did not have the energy to work to their full capacity through illness or tiredness would potentially mean reduced productivity in the field. Economically this could lead to a lower income which impacted on the whole family until the next years farming cycle.

One man, whose livelihood came from both fishing and farming, when asked whether he would repair his fishing net or bednet first if they both had holes, replied, "the bednet. Without a good bednet you can get ill and if I am ill I cannot get fish to feed the family...if I become ill from having a poor bednet that mosquitoes can enter I cannot fish so the bednet has priority for me" (fisherman, 55 years).

Dust falling onto person under a bednet was seen as an all year round problem so that despite the acknowledged fact that, "bednets are important, especially in the rainy season [because y]ou are disturbed by mosquitoes and at the end you have malaria...in the dry season it is still important to use a net to keep off the dust" (traditional birth attendant, female, 65 years).

This was corroborated by an 80 years old *alkalo* who said, "there are no mosquitoes around in the dry season although the nets are left up to stop dust falling onto the bed." So, despite the lack of disturbance by mosquitoes acting as motivation to use a bednet, there was still an incentive to use a bednet during the dry season for some people.

The *alkalo* also raised another reason echoed in other interviews as to why people used a bednet, which was to "give privacy." Multi-occupancy rooms are common amongst Gambians, particularly those of Mandinka ethnicity, resulting in an appreciation of any private area. Females often share a room with other adult female family members as well as children whilst the male household head usually has his own room. There are three kinds of material from which bednets are made: opaque cotton, semi-transparent netting or cotton and transparent mesh. Privacy would only be achieved if either of the first two were used and indeed the three people who spoke of bednets giving privacy used these types of material for their bednet. The issue of quality of the different types of material raised the subject of holes or tears requiring repair appearing in the bednet and this matter is discussed in the next section.

Bednet Repairs

There is a point when a bednet becomes too worn and old to justify the effort of repairing it, although there was no agreed timescale for this amongst the interviewees. Consensus was that if a worn bednet was mended then another hole would form adjacent to the stitching, making it quickly ineffectual and a waste of time and effort mending it. The longevity of the bednet depended on the quality and type of material used as, "[s]ome people have bednets with holes because of the poor material so it is easy for their net to have holes. The poor quality of the material can cause more holes. Holes the size of your finger can damage a bednet because you are giving free way for

the mosquitoes. Even one hole would damage a bednet...A new net may have no holes for two to three years" (tailor, male, 42 years).

The type of material the bednet was made from was a source of discussion with individuals preferring different types for privacy or comfort. Some expressed preference for the mesh bednets because they were cooler in the hot, dry season whereas others felt that opaque cotton bednets were warmer for the cooler nights of the rainy season. However, finances often dictated the type of bednet purchased, as price varied with the material used and preferences were often overruled by the consideration of cost. When investigating the prices of bednets in the local markets it was found that the thicker and more opaque the cloth, the higher the cost of the bednet.

The fisherman summed up the problem of desire for a particular type of bednet and reality of what was available to the individual with a food analogy: "[g]ood quality nets serve for fifteen years. Poor quality nets cannot serve two years. It is like you have *domoda*, *benuchin* or *kutcha*[4] in front of you. Which would you choose? This is like nets. I would have a thick one if I could afford it. It is a personal choice but you can only get what you can afford at the time" (fisherman, 55 years).

When asked who would be the best person to repair holes in bednets the unanimous answer was that it depended on the size of the hole. "If the hole was big a tailor would mend it" (*alkalo*, male, 80 years) summed up the responses of the interviewees. Large holes were deemed to be a better quality of repair and last longer if they were sewn by a tailor using a machine rather than by hand whilst it was accepted that small holes could be mended by hand with a needle and thread. "Machine sewing is better than hand sewing. As I am a tailor this is easy for me. The best person to mend a bednet is a tailor. Everyone has needle and thread however much it costs. They buy them from the shops...To repair a bednet would cost five Dalasi[5] or I would mend it free for my friends depending on the number of holes...Cotton thread is two to five Dalasi

[4] *Domoda* – a meal of rice and groundnut sauce. *Benuchin* – a meal of rice, vegetables and meat or fish. *Kutcha* – a meal of rice and a green leaf sauce.

[5] Gambian currency. £1 = 30 Dalasi in 2002.

depending on the length of the thread...large needles are three Dalasi for a pack of 25 and small needles are two Dalasi for a pack of 25"[6] (tailor, male, 42 years).

Economic restraint was the principal stumbling block to engaging a tailor in mending a bednet. This could perhaps explain why small holes were often mended by hand with a needle and thread but, as the tailor mentioned above he was willing to repair bednets for friends at no cost. The traditional birth attendant acknowledged that she would probably be able to get her bednet repaired free of charge by a tailor due to her age. She also offered advice to those who had no time for repairing any holes or tears during the busy farming season: "[p]eople are careless if they leave holes in a net. The first thing you think of is to mend the hole or take it to the tailors. If you are so busy you haven't time to mend the net then you can put a blanket over the net until you have the time. The tailor is the best person to mend bednets. If I had to pay it would be two Dalasi or three Dalasi or even free as I am old. Most don't have the money to go to the tailors...everybody wants to have a bednet but money is a problem" (traditional birth attendant, female, 65 years).

This raised the question of time and financial constraints on Gambians during the rainy season, from June to October, which is when a bednet in good condition is paramount for protection against malaria. The busiest period of the year in rural Gambia is the rainy season when people spend long working hours in the field preparing, planting, maintaining and then harvesting their crop. Leisure time is more available during the dry season, November to May, and this is also the time when people have more money after selling their crops. However, there are fewer mosquitoes during this period and so the motivation to attend to the needs of a bednet is not as urgent.

There was an equal split between those interviewed who thought that time was the main limitation against those who felt money was the problem, although it was generally acknowledged that people could make time to carry out repairs, as most farming families had one day off a week. "Not time but money is the main problem

[6] I verified this at Farafenni market. Needle and thread was plentiful at a number of stalls. The cheapest threads were not very strong but thread of a reasonable quality could be bought for around three Dalasi. In the villages the prices were lower with quotes of thread costing 25 Butut (100 Butut = 1 Dalasi).

when it comes to sewing up bednets because some people cannot afford it. The priority for money is: food, good compound, clothes, then smaller things like a bednet" stated the tailor (male, 42 years). The *alkalo* agreed that lack of finances could be a block to mending bednets although he felt that laziness was also a contributing factor to not repairing them: "[p]eople have the knowledge about the link between a bednet and mosquitoes but they leave holes in their nets because they are lazy. Lack of money can be a problem for some people who don't mend their nets. One or two holes in a net is all right but more than two holes makes a poor net. Small holes easily develop into larger ones so all should be mended. Tailors are the best people to mend bednets with holes. It would cost five to ten Dalasi depending on the state of the net" (*alkalo*, male, 80 years).

As the tailor alluded to in his last statement, although people preferred to have holes in their bednets repaired on a machine by a tailor, needle and thread was readily available to all. Even if someone had a problem buying needle and thread there was a culture of borrowing from another member of the household or someone within the compound, as substantiated by the traditional birth attendant: "Every compound has needle and thread. If some households don't have [needle and thread], they can always borrow them" (traditional birth attendant, female, 65 years). The *alkalo* agreed that although "[n]ot everyone has needle and thread...people can borrow them from neighbours" (*alkalo*, male, 80 years). Even the fisherman acknowledged that he had the means to repair holes or tears in his bednet despite lack of finances: "I have no money to take the net to the tailor but I have needle and thread" (fisherman, 55 years).

Alternative Means of Protection from Mosquitoes

The people who did not use bednets usually used an alternative deterrent, such as coils, sprays or local plants known for their repellent properties. One male household head and one pregnant female, both from Konteh Kunda Sukoto, spoke at length about the various substitute methods of preventing mosquitoes from infiltrating houses, entering bednets and biting people. They also spoke about their preferences for these alternative choices.

The *Sisiling ngamo* plant is widely known for its protective properties, working by repelling mosquitoes with its "strong scent" (female). This method of mosquito

protection was used historically before the advent of artificial measures, such as coils or sprays. According to the female this "modern technology" had given her family "the knowledge to prevent ourselves from these mosquitoes." The negative aspect of the more traditional natural repellent was that the plant only remained effective for one night after which it dried out. The labour intensiveness of collecting the plant was pointed out, as this is usually the task of women, "who are responsible for the domestic work in the compound from dawn to dusk" (female).

Preference for using coils was voiced by the woman because, "they are effective and less expensive. They keep mosquitoes away for the whole night to give the user a better sleep." However, the man felt that coils "encourage colds...that transmits from one person to another." He named a certain make of coils that he had tried, saying that this was the only effective one he had come across compared with others.

The male continued with his theme of health being affected by some repellents. He thought sprays were "likely to be harmful to you and your children's health...[as] they can affect your breathing." Despite this, he acknowledged that spray was "effective...[as] it works and kills mosquitoes and other insects." The expense of sprays was highlighted by the woman and had never bought any due to this. She said she could not comment on the effectiveness of sprays as they were not in common usage in the village and so she did not know how effective they were.

Despite innumerable national and international projects' intensive efforts to promote the benefits of dipping bednets in insecticide as protection from mosquitoes, differences in the perception of efficacy of insecticide arose. The man felt that insecticide was "more effective than all other things...prevent[ing] the user of that net from mosquitoes and malaria" seeing it as "effective and less expensive" than the alternatives. He stated that bednets without insecticide were ineffectual even if the net was new. The results of using a non-insecticide-dipped net was "infect[ion] by malaria because mosquitoes can always bite from outside the net." The female was not too sure of the effectiveness of insecticide saying that she used coils "to kill and drive mosquitoes away." Belief about the life span of insecticide-dipped bednets varied, with the man stating that it served "up to one year or more...depend[ing] on

the application of the insecticide to your net," whereas the woman felt it only lasted for two months.

Box 6 - Summary of Findings from the Key Informants

- Bednets were used:
  to prevent mosquitoes, other insects or creatures disturbing the bed occupant
  to prevent dust falling onto the bed
  as a means of privacy
- Quality of material affected the life of a bednet
- The best way to repair a bednet was:
  on a machine if the hole or tear was large
  with needle and thread if the hole or tear was small
- The best time to repair a bednet was:
  the end of the rainy season when people had money to pay for repairs
  the beginning of the rainy season when mosquito numbers were rising
- Alternative methods of protection against mosquitoes were chosen for their:
  cost effectiveness
  efficacy

Focus Group Discussions

Priority for use of Bednets

"Priority should be given to children among the whole family...I say that priority should be given to children because elders can take care of themselves to prevent from mosquitoes and malaria but children can't" (older man, aged over 70 years, Konteh Kunda Sukoto). "Small children are given the priority since they are so small they can't take care of themselves...Priority is given to children because we were once a child and our parents took care of us. This is why we also aim to take care of a family so that they can be grown up tomorrow. Children are the [future] elders this is why priorities are given to children" (married man, aged 25-40 years, Konteh Kunda Niji).

Foremost priority for use of a bednet voiced amongst each focus group cohort was identified as, "[c]hildren...up to the age of five years" (breastfeeding mother, Konteh Kunda Niji) because of their vulnerability to disease and lack of ability to take care of themselves, although some felt that older people should also have use of a bednet: "[w]e should target children to ten years of age and even elders," as malaria had "the same effect on both children and elders" (breastfeeding mother, Konteh Kunda Niji).

The villagers' sleeping arrangements were such that women often shared a bed with their children from their birth until another child was born or the child became too big to share. Thus, women frequently benefited from having a bednet in good condition, as recognised by an older man from Konteh Kunda Sukoto who said, "[p]riorities are given to children but most mothers use their net with children in many families." A married man from the same village accepted that, "we think of the safety of both the child and the mother." The women felt justified in having protection from malaria, as they "walk a long way to the rice field, about six kilometres" (breastfeeding mother, Konteh Kunda Niji), a feat they would be unable to fulfil if they contracted malaria due to sleeping under a bednet in poor condition.

Where there were difficulties in providing each wife with a bednet the consensus of opinion was that if a husband had two wives but only one was breastfeeding, "[p]riority should be given to the breastfeeding mother and the baby" (breastfeeding mother, Konteh Kunda Niji). An older man in Konteh Kunda Sukoto agreed that, "[b]reastfeeding mothers and their babies...should be given the priority of using good bednets."

The reason for concentrating on protecting the mother and child was because of the vulnerability of the baby rather than the adult female: "[Women] can waft themselves but the child can't. Therefore more priority should be given to the newly born child and the mother. Normally the husband provides a net for the newly born child and the mother. That's not a problem at all" (breastfeeding mother, Konteh Kunda Niji).

Prioritising one wife over the other was not seen as a problem because "[e]ven though priority is given to the newly born baby and the mother, the other wife will understand it" (breastfeeding mother, Konteh Kunda Niji). An older man from

Konteh Kunda Niji concurred: "[p]riority will be to the child [who is] breastfeeding since there is only one net...anyway the priority is for children and the mother and it will not be a problem for the next wife."

Temporary transfer of bednets from one person to another classed as more vulnerable was described in the following statements by two breastfeeding mothers in Konteh Kunda Niji: "[if] the newly born baby is without a net the other member within the same household allows the baby and the mother to use a bed with a net or even borrow from other relatives up to the weaning stage of the baby or even the mother-in-law will provide the net" and, "[s]ometimes the net that men use are given to the newly born baby or the wife when there aren't two wives...But when two wives are both with babies he can't give to one and leave the other without since all with babies find it very hard to be satisfied. He must neglect them and so all stay without [a] net when not affordable by the husband."

They went on to discuss what steps could be taken to help with provision of bednets for all members of the household. When one wife had a bednet and the other did not one mother added that, "we two will add money together for the [one] without a net depending if we have money in hand, or even for both to benefit from a new net whatever happens in terms of the financial situation of the household."

Responsibility for Bednets

Various aspects of responsibility were discussed during the focus groups, as the word covers responsibility for provision, maintenance, care and correct use of bednets in addition to the responsibility for deciding who should have priority for a bednet, as discussed above.

The responsibility for ensuring people used their bednets correctly lay with the men of the household who took on the role of provider of and advisor about bednets. One married man from Konteh Kunda Niji said that he would recommend people to tuck in their bednet to be protected "from mosquito bites and for his good health." Another described his nightly ritual of checking each of his family members' rooms at night to see if they were correctly prepared: "I go round the rooms within my compound, look at each net to see whether the net is properly tucked in. If not done properly I...call

my wife...for correct bed preparation. Sometimes when my pocket is heavy I buy mosquito spray from Farafenni and spray every room before [the] children are asleep, including my wives."

There was some disagreement about who had responsibility for repairing holes or tears in bednets within a household. One of the older men from Konteh Kunda Niji said, "[t]he household head is responsible for torn or worn bednets for either men or women in the household" yet another said he would "tell my wife to sew [a hole] immediately it is discovered." Others spoke of a shared responsibility: "[b]oth parents are responsible for sewing" and sometimes "[t]he woman will ask the husband to sew the holes or sew [them] herself," whereas one of the mothers from Konteh Kunda Sukoto explained that the "user is responsible for sewing of holes in [their] net," although it was acknowledged that not everyone could sew well by hand.

Initially, one of Konteh Kunda Niji's married men stated that, "[i]n the absence of men, women are responsible for repairing the children's bednet when torn but when men are present, they are responsible," implying that it was them who actively repaired holes or tears. Later, in the same focus group another man admitted that, "[w]ives are mostly responsible for repairing bednets within many households, going round the house untying nets for washing and stitching holes on each net before use" and that, "[t]hey are more active than men in terms of household care," which indicated that women assumed a practical role in the family. This role was recognised by a breastfeeding mother from Konteh Kunda Sukoto who said, "[w]omen are doing all the domestic works. The compound...the household and even the husband's net it is the woman who prepare[s] and repair[s] them when they are torn." The statement, "[b]eing the household head you have sole responsibility for the household and everything should be observed by you" from one of the older men from Konteh Kunda Niji suggested that men had a more supervisory role within the household.

Large holes were generally taken to the tailor for repair whilst sewing by hand was most often the method used when the hole was small. The head of the household was responsible for finding the money to buy needle and thread or to pay the tailor to mend a bednet, as acknowledged by one of Konteh Kunda Niji's older men: "I being the household head I am responsible for repair of torn or worn nets, taking them to the

tailor when the hole is big or sewing it with my hand when small." The implication that the men took the bednet to the tailor was discounted by the breastfeeding mothers from Konteh Kunda Niji, one of whom said, "[s]ometimes when nets are torn the husband would ask the wife to take the net to the tailors for repair...but when the husband lacks money you then use your hand sewing, stitch with needle and thread" with another adding that men repair bednets only "when they have no option *akuntutu mantaffu*[7]."

Environmental Issues

"[G]ood health is very important to mankind...because with health you can do anything but when [you are] not healthy you can't do anything" (married man, Konteh Kunda Niji). The importance of maintaining health was paramount to the villagers, as their livelihood depended on being physically fit to farm and fish throughout the busy rainy season. It was the men's focus groups who mostly spoke of keeping the environment clean in order to reduce the number of mosquitoes present around the villages, thus reducing the chances of contracting malaria. "Clear the surroundings so that we can be safe from mosquitoes" (married man, Konteh Kunda Niji) summed up the general feelings in the groups. Advice given was: "clear the whole surroundings in the village because if a place is filthy, stagnant water, waste pots allows mosquitoes to stay" (married man, Konteh Kunda Niji) and "[e]ncourage a clean place, either household nets, beds, under the beds and even the empty container where mosquitoes breed should be eradicated, clean environment and even clean good food" (older man, Konteh Kunda Niji).

In addition, an older man from Konteh Kunda Sukoto said that one should endeavour to "get rid of animals within our doors," as the presence of animals living in close proximity to houses increased the numbers of insects including mosquitoes. One of his compatriots acceded: "what _____ said is true because I observed when I have my bulls around my house I was feeding lots of mosquitoes but now when I removed them there are less mosquitoes." Agreement was voiced by a married man from Konteh Kunda Niji: "[i]f a place is clean and the other if filthy, one is always more

[7] Literal translation: 'the cloth is torn, it cannot be mended'.

comfortable at the clean place than [the] filthy place. Cleanliness saves you from all type of disease."

Certainly, during the project, villagers organised and carried out group clearing of public areas, such as grasses, around the village whenever they started to encroach on the paths. Interestingly, a clear gender differentiation existed in maintaining clean surroundings, with males predominantly participating in the community-wide cleaning of the area outside the compound, whilst the females maintained the area within the compound. Sweeping of compounds both inside and outside the buildings took place by women at least daily to rid the area of accumulated dust, leaves and debris[8].

The concept of cleanliness was not confined to the environment but "[c]leanliness covers everything, even worshipping God you must be clean" (married men, Konteh Kunda Niji). Cleanliness of the soul was linked to godliness and associated with fewer mosquitoes. The focus group of mothers in Konteh Kunda Sukoto summed this up with, "[i]f we keep our environment and bodies clean, there will be less mosquitoes." Religion played a key role in Gambian reasoning for unusual or unfortunate occurrences, such as the poor rains during the 2002 season. It was "[b]ecause of Allah's mercy for children and animals it rains, for us alone it might not rain, due to how we behaved" (married man, Konteh Kunda Niji). An older man from Konteh Kunda Sukoto stated that the reason for people contracting malaria sometimes lay with darker forces as, "sometimes people...associate malaria cases with the devil and witchcraft" indicating that not all Gambians accepted the link between malaria and a mosquito bite.

[8] I observed this whilst living with a Gambian family during the study.

Box 7 - Summary of Findings from the Focus Group Discussions

- Priority for a bednet was given to:
  pregnant or breastfeeding women and their babies
  children up to the age of ten years
  older people of both sexes
- The person responsible for bednets was:
  head of the household for provision and correct use
  the female in the household for repair
- Environmental cleanliness was important for reduction of mosquitoes

Summary

The data presented here captured the beliefs and attitudes towards bednets. The aim was to find out how best to encourage a change in behaviour towards repair and use of bednets. Two levels of information were represented: those of the individual through the key informant interviews and those of specific age and gender cohorts through the focus group discussions. Common themes emerged from the interviews, which was an encouraging sign, as the study sought to facilitate a community-wide change in behaviour.

The villagers used bednets for a number of reasons, including privacy and as a barrier from falling dust, as found in MacCormack and Snow's (1986) Gambian study but principally they were used as a physical barrier against bites from mosquitoes. This corroborates the work of Okrah et al (2002), Agyepong and Manderson (1999), Thomson et al (1996), D'Alessandro et al (1994) and Thomson et al (1994) who all established that bednet use was prompted by the nocturnal disturbance of mosquitoes.

Applying Hubley's (1993) BASNEF model to measure the likelihood of enabling a change in behaviour, the data described in this chapter show that Gambians recognised that using bednets in good condition would result in fewer mosquito bites and a reduction in contracting malaria (step1 - ensure the change in behaviour will result in improvement in health). It was deemed important by both the individual interviewees and the focus groups to lessen the chance of contracting malaria due to the labour intensive farming season when villagers worked long hours. Illness meant diminished productivity, which had economic implications for households. Although alternative methods of protection were used by some villagers, bednets were recognised by the majority of people as an excellent way to prevent mosquito bites.

The behaviour change required was within the capabilities of community members because it was *culturally appropriate* to discuss the use of bednets in groups, which meant that a community intervention to encourage people to repair and use their bednet appropriately was feasible. Reinforcing the findings of D'Alessandro et al's (1994) and Aikens et al's (1993) Gambian research, the focus groups identified three cohorts that were more vulnerable to mosquito bites: breastfeeding mothers and

babies, children and the older generation and so it would be accepted as *culturally sensitive* to target these people in an intervention.

The interviews highlighted the fact that repair of holes and tears in a bednet could be carried out with a needle and thread, although often the preferred option was for a tailor to repair them by machine. However, a barrier to having bednets repaired by a tailor agreed by the study participants was the cost. Consequently, the recognised benefit of this intervention that needed to be highlighted was the potentially low cost of repair, only requiring needle and thread, an advantage previously acknowledged by Guyatt and Snow (2002), which, as not every individual had these items, were readily available through the accepted culture of borrowing from others within the household or compound. This meant that all members of the community had the enabling factors from step 3 of Hubley's (ibid) model to repair bednets with needle and thread.

A second barrier highlighted by the interviewees was the lack of time to repair holes or tears during the busy farming season. There were two accepted times of the year thought best to actively encourage the maintenance of bednets. One was prior to the start of the rainy season, in June, before mosquito numbers increased and the other was at the end of the rainy season, in December, when people had the financial means to pay for repairs. The problem with these times was that people were usually motivated to repair their bednets because of the annoyance factor of biting mosquitoes, which was during the rainy season. These limitations had already been well documented by Okrah et al (2002), Lines (1996), Aikens et al (1993) and MacCormack and Snow (1989). Thus, the proposed behaviour change was realistic, as required in Hubley's (ibid) step 2 for enabling change but it was not without problems.

The focus groups had shown that both men and women could sew, although it was more likely that females would take on this role. Training to sew bednets was therefore not necessary but the motivation to change behaviour seemed to be a missing element with some people. Identifying key motivational or influential people within the villages who could be utilised was therefore something to address when planning the intervention. The identification of these people would deal with step 4 of the BASNEF model.

The main reason people said they used bednets in good condition, both in the individual interviews and collectively in the focus group discussions, was to prevent bites from mosquitoes and for the prevention of malaria. There was also a discussion in the focus groups about outside forces, including witchcraft and the devil, being responsible for cases of malaria. This shows that the causation was linked to the disease so education about the link would have to be incorporated into the intervention acknowledging Hubley's (ibid) step 5 - identify any indigenous beliefs.

Chapter 4 - The Intervention

Prior to developing a strategy or strategies for motivating rural Gambians to repair and use their bednets correctly, two steps were taken to gather information. In step one, possible ideas for the development of an intervention were collected at a Non Governmental Organisation meeting held in a suburb of Gambia's capital, Banjul, at the beginning of the project. Participants were members of eleven national and international organisations that had a focus on the health promotion and educational aspects associated with malaria. All the quotes included in this section cannot be fully accredited, as the process was one of open and group discussion. Identification has been made where possible.

Emphasis was placed on the fact that community participation with the goal of inducing behaviour change was the key element in the study and as such nothing could be categorically predicted, although previous experiences would be helpful guides to understanding general trends in Gambian society. Representatives from the organisations were asked to discuss three points:

- What strategies facilitate and enhance community participation?
- How would you run this intervention?
- Why would this intervention work for you (if you were a villager)?

Step two of the information-gathering came from the data collected from participants in the interviews, focus group discussions and drawing exercise (see methodology). Males and females of all age groups had an opportunity to put forward their ideas to give a holistic representation of the community and to ensure inclusiveness. The data from each step were built upon until the design emerged of an intervention that would be *culturally compelling*, *culturally sensitive* and *culturally appropriate*. Villagers were also fully involved in the implementation of the intervention, which ensured that the whole process of developing a means to encourage behaviour change was truly participatory and community-led.

Step One - Non Governmental Organisation Meeting in Fajara

Multiple possible methods of devising an intervention were suggested at this meeting with one participant summarising the ideas when he said, "[d]ramatisation; 'how-to' interventions...house-to-house sensitisation; symposiums and workshops; media campaign; focus group discussions; malaria *bantabas*[9]; use of posters, comic strips, cartoons and booklets." The focus on visual and aural methodologies emphasised the low levels of literacy found in rural Gambia[10]. As such, to ensure inclusion of all members of the community, it was essential to use a method easily accessible and understandable to all.

Consensus was reached amongst all attendees that the women were the likely motivators within the community and that one approach mentioned by one meeting attendant would be to, "identify a woman mobiliser, a head of the community group [to be] in charge of the bednet repair." However, it was acknowledged that identifying a single person to motivate a whole village was not feasible and would be unlikely to produce results. *Social mobilisation* was seen as the key to engaging the whole village, with established community groups being responsible for that. The benefit of utilising already established groups was that, "[i]f you base an intervention programme...on these [groups] the community will treat [it] as their own initiative and they will take up the challenge to actually...take up the responsibility of bednets. It will not be difficult for them because...you have people who organise themselves."

In conjunction with *responsibility* for the mending and use of bednets, *ownership* was felt to be necessary to motivate villagers. The idea was for "the communities themselves to pick ownership of this project, for its sustainability." Identified motivators, such as the *keneleng*[11] group, were seen as ideal "because these are also leaders, that when they talk people listen to them. [H]aving them involved would make the project very sustainable." Previous experiences of focus group discussions

[9] A seating area used as a meeting place for villages. Usually made from branches tied together and situated under a tree for shade.

[10] This was confirmed by the socio-economic data collected during the study, which showed that only 2.9% of household heads in the two study villages had received formal schooling. Of the others, 74.5% had received education focussing on the Koran at a Madrassa school and 22.6% had received no schooling.

[11] A group of women who perform and sing in Gambian communities. Motivators within the community.

found that it was likely that some of the people who were attending would be *kenelengs* with one contributor saying: "not long ago...when we organised a focus group discussion...the *kenelengs* were there. During the session they formed their own groups without us even being aware and then they played a song on what we were telling them - that is, all about malaria" (spokesperson from The Association of Youths Against Malaria).

People had to feel there was a valid reason for changing their behaviour rather than doing something just because they were asked to do so. Maintenance of health or prevention of illness was seen as a major motivation for doing so as, "[p]eople will always do it for their own health. And it's cheaper to do it at the household level than go to the tailor." This introduction of economic as well as personal reasons was quoted as another valid element to emphasise when trying to encourage community participation. The rainy season is an extremely busy period for Gambian farmers, with women having to juggle childcare with working in the fields. Awareness of the value of maintaining a bednet in good condition for both the children and the mother in order to avoid illness and sustain a level of fitness commensurate with such an intensive activity was a tack that some felt would encourage action rather than apathy. One attendee explained: "if one of their children is sick, they don't go to the farm, they have to...stay home. It might be two or three days, or a week. So, if you give them that responsibility and the knowledge as well [that] if they sew [their bednet], it will save them from that. Then definitely they will be involved. They will be more willing to do it than actually just having to go on their farm, taking their farm to be more important than repairing the nets."

Changes in behaviour were deemed more probable if the intervention was "[a] communal thing," using peer pressure as an instrument in activating people who may say, " 'because others have been doing it, let me also do it'." The Gambian people live very public lives with little privacy and so open events, such as "a semi-annual event of washing, stitching and dipping [bednets]...at communal level" rather than at a more closed household level was seen as a possible project intervention by the meeting participants. The problem with such an event was that the frequency of bednet washing varied within individual households. Also, such an event would not be possible to measure within the project time frame, as this was a six month study.

An interesting point made in relation to the private vs. public matter was illustrated by comparing the maintenance of school uniforms with bednets. Gambians keep their children's uniforms clean and in good repair whereas it was acknowledged that many Gambians did not maintain their bednets with such fervour[12]: "We noticed that generally speaking someone in the household will always repair the school uniform, that is, sew up. Therefore the skill and the needed equipment is present in the household or available. May I just add, so why is it that you all repair your children's clothes, but you don't repair your child's bednet? Why is it that you look after one thing, and then not repair another? So we thought that there is a public issue involved here – it's more public in school. That the school will maybe call the children, 'go home and get your mother or somebody to sew your uniform. Go get that fixed. Don't come back tomorrow with the torn uniform.' There is some public pressure there. How can we get the public pressure exercised to get people to look after the bednet that might be in the bedroom and nobody from the community sees it? It's not publicly exposed. So social mobilisation is part of it" (spokesperson from the Nova Scotia Gambia Association).

The peer pressure issue was taken a step further when one person recommended using children to disseminate the message regarding the repair and correct use of bednets. Sensitisation of the community by the youths would first start with "[p]eer health educators encouraging children to repair the bednets." The reason for utilising school children was that "[s]ometimes maybe mothers can't see the holes, but if you educate the children how to repair the bednets then maybe they will encourage their mothers to do that;" an idea advocated by the Child-to-Child Approach (Hawes and Scotchmer, 1993; Bailey et al, 1992).

Children were viewed as informants and inspectors, not necessarily as the people to repair tears in bednets. As one person said, "[i]f they [could] participate in repairing, fine. If they [could] be trained to do it, fine. But let them know that from that age they

[12] Whilst living with a Gambian family during the study, I personally saw this supposition put into practice. Children were not always sent home if their uniforms were torn, due to the possibility of them not returning. Instead, at the local school, there was a sewing machine used for the purpose of stitching uniforms as necessary. Pride was taken in the care of uniforms generally and the pupils' overall appearance was also important. Girls paid extra attention to ensuring their hair was plaited neatly and shoes rather than flip-flops were worn whenever possible.

should be responsible, inspect them, and tell their parents 'my net has a problem, please repair my net'." Monitoring and reporting on the state of the family's bednets was an activity that could be integrated into the school curriculum by the teachers as "a class activity." A wider view of education from one person was that, "[i]f you educate the community and inform them, communicate with them, maybe they will participate in repairing bednets."

Remuneration was a final important issue raised by the participants. The aim of the project was to create a self-sustaining intervention that would not be reliant on continuing payment or input from 'outside' authorities. The difficulty lay in the unpaid aspect of the person or people identified as the motivators. One person spoke of "instances...when you go to communities...[and] the village health workers are not very active in giving the voluntary service. So...something must be there for them to appreciate, otherwise they don't do it." Nonetheless, another replied that they had used the "traditional communicators" or *keneleng* groups to "go into the communities, perform...and educate their communities free of charge."

From this meeting, several key points believed to be necessary for the facilitation of a community-led intervention were determined (see box 8). *Community awareness* was essential for any intervention to work whether "through religious leaders, women's leaders, [or] traditional communicators." Without this awareness the message would not be understood and the action required (repair and correct use of bednets) would not take place. *Responsibility* for the intervention from within the community was also needed to act as a focus for the villagers and *ownership* of the intervention was deemed essential for it to have a chance of working. *Responsibility* and *ownership* went hand in hand because when someone feels responsible for something they have a sense of *ownership* for that thing.

People had to be motivated to act upon the intervention and the consensus was that women were probably the people most likely to do this. "[U]sing the...things that are already in the village like social mobilisation, facilitators [and] women leaders" had previously worked for some organisations trying to establish community based projects. Although the ideas gleaned from this meeting were for guidance only and the study villages' occupants formulated the actual intervention, many parallels were

drawn between the findings of the Non Governmental Organisation personnel and the Gambian people taking part in the interviews and discussions.

Box 8 - Key Points for the Intervention

- Community awareness
- Responsibility and ownership
- Social mobilisation

Step Two - Community Input

In agreement with the above findings, the people identified as most likely to motivate the villagers to mend their bednets were established groups or those individuals with authority within the community, such as an *Imam*, *alkalo*, or someone who worked in health, such as village health workers or traditional birth attendants. Status was seen as important in making people listen to others when disseminating information such as sewing up bednets with holes.

"The *keneleng* or *kafo*[13] group heads would...be good" (fisherman, 45 years) and "the *bantaba* or primary health clinic [would be] the place for encouragement to get people to mend their nets" according to a farmer (36 years), who was the brother of an *alkalo*. He admitted that this was a "more casual method" and that "more influential would be the *Imam* in the mosque [as] people listen to the *Imam*," which was agreed by one, who told a project field worker: "I would inform them in the mosque and at ceremonies when people are gathered together...I would educate people about the benefits of having a good net and using it properly. I would even go to people's compounds and educate them there" (*Imam*, 39 years).

A potential problem highlighted by an *alkalo* (58 years) was that despite having recognised authority within a village, if he "talked about mending nets and using them

[13] A group of women of similar age and status within a village.

properly people would think I was boasting." He went on to say that, "at social gatherings people talk together and this is where education about bednets and the way to use them could take place."

The connection of bednets with health influenced some people when asked who would be the best person to encourage the mending and correct use of bednets. "The village health worker is responsible for health issues. He...could speak to people who go to him to seek health advice" said a fisherman (45 years). The role of the traditional birth attendant included liaison with the village health worker to find and monitor the women who were pregnant. A 45 year old traditional birth attendant discussed bednets with pregnant women as part of her role but she did recognise that whilst she could "send out a message and encourage people to use their nets and sew the holes...you cannot force people to do something."

This same traditional birth attendant said she would "attend naming ceremonies and teach people to mend nets and use them properly" whilst another (65 years) said she had enough "social standing in the community" to be able to give out a message about the use of bednets. Village health workers were also recognised as having influence in the community with one (male, 50 years) saying that he "would educate people about sewing their nets." A teacher (40 years, male) agreed that village health workers "would have the power to give information and education to encourage people to mend holes in nets and tuck nets into the mattress."

The tailors that were interviewed felt they had enough kudos to encourage people to repair their bednets, although the other informants did not speak of tailors as having such powers. The role that tailors have according to others was the ability to repair holes or tears in bednets with a sewing machine. One tailor (42 years) said he would "encourage people to mend holes and use their nets properly by sewing their nets for free and showing them the good and bad effects of sewing nets." Another tailor (33 years) said that he would "tell people to be careful with their nets as they are easily damaged and explain the good reasons for using nets."

The public element mentioned during the meeting of Non Governmental Organisation staff was introduced at the focus group discussion with older men in Konteh Kunda

Sukoto. Open discussions were felt to be something that may help disseminate information to everyone. One man stated that the villagers could "talk about the message at public places among friends [and] families on the basics of repairing their bednets." However, according to one member of Konteh Kunda Niji's breastfeeding mothers' focus group discussion, "[t]here are no sewing groups in this village. It is an individual household responsibility rather than a village activity." It seemed as though whilst it was acceptable to talk publicly about bednets and their usage, the activity of sewing was not necessarily something that could be incorporated into Gambian society in such an open manner.

One strategy for encouraging people to mend and use their bednets correctly was to concentrate on the economic benefits of having a good bednet. Financial constraints, especially during the rainy season before the harvests, were major sources of stress and topics of conversation for the villagers. Prevention of illness and associated costs of health care was one tack that the intervention could use to encourage people to participate in the project. One 41 year old village health worker, said he used his position to advise people "to repair their nets...and save money on medicine." "Talking about nets" within the community was "very important" to the participants in the older men's focus group in Konteh Kunda Sukoto because "children suffering from malaria always cause more problems to us and...the talk is all about helping us tomorrow."

As predicted by the Non Governmental Organisation employees and verified in the focus groups discussions (see chapter 3), women were identified as those who would be most likely to sew holes in bednets by hand if there was no money available to send the bednet to the tailor, a male role, for repair. The breastfeeding mothers' focus group in Konteh Kunda Niji discussed the fact that women of all ages took part in the sewing of bednets. Even the grandmothers "help in repairing bednets" and "[a] child will be trained how to sew before leaving the house of the mother to the marriage ground."

Boys as well as girls were shown how to sew by their family; a fact verified by one lady in the neighbouring village discussion who said, "when a boy is grown up he does it himself." However, whilst still at the parent's home "[m]others do the sewing"

when holes were found in the bednets of children. Men had proved that they were capable of sewing with needle and thread during the sewing exercises in the focus groups (see methodology) but they were only likely to do this when they had no alternative. As discussed in chapter 3 everyone had access to needle and thread even if they had to borrow them from neighbours.

Awareness of the value of using a bednet in good repair was already established in the community. Knowledge of the protective factor of bednets from mosquito bites was apparent with those interviewed, as illustrated especially well by one of the breastfeeding mothers from Konteh Kunda Niji's focus group who said, "[t]his [net] is not too bad but there is a small hole. It can't prevent you from sleeping but this one (pointing to a bednet with a large hole) will kill one with mosquito bites. They can suck all your blood."

Design of the Intervention

Consideration of all the facts gleaned from above led to the development of the study intervention. Aspects of customary Gambian community life were deliberated to devise a plan that aimed to produce a sustainable and expandable project.

The method of spreading the project's message about bednets was established through the focus groups. The breastfeeding mothers' focus group held in Konteh Kunda Niji spontaneously started singing a song about malaria, mosquitoes and the value of bednets in good repair at the end of their discussion. Song is an integral part of Gambian life and most households own a radio and/or cassette tape player. The medium of song has been used previously to broadcast health messages and as one older man from Konteh Kunda Sukoto said, "it is very important to use songs in sending messages...[although] we can't compose song but we listen to it and it is valued." Women were seen as the ones who "compose a song" whilst the men were "drummers and singers."

When asked if there was time to listen to songs on radios or tape recorders during the busy farming period, the breastfeeding mothers group from the same village replied: "We have time to listen to radios and cassettes. It is not all the time that we work. We have leisure times...during our leisure we can listen to cassettes and songs with

pleasure." A fisherman aged 45 years spoke of the usefulness of being able to continue with daily activities whilst listening to songs. "The women's song could greatly change their minds to malaria prevention. They sing whilst cooking, washing, working, gardening. Men drum and sing as well...Song can be used anywhere...at any gathering." The communal aspect of listening to songs was reiterated by the older men's focus group in Konteh Kunda Sukoto. When "chatting you can be listening to...the tape...at the *bantaba* and any seating place."

Both men and women discussed the educational aspect of songs: "[s]ong contributes greatly to the giving of a message...People listen to tapes and the radio" (fisherman, 45 years) and "[w]e learn from songs we listen to on radios. There are songs that give messages to the people...We learn a lot from song especially programmes like health and breastfeeding. There are also songs that we don't know about that teaches us other things" (breastfeeding mother, Konteh Kunda Sukoto).

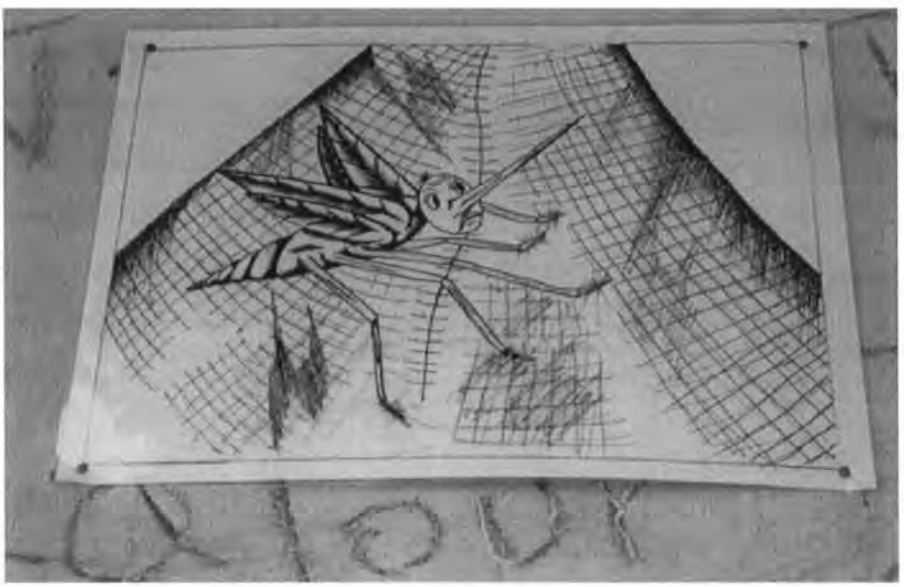
Sustainability of the recorded message was another positive point raised by the older men from Konteh Kunda Sukoto: "[u]sing a tape will best encourage [people to mend their bednets] because those not part of the discussion after hearing the song no-one needs to tell him about the message as they will understand it easily. [The message] will be very strong."

The idea of visual aids to promote a message was introduced by a traditional birth attendant (45 years) who agreed that song could "contribute a great deal to giving a message" but also that "a picture in each *kabilo* would be good." All this information from the villagers lead to the research team devising a two-pronged method of devising an intervention with supporting information and advice being given by the study villages' traditional birth attendants and village health workers (see box 9). It would not only enable the villagers to hear messages about the values of maintaining bednets in good condition but also to have a visual reminder to supplement the songs and have someone that people could turn to for advice if necessary.

Box 9 - Characteristics of the Intervention

- Song
- Posters
- Reinforcing information and advice from the traditional birth attendants and village health workers

Poster 2



Implementation of the Intervention

The principal intervention was through songs that were composed by the villagers themselves. Due to the history of rivalry between the two study villages, it was deemed best to have each village singing their own song. This would ensure a sense of *ownership*, which would hopefully have the effect of promoting feelings of *responsibility*, thus securing *community mobilisation*. The main messages in the songs were to sew or patch holes in bednets using needle and thread and to tuck the bednet under the mattress, although the details of the content was left primarily to the villagers (see appendices for transcriptions of the songs).

Both communities decided how they wished to formulate the song, who was to compose it and who was to sing and play it. Konteh Kunda Niji's song was composed by a man in comparison to Konteh Kunda Sukoto, whose songs were devised by women. Interestingly, it had been the men in the latter village who had stated, "we can't compose song" whilst no one in Konteh Kunda Niji had said this. Perhaps the fact that there were professional male drummers in Konteh Kunda Niji and none in the other produced this contrast.

Recording the song in Konteh Kunda Niji

The male composer of the Konteh Kunda Niji song sang the verses with a group of women and children singing the chorus. Musical accompaniment was provided by one male and two females using a drum, an iron pan and lid and a plastic container and stick respectively. Three songs were composed by the traditional birth attendant in Konteh Kunda Sukoto with her singing the verses and a large group of women and children singing the chorus. Three women using an iron pan and lid, a plastic container and stick and a calabash upturned in water hit with a stick provided the music. Women from the *keneleng* groups in both villages were present and participated in the recording, dancing between the verses and singing the choruses.

The songs were recorded on a cassette tape and copies were made for distribution to *kafos*, groups of four compounds. The *alkalos* were responsible for circulation of the tapes, as they had the recognised authority to ensure a fair allocation. The village health worker and traditional birth attendant from each village were each given a personal copy of their village song, as they were accepted as people of status who could ensure all members of their community understood the messages in the songs.

As a complement to the songs posters were produced and posted in all corners of the villages. The reason for using posters as a supplement to the song was that in the excitement of hearing their own voices on a tape the villagers may not have listened fully to the messages in the songs. The addition of visual support was also a constant reminder of the aural message. The village health workers and traditional birth attendants were identified as the most appropriate people to give advice about the use of bednets. They spoke about the messages in the songs and on the posters whilst carrying out their daily work in the villages.

Poster 3

Summary

The resulting intervention was both a visual and an aural reminder to mend bednets and use them correctly, a duel approach that was effective for Tucker et al (1999). Music has proved to be a useful medium for disseminating health messages to communities in the past (Stephens et al, 1998; Ogede, 1993). Song is a fundamental part of Gambian life both publicly at ceremonies and privately in the home. The unprompted singing at the Konteh Kunda Niji mothers' focus group was an excellent example of how integral song was to their lives. Most people had tape players and radios in the study villages and those that didn't were able to access them by listening to other peoples. The songs were *culturally sensitive*, as they had been composed by community members themselves using their own words and musical rhythms.

Using posters that were visually attractive and used simple lines meant they could be easily understood. They were placed around the villages at meeting places in order to encourage discussion amongst the community. This meant that lack of literacy was not a barrier to receiving the message about bednets and as such the intervention was a *culturally appropriate* and inclusive approach to disseminating information in such a society.

Whilst cultural appropriateness and sensitivity were important, the intervention also needed the motivational factor of being *culturally compelling* to provide the force to drive people's behaviour. From the interviews and focus group discussions villagers had shown that they recognised the benefits of protecting themselves and their family from mosquito bites. The quantitative post intervention data collected would show whether the participants were *compelled* enough to change their behaviour. Rashed et al (1997) focused on the need for communities to feel both pride and ownership of a participatory project for it to be successful. For this study the villagers' participation created *ownership*, as deemed important by the Non Governmental Organisation representatives and pride in the intervention message, with the idea that discussion about bednets would encourage peer pressure between all age groups in the villages giving impetus to change behaviour.

Discussion with Non Governmental Organisation employees had highlighted the need for *social mobilisation* when engaging a community in behavioural change. The

potential for achieving this was through by using the *keneleng* group as motivators and participants in the recording of the songs. Considering these factors against Hubley's (1993) BASNEF model, the behaviour change planned was within the capabilities of all members of the study communities, as everyone had the means and the knowledge of how to achieve this (step 2 – ensure the change required is realistic; step 3 – provision of enabling factors).

Involving influential people within the village setting had ensured that Rubardt et al's (1999) Malawian impregnated curtain project was a success. For this research, traditional birth attendants and village health workers within each study village were identified as key people within the community who had the ability to disseminate or reinforce information about the intervention and how a change in behaviour would benefit their fellow villagers. The plan was that ensuing conversations about the intervention in both public and private places would create interest and thus widen the audience. Because of their recognised influential position the *alkalos* were tasked with distributing the tapes throughout their villages and helping to decide where the posters should be situated. Involvement of these key influential people and encouragement for them to lead by example was hoped to provide endorsement to others that they should change their behaviour. They were also the people identified as being responsible for creating *community awareness*, as discussed by the Non Governmental Organisation personnel. This addressed step 4 of Hubley's (ibid) model: consideration of community influences.

It was generally accepted that women were the ones with *responsibility* for repairing bednets for the family, another key point for successful behaviour change raised at the Non Governmental Organisation meeting. They were also the ones who sought health advice for their children from traditional birth attendants and village health workers where they received education on the benefits of repairing and using bednets correctly. However, it was generally the men who provided bednets for his household and as such there was shared *responsibility and ownership* for the provision and upkeep of a bednet. This means that although the village as a whole was involved in the design of the intervention, the ultimate level at which the actual behaviour change was targeted was household level, which is where the repair and use of bednets was carried out. The identification of the household as the level of influence where people

changed their actions (step 6 - find out the level at which behavioural influences operate) meant that all of Hubley's (ibid) steps had been explored. By incorporating all these findings, the probability of the intervention facilitating a change in behaviour was more likely to be successful.

Chapter 5 – Evidence of Behaviour Change

The impact of the intervention in the study villages was quantitatively evaluated by means of pre and post intervention mosquito collections and bednet surveys. A total of 772 beds were surveyed in the two study communities, of which 554 had bednets. The type of material the bednets were made from as well as the ability of the bednets to be tucked under the mattress was recorded pre-intervention and then twice post intervention (October and November). These data were analysed according to who slept under each bednet in order to identify priorities for bednets in good condition and preference for type of material. However, details on which bednets belonged to those villagers involved in the development of the intervention through focus group discussions, interviews, or the writing or participation of the songs and which bednets belonged to those that did not was not collected during the field work. This means that there could be no comparison between the data to see how participation influences behaviour.

The surveys measured changes from the baseline bednet data collected in July to the number of holes sewn or patched by November and these were then compared to measure any changes following the introduction of the intervention. Light trap data show the number of mosquitoes entering rooms at night in the villages throughout the study to see if annoyance was a factor in motivating people to sew their bednets. Mosquito collections from under bednets were compared pre and post intervention and analysed in conjunction with the repairs to holes in bednets to see whether there was an associated reduction of mosquitoes entering bednets in relation to an increase in the number of repairs. The aim of all these factors was to see if the intervention induced any change in behaviour by the participants.

Profile of Bednets

533 of the 554 bednets had complete data for type of material the bednet was made from (see table 5). The type of material was linked with who slept under the bednet: adults sleeping alone; children; and adults sleeping with children. 32.6% of bednets were made from thick opaque cloth, 31.1% were made of semi-transparent material, and 36.2% were made from transparent mesh. There were no observed significant (Chi-squared test, $p=0.45$) differences in the type of cloth used for a bednet, according to the age and sex of the bednet users.

545 bednets had data on length and whether they could be tucked under the mattress (see table 6). The bednet survey found that 84.2% were long enough to tuck under the mattress with 79.8% actually tucked in during the mosquito collections. However, the difference between pre and post intervention collections was negligible with 79.4% and 80.2% being tucked in respectively. Having a bednet long enough to tuck under the mattress did not differ according to age, although longer bednets appeared to be more common amongst the adults than the younger age groups and amongst females compared to males. There was no difference in length of bednet between the sexes in early adulthood.

Table 5 - Type of cloth according to who sleeps under the bednet.

Net occupants	No. nets	Type of cloth		
		Opaque thick cloth	Semi-transparent	Transparent mesh
Children only (<16 yrs)	108	33 %	36 %	31 %
Adult only (≥16 yrs)				
- male sleeping alone	111	36 %	29 %	35 %
- female sleeping alone	172	29 %	29 %	42 %
Adult(s) with child(ren)[1]	112	39 %	32 %	29 %
Other[2]/missing data	30	20 %	53 %	27 %
Total	*533*	*33 %*	*32 %*	*36 %*

[1]usually a woman sharing a bed with 1 or more children under 5 years

[2]included 3 nets shared by adults (without children)

Table 6 - Length of bednets according to who sleeps under them.

Net occupants	No. nets	Long enough to tuck under mattress
Children only (<16 yrs)	108	79 %
Adult only (≥16 yrs)		
- male sleeping alone	117	88 %
- female sleeping alone	175	87 %
Adult(s) with child(ren)[1]	115	90 %
Other[2]/missing data	30	47%
Total	*545*	*84%*

[1]usually a woman sharing a bed with 1 or more children under 5 years

[2]included 3 nets shared by adults (without children)

Priority for Bednet Use

During the project's bednet survey, three-quarters of beds had a bednet (72%), but use differed significantly (Chi-squared test, *P=<0.001*) according to who slept in the bed (see table 7). Bednet use was lowest amongst children sleeping alone. Young unmarried males become responsible for their own bednets in their teens, and use was lowest in this group, with only half the beds used by teenage males having a bednet. Adult women were more likely to have a bednet than males (78% vs 62%; Chi-squared test, *P=<0.001*), especially if they shared a bed with one or more children. As a result of sharing with their mother, nearly 90% of young children in Konteh Kunda Niji and Konteh Kunda Sukoto slept under a bednet.

Bednet use also increased more rapidly amongst females, with over 80% of females sleeping under a bednet by age 25-29 years. A similar level of coverage in males was not reached until age 50-59 years. The difference between the sexes was most marked in early adulthood, and may reflect differences in age at first marriage. Women often marry in their teens and early twenties, whilst men often cannot afford to marry before they reach 30 years. This difference may also reflect the priority given to protecting babies and young children from mosquito bites, and the fact that young

children often sleep with their mother or another kinswoman. Single adult women sleeping under a bednet was high at 79%, possibly because they had shared their bed with children who had now moved out due to their age.

Table 7 - Bednet use according to who sleeps in the bed

Bed occupants	No. beds	% with net	*P*
Children only (< 16 yrs)	182	60%	
Adult only (≥16 yrs)			X^2 test
- male sleeping alone	179	65%	for trend:
- female sleeping alone	222	79%	*P=<0.001*
Adult(s) with child(ren)[1]	132	89%	
Other[2]/missing information	56	63%	.
Total	*771*	*71%*	.

[1]usually a woman sharing a bed with 1 or more children under 5 years

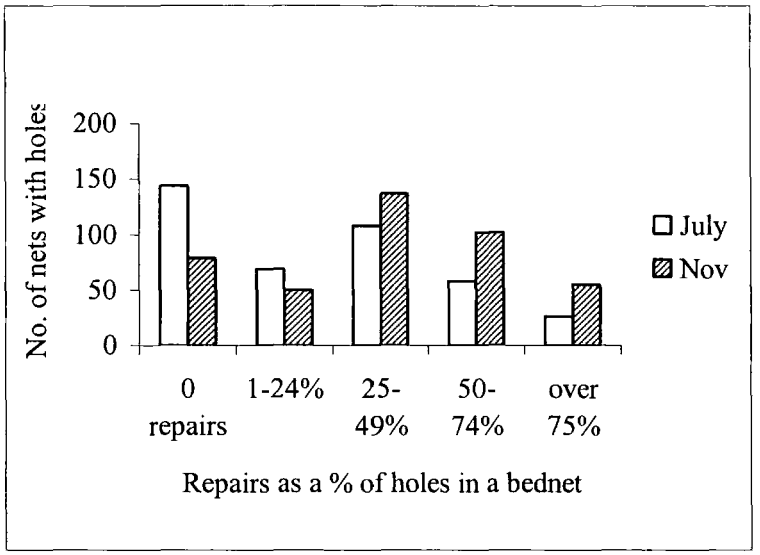
[2]included 3 beds shared by adults (without children)

Bednet use was significantly more common for beds occupied by one or more children under five years of age (Chi-squared test, *P=<0.01)*. However, the data may be incorrect, as there appears to be some under-reporting of infants sleeping with their mother during the census and some beds may have been misclassified.

Number of Repairs to the Bednets

Of the 554 bednets, 138 (25%) were not in need of repair throughout the study and 11 had incomplete data. Another 41 nets were moved, replaced or could not be accessed post intervention resulting in data on a total of 364 bednets for analysis. There was a significant increase in the number of repairs from the start of the research to the completion (see graph 1). The proportion of repairs increased from an average of 27% of holes pre-intervention in July to 41% post intervention in November (paired T-Test, *P=<0.001*). Most of this improvement in repairs was seen in the first post intervention survey in October with an average of 39% of holes in a bednet repaired by then.

Graph 1 - Percentage of Holes Repaired Pre and Post Intervention



Despite the increase in repairs, the state of bednets remained poor and over the course of the study the total number of holes per bednet increased by an average of 2, although because of the number of repairs, this meant an average increase of 0.5 hole per bednet post intervention compared with pre-intervention (data not shown).

Whilst the number of bednets with few repairs (<25% of holes present) reduced over the period of the study (213 pre-intervention, 129 post intervention), the number of nets with most holes repaired (>50%) almost doubled (84 pre-intervention, 157 post intervention). This shows that people were sewing their bednets, particularly those that had many holes, although not at the rate at which holes were appearing. This highlights the importance of continual maintenance of a bednet, as holes develop quickly due to general wear and tear. The data showed that of the 364 bednets analysed, only 22 had been completely repaired by the end of the project.

The number of repairs according to the type of cloth the bednet was made from was recorded (table 8). The bednets made from opaque material offered greater protection from mosquitoes than the semi-transparent or transparent mesh nets, as 40.8% had either more than 75% of holes repaired or were in mint condition. This contrasts to equivalent figures of 32.6% for the semi-transparent and 26.4% for the transparent

bednets. More opaque bednets remained in mint condition (29.9%) than the other types of bednets throughout the project.

Table 8 - Repairs According to Type of Cloth

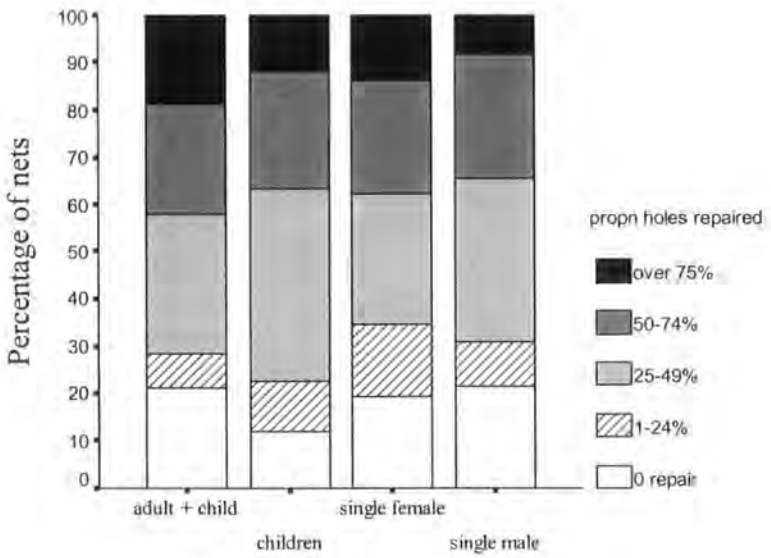
Type of cloth		% Holes Repaired				Mint condition
		0 repair	<50%	50-74%	> 75%	
Opaque cloth	Number repaired	29	43	31	19	52
	% repaired	16.7%	24.7%	17.8%	10.9%	29.9%
Semi-transparent	Number repaired	18	55	31	22	32
	% repaired	10.8%	33.1%	23.5%	13.3%	19.3%
Transparent	Number repaired	29	83	39	10	41
	% repaired	15.0%	43.0%	15.5%	5.2%	21.2%
Total	*Number repaired*	*76*	*181*	*100*	*51*	*125*
	% repaired	*14.3%*	*34.0%*	*18.8%*	*9.6%*	*23.5%*

Priority for Bednet Repairs

Information gathered from the pre-intervention interviews and focus group discussions was that priority for bednet use was given to babies and children sharing a bed with their mother and also to the elderly. Post intervention data were analysed to examine whether these prioritised groups had a higher proportion of repairs to their bednets compared with other members of the community (graph 2). Results show that the proportion of holes repaired according to who slept in the bed were fairly evenly spread across all cohorts and was not just directed at the vulnerable, as stated in the

interviews and focus groups. However, although not significant (ANOVA test, *P=0.190*), the graph does show that there was a slightly higher proportion of repairs to bednets (88%) where children slept alone. The proportion of repairs for bednets under which adult females slept alone was 80% whilst the proportion of repairs for bednets under which either adults and children shared a bed or adult males slept alone were both 78%.

Graph 2 - Groups for whom Bednets were Repaired



Category of who shares net

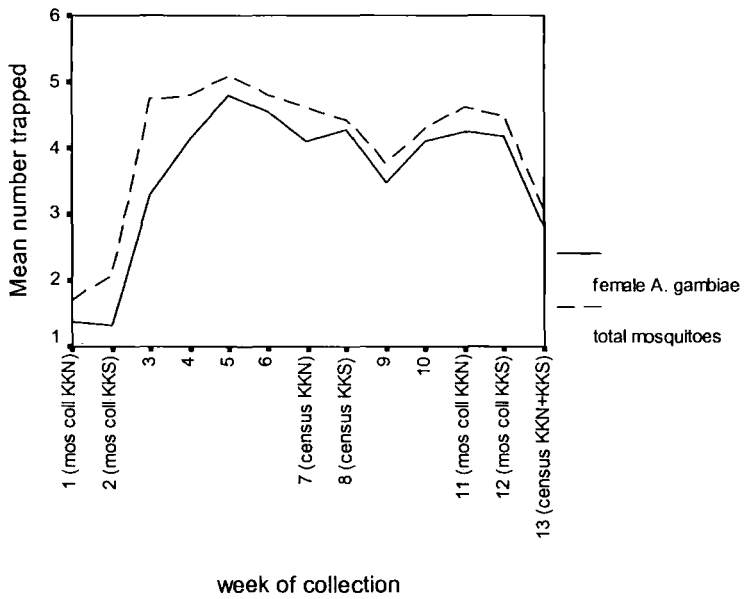
Light Trap Data

Light trap collections made throughout the project period show how the number of mosquitoes varied. Mosquito annoyance was evaluated as a factor that might motivate behavioural changes. The pre-intervention bednet survey was carried out in the two weeks prior to setting up the light traps. Collections for weeks 1 and 2 (weeks beginning 5th and 12th August) were made concurrently with the mosquito counts from under bednets whilst monitoring counts were made during weeks 3 to 13 (9th September to 18th November). Graph 3 shows data from all light traps.

The rainy season was unusual in 2002, as it was late starting and there was not as much prolonged rain as normal. Data collected from the Decadel Agrometeorological

Bulletin (Government of the Republic of Gambia, 2002) shows that there was 389 mm of rain during the 2002 season (July to October) compared with 652 mm in 2001. The highest mosquito densities occurred in the weeks before the first post intervention survey (October 2002), although there was another rise in weeks 11 and 12 during the mosquito collections before a drop at the time of the November (second post intervention) survey.

Graph 3 - Mosquito Counts over the Period of the Study

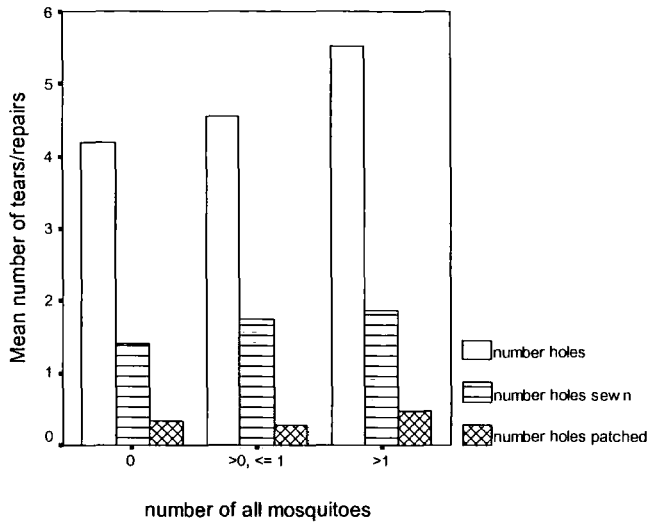


Key
KKN = Konteh Kunda Niji
KKS = Konteh Kunda Sukoto

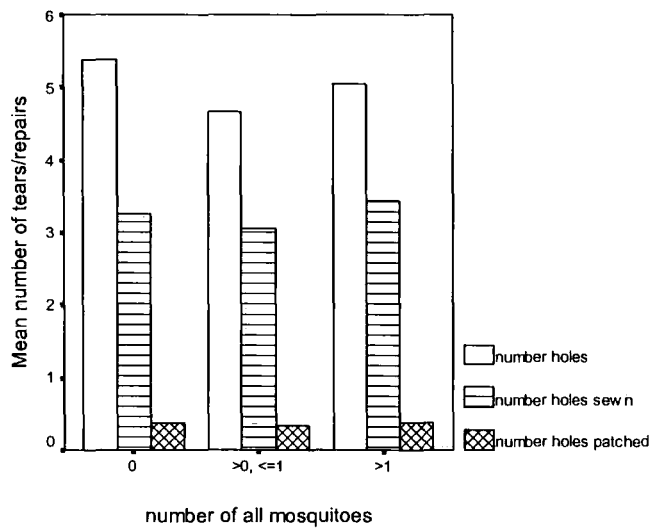
Number of Mosquitoes Found Under the Bednets

The annoyance factor of mosquitoes entering bednets and disturbing sleep should be motivation to sew or patch any holes present. To measure this, the number of mosquitoes collected from under bednets in both villages was compared with the amount of repair occurring before and after the intervention (graphs 4 and 5). There was no significant difference in the number of mosquitoes collected from the bednets post intervention compared with pre-intervention (ANOVA test, $P=0.165$).

Graph 4 - Pre-intervention Survey Linked with Levels of Mosquitoes



Graph 5 - Post Intervention Survey Linked with Levels of Mosquitoes



The graphs show little change with the amount of patches pre and post intervention despite the number of mosquitoes present. Nearly double the number of holes had been sewn with needle and thread post intervention (mean, 3.15) than pre-intervention (mean, 1.61) when mosquitoes were present but this did not appear to be dependent on the number of mosquitoes present. Of those people that were more likely to find mosquitoes entering their bednets with >5 holes, only 20% made some improvement to their bednets over the period of the study.

Insecticide use

Examining the Stitch data, less than 1% of the nets (N=4) were reported to have been treated with insecticide, at the time of the baseline survey (July/August). This is not surprising given that the baseline census was carried out before the first rains fell. It is interesting to note however that these nets were all used by children. A total of 3 bednets had been treated with insecticide by November, one for a second time. A pregnant mother, aged 30 years, her two children, a boy aged 6 years and a girl aged 3 years shared this bed. The other 2 beds were occupied by women sleeping alone, one aged 60 years, the other aged 25 years.

Summary

The analyses of these data show that people did change their behaviour by increasing the number of repairs to the holes and tears in their bednets. The intervention resulted in a significant increase of repairs to holes in bednets using needle and thread ($P=<0.001$). All members of the study community benefited from increased bednet repair but the highest number were carried out on a bednet where there was a child in the bed. Although not significant this showed a trend towards giving priority of bednets in good condition to children. The type and length of cloth was not significantly higher in one age or sex cohort than another. The link between involvement in the development of the intervention and the motivation to repair bednets can not be made as this data were not collected.

Despite the significantly increased rates of repair shown, these were offset by the increasing number of holes due to wear and tear and as a result, the condition of bednets (i.e. the number of holes present) remained similar post intervention when compared to pre-intervention. This showed how much of a labour intensive activity maintaining bednets in good condition was. There was no significant reduction in the number of mosquitoes caught under bednets because of the continuing appearance of holes and tears. Not surprisingly, following Cham et al's (1997) Gambian study where low permethrin re-treatment rates were found, insecticide use was low (<1%) in Konteh Kundas Sukoto and Niji. These facts taken together ultimately meant that the villagers were not well protected against malaria morbidity and mortality.

Chapter 6 – Influences on Behaviour

Targeted in-depth interviews and case studies were held after the first post intervention bednet survey (October) to find out whether there were any cultural or social influences on the process of behaviour. Reasons were sought for why some people repaired their bednets whilst others had not. Participants for these studies were chosen because of the change in data from the initial bednet survey. They were chosen at random from those who had repaired the most holes and tears in their bednets and from those who had not sewn their bednets during the study.

Patterns of bednet swapping and people's movements to another bed which had a bednet were noted from the data to find out if people's priorities changed when the risk of malaria was at its highest. Household and family relationships were the focus of further discussions. Interviews were held with two females who had become new mothers during the study to see if their changes in family circumstances had altered or influenced their behaviour. Additionally, members of two households; one where the husband and his co-wives had a co-operative relationship and the other where the husband and his co-wives did not; were interviewed to find out if different household dynamics affected people's ability to change their behaviour.

Repaired Bednets

Four people, three females and one male, who had repaired their bednets following the intervention, were interviewed. All four reported that they used a bednet throughout the year but that they became more aware of the state of the material nearer the rainy season, when the numbers of mosquitoes rose. The prime reason they all gave for having repaired any holes or tears during the study period was that they valued their bednets for their malaria prevention properties, as they were less likely to be bitten by mosquitoes when sleeping under a bednet in good condition. "Mosquito bites and the rate of malaria also make us think about our nets," said the third female interviewed. "I mended my net when torn. I mended when torn because of mosquito prevention in order to be saved from malaria" was the first female's response to why she sewed her bednet.

The man spoke of the "importance of bednets for the whole family is to prevent one from mosquitoes and malaria." He focussed on the responsibility of looking after the household whereas the women focussed on ensuring their children were protected from mosquitoes. The first female saw malaria as a "burden on parents during the rainy season" and she ensured her own and her children's bednets were repaired "when a tear is immediately discovered or when mosquitoes coming into the net are many." Lack of ability to support kin when ill is paramount in Gambian society and being less than able bodied is seen as a burden to others, especially during the busy farming season.

Repairs were made mostly at the beginning of the rainy season because this was when they started being annoyed by mosquitoes, although the first female interviewed said that "mending of bednets has no specific time." She went on to say, "[w]e think about bednets when the rainy season is coming. We have less mosquitoes at the beginning of the season but during the rainy season mosquitoes are normally very many and [there are] also lot of malaria cases."

Finance was a problem for repairing holes or tears in a bednet for all four interviewees but the second female had managed to overcome this through the culture of borrowing, confirming the pre-intervention interviewees' remarks (see chapter 3):

"The problem with mending my net is that sometimes I can't afford to buy needle and thread unless I borrow from friends, family and family members."

A tailor had mended both the male's and the third female's bednets during the study period. Each said they were responsible for finding the money to pay for these repairs. If there was money available, then the first female said she would also rather pay the tailor to mend her family's bednets. However, as a cost effective measure she was willing to sew any holes by hand with needle and thread when necessary.

The three women spoke of the supporting role relatives play in helping those who were unable to provide good quality bednets for themselves, especially when the number of mosquitoes increased. "We always advise one another to provide a bednet when without a net and even appeal to relatives to help you for your own family security from malaria [as it is] a killer disease" (first female). The reason the male did not mention the supporting role of relatives was perhaps that he was the person to whom his female relatives would appeal.

Non Repaired Bednets

One male and one female whose behaviour had not been influenced by the intervention were interviewed towards the end of the research. Each of their bednets had remained in a state of poor repair with more than five finger sized holes during the study. The source of the holes in the male's bednet was "due to termites on the wall when the net is in use," whereas the female reported that the action of tucking the bednet under the mattress was the reason for the poor state of her bednet: "[i]t is tucking that sometimes causes small holes in the net. This is why I have many small holes in my net."

Nevertheless, the female had tried repairing the holes in her bednet in the past but this had proven to be a pointless exercise because the situation was exacerbated by the state of the material. "The main reason for not fully repairing my net is because the net is very old and not at all strong. Sometimes when stitching [holes] another area tears due to the lightness or easily torn material of the net." She also pointed out that, "most holes in my net are found below...but when tucked in they are not seen." She felt these

were not necessary to mend as no mosquitoes could enter once the bednet was tucked in.

Lack of annoyance from the bites of mosquitoes was the reason the man gave for not repairing the holes in his bednet. "There are...less mosquitoes because of the ceiling in my room...and I am not feeling their effects. The holes in my net are not a problem because when they are a problem I will repair [them] by sewing or replace the net with a brand new net...I have the money for a brand new net but mosquitoes are not a problem."

This dialogue shows that the male's incentive to mend or replace his bednet would be disturbance by mosquitoes during the night, a fact also accepted by the woman who said, "[m]osquitoes coming into the net at night when sleeping would be the main reason for mending my net. The main point of using a net is to protect me and my children from malaria and mosquitoes."

Awareness of alternative means of repelling mosquitoes apart from bednets by the interviewees was apparent but the male said, "I don't use coils, sprays or plants because the whole thing is to prevent mosquitoes and they are less within my house and room." However, the female, who had also not used these alternative repellents, said, "when the rainy season [was] coming I...dipped my bednet in permethrine before I put my net up. That limits mosquitoes coming in."

Swapping of Bednets

There was an observed increase in the use of bednets during the rains, verified in the survey data, where 43 people only started to use their bednets after the pre-intervention survey. These nets had been stored away and were only tied up when sleep became disturbed due to the higher number of mosquitoes.

Evidence of movement of people to other bednets became apparent over the course of the study when comparing the pre-intervention survey in July with the post intervention survey in November. Data was collected on who slept in each bed and so it was possible to monitor any change to the sleeper(s) in that bed. Ten villagers moved from a bed without a bednet to share with a family member who did have a

bednet during the rainy season. Of these, nine were under fifteen years, which indicates that, where possible, children were protected at the time of highest risk of malaria and highlights the priority given to the vulnerable.

One pregnant woman had swapped her poor condition bednet with her brother over the duration of the study, as his was in better condition. Another illustration of prioritising the vulnerable was when a mother swapped her bednet with her daughter, who had just delivered a baby. Although these two examples only represented a minute proportion of the total number of bednets involved in the project, it did illustrate that what the participants said about protecting babies and their mothers was put into action.

New Mothers Behaviour

Two women who had given birth during the study were interviewed to see if their use of bednets and priorities had changed with their altered circumstances. The first new mother spoke of the value of having a bednet in good condition if other protective agents were unavailable: "[i]nsecticide water is important but...if you have a good net, it is no different. The only importance is that the net is good and so mosquitoes cannot penetrate." When resources were limited and there were holes or tears in the bednet she appreciated that carrying out repairs was better than buying a new one, "unless the net is very torn and you cannot patch it."

The second new mother experienced a different domestic situation, as she did not currently live with her husband who was working at the coast but stayed with her mother, a widow. The mother took the advisory role here rather than the father of the child whilst the daughter was living in her compound. The new mother had "discussed with my mother about buying a new net for my baby," as the one she was using was old and had become worn. She planned to move to the coast the following year to be with her husband and eldest son and this was when the responsibility for the provision of bednets would fall to the husband.

Awareness of protecting children from mosquitoes even when sitting outside in the evening was apparent from the two mothers interviewed during the study[14], as explained by the first new mother: "[w]hen I sit with my baby outside at night I always cover over his body with a piece of cloth to protect him from mosquito bites. Or sometimes I take a local fan to wipe away the mosquitoes but I don't stay long with my baby outside, I sometimes lay him under the bednet and put all the sides under the mattress."

Both mothers had experienced the consequences of not using a bednet in good repair with a newborn baby through the deaths of their sisters' babies. Although the situations were different, they had both learnt lessons from these incidents. "I have experience of my sister's child's death because she was having a bad net and the baby died of malaria" said the first new mother. To prevent this happening again, her sister decided to raise some money of her own in order to buy a new net so she went "to the farm and fetch[ed] some groundnuts and baobab from the bush and [sold] it to get money for a new bednet." This female had been made aware of the dangers of not using a bednet, especially with young children, something she was determined not to repeat: "I always make sure that my children sleep under a net, especially a newborn baby. This is why priority is given to babies because the prevention that an adult can take, the babies can't take."

Lack of knowledge or laziness was attributed to the death of the second new mother's sister's baby: "I experienced my sister's baby dying because of malaria. She got a new net but was too lazy to put it up, so when her baby got sick and taken to the hospital, the doctor told her that the baby had malaria and she was in the hospital for two days. On the third day the baby died and when she came home she tied the net up. From that experience I know a baby should sleep under a good net and they should be the first people priority should be given to, then others like pregnant women and children because they are our future elders."

[14] During my time spent living with a Gambian family I experienced this protective behaviour of mothers towards their children. Each evening members of the compound would congregate at a central platform sitting or lying on mats and discussing the day's events. The babies would be covered with a light cloth to prevent mosquitoes from biting them. Locally made fans were also utilised to help waft mosquitoes and other insects away from all members of the household, with children as well as adults gainfully employed in this way, alternately using it on themselves and their neighbour.

Whilst pregnant with her newest child the first female had discussed with her husband the possibility of swapping the bednet she was using. "The one I was using was very heavy and hot" which made it difficult to sleep. She requested a transparent one so that air could get through the bednet making it cooler and more comfortable for herself and her baby. She and her second eldest daughter usually shared this bed and bednet, although when the pregnancy became advanced this daughter frequently slept with her grandmother.

There was evidence of a culture of borrowing bednets from members of the family in order to protect newborn babies if necessary. For example, if this female's husband was not able to provide her with a new or good condition bednet, then she explained she would "go to my relatives to help me...sometimes if you have a newborn baby and you have no net an adult in the family will give you his or her net to prevent your baby getting malaria."

Given the scenario that in a household the older children had a bednet and a breastfeeding mother did not, the first new mother said she would take the older children's one for herself and the newborn baby "although within one week I would try to find another bednet for them. If they don't sleep under a net that means they will not be protected from other illnesses." She felt that resistance from diseases came when children reached ten years old and so the importance of bednets was less after this age.

In a case where there were two bednets, one new and the other with holes, she said she would "give the new one to my baby and the one with holes to the other children. Her reasoning for this was "because their immune system can fight against diseases but a baby can't complain or anything when they are sick and malaria can easily kill the baby quickly."

On the other hand, the second new mother said she would never take a bednet from another child but would "borrow from an adult" or she would speak to her brother, in his capacity as head of the household (following the death of their father earlier that year) to ask him to help with the provision of a good bednet. Family responsibilities, from provision of goods to financial help, lay largely with the male of the household

and an expectation existed from the females that this responsibility would transfer from fathers to brothers or husbands without question.

Co-operative vs. Non Co-operative Household

Case studies of two households were carried out to explore the differences in behaviour regarding provision, care and maintenance of bednets between a co-operative and a non co-operative family. In both cases the householders interviewed were a husband and his two wives (see methodology for the way these households were identified). Each person was interviewed individually and evidence of the different behavioural practices in co-operative and non co-operative households follows in the two studies:

Study 1 - Co-operative Household

The co-operative household consisted of a 30 year old mason, and his two wives. The first wife was 26 years old with five boys and one girl and the second wife was 23 years with two girls. The co-wives shared a room whilst the husband was in an adjacent room on his own.

Throughout his married life, the mason had provided his wives with bednets, replacing them whenever necessary. He accepted without question that, "[i]t is my main responsibility to provide nets for my family." He said that his second wife's net was now old and needed replacing, something he planned to do before the next rains. The wives also felt it was within their rights to voice concerns regarding the condition of their nets to their husband. Monitoring of the state of the bednets in the household was a shared task between the husband and his mother with the second wife saying, "[m]y mother-in-law is responsible for repairing worn or torn nets within the household, while my husband too will go around observing the net. He recommends to his mother which to repair or it may even be done without the knowledge of my husband."

All the children slept with their mothers until they were weaned, after which each child moved to its paternal grandmother's bed, who lived in the same compound. "My mother-in-law uses the same net with each child that is given to her and she has her own net that they use," stated the first wife. The older children then moved from the

compound to sleep with either their respective maternal grandmothers whilst, "the male child is sleeping with _____ (first wife's elder brother's) own children in their own house...being the uncle of my children [he] is responsible for providing a bednet for the children."

Co-operation had been aided by the fact that the co-wives were related, so the kinship ties go beyond marriage. The link was explained by the first wife: "[m]y co-wife's father is my mother's uncle, so when my husband married her, she was told that she should respect me as I am her elder and she also found that respect within the household." Respect featured in the second wife's interview as well when she said, "[s]ince before I married my husband, I was told that I should respect my husband and my co-wife and should consult her if I have any problem and let me take care of her children as my own children and this is what I am doing."

The advantages of co-operation meant that assistance was available at all times. "If you get sick or travel your co-wife will be in the position to help you with domestic work and take care of children," stated the first wife. Proof of this came when the second wife said, "my feeling of living in a co-operative household is important because I got sick and my co-wife helped me with my cooking and sometimes took my child and breastfed her."

Both wives appreciated that their children were likely to learn from observing co-operation firsthand. As "our children get older, they will respect each other because children copy from their parents," spoken by the first wife reflects the opinion of the second who said, "[e]very child will see how I am living with his or her mother. So they will also copy the same thing."

Study 2 - Non Co-operative Household

The non co-operative household consisted of a husband who was a 47 year old shopkeeper and farmer with two wives. He had fathered seventeen children, thirteen of whom were alive. The first wife was a petty trader, approximately 45 years old and had delivered ten children. Seven boys were alive and two boys and one girl had died in infancy. The second wife was in her mid 30s and had a boy and five girls alive, whilst one boy had died aged three years. The first wife shared a house with her

mother-in-law at one end of the large compound whilst the second wife had a house near to her husband's room at the other end of the compound. They did not cook together nor did they share any household tasks such as childcare if one was sick, compared with the description of life in the co-operative household interviews.

Throughout his married life the husband had bought his own bednet, replacing each after approximately ten years. The longevity of the bednets he had owned he felt was because of "the thick quality cloth nets [which] are expensive but they serve longer than the less expensive ones." After this time these bednets were passed on to people he felt did not have the means to purchase their own were in need. He explained, "[m]y old net was given out to my grandmother to use until she died...I gave out [my next] old net, which was still in good condition, to a strange farmer. This man took the net to Mali...[Another] net was given out to my mother's sister's son. This net was in good condition and served him for ten more years...I always give out my nets to people who can't afford to buy one."

He went on to say that he had "been responsible for buying nets for the entire family but now that my son is working, he is responsible for all the domestic problems in the household." The first wife's interview contradicted this when she described her sleeping behaviour once she was married: "I was in the same room with my mother-in-law who did not have a net on her bed...my husband was having a net on his own bed but not on my bed. Then I got pregnant to my first child who passed away at the age of seven months. By then I was provided with a net from my brother." In contrast, the second wife "was provided with a net by my husband" when they married and this one was still in use "so I have never experienced difficulty" in being provided with a bednet.

Both wives shared a bed with each of their children until they were weaned after which the first wife explained that they "slept with their [paternal] grandmother." This is where differences became apparent between the two women once more. According to the second wife, her children moved to another bed which had a bednet provided by the husband but the first wife explained: "as [the children] got older they were transferred to the room near their father's room. That bed was with a net provided by myself from the money I got from my garden and this net is still on the

bed." Petty trading was a private source of income for the first wife and this had been used to provide bednets for her children over the years: "The net I was using served me for years and then got very torn and I bought one from my garden money. Today my children are big enough to provide me with another net...they are now helping me."

Both wives refused to answer more probing questions about their living arrangements. However, it is apparent from these data that there were either factual discrepancies or there was a real division in the household regarding the responsibilities of the husband.

Summary

These interviews provide interesting information in the context of exploring reasons for people's behaviour towards use of bednets and the various factors that can affect bednet use. However, these data do not show that it was the intervention that motivated a change in the interviewees' attitudes and behaviour towards bednets prompting them to repair any holes or tears. The influence to use and repair bednets may have been due to the increasing levels of mosquitoes, availability of finances to pay for repairs, or for other reasons not identified within this research.

The information presented in this chapter reinforces the data extracted from the pre-intervention interviews and is backed up by literature from Okrah et al (2002), Agyepong and Manderson (1999), Thomson et al (1996), D'Alessandro et al (1994), Thomson et al (1994) and MacCormack and Snow (1986) with regards to the beliefs and attitudes towards the use and care of bednets. People repaired their bednets as a preventative measure against mosquito bites and malaria whereas the reasons people had not repaired holes or tears in their bednet was because its age and condition deemed the effort of repair to be a waste of time or because of the lack of annoyance factor from biting mosquitoes.

As a whole, responsibility for the provision of bednets fell to the head of the household, as identified in the pre-intervention focus group discussions portrayed in chapter 3. However, this was not always the case because these studies show that the responsibility was dependent upon individual household dynamics. Marital relationships and geographical circumstances were two variables that dictated to whom this duty fell. A wife in the non co-operative household had been responsible for the provision of bednets for herself and her children for years and one of the new mothers relied on her own mother for provision of a bednet in the absence of her husband, who was working away.

Movement of people from their usual bed without a bednet to one with was apparent from the survey data collected after the intervention. Additionally, data showed that bednets in good condition were lent by family members to those perceived as more vulnerable to mosquito bites and malaria, namely children and pregnant women, for

the duration of the rainy season thus substantiating D'Alessandro et al's (1994) research.

Recognition of vulnerability and being at risk, according to Willms and Sewankambo (cited in Higginbotham, et al, 2001) and steps 4 and 6 of Hubley's (1993) BASNEF model; social influences towards behaviour change and the level (ranging from micro to macro) at which those influences of behaviour change operate; were evident in the studies carried out with the two new mothers. These showed that people within both women's own family had influenced their behaviour and attitude towards the use of bednets. Both told tales of the death of a sibling's child due to malaria, a fact they each attributed to using a bednet in poor condition. These negative peer experiences had induced in them a heightened awareness of the benefits of repairing and using bednets correctly. Therefore, influences for behaviour change operated at household level for these women.

The contrast in behavioural practices towards bednets was highlighted in the studies of members of co-operative and non co-operative households. Influences varied according to whether the husband took an active interest in the welfare of each of his wives. Whereas, in the co-operative household the husband, as head of the household, influenced both wives' behaviour by providing bednets for all his family, this did not occur in the non co-operative household. Here, the second wife and her children were provided with bednets by the husband but the first wife was not. She had had to raise money through petty trading in order to purchase bednets for herself and her offspring.

Whereas the family within the co-operative household and the husband, his second wife and their children who lived in the non co-operative household affected each others' behavioural patterns concerning bednet use and provision, the first wife was independent of these household level influences. Instead she operated out of necessity at individual level, making her own decisions about her bednet rather than be directed by her husband, which was the norm in most households. Thus, whilst most people interviewed for this study were influenced by people at household level this rule could not be applied for all villagers and highlights a variation in step 6 of Hubley's (ibid) BASNEF model.

Chapter 7 - Impact of the Intervention

In addition to asking those interviewees who had or had not repaired their bednets post intervention, the village as a whole were invited to comment on whether the intervention had impacted on their behaviour. Village meetings were held at the end of the project in order to thank the community for their co-operation with the study but also to encourage feedback regarding any aspect of the study. The meetings were an opportunity for the villagers to speak about their views of the study, what they thought of it, what may have been done differently and what general comments they could offer. The plan was to leave the villagers open and willing to participate in any future research.

Consensus from the villagers was that the intervention had been *culturally compelling*, *sensitive* and *appropriate*. These are emotions necessary for success in any intervention, as well as reaching the community as a whole. The constant visual reminder of the posters, which were displayed in all areas of the villages, was something that was noted by many. The songs were well accepted mostly due to the fact that they were participatory community initiatives and a true sense of *ownership* was acknowledged, although it was noted that not all people had heard the songs. An interesting factor was the sense of competition that developed between the villages relating to the comparison in quality of the songs.

Ownership of the Intervention

Acceptance of the intervention was due in part to the fact that the song had been sung in Mandinka, creating feelings of *ownership*, as expressed by a female from Konteh Kunda Sukoto: "It is our own voice and language that is said by us with our own thinking in order to be prevented from mosquito and malaria being a killer disease." Messages disseminated through the medium of song are commonly sung in Wolof, which, although generally understood by most Gambians, was not the villagers' everyday language of Mandinka. "Everyone talk[ed] about the song," according to one Konteh Kunda Niji male and felt the message was more powerful because it was their own and they identified with it and listened to the message because of this. The song acted as a reminder for "people about repairing nets, tucking in under the mattress and also create[d] a discussion on the subject matter."

Two women, both from Konteh Kunda Niji, who had sewn their bednets during the project spoke with remarkably similarity about the value of hearing messages in their own language: "[t]he song...makes me think about my net because it is composed in my own language and the message in the song translated the usage of bednets and also the posters that are seen everywhere in the village, that also translates the proper usage of bednets. Nevertheless, the song talks much about the bednet usage in my language that I listen to every time" and "[t]he song makes me think about my net because the song is composed in our own language and I do enjoy it every time by playing and also the poster, seeing them at every corner of the village. But the song makes me think about my net because of the message and it is in my own language."

The man who had composed and sung the verses for the Konteh Kunda Niji song spoke of his pride in participating in such a project: "I'm very happy about the project because I was the man who composed the song. Anywhere I go I hear the song. The song is very useful. It is not even limited to the village but has been heard in outside villages." By contrast, the singer from Konteh Kunda Sukoto was disappointed as she felt that she "sang too quickly [making] it...hard to hear all the words. The quality of the tape is not good. I would have done it differently if I had known or I would not have sung."

The movement of the tape to places outside the villages was an occurrence that had not been predicted but perhaps shows the value and pride derived from a community designed song. A female from Konteh Kunda Niji spoke of the ability of her family to utilise the intervention message. Her "family was very much interested and it was left in their hands" for further use.

Comparisons between the two study villages' songs were made at the village meetings, creating a competitive element to the project. "We found our own song more interesting than the other song from different people in the other village. The composed song created more information in the village" stated a female from Konteh Kunda Niji. Inter-village competition may have been a useful tool to develop in order to encourage high rates of participation and *social mobilisation.*

Preference for the Songs or the Posters

Time pressure was a reason that some people had not listened to the song as much as they may have wished. When this was the case, the posters were valuable as they were visible whilst carrying out daily activities or passing through the village, as advocated by the first female interviewed who had sewn her bednet during the study when she said, "the song...reminds me to think about my bednet...but the posters play the best role because I am seeing the posters every day...and I get little time to listen to the song" (female, Konteh Kunda Sukoto).

The distribution of the posters to "every corner of the village" (Konteh Kunda Sukoto male who had sewn his bednet) ensured that people saw them "every day." By contrast, a female from the same village felt that "the song play[ed] the best role by listening to the message in the song when played." Interpretation of messages through visual and aural means is subjective and one benefit of the song may have been that the message was more unambiguous.

Neither of the interviewees (both from Konteh Kunda Sukoto) who had not repaired their bednets during the study had heard the song, with the male saying he had "never heard the song because I don't have a tape player only a radio and I have not heard it anywhere in the village." Both had seen the posters around the village and the female said that she felt these were "good at reminding...about repairing a net and of family

security in terms of malaria and mosquitoes." The posters had made the male "think about a net but because there have been less mosquitoes" (as he perceived it) he had not repaired or replaced his net. Both said that they felt the posters worked better than the song because [they were] directly seen in different areas of the village" (male).

Educational Impact of the Intervention

The pre-intervention interviews and focus group discussions showed that the participating villagers already knew about the value of using bednets to protect themselves and their families from mosquito bites and subsequent potential malaria. Therefore it cannot be claimed that the intervention had a great impact on the education of the participants, although it did reinforce existing knowledge and created a discussion point around bednets, mosquitoes and malaria. Interest around the presence of the field workers for the duration of the study also ensured that people talked about the reasons they were there. In spite of the fact that this interest could have been positive or negative at least it meant that the topic of bednets and their use was brought into the public arena.

Implication of the illness-preventing properties of using a bednet in good condition was a message summarised by one male Konteh Kunda Niji resident: "I was staying in Banjul but when I came here I had the information concerning the malaria disease and encouraging the community to use a bednet to reduce the rate of malaria...[s]o I definitely appreciate the project, it is very useful." Succinctly, a man from the other village pronounced that, "[t]he importance of the project is that the net mainly prevents mosquitoes from biting."

Whereas people generally spoke of the increase in awareness of the benefits of using a bednet following the intervention only three statements made by women in Konteh Kunda Sukoto's village meeting offered indications of changes in behaviour over the period of the study. The first two describe how children and pregnant women retired to bed earlier than previously in order to protect these vulnerable groups from malaria: "[e]veryone is very careful not to stay outside with children [at night]" and "[p]eople were able to take good care of children to prevent malaria. Villagers are now putting children to bed earlier. Pregnant and breastfeeding women go in their houses earlier in the night now."

The third statement was the only one that talked about the whole crux of the study: the use of needle and thread to repair holes and tears in bednets. This female described how, in addition to women and children, men had also been affected by the project with regards to their behaviour: "[e]ven the breastfeeding mothers really provided good care of needle and thread. Even the husbands volunteer to repair bednets for their wives and the pregnant women take care of themselves."

This female ended by saying that, "among the whole village, the project has really reduced the rate of malaria and mosquitoes." Along with a statement from a Konteh Kunda Sukoto male: "[p]reviously, the rate of malaria within the village is very high but now your visits, the posters and the song contributes greatly in the reduction of malaria amongst children" this indicated a misconception about the success of the intervention. It shows a perception that the project had made a positive impact on malaria incidence because the number of mosquitoes had reduced under bednets. The reason behind these edicts could have been that people thought they should say something positive and that was what the field workers wanted to hear.

This incorrect idea that the intervention had reduced malaria was tackled by the field workers, who reinforced the fact that many mosquitoes had been found under the bednets of both villages during the collections and that the way to have an impact on reducing the number of mosquitoes entering the bed area, thus reducing the incidence of malaria, was that people had to repair every single hole and tear and also correctly use their bednets by tucking the material under the mattress. This is also the message that the village health workers and traditional birth attendants had been reinforcing when talking to villagers about the intervention song(s) and posters.

Summary

Although the concept of encouraging Gambians to repair their bednets through use of needle and thread had already been formulated prior to the field work and therefore total community participation cannot be claimed, the villagers were involved in the development and implementation of the intervention. This follows Hubley's (1993) grass roots level approach to community participation because the people of Konteh Kundas Niji and Sukoto were fully involved in the design, development and delivery of the intervention, which helped to create feelings of *responsibility* and *ownership* for the project. Decisions from the composition of the songs, to where to place the posters, how to distribute the tapes and who would provide information and guidance on the message of the intervention were made by the villagers.

Community awareness of the message of the intervention was achieved either through the songs or the posters. Preference for the songs or the posters was divided equally amongst both sets of villagers with the constant presence of the posters playing an important part in reminding people of the message about care and maintenance of bednets. Time was a barrier to playing the tape of the songs for some people whereas posters were not affected by time limitations. Some people had not heard the songs as they had been away from their village during the project or they had not had access to a tape. Strong feelings of *ownership* were developed for the songs because of the involvement that the villagers had in composing, providing musical accompaniment and singing them, particularly as they had sung them using their own Mandinka language, which made this form of intervention *culturally appropriate*, as identified by Willms et al (2001).

Social mobilisation came from the competitive feature formed between the two villages regarding the quality of the songs. Comments on the believed superiority of their own song(s) created more discussion about the lyrics and therefore the message the lyrics were giving out. Some people had even taken a tape of their song(s) to family members living outside their village, showing that expansion of this type of intervention was possible.

Appreciation of their participatory role was apparent in the feedback from the villagers during the final meetings, where a sense of pride in their perceived change in

behaviour was tangible. The intervention did have an impact on the study villages, as reported by the villagers, as it generated dialogue amongst themselves around the use of bednets. However, it has to be recognised that the project did not reduce the number of mosquitoes under bednets and so people were still exposed to the risks associated with mosquito bites. The inference according to Willms and Sewankambo (cited in Higginbotham et al, 2001) is that the intervention was *culturally sensitive* and *appropriate* but not so effective that it prompted people to sufficiently alter their behaviour.

Chapter 8 - Discussion

Undoubtedly bednets offer substantial protection against malaria (Miller et al, 1999; Thomson et al, 1999; D'Alessandro et al, 1995; Greenwood and Pickering, 1993; MacCormack and Snow, 1989). Due to problems associated with re-treating them with insecticide this study investigated using untreated bednets to their maximum potential in order to offer the highest protection from mosquitoes possible (Clarke et al, 2001; Thomas and Lindsay, 2000). The value of this project was that it utilised resources already present in the participating villages. No large-scale distribution of materials requiring logistical and administrative support was necessary.

From the outset, the aim of this study was to develop an intervention that would motivate rural Gambians into repairing holes in their bednets and using them correctly by tucking them under the mattress. The result sought from encouraging this behaviour change was reduction in exposure to mosquitoes and thus a reduction in the levels of malaria. Considering the rates of malaria morbidity and mortality in The Gambia, this was an important public health concern.

Significant increases in repairs to bednets were observed following the intervention (paired T-Test, $P=<0.001$), although due to the constant wear and tear of daily use, abuse through children's play and the destructive actions of rats and other creatures, the number of holes and tears remained virtually the same throughout the study. As people sewed their bednets new holes were appearing and so there was not a significant reduction in exposure to mosquitoes and potential malaria.

Application of the Theoretical Model

Effective behaviour change requires examination of the various processes involved in change from preparation to maintenance of that change. Hubley's (1993) BASNEF (Belief, Attitude, Subjective Norm, and Enabling Factor) model of behaviour change in which six steps to enabling change are considered was used as a framework for this research. All six steps were addressed as the project progressed so it was established that the study participants knew about the benefits of repairing their bednets (protection against malaria), had the means to repair them (access to needle and thread), had recognised influences within the community (*alkalo*, *Imam*, traditional birth attendant and village health worker) and had a social structure where influence was at a localised level (household).

As such this theoretical model was useful in determining the basis upon which to build a community intervention aimed at changing behaviour. It was a development from the transtheoretical model, first devised by Prochaska in 1981 and now commonly used in medical fields (e.g. for smoking cessation programmes) to explore the position of a person in the cycle of change (DiClemente and Velasquez, 2002). Here people are put into one of several categories: not ready to change; thinking about change; getting ready to change; changing; and sustaining change. The transtheoretical model adapts well to ensuring successful individual behavioural changes but this study required a paradigm where two villages' beliefs about changing their behaviour could be applied, which Hubley's (1993) seemed to do.

Reflecting on Hubley's (ibid) steps collectively one could have anticipated that the intervention would have an impact on behaviour change. It was Higginbotham et al (2001), who examined twelve community-based interventions to ascertain the essential ingredient to affecting behaviour change, and found that the intervention had to be *culturally compelling* in addition to addressing all of the above factors. However, someone could be ready to change and recognise the need to change but if they were not motivated to do so then the intervention would not be successful and sustainable. Therefore, whilst Hubley's (1993) model provided useful groundwork in establishing information on the beliefs and social influences within the participating communities, it was not enough to create confidence that the intervention would

actually achieve a sustained change in behaviour and so reduce numbers of mosquitoes under bednets.

The *compelling* nature of the study intervention is not disputed, as the intervention built on the existing Gambian practice of using bednets but it was not enough to ensure that the participants turned the idea of utilising the raw materials they all had access to (i.e. needle and thread) into reality and actually repaired their bednets. The villagers needed to recognise that they were the driving force behind transferring this *compelling* intervention into a practically effective intervention.

In their own right the songs and the posters were well received by the villagers and played their part in providing momentum to sew bednets immediately after the introduction of the intervention (from 27% in July to 39% in October with only another 2% by November) but perhaps a more sustained level of repairs would have been achieved if more emphasis had been placed on ensuring that the link between the *compelling* nature of the intervention and the practical element of the behaviour change required had been made.

Achievements of the Intervention

A degree of success in this piece of research can be claimed, as the intervention was created through participatory means, although this did not result in such a behaviour change so as to encourage everyone to repair all holes and tears in their bednets and tuck the material under the mattress. Consequently, there was no reduction in the number of mosquitoes collected from under the bednets and therefore the intervention did not have the public health benefit hoped for. What the project did achieve was to draw attention to bednets and people's behaviour towards them, which considering the short timescale of the project was a promising indicator of potential future success if the lessons learned during this study are taken into account.

The villagers welcomed the project team wholeheartedly, which was perhaps due to the time taken in ensuring that everyone was introduced to the study and the members of the team through village meetings. An open and honest approach to information dissemination was adopted at each stage of the methodology, so that the residents of Konteh Kunda Niji and Konteh Kunda Sukoto were kept fully informed of what was

going to happen and when in order to make them feel an integral part of the study. The resulting co-operation from the majority of villagers in allowing the research to go ahead in the two villages helped make the work of data collection easier without the hurdles that some research projects encounter.

Findings from the interviews and focus groups discussions regarding the beliefs and behavioural practices towards bednets and mosquitoes corroborated those documented in previous research papers. The main benefit of using a bednet for protection against malaria with priority being given to the vulnerable groups identified as children, babies, breastfeeding women and the elderly, recalls previous Gambian studies from Cham et al (1997), D'Alessandro et al (1994) and Aikens et al (1993). The additional uses of providing privacy and protection from dust and insects can also be found in the Gambian studies of MacCormack and Snow (1989 and 1986).

Okrah et al's (2002), Agyepong and Mandersons' (1999), Thomson et al's (1996), D'Alessandro et al's (1994) and Thomson et al's (1994) sub-Saharan Africa research described the desire for an undisturbed sleep without annoyance from mosquitoes as a decisive reason for using bednets. This was also raised by the study participants and proved to be a major incentive for using bednets, especially during the rainy season when mosquito numbers were high.

Interviews and focus groups established that the best time to repair holes or tears in bednets was either just before the rainy season or after harvesting because the villagers' financial situation had improved, supporting data from Okrah et al (2002), MacCormack and Snow (1989) and Lines (1996). Aikens et al (1993) found that the cost of bednets and materials increased as the rains approached, which was when people thought about replacing their bednet, a fact mentioned by some of the interviewees. Economic constraint was mentioned numerous times during the study, mainly as a reason for not paying tailors to repair holes in bednets, a feature also recognised by Okrah et al (2002) and Nuwaha (2001).

Quality of material and the natural life of a bednet has been the focus of many studies (Aikens et al, 1993; MacCormack and Snow, 1989 and 1986; Lines, 1986). In this project the majority of people preferred opaque bednets as they lasted longer,

although some found them too hot, thus preventing a good night's sleep. Where this was the case mesh bednets was the material of choice. MacCormack and Snows' (1986) extensive work on this aspect authenticated the examples of material preference discussed in this thesis.

Pride in the part the villagers played in the development of the intervention was apparent from the final meetings and helped to create a real sense of *ownership* for the intervention. This was particularly mentioned regarding the songs, which were sung in Mandinka, the indigenous language of both villages and summed up by one female from Konteh Kunda Sukoto who said, "[i]t is our own voice and language that is said by us with our own thinking." The visual impact of the posters had added value to the message in the songs because "the posters...are seen everywhere in the village" (female, Konteh Kunda Niji).

Visual and aural means of disseminating health messages are *culturally appropriate* within Gambian society, especially as the literacy rates are low. Song was important to the villagers, as proven in one focus group where the women spontaneously started singing at the end of the discussion. They spoke of songs being used to educate and inform people about health and this is where the idea for the intervention took seed. The media of song and posters was the *culturally compelling* aspect needed to activate a change in behaviour towards bednets. Analysis of the results revealed that people of all age ranges and of both sexes responded to the intervention by sewing up holes in their bednets. This widespread *social mobilisation* shows that the nature of the intervention was universally appealing with potential to be extended to others in The Gambia and perhaps sub-Saharan Africa.

Constraints on Behaviour

Whilst the aim of motivating an increase in rates of repairs of bednets was achieved, as shown by the surveys pre and post intervention, there was no subsequent reduction in exposure to mosquitoes because of the constant wear and tear to bednets in the community. The difficulty is in proving whether it was the intervention that motivated people to repair their bednets or whether it was the natural increase in mosquitoes found in the rainy season. One way to overcome this would be to repeat the research

at another time of year and this is discussed in the Suggestions for Future Developments section below.

Factors that affected the ability of the villagers to sew 100% of holes in their bednets were revealed by the key informants and the focus group discussants. Two main reasons for not sewing bednets raised by the participants were time and financial constraints. The project started at the beginning of the rainy season, which was good timing from the point of view that this was when the levels of mosquitoes increased and provided the motivational factor to encourage people to focus on the condition of their bednets because of disturbance by mosquitoes. However, the start of the rains was when the busy farming period began, requiring villagers to spend long working hours in the fields, which were further elongated by the fact that many had to walk approximately six kilometres to the fields before they could start work.

Lack of time for listening to the tapes of the songs was also mentioned by some villagers due to the labour-intensive period. This was when the posters became invaluable and acted as a visual reminder of the need to maintain bednets in good condition, although whilst people passed the posters on a daily basis on their way to the fields they still encountered the problem of having the time to repair any holes. Even if a villager had sewn all the holes prior to the rains starting, wear and tear meant that their bednet would more than likely develop holes when they were too busy to repair them. Once the villager had time to repair their bednet at the end of the rains the motivational factor of biting mosquitoes had dropped and so was less likely to pay attention to the state of the bednet.

Lack of money available to purchase needle and thread or to pay the tailor to repair bednets was widely discussed by the participants. Preference for the tailor to repair holes and tears was prevalent in the study villages. This option cost more money than using a needle and thread but the perceived longevity and higher quality of repair were reasons given for this inclination. Small holes were generally sewn by hand whereas larger holes were felt to need the expertise of a tailor. Borrowing needle and thread from others within the household was an option for those people who did not possess their own or did not have the money to purchase these commodities.

Another constraint that affected the ability for villagers to sew their bednets was the relationship dynamics within the household. Generally it was the household head who had *responsibility* to provide the means to purchase and maintain bednets for all his family. He was the one who encouraged the females in the household to repair and use bednets properly. It was also the household head that decided who had priority for bednets if there were not enough for one each and understood the benefits of swapping bednets and moving people appropriately during the rainy season when mosquito levels were high.

Exceptions to these general rules of behavioural influence became apparent during the study and were presented in this thesis as the case studies of a co-operative and non co-operative household (chapter 6). The co-operative household operated as one unit with the household head influencing both wives' behaviour and each wife helping the other in domestic matters such as caring for children and sewing bednets. This would have allowed one wife to have free time to pay attention to the maintenance of the family's bednets whilst the other focussed on another task. However, the non co-operative household dynamics were fragmented with the husband actively providing bednets for one part of his family and not the other. This created problems for the wife who was left to her own devices as she had no-one with whom to divide domestic chores resulting in extreme time pressures for her during the rainy season.

Finally, poor quality of material of many of the villages' bednets was a drawback in enabling the project's success. Bednets made of more robust opaque cotton were preferred by many people because of their longevity and provision of privacy. The problem with procuring these was that they were more expensive than the flimsier semi-transparent material or mesh netting. Constant wear and tear caused bednets to remain in poor condition during the study but data showed that bednets made from opaque material remained in better condition than those made of thinner material (40.8% had $\geq$75% holes repaired or no holes). Procurement of a bednet of superior quality was a major investment that was out of reach of most villagers whose main form of income was through subsistence farming.

Appraisal of the Results

Morbidity data for malaria were not collected during this study but the feelings of some villagers who spoke at the final meetings were that they had noticed a reduction in prevalence of malaria. Taking the data into consideration this cannot be true, as the overall number of holes or tears in bednets did not decrease and the number of mosquitoes under the bednets was not reduced during the project's lifespan. These villagers' perceptions highlight the concern that people may have felt protected against malaria when in reality they were not and so if they became ill they would not link it with malaria and postpone treatment due to this misperception. Care had to be taken to make sure that people did not think wrongly that partial mending of bednets was sufficient to affording protection against malaria. The lesson is that clarity and reinforcement of the message, however simple it may seem, is important to avoid any potentially dangerous misunderstanding.

Clearly, cautionary appraisal of the results is necessary to avoid oversimplification of the outcomes of the intervention. On one level the project was successful in that it achieved the aims as laid out in chapter 1:

1. To explore the beliefs and attitudes of Gambian villagers with regard to the repair and tucking in of untreated bednets.
2. Develop a community-led intervention to encourage the repair and correct use of bednets.
3. Evaluate the intervention.

On another level, achieving these aims was not enough to result in a reduction of malaria morbidity and mortality, identified as an important public health issue in the introduction and so the research cannot claim to be a success from this point of view.

There are a number of potential reasons why people did not completely repair their bednets during the period discussed within this thesis. Firstly, the motivation to repair holes could have been dependent on their size and position on the material. For example, if a hole was at the bottom of the bednet then this part was more likely to be tucked under the mattress, thus rendering the hole inaccessible to the mosquitoes.

Similarly, large holes may be stitched or patched whereas smaller ones might be left, as the perceived effort required to sew these may be outweighed by the perceived low

likelihood of mosquitoes entering the smaller holes. Another factor to be considered was the cost of sewing or patching larger holes, which were usually carried out by the local tailor. The rainy season was the worst time for any financial outlay for the villagers and many may have been waiting until after harvesting to repair their bednets when money was more readily available.

Holes were possibly more visible in the thick opaque cloth than in the thinner types of material used for a bednet, perhaps prompting people to sew or patch holes more quickly if they had a bednet made of this denser material. There was also the belief that sewing a mesh bednet produced more holes, due to the flimsiness of the material compared with the robustness of the opaque cloth. Another point to consider was the condition of the bednet in the first place, as there appears to be a point when it was deemed beyond repair. The life of a transparent or semi-transparent bednet was believed to be shorter than that of an opaque one.

During the project only 22 people repaired every hole in their bednet. If more people could be persuaded to sew 100% of holes then one must suppose that the number of mosquitoes found within bednets would reduce, therefore influencing malaria transmission. Increasing mosquito density was not the measurable motivating factor to repairing bednets anticipated prior to this project. In order to obtain accurate counts, the research team only collected mosquitoes from bednets that were still kept down and tucked under the mattress in the morning. However, it is still possible that some mosquitoes escaped, which affected the accuracy of this estimate of exposure. Perhaps the bednet was not kept down and tucked under the mattress for the whole night, allowing the mosquitoes to leave; the door flap to the bednet may have opened due to movement of the person or people sleeping in the bed during the night; the occupant(s) could have got up during the night forgetting to carefully replace the bednet; or the field workers may have inadvertently let mosquitoes out from the bednet when they entered through the opening.

Both genders could have been influenced by different key people in the community and this could have been a reason why some people repaired their bednets and others did not. Influential people of both genders were employed to play a part in influencing villagers to change their behaviour. The *alkalos*, *Imams* and village health workers

were male and the traditional birth attendants were female. Input regarding use of, beliefs about and attitudes towards bednets was sought from as equal a mixture of males and females as possible throughout the study. Where the males were recognised as those accountable for the provision of bednets and were most likely to be the person charged with finding funding for their repair, the females were the ones identified as having the *responsibility* for sewing of the bednets. Perhaps the effort of maintaining such equality diluted the impact of the intervention with certain members of the community.

Cultural acceptability of holding public discussions about bednets did not automatically mean that such a public approach could be taken in trying to change behaviour regarding care for bednets. What people say and do are two different things. The pressure exerted on Gambian families to maintain their child's uniform in good order worked as it was a recognised requirement in the public arena and had been discussed at the Non Governmental Organisation meeting pre-intervention. Bednets were kept inside the house where generally only members of the family or close friends saw them and as such the repair of holes or tears was a private matter. However, the participants allowed the field workers into their rooms to survey their bednets, implying that it was acceptable for relative strangers to enter a private area. This may have been due to the official capacity of the field workers. People may have been comfortable discussing bednets publicly but this did not mean that the discussion translated into carrying out repairs to them privately.

A missed opportunity was that the link between involvement in the development of the intervention and the motivation to repair bednets was not made. Data could have been collected to identify individuals with their own particular bednet. The villagers who played an active part in the study rather than just allow the field workers to survey their bednets may have felt more *compelled* to repair their bednets because of their contribution to the research. A comparison of those villagers who were interviewed, part of the focus group discussions, allowed traps in their rooms or helped in the production of the songs against those villagers who did not take such an active part would have been a valuable tool to show whether participation influenced the hoped for behaviour change.

Finally, the fact that a team of project workers visited the study villages on a regular basis for six months no doubt exercised some level of influence on the villagers' behaviour. There was an intense amount of discussion about bednets initially, which was followed by attention to the actual bednets during the period of the project with surveys and mosquito collections. This can only have served to make people more aware of their bednets, their use and condition and may have been a motivational factor which needs to be taken into account when looking at the study as a whole.

Suggestions for Future Developments

An interesting development of this project would be to repeat the intervention at a different time of year to see if the barriers mentioned by the participants (lack of time to sew their bednets and lack of money to pay the tailor) were lessened or even removed. However inexpensive this study appeared financially to the outsider, care should be taken to acknowledge the cost in time to those targeted. Time is a valuable commodity to Gambian farmers, as recorded by Brown et al (2002) and this needs to be taken into consideration when introducing any intervention. It would also be a measure of the power of the intervention if people did change their behaviour and repair their bednets when the villagers did not have the natural disturbance factor of a seasonal increase in mosquitoes to remind them to do so.

Measurement of the incidence of malaria in the study villages against the ownership of bednets could be another subject of a research project. Accurate methods of collecting medical information on each person partaking in the study would have to be implemented and monitored. As there was a wide geographical dispersal of health clinics that people from Konteh Kunda Niji and Konteh Kunda Sukoto attended for treatment, collecting this information would involve devising an accepted method of recording and training for the medical personnel that was understood by all levels, whether they be internationally qualified doctors or locally trained village health workers.

An in-depth project that focused on one household and their use of bednets would be an interesting progression of this study. Participant observation would uncover kinship structures, the relationships within the household and their behavioural influences. Position and exact size of any holes along with the age of the bednet,

details not recorded during this study, would potentially reveal personal choice of which holes to repair and which to leave. Observed behaviour including the tucking in, washing of and attitudes towards bednets would show the value placed on them. Through this more detailed mapping of the people that use bednets, the finer nuances of Gambian behaviour and their influences would be extracted.

Following up on the gender differences for responsibility for bednets would be an interesting development of the project and a natural progression of the participant observation exercise mentioned in the previous paragraph. As women were found to be the primary sewers of bednets they need time to become empowered and improve their status within the Gambian patriarchal community. This is especially relevant due to the fact that the household head, who was usually male, was the person with the power to make decisions about who should have use of a bednet. Bosc et al's (cited in Brown et al, 2002: 212) studies have shown that "empowerment and participation through organisation building is a process that takes time." A result of that would be commitment to the development initiative, which in turn would encourage self-perpetuating motivation within the community, something that would be sustainable.

A fourth focus group discussion with older women would have redressed the gender imbalance of having two male groups and only one female group. The men's groups were chosen because of their influence within the community or household and breastfeeding women were felt to be a key target group due to the high infant mortality rates set out in chapter 1, which meant that this cohort would have a considerable interest in the care and maintenance of bednets in order to protect their children. Further research in this field would enable exploration of comparisons of beliefs and attitudes within an age range as well as gender differences.

Expansion of the intervention is certainly feasible with the possibility of the songs being played on local and national radio and posters being reproduced and displayed throughout the country. Nevertheless, assumptions should not be made before further investigation into the dynamics of other ethnic groups within The Gambia. Subtle cultural differences may elicit alternative belief systems regarding mosquitoes, malaria and bednet use and these would need addressing. The fact that this study was undertaken in a rural setting may mean that it would not be transferable to urban

areas. All these determinants would need to be explored prior to any development implementation.

An aspect of the songs was that the people themselves devised them and expansion could conceivably weaken the *ownership* element that made this intervention so *compelling* within the villages. If every community were to compose a song not only would this take a long time but it would be extremely difficult to facilitate. One way to overcome this may perhaps be to build on the competitive nature that became apparent between the two study villages. A national competition where the winning community had their song(s) recorded and played is one option to consider. The same idea of encouraging competition could also be used for creating the design of the posters.

Reports from two Medical Research Council field workers visiting Konteh Kunda Niji and Konteh Kunda Sukoto during summer 2005 have verified seeing the study posters hung in both villages as well as cassettes containing the intervention songs (personal communication from Dr Margaret Pinder, July 2005). This does not mean that the villagers now repair their bednets in a timely manner but it does show the acceptance of this type of intervention amongst the villagers. The community were at liberty to remove the posters and throw away the tapes of the songs once the study was completed but the fact that they have not done so may be worth further investigation to find out people's reflections on the intervention.

In conclusion, bednets are continually developing and improving and there are now bednets where the insecticide is incorporated into the material at the production stage (Graham et al, 2005; Lindblade et al, 2005; Yates et al, 2005; Guillet et al, 2001). These bednets are being promoted as long-lasting, although in reality it is the insecticide that is long-lasting and research is ongoing regarding the effectiveness of these. However, as this thesis has shown, bednets are subject to a great deal of wear and tear in a short time. This highlights the point that the material used to make bednets should be strong enough to be as long-lasting as the insecticide, otherwise the insecticide is likely to outlive the bednet and this innovation will not have the impact anticipated.

References

Agyepong, I. A. and Manderson, L. (1999) "Mosquito avoidance and bed net use in The greater Accra region, Ghana." *Journal of Biosocial Science.* 31: 79-92.

Aikins, M., Pickering, H., Alonso, H., D'Alessandro, U., Lindsay, S. W., Todd, J. and Greenwood, B. M. (1993) "A malaria control trial using insecticide-treated bed nets and targeted chemoprophylaxis in a rural area of The Gambia, West Africa. 4: perceptions of the causes of malaria and its treatment and prevention in the study area." *Transactions of the Royal Society of Tropical Medicine and Hygiene.* 87(Supplement 2): 25-30.

Association of Social Anthropologists of the Commonwealth. (1999) *Ethical Guidelines for Good Research Practice.* March 1999.

Bailey, D., Hawes, H. and Bonati, G. (eds) (1992) *Child-to Child: A Resource Book. Part 1: Implementing the Child-to-Child Approach.* London: Save The Children and CAFOD.

Baume, C., Helitzer, D. and Kachur, S. P. (2000) "Patterns of care for childhood malaria in Zambia." *Social Science and Medicine.* 51(10): 1491-1503.

Bell, D. R. (1995) *Tropical Medicine.* 4th Edition. Oxford: Blackwell Science Ltd.

Bhatt, R. M., Yadav, R. S., Adak, T. and Babu, C. J. (2005) "Persistence and wash-resistance of insecticidal efficacy of nettings treated with deltamethrin tablet formulation (K-O TAB) against malaria vectors." *Journal of American Mosquito Control Association.* 21(1): 54-58.

Bloor, M., Frankland, J., Thomas, M. and Robson, K. (2001) *Focus Groups in Social Research.* London: Sage Publications.

Brown, D., Howes, M., Hussein, K., Longley, C. and Swindell, K. (2002) *Participation in Practice. Case Studies from The Gambia.* London: Overseas Development Institute.

Cham, M. K., Olaleye, B., D'Alessandro, U., Aikens, M., Cham, B., Maine, N., Williams, L. A., Mills, A. and Greenwood, B. M. (1997) "The impact of charging for insecticide on the Gambian National Impregnated Bednet Programme." *Health Policy and Planning.* 12(3): 240-247.

CIA (02.04.2003) Internet site:
http://www.odci.gov/cia/publications/factbooks/geos/ga.html

Clarke, S. E., Bogh, C., Brown, R. C., Pinder, M., Walraven, G. E. L. and Lindsay, S. W. (2001) "Do untreated bednets protect against malaria?" *Transactions of the Royal Society of Tropical Medicine and Hygiene.* 95: 457-462.

D'Alessandro, U., Olaleye, B. O., McGuire, W., Langerock, P., Bennett, S., Aikens, M. K., Thomson, M. C., Cham, M. K., Cham, B. A. and Greenwood, B. M. (1995) "Mortality and morbidity from malaria in Gambian children after introduction of an impregnated bednet programme." *The Lancet.* 345: 479-483.

D'Alessandro, U., Aikens, M. K., Langerock, P., Bennett, S. and Greenwood, B. M. (1994) "Nationwide survey of bednet use in rural Gambia." *Bulletin of the World Health Organization.* 72(3): 391-394.

Dawson, S., Manderson, L. and Tallo, V. L. (1993) *A Manual for the Use of Focus Groups.* USA: International Nutrition Foundation for Developing Countries.

DiClemente, C. C. and Velasquez, M. M. (2002) "Motivational Interviewing and the Stages of Change." Contributing authors in: Miller, W. R. and Rollnick, S. (2002) *Motivational Interviewing. Preparing People for Change.* (2nd edition) USA: The Guildford Press.

Erlanger, T. E., Enayati, A. A., Hemingway, J., Mshinda, H., Tami, A. and Lengeler, C. (2004) "Field issues related to effectiveness of insecticide-treated nets in Tanzania." *Medical and Veterinary Entomology*. 18(2): 153-160.

Gambia Gateway (10.06.2003) Internet site:
http://www.gambiagateway.tripod.com/gambia-maps.html

Government of the Republic of Gambia. (2002) *Decadel Agrometerological Bulletin*. Multi-disciplinary Working Group of the Agrhymet Programme.

Graham, K., Kayedi, M. H., Maxwell, C., Kaur, H., Rehman, H., Malima, R., Curtis, C. F., Lines, J. D. and Rowland, M. W. (2005) "Multi-country field trials comparing wash-resistance of PermaNet and conventional insecticide-treated nets against anopheline and culicine mosquitoes." *Medical and Veterinary Entomology*. 19(1): 72-83.

Greenwood, B. M. and Mutabingwa, T. (2002) "Malaria in 2002." *Nature* 415: 670-672.

Greenwood, B. M. and Pickering, H. (1993) "A malaria control trial using insecticide-treated bed nets and targeted chemoprophylaxis in a rural area of The Gambia, West Africa. 1: a review of the epidemiology and control of malaria in The Gambia, West Africa." *Transactions of the Royal Society of Tropical Medicine and Hygiene*. 87(Supplement 2): 3-11.

Guillet, P., Alnwick, D., Cham, M. K., Neira, M., Zaim, M. and Heymann, D. (2001). "Long-lasting Treated Mosquito Nets: a Breakthrough in Malaria Prevention." *Bulletin of the World Health Organization*. 79(10): 998.

Guyatt, H. L. and Snow, R. W. (2002) "The cost of not Treating Bednets." *Trends in Parasitology*. 18(1).

Hawes, H. and Scotchmer, C. with the collaboration of Aarons, A., Morley, D. and Young, E. (eds) (1993) *Children for Health*. UNICEF.

Higginbotham, N., Freeman, S., Heading, G. and Saul, A. (2001) "Cultural Constructions of Risk: Heart Disease I the New South Wales Coalfields, Australia." In: Higginbotham, N., Briseño-Leon, R. and Johnson, N. (eds) *Applying Health Social Science*. New York: Zed Books Ltd.

Hubley, J. (1993) *Communicating Health. An action guide to health education and health promotion*. London: Macmillan Education Limited.

Jones, C. and Williams, H. (2002) "Social science in malaria control." *Trends in Parasitology*. 18(5): 195-196.

Lindblade, K. A., Dotson, E., Hawley, W. A., Bayoh, N., Williamson, J., Mount, D., Olang, G., Vulule, J., Slutsker, L. and Gimnig, J. (2005) "Evaluation of long-lasting insecticidal nets after 2 years of household use." *Tropical Medicine and International Health*. 10(11): 1141-1150.

Lindsay, S. W., Armstrong-Schellenberg, J. R. M., Zeiler, H. A., Daly, R. J., Slaum, F. M. and Wilkins, H. A. (1995) "Exposure of Gambian children to *Anopheles gambiae* malaria vectors in an irrigated rice production area." *Medical and Veterinary Entomology*. 9: 50-58.

Lindsay, S. W., Alonso, P. L., Armstrong-Schellenberg, J. R. M., Hemingway, J., Thomas, P. J., Shenton, F. C. and Greenwood, B. M. (1993) "A malaria control trial using insecticide-treated bed nets and targeted chemoprophylaxis in a rural area of The Gambia, West Africa. 3: entomological characteristics of the study area." *Transactions of the Royal Society of Tropical Medicine and Hygiene*. 87(Supplement 2): 19-23.

Lines, J. (1996) "Review: Mosquito nets and insecticides for net treatment: a discussion of existing and potential distribution systems in Africa." *Tropical Medicine and International Health*. 1(5): 616-632.

MacCormack, C. P., Snow, R. W. and Greenwood, B. M. (1989) "Use of insecticide-impregnated bed nets in Gambian primary health care: economic aspects." *Bulletin of the World Health Organization*. 67(2): 209-214.

MacCormack, C. P. and Snow, R. W. (1986) "Gambian cultural preferences in the use of insecticide-impregnated bednets." *Journal of Tropical Medicine and Hygiene.* 89: 295-302.

Marsh, V., Mutemi, W., Some, E., Haaland, A. And Snow, R. (1996) "Evaluating the community education programme of an insecticide-treated bed net trial on the Kenyan coast." *Health Policy and Planning* 11(3): 280-291.

Marshall, P. (2002) Health Promotion Advisor. *Stop Smoking Seminar.* North Yorkshire Stop Smoking Service.

Miller, J., Jones, C., Ndunguru, S., Curtis, V. and Lines, J. (1999) "A new strategy for treating nets. Part 2: User's perceptions of efficacy and washing practices and their implications for insecticide dosage." *Tropical Medicine and International Health.* 4(3): 167-174.

Miller, W. R. and Rollnick, S. (2002) *Motivational Interviewing. Preparing People for Change.* (2nd edition) USA: The Guildford Press.

Morgan, D. L. (1997) *Focus Groups as Qualitative Research.* (2nd edition) London: Sage Publications.

Nuwaha, F. (2002) "People's perception of malaria in Mbarara, Uganda." *Tropical Medicine and International Health.* 7(5): 462-470.

Ogede, O. S. (1993) "The role of the Igede poet Micah Ichegbeh's Adiyah songs in the political and moral education of his local audiences." *African Languages and Cultures.* 6(1): 49-68.

Okrah, J., Traore, C., Pale, A., Sommerfeld, J. and Muller, O. (2002) "Community factors associated with malaria prevention by mosquito nets: an exploratory study in rural Burkina Faso." *Tropical Medicine and International Health*. 7(3): 240-248.

Rashed, S., Johnson, H., Dongier, P., Gbaguidi, C. C., Laleye, S., Tchobo, S., Gyorkos, T. W., Maclean, J. D. and Moreau, R. (1997) "Sustaining malaria prevention in Benin: local production of bednets." *Health Policy and Planning*. 12(1): 67-76.

Rubardt, M., Chikoko, A., Glik, D., Jere, S., Nwanyanwu, O., Zhang, W., Nkoma, W. and Ziba, C. (1999) "Implementing a malaria curtains project in rural Malawi." *Health Policy and Planning* 14(4): 313-321.

Russell, A. (2000) "Dealing with Physical Illness." *Lecture in Health and Society*. University of Durham, Stockton Campus. 17.02.2000

Sharma, S. K., Upadhyay, A. K., Haque, M. A., Padhan, K., Tyagi, P. K., Batra, P. K., Adak, T., Dash, A. P. and Subbarao, S. K. (2005) "Village-scale evaluation of mosquito nets treated with a tablet formulation of deltamethrin against malaria vectors." *Medical and Veterinary Entomology*. 19(3): 286-292.

Standard Operating Procedures (2002) *RTSS 2002 - Light Trap Collections (SOP-LTC)*. MRC Farafenni, The Gambia.

Stephens, T., Braithwaite, R. L. and Taylor, S. E. (1998) "Model for using hip-hop music for small group HIV/AIDS prevention counseling with African American adolescents and young adults." *Patient Education and Counseling*. 35: 127–137.

Tashakorri, A. and Teddlie, C. (1998) *Mixed Methodology: Combining Qualitative and Quantitative Approaches*. London: Sage Publications.

Thomas, C. J. and Lindsay, S. W. (2000) "Local-scale variation in malaria infection amongst rural Gambian children estimated by satellite remote sensing." *Transactions of the Royal Society of Tropical Medicine and Hygiene.* 94: 159-163.

Thomson, M. C., Connor, S. J., D'Alessandro, U., Rowlingson, B., Diggle, P., Cresswell, M. and Greenwood, B. M. (1999) "Predicting malaria infection in Gambian children from satellite data and bed net use surveys: the importance of spatial correlation in the interpretation of results." *American Journal of Tropical Medicine and Hygiene.* 61(1): 2-8.

Thomson, M. C., Connor, S. J., Bennett, S., D'Alessandro, U., Milligan, P., Aikens, M., Langedock, P., Jawara, M. and Greenwood, B. M. (1996) "Geographical perspectives on bednet use and malaria transmission in The Gambia, West Africa." *Social Science and Medicine.* 43(1): 101-112.

Thomson, M. C., D'Alessandro, U., Bennett, S., Connor, S. J., Langerock, P., Jawara, M., Todd, J. and Greenwood, B. M. (1994) "Malaria prevalence is inversely related to vector density in The Gambia, West Africa." *Transactions of the Royal Society of Tropical Medicine and Hygiene.* 88: 638-643.

Tucker, J. B., Barone, J. E., Stewart, J., Hogan, R. J., Sarnelle, J. A. and Blackwood, M. M. (1999) "Violence prevention: reaching adolescents with the message." *Pediatric Emergency Care.* 15(6): 436-439.

Willms, D. G., Johnson, N. A., Chingono, A. and Wellington, M. (2001) "AIDS Prevention in the *Matare* and the Community: A Training Strategy for Traditional Healers in Zimbabwe." In: Higginbotham, N., Briseño-Leon, R. and Johnson, N. (eds) *Applying Health Social Science.* New York: Zed Books Ltd.

Winch, P. J., Makemba, A. M., Kamazima, S. R., Lwihula, G. K., Lubega, P., Minjas, J. N. and Shiff, C. J. (1994) "Seasonal variations in the perceived risk of malaria: implications for the promotion of insecticide-impregnated bed nets." *Social Science and Medicine.* 39(1): 63-75.

World Health Organisation. (02.04.2003) Internet site:
http://www.who.int/country/gmb/en

Yates, A., N'Guessan, R., Kaur, H., Akogbeto, M. and Rowland, M. (2005) "Evaluation of KO-Tab 1-2-3(R): a wash-resistant 'dip-it-yourself' insecticide formulation for long-lasting treatment of mosquito nets." *Malaria Journal*. 4: 52.

Appendices

MRC Labs, Farafenni, The Gambia, 2002

A stitch in time may save lives: turning poor bednets into good ones SCC/EC No 902

Information sheet

The following should be explained to the participants in a language they understand well.

MRC The Gambia, with colleagues from the Gambian Centre for Innovation Against Malaria, London School of Hygiene and Tropical Medicine and The University of Durham, want to conduct a study to find out how people use their bednets. And if they don't do this then we want to find ways of helping people use their bednets better.

What will happen?

- Before the rains start field assistants will count and record the condition of all the bednets in this village. The field assistants will then come back at the end of the rains and record any changes to the nets.
- In July we will also ask a few volunteers with a knowledge of bednets and/or sewing to discuss this with the field assistants and the scientists in charge.
- We will then ask for volunteers who have a bednet in their home to join discussion groups. There will be separate discussion groups for men and women.
- After the discussions we will come back with information of ways of using your bednets well.
- Then we ask the people who use bednets to leave their bednets down in the morning for 3 days in August so that field assistants can search for mosquitoes. This will be repeated in October.
- We will also ask some people to have light traps to collect mosquitoes in their room during the study.
- At the end of the rains we will come and ask you what you thought of the study.

The information obtained will be collected by MRC, The Gambia, Durham University and the London School of Hygiene and Tropical Medicine. The results will be reported to and discussed with the Ministry of Health and Social Welfare, especially with the National Malaria Control Programme. The names of the villages will appear in the report but no-one will know the results from individual villagers. The information from this study will help decide ways of using bednets better to reduce malaria.

You do not have to join this study. If you join, you can withdraw whenever you wish. If you have any questions or queries during the study, Heather Lomas, MRC Farafenni will be happy to talk to you about them.

This study has been approved by the Joint Gambian Government/MRC Ethic Committee

MRC Labs, Farafenni, The Gambia, 2002

A stitch in time may save lives: turning poor bednets into good ones SCC/EC No 902

Information sheet and Consent form (Key Informants)

The following should be explained to the participants in a language they understand well.

MRC The Gambia, with colleagues from the Gambian Centre for Innovation Against Malaria, London School of Hygiene and Tropical Medicine and The University of Durham, want to conduct a study to find out how people use their bednets. And if they don't do this then we want to find ways of helping people use their bednets better.

- You have a knowledge of bednets and/or sewing.
- The field assistants and the scientists in charge would like to discuss this interest with you. The discussion will not interfere with your daily activities.
- This information will help us to understand more about the sewing practices and the use of bednets in the villages.

The information obtained will be collected by MRC, The Gambia, Durham University and the London School of Hygiene and Tropical Medicine. The results will be reported to and discussed with the Ministry of Health and Social Welfare, especially with the National Malaria Control Programme. The name of your village will appear in the report but no-one will know the results from individual villagers. The information from this study will help decide ways of using bednets better to reduce malaria.

You do not have to join this study. If you join, you can withdraw whenever you wish. If you have any questions or queries during the study, Heather Lomas, MRC Farafenni will be happy to talk to you about them.

This study has been approved by the Joint Gambian Government/MRC Ethic Committee

I have explained the study to the volunteer named below in a language that he/she understands well. I believe he/she has understood and is participating out of his/her own free will.

Signature or thumb print _____ Date / /

Name of person obtaining consent _____ Position _____

Name of volunteer _____ Study No _____

Thank you for your participation in this study.

Please accept a copy of this explanation, which you may keep for reference.

Song Composed by Residents of Konteh Kunda Niji

1. *Ali nga susula lu kelai* (Let us fight against mosquitoes)

Chorus

Aa ali nga susula lu kelai

Aah, let us fight against mosquitoes

Mosquitoes are our big enemies

Chorus

Mosquitoes are our big enemies in the world

Chorus

The first bad effect of mosquitoes is on our children

Chorus

It leads us to buy expensive nets

Chorus

We should tie up our bednets on our beds for our families

Chorus

But if you tie up your bednet that's not the end of it

Chorus

When putting your children under the bednet

Chorus

You wipe the bednet clear

Chorus

You tuck all the sides of the net under the mattress

Chorus

You can then put the children under the bednet

Chorus

That's wiping and tucking

Chorus

The tears in our nets

Chorus

We can look for needle and thread

Chorus

That tear we see in the bednet

Chorus

We can use the needle with thread

Chorus

We then patch the holes

Chorus

So that we prevent our families from difficulties

Chorus

Mosquitoes are our big enemies in the world

Chorus

Apart from children

Chorus

We should look to our future bearers who are pregnant women

Chorus

Because if you hear children they are born by parents

Chorus

Mosquitoes are big enemies on pregnant women

Chorus

Among all the mosquitoes, the female mosquito

Chorus

The female mosquito is very harmful to pregnant women

Chorus

It has long palps and long back legs

Chorus

If that mosquito bites a pregnant woman it doesn't affect only her

Chorus

The unborn baby also suffers

Chorus

If the child is one month old, he can become anaemic

Chorus

Sometimes not only anaemia but other sickness

Chorus

He may get polio, which cannot be cured

Chorus

It causes another sickness, which is a convulsion

Chorus

All of this is from mosquitoes, mosquitoes are our big enemies

Chorus

Some may say he has fits

Chorus

Mosquitoes are making difficulties in the world

Chorus

When taking your child to bed make sure you wipe the net

Chorus

Children are our future elders

Chorus

Banjul is very far, we have no money

Chorus

If they ask you to take your child to Banjul when your child is in a coma what will you do?

Chorus

You have to suffer because of your child

Chorus

Mosquitoes are our big enemies in the world

Chorus

Mosquitoes are making it more difficult in the world, let's fight mosquitoes

Chorus

Mosquitoes are the cause of malaria

Chorus

You may see somebody very fat (healthy looking)

Chorus

If he goes to Farafenni they will tell him that his blood is finished (anaemic)

Chorus

All of that is caused by mosquitoes

Chorus

Mosquitoes are making it more difficult in this world

Chorus

The female mosquito is the harmful mosquito in the world

Chorus

It has long palps and long back legs

Chorus

That mosquito's poison is more harmful than all the other mosquitoes

Chorus

Mosquitoes are big enemies, let's protect ourselves from mosquitoes

Chorus

The female mosquito

Chorus

In the evening

Chorus

That female mosquito comes home

Chorus

The mouth has two palps

Chorus

If it sucks

Chorus

It sucks blood

Chorus

And where it transmitted poison

Chorus

That female mosquito lays eggs

Chorus

Only blood, only blood

Chorus

Mosquitoes are our big enemies

Chorus

Whites call it malaria

Chorus

We don't know the name malaria

Chorus

We call it *kaajay kurannoo*

Chorus

This *kaajay kurannoo* is harmful to everyone

Chorus

If the person has *kaajay kurannoo*

Chorus

The person keeps vomiting

Chorus

Loss of appetite

Chorus

Sleeping and drinking all the time

Chorus

Mosquitoes are our big enemies

Chorus

If the child has malaria

Chorus

People will start saying it is witchcraft

Chorus

Others will say it is devils

Chorus

Mosquitoes are our big enemies

Chorus

What are we going to do to protect ourselves

Chorus

That is why we try to have a bednet

Chorus

But don't just say I have a bednet

Chorus

You need to put up your bednet

Chorus

Still we are not protecting ourselves

Chorus

If you have a bednet

Chorus

Before going to sleep, wipe the bednet

Chorus

So that we can protect ourselves from our enemies, which are the mosquitoes

Chorus

It does not look whether you are an elder

Chorus

It does not look whether you are a child

Chorus

It does not look whether you are pregnant

Chorus

Malaria is worse in pregnant women

Chorus

It kills the mother

Chorus

It kills the foetus or unborn baby

Chorus

Mosquitoes are our big enemies

Chorus

The disease malaria is caused by mosquitoes

Chorus

Songs Composed by Residents of Konteh Kunda Sukoto

1. *Malaria Kuranwo* (Malaria Disease)

Chorus

Malaria kuranwo, kuran balemoo

Ala bayee

Jana abee dunna, kuran balemoo

Ala bayee

Malaria disease is a big disease

Kick it out

Before it enters, it's a big disease

Kick it out

At first malaria disease was a problem because it kills lots of children

Chorus

Especially in the rural area, if it attacks a child before getting transport to the hospital, if Allah don't save you, you might die

Chorus

Now doctors have made research, talking about it on the radios and televisions

Chorus

The way we should prevent ourselves without paying fares and any other thing

Chorus

Thinking of getting 5 Dalasis to buy permethrine, you do not need 5 Dalasis, only stitch your net when torn

Chorus

Bednets, when washed clean, if there is a big hole that cannot be stitched it should be patched

Chorus

Niceness does not matter in a bednet but gives security for you and your children

Chorus

Malaria disease is first of all caused by female mosquitoes

Chorus

They normally come around 7pm

Chorus

And it spreads the disease in many ways because when it bites an infected person it can transmit to the healthy person

Chorus

If a child is sleeping inside saying he or she is very hot you bring him or her outside

Chorus

If lazy you fall asleep and mosquitoes keep biting

Chorus

Not knowing that mosquitoes bite but the mosquitoes that bite infect the child

Chorus

First of all if a child is infected they have a blocked nose

Chorus

It makes the child have a runny nose, be sleepy and have a headache

Chorus

Child breathing hard, you tell the doctor he was sick yesterday, while it was long since

Chorus

Already has high fever and headache

Chorus

When too high (temperature), he faints

Chorus

Saying words unconsciously (the child) people say it is witchcraft, devils, evils

Chorus

Pregnant women can also be infected from it

Chorus

When a pregnant woman is infected, when the infection is great, she may have a premature birth

Chorus

If the infection is so high it can kill both the mother and the unborn baby

Chorus

That's the time people say that pregnant woman is anaemic, while malaria is in her blood

Chorus

Now no other burden, nothing less, only repair bednets

Chorus

If it is 7pm don't be in a haste, wipe your net clear

Chorus

Don't just roughly tuck the net under the mattress and get back, no, no, that's not it

Chorus

Wipe it clear and tuck properly so that mosquito penetration will not be allowed

Chorus

Then you and your children will be safe, you will be OK in the side of health

Chorus

Mothers, malaria disease is a big disease, kick it out, before it enters, kick it out

Chorus

---

2. *Al-sankew dedaa aibeteya* (Mend Bednets Good)

Chorus

Al-sankew dedaa aibeteya

Mend Bednets Good

So as to be protected from mosquitoes

Chorus

Aaaaah

Chorus

For the problem of mosquitoes

Chorus

Aaaaah

Chorus

Because of the great infection of mosquitoes

Chorus

Let us mend our bednet, if our bednet is torn

Take needle and thread and stitch, also wipe your net clear

Chorus

The malaria disease was a big problem but now white doctors are following us, fighting against it

Chorus

The disease causes many empty handed (still birth)

Some will keep delivering and none survive

By sending a message to their people a child will survive

Chorus

White doctors sympathise with mothers

Lets follow them; this disease is caused by mosquitoes

Chorus

So as to be protected from mosquitoes

Chorus

Aaaaah

Chorus

In any case don't be hurried, take care of the children

Wipe the bednet clear; make children sleep in the bed

Then if you want you can chat outside

Chorus

Concerning the malaria disease

The doctors are mainly working for the pregnant women and mothers, child-bearing mothers

Chorus

We, the ones singing, you just say they are just singing

But this is what they will tell you from the hospital

Chorus

Then this malaria disease we call sudden faintness

While unknown if you are infected

If Allah says your time is up, you are dead

Chorus

So as to be protected from mosquitoes

Chorus

Well done

Chorus

The message is there for both pregnant women and the child-bearing mothers

Not only for pregnant women

Chorus

For the pregnant women if sitting outside in the night

They should have a limit set or you should sit under bednets

Chorus

You, the pregnant mother, if you are infected, it might infect the child too

Chorus

Doctors are following us because of the malaria disease

Then lets follow them in the fight

Chorus

Then (in the past) people were saying doctors said there were less people
But now they don't say less people they say more people (higher population)
Chorus

Aaaaah, malaria disease is the cause
Chorus

Aaaa yoooo, so as to be protected from mosquitoes
Chorus

If there is a big hole and your net can be patched
Let it be patched because there is needle and thread in every shop
Chorus

When it is a small hole please stitch it
For mosquitoes not coming in is to save you and your children
Chorus

Doctors love to eradicate the disease
But we have to accept this ourselves
Chorus

Before seeking treatment from the doctors to treat your child
You first save the child
Chorus

So as to be protected from mosquitoes
Chorus

Women
Chorus

Aaaaah
Chorus

Aaaaah, malaria is a big disease

Chorus

Aaaa yoooo, so as to be protected from mosquitoes

Chorus

We were taught many programmes by doctors

But the whole thing is with us because since our great grandfathers we were using bednets

Chorus

But now they give us more courage

Because they follow our good health

Chorus

Doctors driving their cars

Following us for our own good health

People are saying that doctors say there are less people

But they don't say less people they say more people

Because of lack of education

Chorus

So as to be protected from mosquitoes

Chorus

Malaria is a big disease

Chorus

Aaaah

Chorus

Aaaah, so as to be protected from mosquitoes

Chorus

Aaaah

Chorus

Malaria is a big disease

Chorus

Aaaah

Chorus

Aaaah, so as to be protected from mosquitoes

Chorus

Malaria is a big disease

Chorus

Aaaah

Chorus

Aaaah yoooo, so as to be protected from mosquitoes

Chorus

Child-bearing mothers

So as to be protected from mosquitoes

Chorus

Aaaah, malaria is a big disease

Chorus

---

3. *Dinbalu yee-fankanta sankew-la* (Families, Plan for Future Use of Bednets)

Chorus

Aaaah, Dinbalu yee-fankanta sankew-la

Aaaah, families, plan for future use of bednets

Dinbalu yee-fankanta sankew-la

Susula kaa kuranbalikee

Dinbalu yee-fankanta sankew-la

Aaaah, Dinbalu yee-fankanta sankew-la

Susula kaa kuranbalikee

Dinbalu yee-fankanta sankew-la

Families, plan for future use of bednets

Mosquitoes cause serious disease

Families, plan for future use of bednets

Aaaah, families, plan for future use of bednets

Mosquitoes cause serious disease

Families, plan for future use of bednets

Repeat 4 times

Chorus

If mosquitoes are around

If I can't provide a net

The man I marry will buy one for me

Chorus

If the sickness is not controlled and you want to control other problems

Chorus

If one is sick you find him too tired

Chorus

Now we say families and children should use bednets

Then we should all find bednets

Chorus

A bednet is not a dress which if worn rough you may feel ashamed

Chorus

Even if it is torn and cannot be stitched

Use needle and thread and patch

Chorus

If you feel ashamed of the patch put the net up every morning

Chorus

In the night wipe it clear

Spread it over the children so they are protected against disease

Chorus

I bet families plan for future use of bednets

Families plan for future

Chorus

When the rainy season comes

Let the same plan you give to crop production be given equally to bednet provision

Chorus

The products from the field are shared with people

Chorus

The crop growing in the field grows very wonderfully as seen already

Chorus

Leaving your child at home with open bednets
You spend all your time in the rice fields
Mosquitoes biting until daybreak
Chorus

At the time of enjoying our product
That's when malaria comes
Chorus

If your child is infected with malaria
You will not go for harvesting in the rice field
Chorus

The lot of rice in the field
If Allah doesn't help you
Monkeys and pigs take away
Chorus

If Allah doesn't help
You find all your rice eaten by pigs
Chorus

The way you protect your crops
Protect your children and the whole family will be safe
Chorus

Then you can relax and the health workers can relax
Chorus

Let's compare last year and this year
Malaria has not too many unconscious people
Chorus

I bet families plan for future

Parents, families, plan for future use of bednets

Chorus

I bet families plan for future

Parents, families, plan for future use of bednets

Chorus

Time past, most people are admitted to the health centre or hospital

Chorus

Daily you people are getting transport fro your sick child

Chorus

When I was cooking lunch the child with me had a fever

I washed her body

Before getting ready she fell unconscious

Chorus

People say its devils or evil

But her time was up

Chorus

But now last year and this year when we join

People fight against mosquitoes

Chorus

Aaaah, plan for future use of bednets

Families, plan for future use of bednets

Chorus

Malaria is a disease that mostly affects pregnant women and children equally

Chorus

When a pregnant woman at 4 months is affected by malaria

Your pregnancy may spoil and the child may die

Chorus

An infected child is not like any other child

Chorus

Anytime you attend the nurse it has a low weight

Chorus

Let's compare a protected pregnant woman and a pregnant woman who is not protected

After delivery the health of the 2 children will be different

Chorus

I bet families plan for future

I bet families plan for future use of bednets

Chorus

Now for any sickness you are the cause

Since they talk about it on the radio, television and even in the towns and villages

Chorus

Every platform in the village has a poster

Child sleeping under a net

Children are not the same

Chorus

At which you did not ask for a butut (nothing)

Just to wipe the net clear and tuck over your child

For your and your child's safety

Chorus

Then nothing should cause mosquitoes to bite your child

Chorus

I bet families plan for future use of bednets

Families plan for future use of bednets

Chorus

I bet families plan for future use of bednets

Families plan for future use of bednets

Chorus

I bet families plan for future use of bednets

Families plan for future use of bednets

Chorus