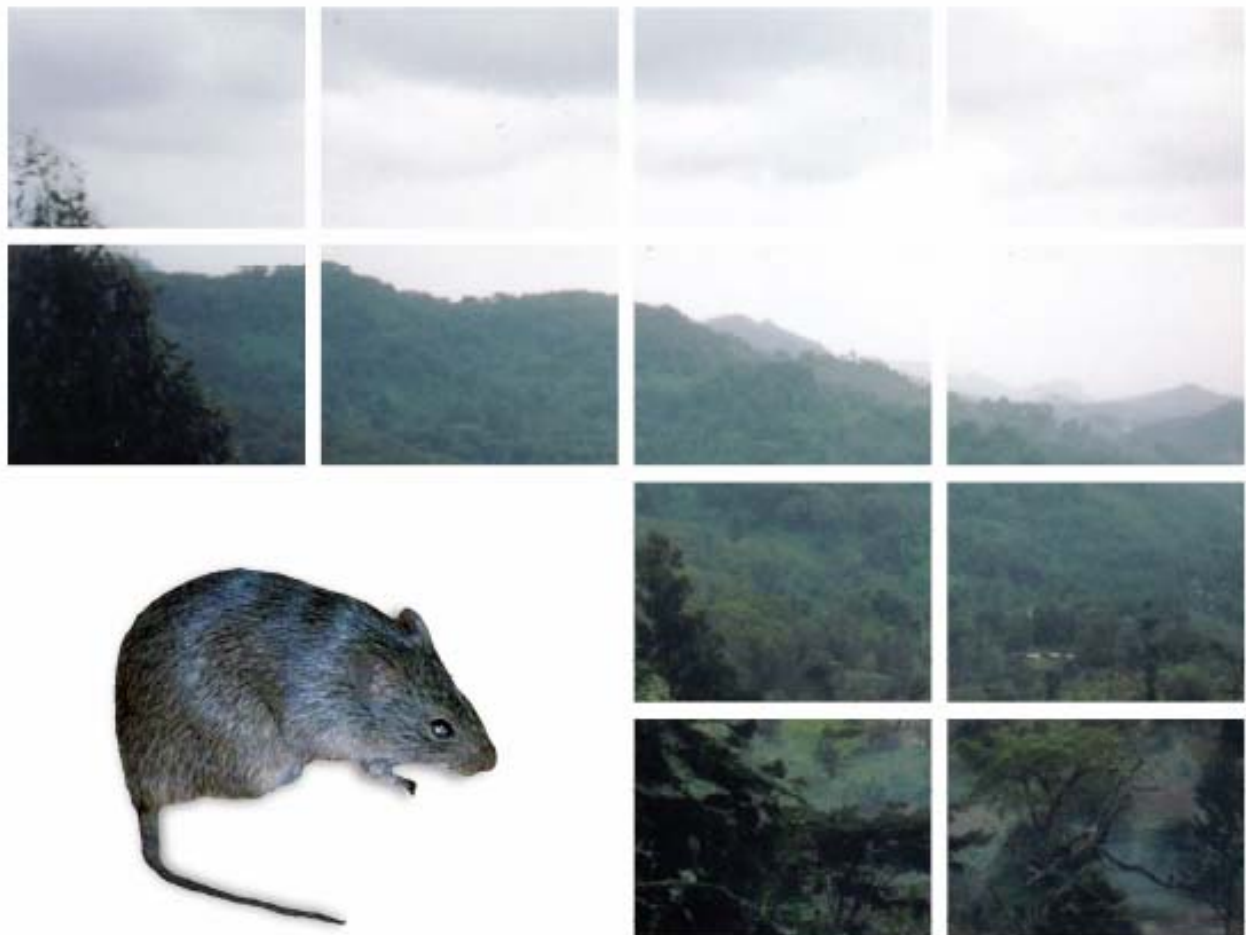


The RATZOOMAN Project
Social Anthropological Study: 3
NRI Report: 2779

**Perceptions and Practices relevant to the
Transmission of Plague, Leptospirosis
and Toxoplasmosis**

Lushoto, Tanzania

October 2004



Dr. Monica Janowski (Natural Resources Institute, University of Greenwich, UK)

Dr. Flavianus T. Magayane (Dept. of Agricultural Education and Extension, Sokoine University of Agriculture, Morogoro, Tanzania)

Dr. Edmund J. Kayombo (Institute of Traditional Medicine, Muhimbili University College of Health Sciences, Dar es Salaam, Tanzania)

Fieldwork carried out by Dr. Edmund J. Kayombo, Dr. Flavianus T. Magayane and Ms. Devotha Mushi

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1. Introduction

The study on which this report is based forms part of a project funded by the European Union, RATZOOMAN, which focuses upon the prevalence and transmission to humans of three illnesses: plague, toxoplasmosis and leptospirosis. As part of the project, studies of various kinds are being carried out in a number of field sites in Tanzania, Mozambique, South Africa and Zimbabwe, including social anthropological studies.

While some field sites have been selected to reflect different types of ecosystem or settlement pattern, which could be related to prevalence or transmission of any of the three illnesses on which RATZOOMAN is focusing, Lushoto was selected primarily because it is a site where plague is known to occur. Because of this, this study has focused upon practices and perceptions relating to plague, although some data was also gathered on those which could be relevant to the transmission of toxoplasmosis and leptospirosis.

Of the three illnesses studied through the RATZOOMAN project, plague is the only one which is definitely known, from district statistics as well as discussions with community members, to have occurred in the district. There is no medical data relating to occurrences of leptospirosis or toxoplasmosis, although they may well occur. 7869 cases of plague with 630 (8%) deaths had been reported between the time when statistics began to be kept in 1980 and December 2002 (DMO 2003). These figures suggest a high prevalence of plague in the district; because some of the plague cases and deaths are not reported to the relevant health authorities, the prevalence is likely to be even higher. However, it is important to note that only a limited number of the cases reported to have plague were subjected to confirmatory diagnosis of the causative agent.

1.1 Plague in Tanzania

Plague has been endemic in Tanzania for well over a century. The disease may have been introduced into the country through Uganda and Kenya long before the arrival of European missionaries, explorers and administrators. Its spread appears to have been facilitated by slave and ivory trade caravans which usually started in Uganda and went eastward through the hinterland of Kenya to Mombasa, and southwards to Tabora and Ujiji in western Tanzania, and then across the hinterland of Tanzania to the coast (Gray, 1947). Some routes ran from northern Tanzania through the Kilimanjaro area to Mombasa (Msangi 1968). Most of the currently active and quiescent foci of the disease in Tanzania are found along these ancient trade routes (Kilonzo and Msangi, 1991).

The first reliably recorded outbreak of human plague in Tanzania occurred in Iringa in 1886 (Roberts, 1935; Davies et. al, 1968). However, the disease was already familiar to villagers in several parts of the country at that time, and vernacular names as well as traditional control strategies already existed. These names included *chambafu*, *shambafu* and *rubunga* in Iringa, Njombe and Kagera respectively. Control measures were practised including burning

of dwellings where the disease occurred regularly, killing of rodents by mechanical methods and isolation of plague patients.

The former head teacher at Ubiri Village, who was at Kingokho, ten kilometres from Shume where plague is believed to have occurred for the first time in Lushoto, and Mr. Issa, an elderly informant in Lukozi, told the research team involved in this study that plague in Lushoto occurred earlier (probably in the mid 1970s) than the date which is documented (1980).

According to the information available at the district level, 48 sub-villages in Lushoto had cases of plague between 1986 and 1995, and some 4,057 clinical cases were reported of whom 308 (7.6%) died of the disease. The most badly hit sub-village was said to be Manolo, where 714 clinical cases with 42 deaths were reported during the 1986 to 1995 period.

Kilonzo et al (2003) argue that the introduction and spread of plague may have been due to the impact of heavy deforestation that took place in 1960s, mostly for agriculture but also for residential purposes. Such activities interfered with the natural habitat of forest rodents and consequently forced the rodents to seek alternative residence in fallow fields, thus facilitating close contact with human beings.

In recent years (1990s) it is only Lushoto, Singida and Karatu districts that have experienced plague outbreaks and, of these districts, Lushoto has experienced a disproportionately high incidence of the disease. This has persisted for nearly 17 years. Efforts to curb plague in Lushoto through conventional methods, including control of vectors and reservoirs, chemotherapy and chemoprophylaxis, enforcement of sanitation improvement as well as health education, have been applied every year for more than 16 years. Community-level motivation sessions by a multi-disciplinary District Plague Prevention and Control Team (DPPCT) are used to attempt to ensure that all factors identified as responsible for the persistence and repeated outbreaks of the disease in the district are well understood by the relevant communities and addressed, so that appropriate measures to prevent escalation of an outbreak are implemented promptly and adequately. Nevertheless plague persists in the area.

1.2 Lushoto District

Lushoto District is one of the six districts of Tanga region and is situated roughly between 4°38' to 4°57'S and 38°29' to 38°37'E. The district has a total land area of about 3,500 sq. km. It is bordered by Kilimanjaro region to the northwest, Korogwe and Muheza districts to the west and south respectively, and Kenya to the east. The District is mountainous with meandering valleys and an elevation that ranges from 500 to 1700 metres above sea level. It has a montane climate with a maximum temperature ranging between 20°C and 25°C and a minimum temperature range of 15°C to 21°C. Rainfall is extremely variable, ranging from 12mm to 1500mm per year. Lushoto is covered with forests and has a number of indigenous protected forests. It is administratively divided into 4 divisions, 21 wards and

230 villages. (Planning Commission and Regional Commissioner's office Tanga 1997)

Lushoto district had in 2002 a total population of 419,970 of whom 54.3% were women (2002 Population Census). The population profile is young, with 48% aged under 14. Population density is 120 per sq. km. (Planning Commission and Regional Commissioners office Tanga 1997). The Wasambaa constitute the largest (78.3%) ethnic group, is followed by the Wapare (14%) and other minor groups, including the agro-pastoral Wambugu. Smallholder farming is the main economic activity for the majority of households, and vegetables, Irish potatoes, and fruits are among the main cash crops. Maize, cassava, beans, sweet potatoes, and plantains are the main food crops grown in the district.



Figure 1: The location of Lushoto District in Tanzania

1.3 Methodology

Fieldwork was conducted by three researchers between December 2003 and January 2004. One week of the study time was set aside for familiarization with the authorities of the villages and the study sites, with selecting key informants and planning the study. The rest of the time was devoted to participant observation and informal interviews. For each key informant household selected, one day was devoted to discussions, in-depth interviews, and observation within the household. Discussions were normally held with the male head of the household and his spouse where possible. Additional information was obtained through discussions with village local authority staff, traditional healers, district officials and village health attendants.

Details on the findings are presented by village and by individual household in Annex 1.

1.4 Selection of study villages

In order to attempt to differentiate between villages which have experienced different levels of plague, three villages in Lushoto district were selected for study: Ubiri in Lushoto Division, Lukozi in Mlalo Division, and Mbuzii in Soni Division. Ubiri is a village that experienced plague until 1990 but has not been affected since; Lukozi has experienced high levels of plague within the last ten years; and Mbuzii has had low levels of plague since 1980 (it is recorded as having had no plague but we found that there had in fact been a few cases of pneumonic plague at Sunga sub-village in 1990, thought by the Village Executive Officer to have been brought by businessmen; there have been no cases since then). All these villages are big and have many sub-villages (*vitongoji*) (Table 1). The sub-village of each household selected is indicated in the appendix.

Name of village	Plague status	Number of sub-villages	Estimated population			Number of informants selected
			Male	Female	Total	
Mbuzii	Very little plague	16	1 938	1 815	3 745	14
Ubiri	Plague until 1990	16	864	1 012	1 876	15
Lukozi	High level of plague	9	-	-	5 730	14
Total		41	2 802	2 827	11 351	43

Table 1: Study villages, plague status and number of informants selected

1.5 Selection of informants

With the help of village authorities and the village health workers, a total of 43 households were selected in the three villages, using a multistage sampling technique to ensure that every part of the village (i.e. sub-villages) was represented. Within each village, 15 households were selected as key informants, representative of the following differentiating criteria:

- High, medium and low socio-economic status (assessed primarily by quality of housing)
- Relative levels of exposure to plague within the household, including, where relevant, households with members who were immediately taken to clinic for treatment, households with members who were not taken to clinic, and households in which some members died of plague.
- High, average and low levels of hygiene
- With and without cats
- With different types of house structure
- With different sources of water (standpipe, river, stream) for domestic use, for washing of clothes and for bathing
- With different types of storage structure for water
- With different types of crop storage

The intention was to cover socio-economic characteristics differentiating households as well as characteristics and behaviour relevant to plague and to the potential transmission of toxoplasmosis and leptospirosis.

The location of the key informant households in Mbuzii and Ubiri (but not of those in Lukozi) is marked on the maps of the villages which are included.

Distribution of informants by socio-economic status				
Socio-economic status category		Number		
High		12		
Medium		11		
Low		18		
Total		41		
Distribution of informants by age group and sex				
Age group	Male	Female	Total	
<20	1	-	1	
20-29	6	-	6	
30-39	1	4	5	
40-49	9	2	11	
50-59	4	4	8	
60 and above	8	2	10	
Total	29	12	41	
Distribution of informants by village by household size				
Household size	Lukozi	Ubiri	Mbuzii	Total
1-3	1	3	2	6
4-6	7	9	7	23
7-10	4	3	3	10
>10	1	-	1	2
Total	13	15	13	41

Table 2: Characteristics of informants

2. The study villages

2.1 Mbuzii village

The area in which Mbuzii village is situated consists of heavily incised, dry deep valleys. Settlements are on the ridges of the Usambara Mountains. The

Ubiri village is very close to Lushoto town, on the way to Tanga. It is situated in an area of sharp and undulating hills, with small plateaux scattered here and there within the inhabited area. In contrast to Mbuzii, the village has one main river flowing across the village. The valleys of Ubiri are fertile and most of them are under intensive gardening. The Lushoto – Dar-es-Salaam road goes through the village, providing access to means of transport to Lushoto or Dar-es-Salaam and the possibility of selling vegetables. Nearly every house in Ubiri has a cow; all cows were under the zero grazing system, as in Mbuzii.

Ubiri village has 16 sub villages, divided for administrative purposes into three zones: the Western, Eastern and Central zones. It has a total population of 3 753 people, of which 1 930 are reported to be males and 1 815 to be females. Whereas in Mbuzii settlement is only on the ridges, settlement in Ubiri is on the ridges, small plateaus and along the slanting valleys.

Plague in Ubiri

Plague broke out in Ubiri in 1990 in the sub-villages of Handeni and Kiguzu. Two of the cases died while four survived. Following the plague outbreak, the Lushoto – Dar-es-Salaam road was closed to stop the further spread of plague. In addition, all of the houses in the village were fumigated and cleaned and people were made to sleep in beds rather than on the floor where they were more exposed to fleas. It was a hectic period that people still remember clearly. Since that time Ubiri has not suffered from plague.

Villagers in Ubiri told us that they believe that their village is not likely to develop a serious rat problem, and believe that this is why they do not have much plague. They argued that the weather in Ubiri is not conducive for rats with fleas. They also expressed the belief that the persistence of plague at Lukozi and Shume results from the fact that harvested crops are stored in houses, which therefore attract rats/rodents that search for food. In Ubiri, however, a large proportion of the crops are sold at harvest and are not stored in houses, which, they said, rules out rat infestation, as there is less food for rats in houses. The small amount of crops brought into homes is, they said, consumed within a few days.

In fact, the research team observed that rat infestation in the area was common, and households do in fact store a significant amount of crops in the houses. However, villagers argued that these are house rats which do not carry plague. They believe that it is only rats from the forest which carry fleas with plague, and pointed out that there is no forest nearby to act as a source of rats with plague fleas.

Despite what researchers were told at the formal meeting – that people believe that forest rats are the source of plague – individual households expressed different views. It seems that there is no clear consensus in Ubiri as to what people believe regarding the way in which plague is transmitted. 50% of the households could not explain how one can be infected with plague. For example, some said the cause of plague was the presence of the dog or eating cold food.

It is also to be noted that a significant number of the key informants interviewed could not mention even one symptom of plague. This suggests that there is a low awareness about plague in the village.

2.3 Lukozi village

Village statistics showing the total number of people in Lukozi were not available. However the ward executive officer estimated the population to be about 5,730 people. Lukozi village has 9 sub-villages with a total of 1,146 households. It is administratively divided into four parts: Viti road, Mlalo road, Lushoto road and Lukozi *mjini*.

It is notable that Lukozi was a forest until about 20 years ago, when people moved in and settled along the valleys, where clusters of human settlement developed. Remnants of forest can be seen here and there around the village. The village is in a large basin surrounded by ridges of forest. Settlement in Lukozi follows the river valleys, by contrast to settlement patterns in Ubiri and Mbuzii, where settlement is on ridges. The village has fertile land with adequate water throughout the year. Farming in Lukozi is intensive and the valleys are always green with vegetables. Symptoms of land shortages can be clearly seen. These include cultivation on steep slopes, at the margins of the forest and farm fragmentation.



Figure 4: Sketch-map of Lukozi village

Plague in Lukozi

Lukozi has experienced one of the highest levels of plague in Lushoto district, being in the top ten in terms of incidence. Mr. Issa, an elderly person in the village to whom the research team was referred as a guide and informant by the village authorities, told the team that plague is believed to have been brought by a man from Upare who came to Mkungu sub-village between 1970 and the 1980s, from which the disease spread to the whole of Shume area in Malindi ward and then to Rangwi area in Mtae ward.

Mr Majid is the community health worker for Lukozi village and he accompanied the fieldwork team during data collection. He provided plague infection statistics for Lukozi village, which are presented in Table 2 below. It is notable that the age group 8-15 is the most affected age-group. Within this age group slightly more boys than girls have had plague. In fact many informants told the team that boys are significantly more likely to contract plague. This is probably because boys do not stay with their mothers but are more likely to stay in *bweni* dormitories, where conditions are very favourable for rat infestation and hence plague (see discussion of factors related to the transmission of plague below).

Children infected with plague by age and sex			
Age group	Female	Male	Total
0-3	5	9	14
4-6	11	9	20
7-9	14	9	23
10-12	15	23	38
13-15	10	8	18
Total	55	58	113
Adults infected by plague by age and sex			
Age group	Female	Male	Total
16-30	17	10	27
31-45	1	2	3
46-60	1	-	1
Above 61	3	1	4
Total	22	13	35
Number of plague patients by sub-village		Number of infected persons	
Name of sub-village			
Kwezizi		45	
Ndabwa		21	
Mkatano		21	
Tiku		17	
Kwenkaga		16	
Makanya		13	
Kwemunyu		8	
Lukozi		7	
Chamkwavi		4	

Table 3: Plague infection statistics for Lukozi village, 1995 – 2003

3. Lushoto District: concepts of hygiene, food preparation and storage and water sourcing and storage

Informants in all three villages were asked what they thought constituted good hygiene, about what constituted a good housewife and a good husband, about their food preparation and food storage habits, and about their sources and storage habits in relation to water. There were no significant differences between answers from the three villages.

In relation to what constitutes good hygiene, emphasizing a well-built house, preferably built of brick. It should be well plastered with no crevices and it should have a good floor. Informants placed a particular emphasis on tidiness and a well-kept household, in the local view, has an uncluttered and tidy environment outside and inside. A number of the informants said that bushes should be removed from around the house, but it is difficult to know whether this was because they had been told that this should be done by the health authorities, to reduce harbourage for rats, or whether it is related to local concepts of a tidy environment around the homestead.

Rats are seen as dirty and as an indication of a dirty household, and households of higher status appeared keen to emphasise that they do not have rats. However, many households, particularly poorer ones, seemed to accept the presence of rats, seeing them as a nuisance one has to live with, particularly during the dry season when there is little food in the fields for the rats. Many said that they occasionally buy rat poison but could not do this often because it is too expensive, and that as soon as the poison is finished the rats come back.

Cats were seen roaming about but only about a quarter of households said that they owned a cat. It is probable that many are semi-wild. Many households said that cats do eat human food, and rats also do this. Most said that they throw the rest away if this happens, but it is probable that they do not in many cases; one household admitted that they would not throw away a chicken that had been partially eaten by a cat, because it is too special and valuable.

Cleanliness was much emphasized in discussions about what constituted a good housewife. Women are responsible for food preparation, for all cleaning and for childcare. A good housewife should keep her house and her utensils, her own body and clothes, and her children, clean. Some informants said that she should wash bedding regularly and should regularly put the bedding out to air in the sun, although they did not say whether this is related to removal of vermin such as fleas.

Some households clearly made efforts to stop rats and cats from reaching cooked food. Households of higher status and a higher socio-economic level had cupboards which appeared rat- and cat-proof; these were generally households which also had less cluttered rooms and therefore fewer rats.

A good husband was said by some informants to be one who makes sure that the house is well plastered and painted and ensures that the floor is also

plastered. However other informants seemed to see the responsibility of keeping the house plastered as that of the wife, and said that it was shameful for a man to plaster a house. Yet others said that this is a job which should be shared.

Having a pit latrine was mentioned by some informants as a mark of good hygiene. However this was practically always mentioned after prompting by the research team members. It did not seem to be a priority for most households. However, washing one's hands after using the latrine *is* considered important locally since the people of the area are Muslim and Islam demands hand washing after using the latrine, and presumably because of this many people mentioned the importance of water being available in the latrine to wash their hands. Availability of water was in fact considered very important, and was cited by many informants, especially those who have difficulties in getting water, as the foundation of good hygiene; one informant said that *usafi ni maji* (hygiene is water). Details regarding the collection, storage and handling of water are provided below in the section dealing with practices related to the transmission of leptospirosis.

4. Perceptions and beliefs in Lushoto District relating to rats and to the source and transmission of plague

As already mentioned, rats are perceived to be an indication of a filthy environment in the Lushoto area and it is therefore shameful for a household to have rats. When touching rats, informants said that one has to be careful not to make contact with blood from the rat, the rationale being that in the Islamic faith blood is not supposed to be touched by human beings and when one accidentally comes in contact with blood, one needs to clean oneself thoroughly.

A number of varieties of rat were identified by informants. Informants in Mbuzii identified two main types of rats: homestead rats called *ngoshwe* and field rats called *ngitu*. The field rats were said to be larger in size and to bite humans, which is never the case with homestead rats. Informants occasionally however, one informant in Mbuzii said that there are black rats, which are the ones used in witchcraft. In Ubiri informants said that plague is caused by forest rats called *panya puku*. In Lukozi, one informant mentioned a big rat called *puku*, as well as small domestic rodents called *mapinje* and *pare*. Most Lukozi informants said that there were two kinds of forest rat, one called *nitu*, the same name as used in Mbuzii, and another called *mphuka*, which is said to have a long mouth. They said that the ones found in houses are called *ngoshwe*, using the same name as in Mbuzii. Yet another informant in Lukozi mentioned a white variety of rat from the wild, probably the forest, which he believes carries plague, and which likes dirty environments. This is probably either *nitu* or *mphuka*.

Locally, plague is described as *tauni*, in Swahili, by health personnel. However, plague symptoms are often considered by Lushoto people to be symptoms of two illnesses believed to be caused by witchcraft, which are described as *kuvunja vyungu* and *usinga* (Kilonzo and Mhina 1982).

Perceptions in the study villages about what plague is, where it came from and how it is transmitted were found to be complex and multi-stranded. There appear to be two main strands of perception relating to the source of plague: one is that it came via rats and the other is that it was brought in by a person or persons. Related to this, there are also two strands of perception regarding the way in which plague is believed to be transmitted, which probably co-exist in the minds of many people. One is that plague is transmitted via witchcraft; the other is that it is transmitted by rats (with or without the perception that this occurs through fleas; many people said that plague could be caught through eating food which a rat with plague had partially consumed). These perceptions can, it was found, co-exist, if it is believed, as many people do believe in Lushoto, that rats carrying plague can be sent by witchcraft.

When people contract plague, they tend to go initially to traditional healers because they think of the disease as being either *kuvunja vyungu* or *usinga*, which they believe can only be treated by traditional healers and not by hospital personnel. *Kuvunja vyungu*, which literally means 'breaking pots', is related to the belief among the people of Lushoto District that a woman, when annoyed, can cause the deaths of individuals designated by her as well as her own death. The source of anger is in most cases her husband, but occasionally the source can be her relatives. She takes a cooking pot, tells the pot what she wants (*kunuizia*), whom she wants to affect and the symptoms of illness of each intended victim, including herself. She then breaks the pot, which is what is referred to as "*kuvunja vyungu*" or "*nyungu*" and that is the final stage of the process. This final stage culminates in the designated individuals falling sick with the designated symptoms for the illnesses. Victims of the process cannot, it is believed, be cured in hospital but only by traditional healers.

Some of the symptoms and outcomes of *kuvunja vyungu* are said to be similar to those of plague. An example of an outcome that is similar to plague is many deaths in a series in a household. Kilonzo and his colleagues have, in fact, come up with an additional classification of plague named *nyungu* or *vyungu*.

Usinga literally refers to the end part of a tail of a wildebeest - the long fur which traditional healers use for curing diseases or ailments. It is believed that this is used to send a charm that causes harm and suffering. The symptoms of the *usinga* illness may manifest as those of plague or in some other way depending on what the witch decides upon. *Usinga* can cause a series of deaths in the household and even among non-resident relatives if not attended by a specialist (a traditional healer) at once. *Usinga* symptoms are, like those of *kuvunja vyungu*, similar to those of plague.

Although the village executive officer told the research team that there is a clear difference between the symptoms of plague and those of *kuvunja vyungu* (he said that while the symptoms of plague include skin rashes, swelling of glands on the neck and the armpits, high fever and diarrhoea, with *kuvunja vyungu*, there is no diarrhoea and the patient loses a lot of water through sweating), it is clear that for local people the differentiation between the two illnesses is not that clear.

In fact differentiation between plague and illnesses caused by witchcraft is difficult from the local point of view, because an illness caused by a witch can, it is believed, take any form; the philosophy behind this is that the witch when sending the charm can instruct the illness to manifest as plague, thus confusing the caregiver and delaying the proper treatment (i.e. treatment from a traditional healer). This of course implies that it is safest to seek treatment from a traditional healer in case the illness is caused by witchcraft.

Traditional rulers called *zombe* are associated with the origin of plague. Even though the system of traditional rulers officially ended in the 1960s, one can still find traditional clans of rulers in some communities. In Ubiri village we learnt of the *zombe* (*jumbe* in Kiswahili), who is the traditional ruler. In the past, besides being a governor /ruler of the people, the *zombe* was believed to have the power to bring rain. In return he had to be given a contribution in kind, in the form of farm produce. He was also believed to have the power to punish those who broke the laws by asking the ancestral spirits to bring disasters like floods and plagues of rats to eat crops.

Tracing the history of plague, the village chairman of Mbuzii reported that there was a *zombe* whose people went to work on his farms at Shume. Shume being fertile, the *zombe* got a bumper harvest and his people began boasting. It appears however that his people in Shume did not pay the labourers who worked for them. The *zombe* became angry and used witchcraft to send rodents to Shume; and that was the beginning of a rat infestation in the area. Rodents were from that time (estimated by the village chairman to be between 1972 and 1974) onwards seen everywhere in the area, even during the daytime, eating all the available grain in the farms and that which was in the stores. People believed strongly that rodents were sent by the *zombe* and so they went to traditional healers for treatment. Many people died after receiving treatment from traditional healers, which prompted the government to take action.

There have been efforts since 1980 to inform the people of Lushoto, particularly of those villages, like Lukozi, which have suffered high levels of the disease, of the route of transmission of plague, with the aim of introducing changes in behaviour to reduce the likelihood of transmission. The Ecosystem Health Project on Plague, an IDRC funded project, has been active in the Lushoto area since 2002. The project uses the Eco-systems Health Approach to control plague through community participation and mobilization. In the areas where plague has occurred frequently, the EHP project has been particularly active and it was reported to us by the district authorities that everybody knows the symptoms of plague and the mode of transmission.

The health authorities and local community leaders in the villages studied have been very active whenever there is plague outbreak. A quarantine is always declared in the affected area, sanitation in all houses is enhanced during the outbreak, and stern measures are taken during the outbreak against those who do not follow sanitation rules and regulations. These measures were referred to by informants in Lukozi who have experienced plague themselves.

The efforts of the Ecosystem Health Project and of the health authorities have certainly had some impact. A very large proportion of informants told us that plague is brought by rats. Many told us that the belief that plague is caused by witchcraft, or that it is in fact *kuvunja vyungu* or *usinga*, is diminishing. This was the view of one of the sub-village chair-persons in Mbuzi regarding the transmission of plague:

“There are three types of rats: (i) those found in the houses, (ii) small rats [probably mice], and (iii) those found in the forest. It is the forest rats that are most dangerous. These rats infect the rats in the houses. The legs of the infected rats swell and they look as though they had elephantiasis. If the fleas from these rats bite people, the bitten person becomes infected with plague. The sub-village chairperson further reported that at first it was believed that plague is a result of witchcraft, and therefore that when someone becomes ill with plague, he or she should go to traditional healers for treatment. It was during that period that many people died of the disease. Later, as plague control interventions began and became popularized through public meetings and seminars, awareness about plague among people increased. Following the increased awareness, especially on the symptoms and the need to report to hospitals or health centres for controlling the disease, many more people dismissed the witchcraft notion of plague and reported to health centres, where immediate action led to recovery, which further dispelled the idea of plague being witchcraft”.

Based on what the authorities as well as many individual informants told us, it would seem that many people have accepted the message from the health authorities, which is that plague is caused by fleas brought by rats. However some informants, while they associate plague with rats, are not aware of the role of fleas. Although many people now believe that rats carry plague, many, particularly in Lukozi, interestingly (considering that this village currently has plague), believe that this is through food rather than through fleas. Many informants told us that this is the route of transmission.

Some of the informants said that rats which transmit plague have ‘twisted’ or ‘kinked’ legs, and that they stagger about and the fleas fall off them. In Ubiri, such rats are said to be the forest rats called *panya puku*.

Even though they accept that rats bring plague, it is likely that many, possibly most, people also believe, at the same time, that these rats are ‘sent’ by witchcraft rather than being attracted by dirty environments or by food. This is implied by the fact that people do not seem to have changed their practices in relation to reducing harbourage for rats or reducing levels of stored and cooked crops and food which could attract them. Even though informants are pretty well universally aware that the authorities believe that it is important to reduce the numbers of rats by reducing harbourage for them, it is not clear that they believe that this will work. Even though many people did tell us that plague is associated with lack of hygiene and a dirty environment, they do not behave as though they believe this. Possibly the reality is that those households which would act on this advice have already done so, since as we have seen cleanliness and tidiness, including well plastered walls and floors without cracks and an environment without clutter and rubbish are already

the ideal. Households which have not acted on this may well be those which did not conform to the ideal beforehand.

There are also other indications that people appear not to understand or go along wholeheartedly with the prevention methods which are imposed by the authorities. The research team learned that quarantine is often not properly observed, particularly in relation to traditional healers. They enter houses that are infected with plague very late at night and leave the place very early in the morning. In some cases patients are not disclosed because of the stigma which is attached to the disease. Households which had been infected with plague appeared to accept the research team only because it was brought by the village health worker; otherwise the research team felt they would not have been willing to meet with them or to disclose that they had had plague.

The research team found that there appeared to be connection between having had plague cases and having a clean area around the house. No marked difference was noticed between houses that had been infected with plague and those that had not been infected.

The research team felt that the people of Lukozi, which currently suffers from plague outbreaks, seemed to have become used to the disease and to feel that there was no point doing anything about it. The village health worker who accompanied the research said that controlling plague in the village was *kuzima moto* (fire-fighting – in other words you do something at the time and then just go back to normal life).

The same attitude was found to exist on the part of the village authorities. Mr. Majid, the village health worker in Lukozi, has the task of sensitizing the public about hygiene, of following up to ensure adherence to procedures to be followed during plague outbreaks, of providing healthcare for people who are infected with plague, and of ensuring that quarantine rules are followed promptly. Majid is the secretary of the health committee and he mentioned several measures that were proposed by the health committee that would curb the spread of plague. Some of the measures were fines for those who in one way or another violate regulations in relation, for example, to having latrines or pits for disposing domestic waste. However, he said that the village government was not supporting the health committee. He said that even though everybody was supposed to have a pit latrine, no measures were taken against them on being sent to the village government. The health worker told us that there is no systematic follow up to ensure the disease permanently has disappeared.

Beliefs in witchcraft as the cause of plague are still strongly held by most people and plague is particularly strongly associated with the illness called *kuvunja vyungu*, which is believed to be caused by witchcraft. The currency of the belief is indicated by what happened when there was an outbreak in Lukozi in June/July 2003, related to us by one informant, Mr. Issa. This was identified by the village health worker (and, he said, by Mr. Issa himself) as plague but was seen by community members as witchcraft. This delayed the patients being taken to the health services, with the result that one person died. Following the death of this person, medical personnel examined the

patients, diagnosed them as plague cases and accordingly instituted plague control measures.

Some informants were aware that there are different types of plague, and some were able to list these as bubonic, pneumonic and systemic. However they were not clear of the differences between them, and none mentioned the different routes of transmission or the fact that pneumonic plague is infectious. It is likely that people are somewhat confused as to the routes of transmission. Clearly the logic of quarantine is that plague is transmitted from person to person and for it to be accepted it is important that people realize that the route of transmission changes with pneumonic plague. However, only two informants told the research team that they believe plague to be infectious. It would seem probable that the message regarding the role of rats in transmitting plague has been the main message which has been successfully put across to villagers so far by the health authorities.

5. The treatment of plague in the study villages

Following many years of health education on plague, people's perception and therefore behaviour in relation to plague were reported by village authorities to have changed. The research team were told that while at the beginning plague was associated with *vyungu kuvungu* and *usinga*, which confined their treatment to traditional healers, it is now seen as being in the domain of modern medicine. They said that it is now relatively common to send plague patients to a modern clinic and not to traditional healers.

Nevertheless, as discussed above beliefs that witchcraft or cursing can be a cause of illness were still found to be common during the study period. The research team found that a number of plague cases had been sent to traditional healers for treatment. Kilonzo et al (1997) reported that 68% of respondents expressed the strong belief that healers could effectively treat plague. It is probable that few households neglect to try traditional healers, even where they also resort to modern medicine. It is very likely that many traditional healers in Lushoto District are involved in treating plague, knowingly or unknowingly. The story of Mr. Hoza's mother (household no. 9, Ubiri) is a good example of what is probably very common practice: here, a traditional healer was informally allowed to break quarantine by the village health worker so that he could perform rituals at the grave to remove what the family believed to be *vyungu*, and not plague.

The fact that there is no clinic in Lukozi is however almost certainly also very relevant in determining what relatives do when a household member becomes ill. They call a traditional healer not only because of the type of illness, but also because local healers are known, easily available, and close by. Traditional healers have for years been the main providers of healthcare to the community in which they live and will continue to play this role for some years to come in Tanzania. It was therefore imperative that their ideas about plague are taken into account. For this reason, in each of the villages selected for study one reputable traditional healer was selected and interviewed.

The three healers were Mr. Mwakagosi, living in Ubiri; Musa Shelukindo living in Mbuzii; and Mr. Salehe Mwambashi living in Lukozi. All three of them became healers after having been ill themselves for a long period; this is the usual preparation for becoming a traditional healer.



Figure 5: Traditional Healer Mwakagosi with his divination tools

Mr. Mwakagosi is about 60 years old. His father was a traditional healer. Mr. Mwakagosi claimed to be competent in two areas; dealing with sorcery and witchcraft (*tego* or *usinga, songo la ndani*); ensuring that businesses prosper well; infertility in both males and females; and mental illness. He told us that plague is caused by fleas coming from rats with plague, and the symptoms are swellings and boils in the genital area, the armpits and around the neck. Mr. Mwakagosi is known to have identified a plague case and referred the person concerned to hospital; he explained that he had, through divination, established that he could not treat the illness of this patient and had therefore sent her to hospital. It was the divination, he said, rather than the symptoms, which informed him that the patient should be sent to hospital. He said, however, that plague could be treated by traditional medicine, and that he had five medicinal plants that could be used (although he did not want to say what they were) which were prepared by frying until they become black, and then mixing them with oil; the resulting mixture is smeared over the whole body. He also had five other plants which could be taken orally against plague.

Musa Shelukindo is a traditional healer in Mbuzii village, aged 50 years, who started practicing traditional medicine in 1981. He claimed to be able to cure infertility, mental illnesses, paralysis, problems of the eyes and ears and liver problems. He told us that plague is associated with poor hygiene. The most

affected are children and women. The bedding of women and children tends to be dirty - a good place for the fleas. He also associates plague with the presence of forests and bushes close to the house. He said that plague is brought by fleas from the black rats called *ngitu*, which live in pit latrines. He listed the symptoms of plague as abdominal pain, diarrhoea, vomiting and swelling of the legs. He said that the disease could be treated using traditional medicine and that he had successfully treated two plague patients using traditional medicine. He did not refer patients to hospital. Four medicinal plants were used to treat the plague patients.



Figure 6: Traditional Healer Musa Shelukindo with his remedies

Mr. Salehe Mwambashi is a healer living in Lukozi. His father had been a traditional healer. He told us that he had converted to Christianity and that his bag of medicines had been blessed by the priest. The illnesses which he claimed to be competent in treating were infertility, bad breast milk in a mother and mental illnesses. He also said that he was able to remove evil spirits. He was well aware of plague. He said that the disease is brought by fleas from rats that have plague. The symptoms, he said, include diarrhoea, vomiting and swelling of glands at the armpits and on the private parts. He told us that plague could not be treated by traditional medicine, and that a patient suffering from plague should be immediately referred to hospital.

Given the fact that plague occurs in Lukozi at the moment, it is interesting to note that, of the three healers interviewed, it was only the healer in Lukozi who was clear that he should not attempt to treat plague; he may have learnt from experience that if he tries to treat plague his patients die, or he may have been exposed to more information from the health authorities. It is not possible to say definitely that he does not in fact attempt to treat plague, however, since he is probably aware that the authorities do not believe that he should be treating plague and might therefore not want to admit that he does.

Lukozi village has no health facility, and has little in the way of medical stores. People therefore have to resort to health care to traditional healthcare practitioners or self-medicate using drugs bought from small shops, even when they would prefer to seek help at a clinic. The lack of a health facility can lead to delay in reporting or failure to report cases of plague to the appropriate health authorities for prompt treatment and appropriate control measures. One informant in this village gave the view that the village health workers and those who sell the drugs from small shops in the village “are taking on the role of doctors and they try to treat the patients with inadequate doses; this delays the patient getting proper treatment [at the clinic]”. Similar observations by informants have been reported by Kilonzo and his team (2003).

Traditional healers clearly have an important in current treatment for plague. They may also, however, play a role in the spread of plague. As has already been mentioned, quarantine is often broken so that healers can enter the house. Patients with plague being treated only by traditional healers are not isolated and these patients are in contact with many people. We witnessed this at the house of Musa Shelukindo, who had more than 30 patients who came to consult him during the study period. If one of his patients were to have pneumonic plague, many of these people could be infected with plague and would in turn spread the infection to other people in the village and eventually to people throughout the district. Important as they are in providing healthcare in rural settings, the involvement of traditional healers in treating plague cases may contribute to the persistence of plague in villages that are infected with the illness.

6. Practices relevant to the transmission of plague

Very few houses whose members were interviewed during the study were rodent-proof. Informants reported having many rats and the research team noticed many rats in and around the houses.

However there were differences between households of low, medium and high socio-economic status. Having a neat and tidy homestead inside and out, built of brick, well-plastered and without bushes or garbage outside, does appear to represent the ideal as far as local standards are concerned, and higher status households tended to conform to this. In all three villages, houses of medium and low income households tend to be closer to each other than those of higher income households, and this facilitates the movement of rodents and fleas from one house to another. Houses belonging to many poorer households interviewed were found to have wide cracks, holes and rough floors and walls through which rats could enter and in which fleas could find harbourage.

Households of a high socio-economic status, and some households with a medium socio-economic status, stored cooked food leftovers in cupboards situated in the sitting rooms or kitchen, which were relatively rodent-proof, while households of a low socio-economic status kept the leftover food in places which rats could reach more easily: inside buckets, on top of cooking stoves, or on tables in the kitchen, sometimes uncovered. Households of a

higher socio-economic status also tended to have cleaner, less cluttered kitchens, which would be less likely to attract rats.

Households in all three villages, and of all socio-economic levels, had practices which allow rats harbourage outside the house. In all cases waste was disposed of relatively near the house, attracting rats. Most households of a low socio-economic status disposed of waste on open ground near the house, while households of medium or high socio-economic status disposed of waste in pits. In general cow dung was not removed from around the house, where it gets mixed up with left-over fodder brought for the zero-grazed cattle and provides harbourage for rats. A shrubby plant locally known as *mnywanywa* is often planted close to the house, especially along fences, and this also provides harbourage as well as breeding sites for rodents, and serves as food for the rodents when there is little stored grain available.



Figure 7: Maize tied in trees for storage, a practice which attracts rodents

Kilonzo et al (1997) found that in Lushoto 91.5% of respondents stored crops above the ceiling and/or on the floor, which would attract rats to the house. Storage and cultivation practices in Lukozi village seem to be particularly likely to attract rats. The area is, as already discussed, fertile, but land is short; this means that fields are often close to houses. In Lukozi, crops are sometimes stored tied to trees near the house, which will also attract rats. It is possible that higher levels of stored food and the proximity of fields to the houses may be attracting more rats in Lukozi. In Mbuzii village, by contrast, a little of the crop is stored, and there may therefore be fewer rats.

Although many informants were aware of the fact that the authorities wanted to reduce harbourage for rats, it was found that there is actually very little attempt in any of the villages to put into practice the recommendations regarding reducing harbourage for rats or fleas, or for reducing exposure to rats and fleas, particularly on the part of women and children. However, there

was more evidence of attempts to follow the recommendations in Lukozi than in Mbuzii and Ubiri, which may well be related to the fact that there continues to be plague in Lukozi and that the village health worker makes attempts to enforce regulations intended to reduce transmission, and to educate people.

Lukozi villagers make more efforts to plaster their walls, which reduces fleas, than do the people of Mbuzii and Ubiri; however it must be recognized that there is more water available in Lukozi. It is very difficult for households to put this into practice in Mbuzii and Ubiri, since there is a serious shortage of water in Mbuzii, and many households in Ubiri also have very difficult access to water. Households in some parts of Ubiri have to travel long distances to collect water and stay for hours waiting for water from springs.



Figure 8: Women in the Northern zone of Ubiri waiting for water to collect in the well so that they can fill their pails. They have been waiting for more than six hours.

In all three villages there exists a practice of boarding out both boys and girls from the age of 6 or 7 upwards in dormitories called *bweni*, which is probably a key factor responsible for the fact that children above that age, and teenagers, have a high incidence of plague. Boys in particular are likely to sleep in *bweni*. These are usually constructed near a grandmother's or grandfather's house. Although the village executive officer reported that the practice was less common than in the past, it is clear that it is still practised, apparently more often on the part of poorer families. He stressed that in the *bweni* it is usually dirty, crowded, there are no windows and it is not a good place to stay. There are chances of contracting diseases. One informant (Mr. Mark from Mbuzii) told the research team that the reason for sending children to *bweni* is limited sleeping space in houses as most houses used to be small in relation to the number of household members. In recent years, he said, people have not sent their children to *bweni* so often because most of them have big houses and a room for the children and that room acts as *bweni*. However,

poorer households are less likely to have enough sleeping room and therefore it is these households which continue to use the *bweni* system.

The village committee member from Lukozi told the research team that in Lukozi there are separate *bweni* for boys and for girls. Related children, or friends, from different households usually share a *bweni*. Children living in *bweni* sleep on grass or sacks full of pine needles, which attract rats, and in crowded conditions; it was reported that three to four and sometimes more than six children sleep in each hut. Boys are more likely to be sent to sleep in *bweni* than girls. They are invariably occupied by boys from usually more than one family. Since boys are not used to cleaning houses, the *bweni* more often than not becomes untidy, thus encouraging rats to take residence.

Mr. Shelukindo, one of the traditional healers whom we interviewed, told us that he has not sent his children to the *bweni* because most of them are dirty, and children often urinate where they sleep. He declared that such 'dirty' behaviour attracts insects, including fleas. Mr. Shelukindo said that the children's clothes may have fleas and when a child goes to his or her mother the fleas may bite the mother too. This, he felt, explains why children and women are more affected by flea bites than men, and why they get plague more often.

The fact that women are more likely to sleep on the floor than men, with their small children, is a very important risk factor in relation to transmission of plague, since they are in contact with rats and with fleas from rats more than men, who are more likely to sleep on beds. Women sleep on simple bedding materials such as mats, pieces of sack or rugs laid on the floor. At births, deaths and weddings, in particular, most women sleep on the floor at the hosts' house; this was mentioned by informants in Lukozi as a reason why they get plague more often than men. As is shown in the table above, there is in fact a higher incidence of plague in Lukozi among adult women than adult men (22 cases among women, and 13 among men).

Villagers told the research team that fleas are a big problem within their houses between June and December. This is the period when there are no crops in the fields, and rats are therefore forced to move to homesteads in search of food. Children are said to be the ones bitten most by fleas, possibly because children sleep on floors and their rooms are overcrowded, particularly those who stayed *bweni*. Children from households with a high socio-economic status were found to be less likely to sleep on floors and therefore less likely to be bitten by fleas than those from households with a low socio-economic status. Moreover, allocation of a household to a socio-economic status was based largely on good housing, which meant that it was constructed of modern building materials and was cleaner. This type of household would be less likely to have their children sleeping on floors.

Use of insecticides to control fleas and of poison to control rats was widely said to be practiced by informant households. However it is likely that many, especially those of a low socio-economic status, actually rarely buy these and simply put up with infestation. Many households said that they could not afford to keep buying poison and insecticide.

Since having rats is seen as considered shameful it is likely that their presence is under-reported in the data. It was noteworthy that very few households of higher socio-economic status admitted to having rats. This is partly because such households clearly do make considerable efforts to eliminate rats, but it is likely that they would not admit that they had them even if they did. It seems likely that poorer, lower status households are less likely to be concerned about them, and less worried about admitting to their presence as well, because they do not have as much to lose in terms of social standing.

7. Practices relevant to the transmission of leptospirosis

The presence of significant numbers of rats in houses and around houses is relevant to the potential for transmission of leptospirosis. The fact that rats have easy access to houses, to stored crops (particularly in Lukozi and Ubiri, where crops are stored more) and, especially in poorer households, to cooked food left out, means that it is quite likely that rats are urinating on food and licking hands and bodies of sleeping people, and that they could be transmitting leptospirosis.

The local culture favours bathing at home rather than in rivers. In any case, there are very few rivers in the study area and even if it was acceptable, culturally, to bathe in rivers, it would not therefore be a common practice. However, women and children are more exposed to river/pond water due to the fact that women and children are responsible for fetching water for the rest of the household members. Quite a few informants said that children, especially boys, bathe in the streams, and women wash clothes there. Some men were said to bathe in streams on their way home from the field, and in some sub-villages women too were said to do this sometimes.

Water is fetched from a variety of sources, ranging from standpipes (which often deliver water for only a small amount of time and irregularly) to streams, rivers and springs. Some households said that they get water from the Soni falls, which is probably purchased. Women normally go for water, with the help of children. It is usually collected in a number of trips every day or every few days, to fill the household's water containers. In Lukozi, men assist with water collection since water is only available at night because of the sluggish flow. Water is usually brought either every two days or every couple of days to the house. A number of trips are made to fill the household's water containers.

Water is kept in a variety of containers, including large plastic tanks, smaller plastic containers, buckets and traditional pots. These vary a great deal in how they are covered and how rodent proof and cat proof they are. Mr. Shelukindo, a traditional healer who was one of our informants, said that most women do not cover water stored in the house. Rats could therefore gain access to this.

Most households said that they clean out the water containers before refilling them, but it was observed that some containers appeared to contain water that had been there some time and that the containers had not been cleaned. A

good proportion of households said that they boil water for drinking, but this may not be reliable since it is clear that they know that the authorities think they should boil it and therefore they may have told the researchers that they do so when they do not. Some households said that they use water from streams only for washing, and use standpipe water for drinking.

A quarter to a third of the households interviewed said that they boil drinking water. Some only boil their water if there is an outbreak of disease. A number of informants said that they do not believe it is necessary to boil water from local streams and springs since these have been used by their forebears for many years without anyone coming to any harm. No households appeared to use treated water for washing fruit and vegetables, although they knew that this was recommended by the health authorities.

Almost all households said that they eat from one or a few common plates, with all household members sharing this. This could be a risk factor for the transmission of leptospirosis if one member of the household has touched water which is contaminated. Many households also said that they share food with neighbours.

8. Practices relevant to the transmission of toxoplasmosis

People in Lushoto do not eat rodents; they say that rats are considered dirty by the Islamic faith. Most informants said that they eat meat infrequently, a couple of times a month. Some households in Mbuzii, where there is more cash due to the sale of vegetables, said that they eat meat a couple of times a week. This is mainly boiled and then fried rather than roasted (beef and chicken, the main meat eaten, would probably be from relatively old animals and would therefore need long cooking), and it is therefore likely that it is well cooked inside, although this cannot be said for certain.

The most important risk factor in terms of transmission of toxoplasmosis in Lushoto is contact with cat faeces. There were found to be a significant number of cats in all three villages and villagers reported that food left out was sometimes eaten by cats. Although they said that they threw this away, it was judged unlikely by the researchers that they did in fact do this, especially in the case of highly valued meat. This means that food which has been in contact with cats' paws, and possibly their faeces, may be eaten.

Spontaneous abortion, which could have been caused by toxoplasmosis, was reported by the village health worker in Ubiri and by the village executive officer at Mbuzii.

9. Control and prevention of plague: some recommendations

All three villages studied had health committees focusing on sanitation and a healthy environment. These committees were reported to be very active during an outbreak of plague, when even the district health personnel goes to the infected village. However, when the outbreak is over, the health committee

and medical personnel are on leave waiting for another outbreak. Thus, they tend to focus on 'fire-fighting' during outbreaks rather than on regular prevention. During an outbreak control methods are enforced which include killing fleas and rodents with insecticides and poisons, drug treatment for patients, prophylaxis for contacts, enforcement of environmental cleanliness and sanitary improvements, health education for leaders and communities in the affected areas and quarantine of affected localities when possible. These programmes are very costly and are not sustainable. There is no systematic follow up to ensure the maintenance of cleanliness at household level. Using poisons to kill rats is not sustainable since most households cannot afford them.

⇒ A sustainable approach to plague control needs to be developed which is ongoing and involves control measures which are affordable and practical at household level

Traditional culture, beliefs and practices, and what is feasible and practical, are not taken sufficiently into account in planning plague control. Messages regarding changes in behaviour are not taken up because the changes suggested are often not culturally or economically appropriate.

⇒ It would be advisable to involve the community in discussions and decisions regarding feasible changes in daily practice which could reduce the likelihood of transmission. This needs to incorporate discussion regarding actions on the part of individuals, different categories of households, and groups.

The role of leaders, including through what are locally perceived to be magical powers on their part as well as through their role as opinion leaders, is not taken into account in designing plague control at present. Experience shows that once such people cooperate in an intervention programme it is much more likely to be effective (Foster, 1973).

⇒ It would be advisable to involve *zumba* leaders in strategies to reduce plague, through training and discussion.

Local beliefs about hygiene and the transmission of illness affect responses to messages regarding changes in behaviour, particularly as regards recourse to traditional healers. However, this is not well understood or taken into account at present in designing plague control strategies. The fact that traditional healers are implicated in the spread of plague because they are allowed to break quarantine by villagers makes it particularly important to understand the role which they currently play in treating plague, and to bring them into plans to control plague more effectively.

⇒ It would be advisable

- a) to involve traditional healers in strategies to reduce plague, through training and discussion
- b) to incorporate research into the way that traditional healers respond and behave as a follow-up to training they may receive and to

increased interaction with health authorities, in order to assess the effectiveness of training and interaction and refine this further.

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Annex – Key informant household profiles

Households in Mbuzii

MBUZII: HOUSEHOLD NUMBER 1

Household Head:	Juma Said, Male
Name of spouse:	Zaina Juma, Female
Key informants interviewed:	Zaina Juma & Juma Said
S-E status of household:	High
Main occupation:	Farming
Sub-village:	Dindila

General background

The household consists of five people, a couple and their three children. All the three children have completed primary school education. The household has several buildings with the main house having a dining, sitting, store, and bedrooms, whereas other buildings are for visitors. Bathing and toilet compartments were next to the main house, followed by a kitchen room. Maize, beans, rice and other food materials are kept in bags and stored in the storeroom, while water is stored in the kitchen. There is a special area used to wash utensils. Generally, the house is clean and attractive. The main house is constructed of corrugated iron sheets and has a cement floor with wooden doors, thus making the household fall under the high status category. The wife, Zaina, said she stayed in a *bweni* during her childhood. However she now says she will not send her children to *bweni* because the household has a big enough house to accommodate all household members, plus visitors. Total land holding for the household is estimated at four acres divided into seven parcels of different sizes. Coffee is grown on two acres while the remaining acreage is normally planted with beans, maize, cassava, plantains, Irish potatoes, sweet pepper and tomato. Sweet pepper and tomatoes are grown under irrigation and, together with coffee, are the main source of income for the household.

Plague

Zaina had heard of plague and said that the disease is prevalent in the Mtae and Mlalo areas of Lushoto District. She said that rats are the cause of plague. One gets plague if bitten by rats, eats food that has been eaten by rats, sleeps on the ground, and through use of utensils that have been contaminated by rats. She said that Mlalo and Mtae are the sources of plague although she recognizes that plague affects all people. The reason why Mlalo and Mtae are the sources of plague is that the areas have many rats.

Food preparation, consumption and storage

Boiled or fried and roasted meat are preferred rather than roast meat. Food is served and eaten from a common plate. Food leftovers are stored in the cupboard. Food sharing among households is said to be uncommon.

Rats and cats

We were told that the household experiences no rat infestation. Occasionally, however, one or two rats are seen in the house, and the household then buys chemicals for rat control, which eliminates them. No cats were mentioned.

Water

A nearby spring and a village standpipe are the sources of water used. Water is collected and stored in big plastic containers and used for two days before more water is collected.

Fleas

No flea infestation is experienced by the household.

Health problems

This household has had no plague cases. The common illnesses that have affected members of this family include malaria, coughing and flu.

MBUZII: HOUSEHOLD NUMBER 2

Household Head:	Abdurahman Rashid, Male
Name of spouse:	Abdurahman Sabitina, Female
Key informants interviewed:	Abdurahman Rashid and Sabitina Abdurahman
S-E status of household:	Low
Main occupation:	Farming
Sub-village:	Kweganga

General background

The household is made up of five people, a couple and their three children. It has one house with four rooms: one is for the parents, another for the children, the third one is a kitchen room, and the fourth is a sitting room which also serves as cow-shed at night. Water and food (flour, beans, cassava) are stored in the bedrooms. Maize is stored above the ceiling. Utensils are washed outside the house. The house is of low quality, with walls and a floor that are relatively rough providing good sites for flea and rat infestation. During their childhood both respondents stayed in *bweni*. However, they now dislike the idea of *bweni* and would not send their children to them. Total land holding for the household is estimated at 3 acres divided into 3 parcels of one acre each. Crops grown include beans, maize, cassava, Irish potatoes, and tomato. Tomatoes are grown under irrigation and form the main source of income for the household.

Plague

Mr. Abdurahman did not understand what plague is and he was not sure about the symptoms involved. He mentioned cold and headaches.

Food preparation, consumption and storage

The household eats beef at most once a month. Beef is normally first boiled and then fried. Meals are served on a common plate for all household members to eat from. Food leftovers are kept in the cooking pot and placed near the cooking stones in the kitchen.

Water

A nearby spring and the village standpipe are the sources of water. Water is kept for two days in big plastic containers before more water is collected. Normally the water containers are emptied before being refilled. Drinking water is not boiled.

Rats and cats

The household acknowledges rat infestation as a problem and estimates that at any one time there are about four rats in the household. However, the informants do not perceive rats to be a major problem. When there are rats, informants said that the household buys and uses chemicals to eliminate the rats.

The household does not count on cats to eliminate rats, because they do not have a cat. It relies on free range cats in the area, which do not normally come into the house.

Fleas

The household experienced flea infestation last year (2002) and this caused one of the household members to be infected with plague. According to the respondent, the level of flea infestation was high as there was movement of rats from the fields/forest to the houses, mostly during the off-season period, when there were no crops in the field. Dead rats were found in the surroundings and above the ceiling in the house. These were disposed of in toilets and buried in the ground. There were no dead rats found in 2003.

Health problems

Besides the case of plague in 2002, malaria was said to be the most common illness in this household.

MBUZII: HOUSEHOLD NUMBER 3

Household Head:	Musa Shelukindo, Male
Name of spouse:	Zeituni Shelukindo, Female
Key informants interviewed:	Musa Shelukindo and Zeituni Shelukindo
S-E status of household:	High
Main occupation:	Traditional Healing and Farming
Sub-village:	Zeta

General background

The household has eight members: a couple, their three children and three other adult relatives. It has three buildings all of which have corrugated iron sheet roofs and cement floors. The main house has several rooms and the other two buildings are for visitors and patients, as the informant is a traditional healer. Food (flour, beans and cassava) is stored in a store while water is stored in the kitchen in 200L metal drums and plastic buckets. Unshelled maize is stored in the house ceiling until it dries, when it is shelled and placed in the store. Utensils are washed outside the house. The buildings are of high quality and the general environment and surroundings are very clean. During their childhood both respondents stayed in *bweni* with grandmothers and grandfathers. However, they now dislike the idea of *bwenis* and would not send their children to *bweni* as the household has enough room to accommodate the children. Total land holding for the household is estimated at eight acres divided into 12 parcels of different acreages. Crops grown include plantains, beans, maize, cassava, Irish potatoes, sweet potatoes, cabbage, carrots, and tomatoes.

Plague

Mr. Shelukindo is a traditional healer and has many patients. (See section on traditional healers for more information on his attitude to plague.)

Water

A nearby stream and a standpipe are the sources of water used. The informants said that the water from the stream is dirty and is only used for washing. Clothes are washed at the stream site. Drinking water is obtained from the standpipe. The household has a reserve 1000L plastic tank, which is used to store water. Water is collected every day and is stored in this tank, which is said to be emptied and refilled daily. The household is said to boil drinking water in order to prevent diseases such as cholera, dysentery and typhoid.

Rats and cats

The household reported that rats are not a problem as the household has two cats, which takes care of the rat problem. Even in the maize store, there are no rats. They also said that the buildings are so clean that rats are discouraged from taking residence in them. In the rare case where one or two rats get into the house, poison is used to eliminate the rats.

Fleas

According to the respondent this household has no problem of flea infestation as the household has no rats. Since all the buildings belonging to this household are plastered and have cement floors, fleas cannot survive easily.

Health problems

Malaria, flu, and headaches were the health problems that the household reported as being most common for members of the household.

MBUZII: HOUSEHOLD NUMBER 4

Household Head:	Twahib Yusuf, Male
Name of spouse:	Zuhura Twahib, Female
Key informants interviewed:	Twahib Yusuf and Zuhura Twahib
S-E status of household:	Low
Main occupation:	Farming
Sub-village:	Msigitini

General background

The household has three members, a couple and their 12-year-old child. It has one main house which is used by the parents, which has a sitting area, and a kitchen hut, which is also used as a sleeping room for the child. The toilet and bathroom are located a few metres from the main house and there is an open space behind the house that is utilised as a washing place for utensils. Water and food materials such as flour, beans, sugar, tomatoes, vegetables etc. are stored in sitting room of the main house, while maize and cassava are stored in the ceiling of the main house. The wife stayed in a *bweni* during her childhood but the husband did not because his parents had enough accommodation for all children in the main house. The household has a total land holding of about two acres that consist of three parcels. Maize, beans, and cassava are the main crops grown by the household. The household has no “*vitivo*” for growing irrigated crops.

Plague

Both informants reported that plague is brought by rats both from the wild and those found in the house. Both respondents are aware of plague and the male respondent had seen a plague patient back in 1996 in the Magamba Kiboheo area. They both associate plague with rats. The female informant further believes that rats have fleas that causes plague. She said if these fleas bite a person, the chances of the contracting plague are high. She said that the symptoms of plague include swelling of legs. The most affected are children followed by women because these people spend time at home. She said that because children eat everything they can contract the plague more easily (implying that plague can be caught through food). On the factors that favour rat infestation, the two informants differed. While the female informant thinks that dirty environments, including shrubs, favour rat infestation, the male informant contends that rats that bring plague are “sent” by people to punish individuals who do not abide by the ideals of the “*zumbé*”, who is the traditional ruler. The male informant further believes that there are rats that are sent by bad people to harm some individuals, including inflicting plague and devastating crops. The informant cited a situation last year when a 2 acre maize field was devastated by rats overnight. Asked why he thinks dirtiness has nothing to do with rat infestation, he cited many households in the Mlalo area whose environments are clean, yet people contract plague. Further, the informant argued that he once stayed in the Mlalo area in the same houses with people in the area but never contracted plague, while the people in the area did contract the disease. He then concluded that the disease is a punishment sent to people who do not abide by the ruler’s ideals. Regarding the continuing occurrence of plague in the Mlalo area, the male informant said that the Mlalo people violated rulers’ ideals sometime in the 1950s. During that period, the people of Mlalo got a bumper harvest of maize, Irish potatoes, and beans. They then mocked the rulers with their bumper harvest, joking about using stiff porridge as building blocks for houses, Irish potatoes as materials for floor making, and beans to decorate houses. The rulers were angry and handed down plague to punish the people.

Food preparation, consumption and storage

Boiled and fried beef is eaten at most once a month. Fruits and vegetables are washed thoroughly before being utilised. Food is eaten from one plate shared by the whole household. Leftover food is kept inside a bucket. Plantains, potatoes and flour are sometimes shared with other households, but cooked food is not shared.

Rats and cats

The household reported that rats are a problem. They eat stored and leftover food. The household uses chemicals to control the rats but the success rate is very low as rats re-infest the house as soon as the chemical is finished. They cannot buy it often because they cannot afford to. The household has no cat of its own but relies on cats that move around in the area. Such cats are not very reliable in controlling rats; instead, they eat food kept in the houses rather than preying on rats.

Water

A local spring and the river are the sources of water used. Water is collected about five times a day and is stored in traditional pots and in buckets. The household is said to boil water to prevent disease.

Fleas

According to the respondent fleas infestation is serious problem, though the household has not been affected by plague. The household members came in contact with fleas between July and February, period when the rate of in-house rats infestation is high. Children are the one most affected because they sleep on floor in the kitchen, which is overcrowded with other things.

Health problems

Malaria, heart problems, abdominal disorders including stomach ache, diarrhoea, rumbling of stomach, chest pain and flu.

MBUZII: HOUSEHOLD NUMBER 5

Household Head:	Ramadhani Shemahimbo Male, very old
Name of spouse:	Mariam Ramadhani, Female
Key informants interviewed:	Ramadhani Shemahimbo and Mariam Ramadhani
S-E status of household:	Low
Main occupation:	Farming
Sub-village:	Hambalai Shuleni

General background

The household has four members: a couple and their two grandchildren. There is one sleeping house for the adults and another for the children. Food such as flour, beans, sugar, tomatoes, vegetables etc. are stored in a sitting area within the grandparents' room, while maize and cassava are above the ceiling. Water is kept in a separate kitchen hut. In front of the house there is an open space used for washing utensils. Garbage is disposed of nearby. The houses are built close together in the area, which facilitates easy movement of rats from one household to another. Ramadhani said he stayed in *bweni* during his childhood as there were five to six boys. His children were also sent to *bweni* as they were growing up. The land holding of the household is estimated at four and a half acres, which consists of three parcels, each of about one and a half acres. The main crops grown by the household are cassava, maize and beans.

Plague

Mr. Ramadhani said he had heard of plague but in the Magamba area. He said that plague is caused by rats that stay in the forest, which are referred to as *panya buku*. Ramadhani reckons that plague started at Magamba and then spread to other areas. He said these rats prefer a dirty environment and areas that have shrubs. Mr. Ramadhani had stories on how the plague started in Lushoto district. There was hunger in some parts of Magamba, but other parts of Magamba had plenty of food. The part that had plenty of food cooked beans, used them to decorate their houses and did not respect the chief. This angered the chief and he sent rats. These rats ate all the available food stock. Then they began biting human being who became sick and had to seek treatment from traditional healers. Only traditional healers could cure the disease because it was handed down as a curse by human beings as a punishment to human beings. See below for discussion on rats and plague.

Hygiene

To Mr. Ramadhani, hygiene is a clean living environment including inside the house. The house should be well roofed with iron sheets and a good sleeping place. It should have a pit latrine and that latrine should have water. Further, according to him, a good wife is one who can plaster the house well and make sure water is available for drinking, bathing and for cooking food. She should have clean clothes and her children should be clean. Ramadhani underscored the need for availability of water in maintaining high hygiene levels by saying: *usafi unanza na maji* (hygiene starts with the availability of water).

Food preparation, consumption and storage

Meat is predominantly beef and is consumed at most once a month. People in this household serve themselves when they want food and food leftovers are stored in pots. Food storage facilities and methods are not rodent/vermin proof and food contamination is common. Food sharing (*ugali*, *makande*, rice, sugar and flour) between this household and others is common.

Water

Water is collected from a spring three times a day and is stored in traditional pots. These are emptied daily before being refilled. The household claims to boil water for drinking to prevent disease.

Rats and cats

The household reported that rats are a problem in the household despite keeping a cat. Informants recognize two types of rats: “*ngoshwe*” and “*puku*”, which correspond to homestead and forest rats respectively.

Rats that bring plague are “sent” by a traditional ruler (a *zombe*) to punish individuals who do not abide by his ideals. Asked about the continuing incidence of plague in the Mlalo area, the informant said that the Mlalo people violated rulers’ ideals sometime in the 1950s. During that period, the people of Mlalo got a bumper harvest of maize, Irish potatoes, and beans. They then mocked the rulers with their bumper harvest as they joked about using stiff porridge as building blocks for houses, Irish potatoes as materials for floor making, and beans to decorate their houses. The rulers were angry and handed down plague to punish the people.

Mr. Ramadhani reported having a good cat which does not eat the food prepared for human consumption. He sees no danger in keeping cats as he has no young children who would play with it, thus putting the children at risk of getting scratched or bitten.

Fleas

No flea infestation was reported.

Health problems

The most common health problems reported by Ramadhani's household informants were headache and coughing.

MBUZII: HOUSEHOLD NUMBER 6

Household Head:	Mama Mamulugu, Female, aged 70
Name of spouse:	None
Key informant interviewed:	Mama Mamulugu
S-E status of household:	High
Main occupation:	Farming
Sub-village:	Dukani

General background

The household has two members, two adult females and two grandchildren aged seven to eight years and two years. There are two main houses (one rented to a primary school teacher) and a kitchen. Each main house has a dining room, a sitting room, and bedrooms. The main house is used for storage of maize in the ceiling, while other food e.g. flour, sugar, beans, rice, cooking oil, etc are stored in the sitting room. Water is stored in both the kitchen and the sitting room of the main house. The bathroom and toilet are located a few metres from the main house. Utensils are washed inside the kitchen or sometimes outside. Generally, the houses are very clean and attractive although plantain trees and other vegetation are close to the homestead. During her childhood Mama Mamulugustayed in *bweni*. However, she never sent her children to *bweni* because *maisha yamebadilika* (life has changed) and does not favour *bweni* culture as well as due to the fact that she was afraid that her children could be taught bad behaviour. She further said she has a big house and room for her grandchildren there. In the past the houses were small and that is why the children went to stay in *bweni*. The household has about two acres of land in four parcels. The main crops grown by the household include maize, beans, cassava, plantain, sweet potatoes, and Irish potatoes.

Plague

Mama Mamulugu reported that plague is caused by fleas from rats. She said these rats are from the forest. She said that plague started in Mlalo and then spread to other places in Lushoto. The most affected people by plague are children and women because these are the people who stay at home. The women do the cleaning whereas the children play with dirty things and dirty places where they can be infected by plague. During periods of food shortage, the wild rats starts looking for food and eventually enter houses in search of food. She stressed that there was a relationship between shrubs and hygiene and the spread of plague.

Hygiene

For Mama Mamulugu hygiene is related to the condition of a house. A good house is one which is clean. It should be well plastered and should have a pit latrine and water. A good housewife is one who cleans her house, washes her clothes and those of the children and keeps her utensils and bedding materials neat and clean. A good husband ensures that houses are plastered in order to get rid of crevices that encourage rats.

Food preparation, consumption and storage

Beef or chicken are eaten at least once a week.

Water

A natural well is the source of water for domestic use while the village standpipe is occasionally used – the household does not rely much on this source. Water is collected and kept in a storage container which is emptied and refilled every two days. Drinking water is normally boiled and stored in a small bucket of 10 litres.

Rats and cats

Mama Mamulutu reported that rats are a problem in the household despite keeping a cat. The informant recognizes two types of rats: “*ngoshwe*” and “*puku*”, which correspond to homestead and forest rats respectively. It is the forest rats that bring plague, coming to homesteads in search of food when food in the forests becomes scarce. Rats are an indication of filthy conditions, including dusts and crevices or holes in houses, improper storage of foodstuffs and water, and shrubs in the surroundings of the house. Due to their connection with plague, rats are seen as menace and efforts are always made to kill the rats whenever they are seen in the house. This includes using poison, physically hunting and killing rats in houses and keeping cats.

Mama Mamulugu has a cat that helps keep the population of rats down although so far it has failed to eliminate rats completely.

Fleas

Mama Mamulugu said that the household has never experienced flea infestation.

Health problems

Malaria and flu are the health problems common in her household.

MBUZII: HOUSEHOLD NUMBER 7

Household Head:	Bakari Shunda, 60 years old
Name of spouse:	Habiba Shunda, female
Key informants interviewed:	Bakari Shunda and Habiba Shunda
S-E status of household:	Low
Main occupation:	Farming
Sub-village:	Mlazi

General background

The household has two members, a couple and their two grandchildren. There are three houses, which form part of cluster of houses of many households. The layout of the houses in the cluster makes the compound overcrowded. The three houses belonging to the Shunda household include two main houses and a kitchen hut. There is a bathroom within one of the main houses. Water is stored in the kitchen hut in drums and plastic buckets. The kitchen hut is used as a cowshed at night. Water and food materials are stored in the sitting room, while maize and cassava are stored in the ceiling. Utensils are washed outside the house. The household was very close to other households of the same clan since they are concentrated on the same land inherited from their parents, and movement of rats from one household to another was common. Rat control is difficult according to the informant, since not all households are seriously concerned about rats. During his childhood Mr. Shunda stayed in a *bweni* and so did his children when they were small. They are now grown up and live in Dar es Salaam. The land holding of the household is estimated at seven acres, which consists of five parcels. The main crops grown by the household include maize, beans, and cassava, and onions, tomatoes, and sweet pepper grown in “*vitivo*” under irrigation.

Plague

Mr. Bakari reported that he had heard of plague, and that he knew that it had attacked the Lukozi area of Lushoto District. He had never heard any details regarding the disease. He disagrees with the notion that plague is associated with dirtiness, because if this were so, then he argues that the disease would have occurred in Mbuguzii village as well since there are many households that are dirty.

Hygiene

Mr. Bakari conceived of hygiene as having a good house and a clean environment around it. He further went on to mention having a pit latrine as an important aspect of hygiene. A good

wife is one who has a clean body and clean clothes, keeps her utensils clean, and keeps a clean house that has been well plastered.

Food preparation, consumption and storage

Beef is normally eaten about twice a month. Cooked food is served on one or two plates which household members share. Food leftovers are stored in a bucket and are re-boiled and consumed as breakfast or lunch the next day. Food sharing and exchange with neighbouring household is common practice.

Water

Water is collected from the village standpipe and is stored in traditional pots. These are emptied and refilled every day. Water for washing and laundering is sometimes drawn from the Zeta river, which passes through.

Rats and cats

The household reported that rats are a problem despite keeping a cat.

Fleas

Contact with fleas from rats occurred within the household when there was movement of rats from fields to the house. The household faces flea infestation in June-December of most years. They said that they control fleas by using insecticide and by adopting environmental sanitation measures.

Health problems

Malaria, coughing and abdominal pain are the most common health problems in the household.

MBUZII: HOUSEHOLD NUMBER 8

Household Head:	Juma Abdallah Shekalege, Male, 62
Name of spouse:	None
Key informant interviewed:	Juma Shekalege
S-E status of household:	Medium
Main occupation:	Farming
Sub-village:	Mlesa

General background

The household consists of 11 members of whom 9 are grandchildren of the household head. It has three buildings situated very close together: two main houses and a kitchen hut. There is a bathroom within one of the main houses. The homestead looked clean in general but grass was growing close to the houses. Water is stored in the kitchen hut in drums and plastic buckets. Water and food materials are stored in the sitting room, while maize and cassava are stored in the ceiling. Utensils are washed outside the house. The homestead is a bit isolated from other homesteads. During his childhood Mr. Shekalege stayed in a *bweni* and his children stayed in *bweni* when they were small. They are now grown up and live in Dar es Salaam. The land holding of the household is estimated at four acres, consisting of five parcels. The main crops grown by the household include cassava, maize, Irish potatoes and beans; onions, tomatoes, and sweet pepper are grown in “*vitivo*” under irrigation.

Plague

Mr. Shekalege's perceptions about the source and transmission of plague came across as confused and somewhat contradictory. The research team judged that he does not understand the causes of plague and control measures well, although he knew the symptoms of plague, such as boils in the private part of the infected person.

He started by saying that plague is caused by *kunguni* (bed bugs) which are related to dirty bedding. But when asked where the plague started in Lushoto district, he responded by saying that it was brought by rats, which came initially to Manoro in the Shume ward of Mlalo division. He said it is not all the rats that transmit plague.

He told the research team that at first plague was believed to be sent by a human being through witchcraft; it was believed that rats can be sent by a witch to a targeted person and if one bites that person, the result is plague. But it was believed to depend on the witch's intention how the symptoms will manifest. However, he also said that this belief is now dying out due to the introduction of modern understandings of plague transmission. It was not clear to what extent, if at all, he himself believes that plague is caused by witchcraft.

Mr. Shekalage said there is a strong relationship between poor hygiene and shrubs and the prevalence of plague, and that plague affects children and women because of crowding and because women stay with children.

Hygiene

Hygiene for Mr. Shekalage is measured by having a well-plastered, good house with a good well-plastered floor. The last thing he mentioned was the presence of a pit latrine, which he added should have water. A good housewife is one who ensures that there is water in the latrine. She should also keep a clean house, work hard, keep clean utensils, keep herself clean, and keep the surroundings of the house clean.

Food preparation, consumption and storage

Cooked food is placed in two bowls and the family shares these.

Water

Water is obtained from a village standpipe and from a spring. It is stored in buckets and these are normally refilled every two days. Drinking water is rarely boiled and fruit and vegetables are washed in untreated water in spite of the fact that they are aware of the disease risk associated with untreated water.

Water

The household claims it boils drinking water in order to avoid outbreak of water borne diseases.

Rats and cats

The household reported that rats are a minor problem in the household as the household keeps a cat. The informant reported that in 2001 they had a serious rat infestation both at the homestead and in the fields.

The informant recognizes two types of rats: "*ngoshwe*" and "*mpuku*", which correspond to homestead and forest rats respectively. The informant was of the opinion that it is only field rats with "kinked legs" that bring about plague.

Fleas

No flea infestation was noticed.

Health problems

Malaria was the most common illness that affected his family.

MBUZII: HOUSEHOLD NUMBER 9

Household Head: Waziri Simoni Kibiriti, Male, aged 37
Name of spouse: Mona Waziri, Female
Key informant interviewed: Mona Waziri
S-E status of household: Low
Main occupation: Farming
Sub-village: Kishului

General background

The household has six members: a couple and their four children aged 16, 12, 10, and 6 years. There is one main house and a kitchen hut. The main house has bedrooms for the children and the parents. The kitchen hut is opposite the main house and in between is an open space used for washing utensils. Water and food as flour, beans, sugar, tomatoes, vegetables etc. are stored in the sitting room, while maize and cassava are stored in the ceiling. It was judged that food storage and garbage disposal in this household are such as are likely to attract rodents. Land holding for the household is estimated at 13 acres consisting of 8 parcels. Crops grown include maize, beans, cassava, plantain and vegetables including cabbages, tomatoes, and onions. During her childhood, Mona Waziri lived in a *bweni* with her grandmother along with 7 children from other families. Mona said she doesn't send her children to a *bweni* because she has a big house which can accommodate her children.

Plague

Mrs. Waziri said plague is brought by wild rats. She believes that plague is carried through food; she stressed that once a wild rats carrying plague has eaten food, any person who eats that food will be infected with plague. She also said that there is relationship between hygiene and shrubs and the prevalence of plague.

Hygiene

Mrs. Waziri associated hygiene with a clean environment surrounding the house as well as with the cleanliness of the items inside the house, including utensils. A house should have well-plastered walls which should be painted with coloured paint. After hints, she mentioned the presence of a latrine.

Food preparation, consumption and storage

Cooked food is eaten from common dishes by the family.

Water

Water is obtained from the village standpipe and a spring. It is stored in buckets and these are normally refilled every two days. Drinking water is rarely boiled and fruit and vegetables are washed in untreated water although the informant knew of the problems associated with untreated water.

Rats and cats

Mrs. Waziri had no cat but there were cats moving around. They do not, she said, eat her food.

Fleas

No flea infestation had taken place.

Health problems

Malaria was the most common health problem in her household.

MBUZII: HOUSEHOLD NUMBER 10

Household Head: Mark Omary, Male, 23 years old

Name of spouse:	Jasmin Mark Omary
Key informants interviewed:	Mark Omary and Jasmin Mark Omary
S-E status of household:	Low
Main occupation:	Farming
Sub-village:	Mgombelwa

General background

The household has three members: a couple and their 12-month old baby. There is one main house with separate bedrooms for parents and children. Food such as flour, beans, tomatoes, vegetables etc are stored in the sitting room, maize and cassava in the ceiling. Water is kept in the kitchen room. Utensils are washed outside in an open space. During his childhood Mr. Mark stayed in a *bweni*. Farming is the mainstay of the household economy. The household has 2 goats and has a landholding size of about one and one half acres. The main crops grown include beans, maize, onions, and cassava. The household has no “vitivo”. The homestead surroundings are bushy and the houses are in a cluster of many houses around.

Plague

Mr. Mark said that plague is caused by rats and there were special rats that stay in the wild and have the plague virus. He said that once these rats eat food and a person then eats these leftovers that have been nibbled by rats, the person has a high probability of being infected with plague. He also said that the origin of plague in Lushoto is the Mtae ward, and that it spread outwards from there to other places. At first, he said, it was thought that plague was brought by human beings through witchcraft, but now people are moving away from that belief and recognize that the disease is brought by rats from the wild. He said that poor hygiene and shrubs close to the house attract wild rats to enter in the house. Mr. Mark distinguished the symptoms of plague from those of “*vyungu*”, saying that “*vyungu*” causes sudden fever, vomiting, and a severe headache, but was not associated with “swelling of glands”, which is typical of plague.

Hygiene

To Mr. Mark clean surroundings around his house were thought to represent good hygiene. In addition the house should be well plastered, painted with coloured paint, and have a good floor. The presence of a pit latrine was mentioned after giving hints. A good housewife, he said, is one who keeps the house clean, keeps clean utensils and a clean kitchen and keeps herself and her children clean.

Food preparation, consumption and storage

Beef and chicken were said to be eaten twice per week. Cooked food is served on one plate and household members eat together. Leftover food is kept in a bucket. Food sharing between the household and neighbours is common. Flour, rice, cassava and potatoes are the food most often shared.

Water

Water is collected from a spring. This never runs dry. This household does not boil drinking water because it believes that spring water is clean and safe when compared to other sources.

Rats and cats

The household reported that rats are a problem. They use chemicals to control the rats but the success rate is very low as rats re-infest the house as soon as the chemical is used up. They cannot buy the chemical often because they cannot afford to do this.

Rats that bring plague are the forest rats. They come to homesteads in search of food when food in the forests becomes scarce.

The household has no cat but there were some moving around and Mr. Mark said that they do not eat the household's food.

Fleas

The household comes into contact with fleas between July and November, a period when there is rat infestation in the house. According to Mr. Mark children are the ones bitten most often by fleas, probably because they sleep on the floor. The household uses hot water as a means to control fleas.

Health problems

Mr. Mark reported malaria, coughing and flu as the most common health problems in his household.

MBUZII: HOUSEHOLD NUMBER 11

Household Head:	Abas Bakari, Male, 40 years old
Name of spouse:	Fadhila Abas
Key informants interviewed:	Abas Bakari and Fadhila Abas
S-E status of household:	Low
Main occupation:	Farming and Imamu of a mosque (male head)
Sub-village:	Kongei

General background

Mr. Abas is the Imamu of the mosque of Kongei. The household is made up of six persons including a couple, their two children and a grandmother. There is one main house for the parents, while the children sleep with their grandmother in another house. The kitchen and livestock-shed are some distance from the main house. Food items are stored in the sitting room, while maize and cassava are stored in the ceiling. Water and utensils are kept in the kitchen room. Utensils are washed outside the house, and next to it is a pit for waste disposed. The area around the houses is littered with garbage, including bedding for livestock scattered around, which creates a good basis for rat infestation. Mr. Abas reported that he stayed in a *bweni* during his childhood, which housed ten members. He however does not intend to send his children to a *bweni* because they are overcrowded and dirty and the children sleep on the floor with poor-quality bedding material, which may lead to contracting illnesses. The household has 5 heads of cattle and some goats. Its landholding is estimated at 4 acres distributed among 5 parcels, one of which is a "*kitivo*". This is used for growing vegetables while the other pieces of land are used for growing maize, beans, as well as cassava.

Plague

Mr. Abas had only heard of plague by hearsay. He said that plague is caused by rat fleas and it is when these fleas bite a human being that the human becoming infected with plague. Although he recognized that both wild and homestead rats have fleas, he said that only one type of rat transmits plague – "*panya mwenye matege*" (rats whose legs are twisted). These have fleas that fall off the rat as it moves around in the house, and people, mostly children and women, come into contact with these fleas and may be bitten by them. Most of these rats stay in the forest. He did not believe that any particular category or people is most affected with plague. Mr. Abas believes that areas that are infected with plague are Soni near Lushoto and Lukozi village.

Hygiene

Clean surroundings around a house, well-plastered walls and the presence of latrine with water were, he thought, the essence of good hygiene. Mr. Abas said that a good housewife is someone who keeps her body and clothes clean, maintains a clean house and keeps her utensils clean. She also keeps her children's clothes clean, as well as their bedding material.

Food preparation, consumption and storage

Food leftovers are covered with banana leaves and kept in a cooking pot that is placed on the fire place. These are not rodent-proof or cat-proof.

Water

This household collects water from a standpipe and from a stream nearby and it is used the same day. Water is kept in traditional pots which are rodent-proof unless left improperly covered. They are normally emptied before being refilled. Drinking water is purchased from the Soni water falls and is assumed to be clean and safe compared to other sources so it is not normally boiled unless there is a disease outbreak. The respondents argued that the same water has been used for years without causing anyone to become ill.

Rats and cats

The household reported that rats are a minor problem, mainly during the harvest season when many rats come to the homestead in search of food. They normally use chemicals to control the rats but the success rate is very low as rats re-infest the house as soon as the poison is used up. They cannot buy it often because they cannot afford to.

Informants said that the rats that bring plague are the forest rats, which come to homesteads in search of food when food in the forest becomes scarce.

Mr. Abas has no cat and no cat was seen around his house.

Fleas

No flea infestation has been experienced by the household.

Health problems

Mr. Abas reported that malaria was the most common health problem for his household.

MBUZII: HOUSEHOLD NUMBER 12

Household Head:	Rashid Shewedi, Male
Name of spouse:	Mwanaidi Shewedi, Female, 40 years
Key informants interviewed:	Rashid Shewedi and Mwanaidi Shewedi
S-E status of household:	Low
Main occupation:	Farming
Sub-village:	Kwengodi

General background

The household has nine members: a couple, their five children, and two grandparents. The household has several houses – one for the parents, one for the children, one for the grandparents, and a chicken hut. Food is stored in a storeroom, and water is stored in the kitchen. The livestock shed, the toilet and the bathroom are some distance from the household dwelling and utensils are washed outside. Mrs. Mwanaidi said that during her childhood she stayed in a *bweni* with four other children. However she was not intending to send her children to a *bweni* because she has a big house in which one room can accommodate the children. The household's landholding is estimated at 5 acres composed of four parcels. The biggest parcel is where the homestead is located and is two and a half acres. The other piece is a "*kitivo*" while the remaining three pieces are upland. Food crops grown include maize, cassava, and plantain while tomatoes, onions, sweet pepper, and cabbage are the main cash crops, and are grown in the *kitivo*.

Plague

A guest in the household became ill with plague in 1998 or 1999. The guest had contracted the disease in Mlola village, not in Mbugii village.

Mrs. Shewedi said that plague is caused by rats and the most affected are women and children because they are frequently in contact with rats. She said plague started at Mlola. Mr. Shewedi had been in contact with plague, since he had taken care of a plague patient in 1998-99. The patient was a village secretary who came from the Mlola area, where he had contracted the disease. At first the patient was sent to a dispensary where he was treated as a malaria case. Failure to recover with malaria treatment meant that the patient was sent to the Lushoto District hospital where he was diagnosed with plague. He was treated and recovered fully. All members of the household received protective treatment as it was assumed that they all had been in contact with the patient.

Hygiene

Clean utensils, a house with well-plastered walls both inside and outside, and with good decoration were thought to amount to good hygiene. In addition, the house surroundings shouldn't have bushes and shrubs. A latrine was mentioned after a hint was given. A good wife is one who has clean utensils and good bedding materials, and who makes sure that there is water in the latrine.

Food preparation, consumption and storage

Cassava flour is prepared from fresh cassava tubers that are peeled, washed and dried in the sun for 3 to 5 days (when the pieces could be accessible to cats). The dried cassava is then put into the ceiling near the fire for about one month, to dry further and make it easy to grind. Beef is eaten about twice a week. Leftover food is stored in the kitchen and given to the children next day.

Water

A standpipe is the main source of domestic water, followed by the Zimuyi and Nyasa streams. There is a standpipe within the homestead area and the homestead gets water from the pipe twice a week along with homesteads in the area. Drinking water is boiled and is kept in small buckets of 10 litres. Water is fetched throughout the day and is stored in drums of 120 litres capacity. The research team noted that the storage containers were not clean and that the water in them appeared to have been there for some time.

Rats and cats

The household reported that rats are a big problem, largely during the harvest season when many rats come to the homestead in search of food. They estimated that the house can be infested with as many as 10 rats during the harvest season of August to September. They normally use chemicals to control the rats but the success rate is very low as rats re-infest the house as soon as the poison is used up. They cannot buy poison to kill rats often since it is too expensive.

Mr. and Mrs. Shewedi said that rats that bring plague are the forest ones which come to homesteads in search of food when food in the forests becomes scarce. Rats, they said, are an indication of dirty houses, a dirty environment and people who are dirty. A dirty way of storing food is a big factor favouring rat infestation.

Mrs. Shewedi has no cat in her house.

Fleas

According to the informants, the household is free from flea infection.

Health problems

Intestinal worms was the most common health problem in the household. She also cited other neighbouring houses in which worms was a common problem.

MBUZII: HOUSEHOLD NUMBER 13

Household Head:	Rashidi Mgunya, Male, 57 years old
Name of spouse:	Zubeda Mgunya, Female
Key informants interviewed:	Rashidi Mgunya and Zubeda Mgunya
S-E status of household:	Medium
Main occupation:	Farming
Sub-village:	Kwampera

General background

The household has five members: a couple and their three grandchildren. The household has one main house with a bedroom for the grandparents and one for the children. There is another house with a kitchen room and another room used as a livestock shed. The homestead is surrounded by shrubs and the kitchen is thatched with plantain leaves. Food such as flour, beans, sugar, tomatoes are stored in a storeroom, while maize and cassava are stored in the ceiling. Water containers are kept in kitchen. In front of the house there is an open space used for washing utensils and a garbage disposal pit.

Mr. Mgunya said that during his childhood he stayed in a *bweni* with five other boys. They went around as a group and went to *ngoma* (traditional dances) together. He said that they were regarded as children of the area. But today, he said, things have changed. That tie between children and the community in general is gone. Mr. Mgunya did not send children to a *bweni*. The children are now going to school. Crop production is the main livelihood activity for the household. Its landholding is estimated at four acres and maize and cassava are main food crops grown while sweet peppers, tomatoes and cabbage are the main cash crops grown.

Plague

Mr. Mgunya said in 1993-1994 plague entered Lushoto and was brought by rats. There are two types of rats, one of which is *ngoshwe mweneye tege* (rats with twisted legs) which is the harmful one. This kind of rat walks slowly and as a rat walks the fleas falls off it. Once the fleas bite a human being, s/he becomes infected with plague. Mr. Mgunya said *ngoshwe mweneye tege* enter the house during the night and it is at that time that it leaves the fleas that transmits plague. The other type of rat is *ngoshwe wa kawaida* (normal rat). This kind of rat is not harmful. It is reddish in colour and has a pointed mouth. These are the rats that are also found in houses.

He also said that there was strong relationship between poor hygiene and shrubs and plague. The most affected by plague are, he said, children because they stay in *bweni*, which are not clean. However children under five are, he said, loved by their parents and are well protected.

Mr. Mgunya also gave the impression that he believes that plague has its origins in witchcraft. He told a story regarding the origin of plague in Lushoto. This is that the property of a certain person was taken by force by some other people (it is not known whether by the government or by some other authority in the village) at Lukozi. The owner of the property went to a traditional healer who then prepared miracle rats that can be used for revenge. This led to their being many rats at Lukozi. They ate all the grain and other food. Then they began biting people and that was the beginning of plague. Many people went to traditional healers for treatment. Many of them died including the traditional healers who were treating them.

Food preparation, consumption and storage

Fried or roasted beef or chicken is eaten two times per week by the household. Food is served on one plate which household members share. Leftover food is stored in the pot and placed in a cupboard.

Water

The household gets domestic water from a spring. Water is collected every day and stored into traditional pots. Drinking water is not boiled.

Rats and cats

The informants said that rats are a problem for their household particularly in 1996 when they invaded crops to the extent that the maize yield fell drastically. They sometimes use poison to control rats but this doesn't work very well as the rats come back when the poison is finished, and they cannot afford to buy poison all the time. The household has no cat of its own but relies on cats that move around in the area.

Mr. Mgunya said that there are some rats that have magic that stops them from being eaten by cats.

Fleas

Currently, the household does not have a problem with fleas but in 2000 - 2002 they had a serious infestation.

Health problems

Mr. Mgunya said there were no health problems affecting his household.

MBUZII: HOUSEHOLD NUMBER 14

Household Head:	Athuman Besha, Male, 57 years old
Name of spouse:	Farida Besha
Key informant interviewed:	Athuman Besha
S-E status of household:	High
Main occupation:	Farming
Sub-village:	Mahanje

General background

This household has four members, the husband, his wife, their 13-year child, and the father of the household head. The household has two houses. The main house has several rooms (parent, children, and guest bed rooms, sitting room, kitchen and store room), and the second house is for the grandfather, and also has several rooms. Maize, beans and other crops are kept in bags and stored in the store room, while food such as flour, cassava, potatoes, sugar, tomatoes, vegetables etc. are stored in a cupboard in the kitchen. The house was clean and attractive. The household has a landholding of some 12 acres distributed among 10 parcels. Mr. Besha is a son of the ruling clan, and that is why he has a big landholding. The household grows maize, beans, cassava, sweet potatoes, and yams. Rice is grown as cash crop in the Mombo area, where he has another homestead.

Plague

Mr. Besha said that plague is caused by rats and there were special rats that stay in the wild and have the plague virus. He said that once these rats eat food and a person then eats the food that remains, the person has a high probability of being infected with plague. He said that plague in Lushoto originated in Mtae ward, from where it spread to other areas of Lushoto District. Besha stressed that poor hygiene and the presence of shrubs close to the house were the main attractants of wild rats into homesteads and therefore houses. Mr. Besha distinguished plague from "vyungu" by saying "vyungu" leads to sudden fever, vomiting, and severe headache, but was not associated with "swelling of glands", which is typical of plague.

Hygiene

Mr. Besha believes that clean surroundings around homesteads is the most important marker of good hygiene. In addition the house should be well plastered, painted with coloured paint and have a good floor. The presence of a latrine was mentioned after giving hints. A good housewife is one who keeps the house clean, and has clean utensils, a clean kitchen and keeps herself and her children clean.

Food preparation, consumption and storage

Beef or chicken is eaten by this household about twice a month. Boiled and fried meat was preferred to meat roasted on the fire. Untreated water was used to wash fruits and vegetables, though respondent was aware that contaminated water was a potential agent for spreading water-borne diseases. People take their own food out of the pot when they want it. Food sharing with the households of close relatives was common, in relation to rice, ugali, potatoes and beans.

Water

Domestic water is collected from the river three times per day and stored in the buckets. Water is used immediately, and the buckets were said to be emptied and cleaned everyday before being refilled. Informants said that the household uses boiled drinking water in order to avoid disease.

Rats and cats

Mr. Besha said that rats are a problem. The household does use poison to control the rats but the success rate is very low as rats re-infest the house as soon as the poison is over, and they cannot buy poison often because it is too expensive.

The household has one cat, but it is not very effective in controlling rats.

Fleas

Household had never experienced flea infestation.

Health problems

Mr. Besha reported that malaria is the most common illness among his household members.

Households in Ubiri

UBIRI: HOUSEHOLD NUMBER 1

Household Head:	Issa Hassan Msumari, Male, 70 years
Name of spouse:	Amina Msumari
Key informant interviewed:	Issa Msumari and Amina Msumari
S-E status of household:	Medium
Main occupation:	Farming
Sub-village:	Kibago

General background about the household

This household has three members: the husband, his wife, and their 10-year grandchild. They have two houses: one main house that has a sleeping and a sitting room, and another house with the kitchen and storage rooms. The sitting room also serves as storage room for water, food and agricultural equipment, and maize and cassava are stored in the ceiling. Utensils are washed in an open space in front of the kitchen. The house surroundings were clean and pleasant to look at. Maize, beans and other crops are kept in bags and stored in the sitting room, while food such as flour, cassava, potatoes, sugar, tomatoes, vegetables etc are stored in a cupboard placed in the kitchen room. Mr. Msumari has a landholding of some 6 acres distributed among his 4 parcels. The household grows maize, banana, and Irish potatoes. Beans are grown mainly as a cash crop.

Plague

Mr. Msumari said that wild rats cause plague. He said that if a person eats food that has been nibbled by rats s/he is likely to be infected with plague. Also if rats bite a person it is likely that that person will be infected with plague. Mr. Msumari said that the source of plague in Lushoto district is the Shume area of Mlalo ward. It was brought in by business people who came to buy food items.

He seemed to be aware about plague and he knew the symptoms such as diarrhoea, vomiting and swollen glands in the armpits. He believes that there is a relationship between poor hygiene, the presence of forest and shrubs near the house and the prevalence of plague.

Hygiene

Mr. Msumari sees hygiene as clean clothes and houses, including the house surroundings. For him, a good housewife is one who washes clothes, cleans the house, cleans the pit latrine and sees to it that water is available for use in the latrine.

Food preparation, consumption and storage

Beef is consumed once or twice a month depending on the availability of cash to purchase it. Prepared food is served on a plate which members of the household share. Leftover food is stored in the kitchen uncovered.

Water

Water for domestic use comes from the Nyasa river. It is collected twice a day (very early in the morning and very late in the evening) and stored in traditional pots. It was observed that storage containers for water were not covered. Informants said that since contaminated water is a potential agent for spreading water-borne diseases, therefore drinking water is boiled.

Mr. Msumari expressed concern that people are contaminating the source of water which many people use. He cited GIRAF (wattle bulk industry), which discharged oil and industrial waste products in the river. Also the secondary school students and Lushoto district hospital wash clothes in the river and hence contaminate the water.

Rats and cats

Mr. Msumari said that rats are a minor problem as there are very few in their household. They do use poison sometimes to control the rats but this is not very effective since they cannot afford to buy it all the time.

The household has a cat, which is largely a pet for children as it is too old to attack rats. The cat does not eat food unless it is given the food by household members. This is a result of the cat having been trained well.

Fleas

The household has not experienced any flea infestation.

Health problems

The most common health problem that has troubled Mr. Msumari's family is malaria.

UBIRI: HOUSEHOLD NUMBER 2

Household Head:	Muru Sembe, Male, 40 years old
Name of spouse:	Amina Shekifu
Key informants interviewed:	Muru Sembe and Amina Shekifu
S-E status of household:	Medium
Main occupation:	Farming
Sub-village:	Shughuli
Education of HH:	Standard 7

General background

There are five members in the household.

Plague

Mr. Sembe said that fleas which have plague virus cause plague. When such a flea bites a person, then that person is likely to be infected with plague. He said that there was a relationship between the presence of forest and shrubs close to the house and the prevalence of plague, and he said that a dirty environment encourages rats to come close to the house.

Mr. Sembe seemed relatively knowledgeable about plague. During our discussion he even mentioned two types of plague - bubonic and pneumonic.

Hygiene

Mr. Sembe said that the way a house looks reflects the hygiene of the people living in it. He mentioned the presence of a latrine last after hints from the research team. A good housewife, he said, is one who is beautiful, has a kind heart, and keeps the surroundings of the house clean.

Rats and cats

The household has a cat and children play with it. This cat has been known to eat the household's food, but he said that if this happens they throw away the rest of the food.

Health problems

Mr. Sembe said that the most common illnesses that affected his household were malaria, flu and abdominal pain including diarrhoea.

UBIRI: HOUSEHOLD NUMBER 3

Household Head:	Abraham Sembe, Male, 49 yearsold
Name of spouse:	Amina Shekifu
Key informants interviewed:	Muru Sembe and Amina Shekifu
S-E status of household:	Low
Main occupation:	Farming
Sub-village:	Mission
Education of HH:	Standard 7

General background

The household consists of three members: the wife, the husband, and a grandson. They are Christians and the household was selected with their religion in mind so we can see the impact of Christian teaching on hygiene and awareness of plague. The household has a single house with two rooms (bed room and kitchen room). The kitchen room is also used as sleeping room for the grandson and for storage of foodstuffs and water. Food items such as such as maize and cassava are stored into the ceiling. The household has 2 cows and the cowshed is beside the house. The homestead is isolated and there were no vegetation around. However, animal beddings were nearby the house and they seem to be attractive as rodent habitats. The household has 4 parcels of land with a total acreage estimated at 4 acres. The most important crops grown include maize, beans, and tomatoes.

Plague

In the discussion with Mr. Sembe the research team discovered that he has seen a patient suffering from plague. While training in Bible studies at Vuga in 1990 he had first heard about plague. He learnt that fleas from rats were the ones that transmit plague. He said that most of these rats were from forests and shrubs where they stay. He said that there are specific rats

which have fleas that cause plague. These rats have pointed mouths and are called *ngitu*, he said.

Hygiene

For Mr. Sembe good hygiene meant having a well plastered house with clean surroundings and a latrine. When one of the research team asked to see his latrine, he said he did not have one and was using a neighbour's. A good housewife is, he said, one who cleans her utensils and plasters the house well.

Food preparation, consumption and storage

According to Mr. Sembe meat is rarely consumed by the household and therefore it is carefully kept to avoid rats or cats getting to it. It is usually boiled for 2 hours and then fried with other ingredients. However he said that they also liked roast meat. Cooked food is served on a single plate and all the household members share this plate, except children who are served on their own plate. Food leftovers are stored in a container and placed in a plastic bucket that is well covered. Fruit and vegetables are washed in tap water although Mrs. Sembe said that she was aware that this is not recommended.

Water

The Ubiri river is the main source of domestic water, which is normally collected three times in a day and stored in traditional pots holding 60 litres. Water is used immediately and the container is emptied before the next day. The respondent believed that water could carry harmful micro-organisms that cause infectious diseases like cholera, typhoid, and dysentery, but not plague. Drinking water was only occasionally boiled particularly during disease outbreaks. The household assumed that local water was clean and safe since their forefathers have always used it without coming to any harm. In addition to that they said that it was a lot of bother to boil drinking water, and they suffered from a shortage of firewood.

Mr. Sembe and his grandson occasionally take baths in the river.

Rats and cats

The household reported that rats are a problem especially during periods when they have food stored above the ceiling, and at night. Rats eat stored food and leftover cooked food. They sometimes buy poison to kill rats but cannot do this often because it is expensive; they cited the price of a packet of poison as Tshs 200 at Soni nearby.

They have never found any dead rats unless they have used poison to kill them. Rat carcasses are said to be disposed of in a pit latrine or buried deep in the ground to avoid contact with human beings.

The household has no cat.

Fleas

The household normally faces flea infestation during the period between August and January. Mr. Sembe could not clearly distinguish between rat and human fleas, but he understood that these were different from other insects like ants, cockroaches, bed bugs, lice and ticks. Hot water and house cleanliness were used as control measures against fleas.

Health problems

Mr. Sembe said that common illnesses that attack in his household are malaria, fever and scabies.

UBIRI: HOUSEHOLD NUMBER 4

Household Head:

Bakari Rashid, Male, 54 years old

Name of spouse: Zuhura Bakari
Key informants interviewed: Bakari Rashid and Zuhura Rashid
S-E status of household: High
Main occupation: Farming
Sub-village: Nkaloi
Education of HH: Standard 8

General background

Mr. Bakari had been employed in the Ministry of Works but was made redundant in 1995, when he turned to farming. His household has six members, including four children. The homestead consists of two houses adjacent to each other, one with three rooms (a sleeping room for the children, a sitting room and a kitchen). The second house has a bedroom for the parents and a sitting room. The household has two heads of cattle, which are normally kept inside the house at night while during the daytime they are tethered outside. The sitting room in the children's house is used as a store and cow shed at night. Water and foodstuffs are stored in the kitchen. Crops such as maize and cassava are stored in the ceiling. Though the house is constructed with local materials, it was found to be very clean and attractive. The landholding of the household is estimated at 4 acres in 4 parcels. The main crops grown include maize, cassava, beans, and sweet potatoes.

Mr. Bakari said that he did not stay in a *bweni* when he was a child and his children were not sent to *bweni* either because he has plenty of room for them to sleep in the kitchen house.

Plague

Mr. Bakari said that fleas from rats are the ones that transmit plague to human being. He said there were two types of rats – those that are common in houses and those from the forests. He was not sure which ones brings plague but he thought it is probably transmitted by rats from forests as they are the ones with fleas and it is the fleas that brings plague to human beings.

He said that plague started at Shume because it was near the forests. He told the following story about the origin of plague. Traditionally, when the rains fail elders go to the *zombe* to ask for rain. The *zombe* then sends a person to a secret place to carry out rituals to bring the rain. The condition for the *zombe* to bring rain is that he should be respected and this is expressed through making a contribution of part of the harvest to the *zombe* in return for rainfall. One year (he did not mention which year) at Shume they got plenty of crops like beans and maize while the rest of the places under the jurisdiction of the *zombe* did not get good harvests. Following the bumper harvest by the people of Shume, they became arrogant towards the *zombe*. They did not contribute part of their harvest and other offerings to him. Worse still they even used some of their crops to plaster their houses, particularly cooked beans, which they used to provide colour. The *zombe* became angry and brought the rats that ate all the crops in the farms and in the stores. Then the rats began biting people and that was the beginning of plague in Lushoto.

Mr. Bakari knew the symptoms of plague, and mentioned swelling of the glands and high fever. He said that there was a strong relationship between shrubs, poor hygiene and plague, since shrubs attract rats from the forest who may then enter the house. He said that if one is bitten by fleas that have plague one should go to hospital.

Mr. Bakari suggested the following to prevent the further spread of plague in Lushoto district

- People should remove shrubs from around their houses
- People should plaster their houses
- The government should force people to conform to the bye-laws made in the village intended to reduce the spread of plague.

Hygiene

Mr. Bakari saw hygiene as a good house with well plastered walls, a good floor, painted with coloured paint, which has a pit latrine with a cover. In the latrine there should be water for

use after using the toilet. A good housewife is one who washes her clothes, takes a bath, cleans the house, washes the children and their clothes. Interestingly he said there were few houses in Ubiri that conform to this.

Food preparation, consumption and storage

Beef or chicken was said by Mr. and Mrs. Bakari to be eaten twice a week. Meat is usually prepared by boiling and then frying with other ingredients. It is sometimes roasted. People serve themselves from a pot.

Water

The household gets its water from a spring which is quite a distance away from the homestead. However the spring does not supply enough for all the people who use it, and the level of water often becomes so low that one has to wait for long periods to get enough water. There is more water at night-time, and men often go to fetch water at that time. Water is usually collected every day and is stored in traditional pots. According to the informants storage pots are emptied and cleaned before being refilled. They do not boil water, believing that water from the spring is cleaner and safer than tap water would be.

Rats and cats

The household acknowledges rat infestation as a problem especially during the harvest period when the household usually has three to four rats at any one time. It identifies at least two types of rats: house rats and bush rats. Rats that bring plague are the forest ones, which come to homesteads in search of food when food in the forests becomes scarce.

The household did not have a cat during the study period but there were cats which passed through the house. Mr. Bakari said that these cats ate the household's food once but he said that they threw the food away.

Fleas

Mr. Bakari pointed out that the household has not had a flea infestation for more than five years and has never had plague.

Health problems

The most common illnesses that the household experienced were eye problems, headache, coughing, vomiting, diarrhoea and malaria.

UBIRI: HOUSEHOLD NUMBER 5

Household Head:	Abdi Bodwe Iddi, Male, 54 years old
Name of spouse:	Azmar Iddi
Key informants interviewed:	Abdi Hamisi, Male, 28 years and Azmar Iddi
S-E status of household:	Low
Main occupation:	Farming
Sub-village:	Gharamo
Education of HH:	Standard 7

General background about the household

Mr. Iddi's household has seven members, including husband, wife, mother in law, a child, and three grandchildren. The homestead consists of two houses. One of the houses has a sitting room and bedrooms for parents and children, while the second house is reserved for the mother in law and her grandchildren, who occupy one room while the second of its rooms is used as a kitchen. This also acts as a storage room for water, foodstuffs, with cassava and maize in the ceiling. The homestead is surrounded by grass, which act as good habitats for

rodents. The landholding of the household is estimated at 2 acres in from 5 parcels. The main crops grown include maize, beans, and tomatoes.

Mrs. Iddi said that she stayed in a *bweni* during her child hood and her children were at *bweni* with their grandmother at the time of the study. She has seven children, six boys and one girl.

Plague

Mrs. Iddi said that plague is caused by fleas from rats. She said that once these fleas bite a person, then that person is likely to be infected with plague. Rats carrying fleas with plague are, he said, mainly from the forests. Mrs. Iddi was living at Kiguzu at the time of a plague outbreak; she said that some of the people died and others were sent to a place where they got medication. Kiguzu was put under quarantine to avoid other people being infected with plague. On the origin of plague, Mrs. Iddi said plague started in Mtae/Mlalo ward and then spread to all parts of Lushoto.

Hygiene

Mrs. Iddi considers hygiene to be expressed in a house that is roofed with iron sheets, has good floors, well-plastered walls and clean surroundings. It should have a latrine. However the study team learnt that she does not have a pit latrine and was using the neighbour's one.

Food preparation, consumption and storage

Beef was said to be eaten once a week. Leftover food is stored in a bucket.

Water

Water is collected from a spring and occasionally from the village standpipe; the latter is often dry. It is collected 3 times per day and stored in pots and plastic buckets.

Rat and cats

The household acknowledges rat infestation as a problem especially during the harvest period when the household often has three to four rats at any one time. Informants identified at least two types of rats: house rats and bush rats.

Rats that bring plague are the forest ones and come to homesteads in search of food when food in the forests becomes scarce. The household buys rat poison from Soni at Tshs 300 per packet, but this does not last long.

The household did not have a cat during the study period but there were some cats that were moving and passing through the house. They had sometimes eaten her food, but she threw away what was left when that happened.

Fleas

The household faces flea infestation in some periods of the year, which is related to infestation by rats during periods when there was food shortage in the field/forest. They said that application of insecticides such as sulphur powder, and environmental sanitation measures helped to reduce rats and fleas infestation.

Health problems

Common illnesses experienced by Mr. Iddi's household were eye problems, headache, coughing, and malaria.

UBIRI: HOUSEHOLD NUMBER 6

Household Head:

Mahamud Magogo, Male, 48 years old

Name of spouse: Zalihina Mohamedi
Key informants interviewed: Mahamud Magogo and Zalihina Mohamedi,
30 years old
S-E status of household: Medium
Main occupation: Farming
Sub-village: Saweni
Education of HH: Standard 7

General background

Mr. Mahamud's household has five members including the husband, wife, and children. The homestead consists of one house with six rooms: two bedrooms, a kitchen, a storeroom, and another room that is used as livestock shed. The house is close to many other houses belonging to other households, which make a cluster of houses. Water and food is stored in the store while maize, and cassava are stored in the ceiling. There was a latrine located at some distance from the main house. Utensils are washed outside the house. Landholding is estimated at eight acres distributed among four parcels. The main crops grown include maize, beans, plantains and tomatoes.

Mrs. Mohamedi said that she did not stay in a *bweni* during her child hood but many of her peers did, from the age of 9 or 10. She said custom of *bweni* is becoming unpopular because nowadays households have large houses that accommodate all household members, thus diminishing the need for *bweni*.

Plague

Mrs. Mohamedi believes that plague is caused by fleas from rats. Once these fleas bite a human being then that person is likely to be infected with plaque. She had had experience of plague at Kwamshai. She saw people vomiting and others had swollen glands. Some of the patients were cured and others died. She stressed that plague is infectious. She believed that all rats could transmit plague but she also said that those called "*panya buku*" were the ones responsible for having fleas which have the plague virus.

She told us that she knew that there was a relationship between a dirty environment around the house and shrubs and the possible prevalence of plague. Mrs. Mohamadi's father was a village health worker and assisted medical personnel in treating people who were infected with plague during an outbreak. After the plague outbreak she said that there was a serious campaign to bring about a better level of cleanliness in the whole village. Every house in the village was cleaned, including the surroundings. Each person was told to sleep alone to avoid the movement of air from one person to another that might lead to infection with plague. All the houses were plastered with mud and some with cement.

Hygiene

On hygiene, Mrs. Mohamedi focused on the house, saying it should be clean, have well plastered walls, a clean floor and clean surroundings. Interestingly she did not include the presence of a latrine, even though she has one. A good housewife, she said, is one who washes her clothes, has clean utensils, cleans the house, keeps the children clean and irons clothing. However she said there were few houses in Ubiri v illage that conform to this description.

Food preparation, consumption and storage

Beef is eaten 1 -2 times per month. It is normally boiled but occasionally roasted. Fruit and vegetables are washed with untreated water though the respondent was aware that treated water was recommended. Food sharing between this household and others was common in relation to such foods as cassava, sweet potatoes and flour.

Water

Water for domestic use comes from a spring which is about 400 m away from the household, and also from the river Nyasa. Water is collected three times per day and stored in pots. In

this household, it is worth noting that the husband fetched water as well as the wife, because it was collected at night time. According to the informants drinking water is sometimes boiled to avoid transmission of diseases to humans. However, boiling is only done during periods when water seems to be very contaminated, usually after heavy rainfall.

Occasionally, boys take a bath and wash clothes at the river Nyasa and in the pond nearby that is a result of excavation for road construction.

Rat and cats

The household acknowledges rat infestation as a problem especially during the harvest period when the household often has three to four rats at any one time. Rats are a problem in the household because they eat stored foods and leftover foods. Informants identified three types of rat: house rats referred to as '*ngoshwe*', forest rats referred to as '*mphuka*', and forest rats referred to as '*ngitu*'. The '*ngitu*' is distinguished from other forest rats by the fact that they eat literally anything, including human flesh as well as clothes. The characteristic feature of the '*mphuka*' rat is its long mouth.

The household has no cats to control the rats and does not have enough money to buy chemicals to control rats. Rats are seen as an indication of filthy conditions and are therefore shameful creatures. The population of rats in the houses is highest during the dry season, when there is no food for rats in the fields, which compels the rats to search for food in homesteads

Fleas

According to the informants, flea infestation occurs between September and February as that is the period when houses are heavily infested with rats. Luckily, however, the household has not been affected by plague at all.

Health problems

Mrs. Mohamedi said that the most common illnesses which affected her family were chest pain, flu, headache and malaria.

She said that spontaneous abortion was a problem in the village; many pregnancies end this way.

UBIRI: HOUSEHOLD NUMBER 7

Household Head:	Yasini Mohamed, Male, 28 years old
Spouse:	Bisura Emamu Mohamed
Key informants interviewed:	Yasini Mohamed and Bisura Emamu Mohamed
S-E status of household:	Medium
Main occupation:	Farming
Sub-village:	Bangwi
Education of HH:	Standard 7

General background

The household has four members. It has two houses – the main house and the kitchen. The homestead is in a cluster of houses with vegetation close by. The main house has bedrooms for children and parents. The kitchen hut has a cooking room and another room used as sitting place and cow-shed during the day and at night-time respectively. Water and foodstuffs such as flour, beans, sugar, tomatoes, vegetables etc. are stored in the sitting room, while maize and cassava are stored in the ceiling. The landholding of the household is estimated at two acres made up of four parcels. Maize, beans, sweet potatoes and cassava are the main food crops grown while the main cash crops grown include tomatoes and sweet pepper,

Mrs. Mohamed said that she stayed in a *bweni* during her childhood, with six other girls. They slept on the floor. The children were sent to *bweni* when they were seven. But she was not intending to send her children to *bweni* because she has room for her children in the house.

Plague

Mr. Mohammed said that plague started at Mlalo. He said that plague is spread by rats but it was not clear whether he was aware of the role of fleas. At first he said it is transmitted by eating food that has been eaten by rats. Later, however, he said that fleas from rats that have plague will transmit plague to a person when they bite you. He mentioned diarrhoea and vomiting as symptoms of plague. He said that there was a relationship between plague and the presence of shrubs and a dirty environment around the house.

He said that children are most affected by plague, followed by men and lastly women. His response was contrary to what the other people interviewed said, which is that people who are exposed are predominantly women and children.

Hygiene

Mr. Mohamed emphasised that the environment around a house should be clean. There should be a pit/latrine, and channels of dirty water should be cleaned. A good housewife keeps her house and her children clean, as well as her utensils. She herself should be clean, and she should keep the bedding clean. He said most of the houses in Ubiri are clean houses such as he has described.

Food preparation, consumption and storage

Beef or goat meat is eaten in the household once a month. Cooked food is served in two plates, for men and women. Leftover food is stored in a cupboard which the informant believes is not accessible to rats and cats. Food sharing between this household and neighbours is common.

Water

River water was the main reliable source of water for domestic use. Water is collected 4 times per day and stored in a traditional pot with a capacity of 60 litres. The informants were aware that contaminated water was spreading infectious water-borne diseases such as cholera, diarrhoea and typhoid, and therefore the household is said to boil drinking water.

Occasionally, boys belonging to the household bathe and wash clothes at the spring site.

Rats and cats

The household suffers from rat infestation. Rats are a problem in the household because they eat stored foods and leftover foods. The population of rats in the houses is highest during the dry season, when there is no food for rats in the fields, which compels the rats to search for food in homesteads. Informants distinguished between three types of rat: house rats referred to as '*ngoshwe*', forest rats referred to as '*mphuka*', and forest rats referred to as '*ngitu*'. Rats are seen as an indication of filthy conditions. The household contends that the rats in the houses cannot cause plague because if they could, members of the household would have caught plague long ago.

The household has no cats to control the rats but there were number of cats moving around the house and they are said to have eaten the household's food. This is said to have been thrown away.

Informants said that they do not have enough money to buy chemicals to control rats, as a packet sells at Tshs 100-150 and would be used up in just a day.

Fleas

The household has experienced flea infestation often but has not been affected by plague at all. They control fleas by pouring hot water over the floor and by improved environmental sanitation measures.

Health problems

Malaria, coughing, flu and abdominal pain with diarrhoea are the most common illnesses that disturb this family.

UBIRI: HOUSEHOLD NUMBER 8

Household Head:	Rajabu Sheubua, Male, 66 years old
Spouse:	Maliwaza Amir, 56 years old
Key informants interviewed:	Rajabu Sheubua and Maliwaza Amir
S-E status of household:	Low
Main occupation:	Farming
Sub-village:	Nduiyo
Education of HH:	None

General background

The household has five members. The homestead is very close to shrubs. It is also very close to two other homesteads of the same clan. There is a main house with sleeping room and sitting room and the kitchen is adjacent to the main house. The kitchen house consists of a cooking room and another room used as a sitting room and livestock shed during the day and at night respectively. Farming is the main occupation of the household but the household also keeps livestock. Crops grown include maize, beans, Irish potatoes and tomatoes. The household's landholding is estimated at two acres.

During his childhood Mr. Rajabu said that he stayed in a *bweni*.

Plague

Mr. Rajabu said that plague was brought by the fleas of rats which are in the forest. If these fleas bite a human being then the chances of being infected with plague are high. He said that plague started at Shume where they were there is a timber industry. He is strongly persuaded that there is a relationship between forests and shrubs and the prevalence of plague. The people who are infected most with plague are women and children, because most of the time they are in the house, cleaning the house and engaged in other domestic activities, which exposes them to being bitten by fleas.

Mr. Rajabu recommended that there is a need to cooperate in keeping the environment clean. He said that there were some neighbours who were throwing human waste near his house. One of the research team saw human faeces near his house, thrown by his neighbour. Also shrubs and bushes should be cleared and every house should be clean. All chairmen of sub-villages should make sure the environment is clean.

Hygiene

Mr. Rajabu associated good hygiene with clean surroundings around his house, well plastered walls, roofing with iron sheets, clean utensils and the presence of a latrine. A good housewife is one whose clothing and body are clean, and who keeps her utensils and bedding materials clean.

Food preparation, consumption and storage

Meat is boiled for at least 2 hours before being fried with onions, tomatoes and cooking oil. Beef is eaten by the household about 2-3 times in a month. Cooked food is served on two plates which household members share. Leftover food is kept in a bowl in a covered bucket and then eaten for breakfast the next day.

Water

Spring water is the main source of water for domestic purposes. The village stand pipe also provides water occasionally. Water is collected every two days and stored in traditional pots holding 50 litres. The respondent was aware that water can carry and transmit harmful micro-organisms that cause diseases such as cholera, diarrhoea and typhoid, and therefore the household boils drinking water to avoid disease.

Occasionally, boys take a bath at the spring and wash clothes there.

Rats and cats

The informants reported that rats are a problem. They sometimes use poison to control the rats but the rats re-infest the house as soon as the poison is finished. They cannot buy poison often since they cannot afford this.

Rats that bring plague are the forest ones, which come to homesteads in search of food when food in the forests becomes scarce. Rats are an indication of filthy conditions and because of their connection with plague, rats are seen as menace.

The household has no cat of its own but relies on cats that move around in the area. Such cats are not very reliable in controlling rats and instead, they eat food items kept in the houses rather than preying on rats. A reliable way of minimizing rat infestation is plastering the houses. Cats entering the house, have been known to eat food. Mr. Rajabu said that if this happened the food was thrown away, because cats have hairs which could fall in the food and create health problems.

Fleas

No flea infestation had been experienced.

Health problems

Malaria, coughing and flu were the most common illnesses affecting Mr. Rajabu's family.

UBIRI: HOUSEHOLD NUMBER 9

Household Head:	Hassan Hoza, Male, 43 years old
Spouse:	Ashura Hoza, 35 years old
Key informants interviewed:	Hassan Hoza and Ashura Hoza
S-E status of household:	Medium
Main occupation:	Farming
Sub-village:	Kiguzu
Education of HH:	Standard 7

General background

The household has five members, occupying two houses. The main house has three rooms (sitting room, parent's and children's bedrooms). The second house has two rooms (kitchen and cow-shed). Food and water are stored in the sitting room, which was overcrowded with other things including utensils, bags etc.. Maize and cassava are stored in the ceiling. The landholding of the household is estimated at four acres distributed among three parcels. The main crops grown include maize, beans, tomatoes, cabbage, and cucumbers. The household has 3 heads of cattle and some goats.

Plague

Mr. Hoza said that plague in the area started at Gale and the patients were sent to Lushoto. It is a serious problem in the district. He said plague was transmitted by the fleas of rats. Once a person is bitten by fleas that have the plague virus then that person becomes infected with plague. Most of these rats that have fleas with plague are, he said, from the wild – from forests and shrubland. The origin of plague is Lukozi/Mtae, Mambleo and Malindi

Mr. Hoza said that his house lost one person to plague in 1990 - his mother. His mother became sick and was thought to be ill of malaria. She was sent to Lushoto District hospital where she died the same evening. Later they were told that it was not malaria which she had, but plague. His house was quarantined for seven days. All the people in the house were given medicine for fear that they might have been infected with plague. It was the same period when the whole district was quarantined and rat traps were brought.

Mr. Hassan said that the symptoms of plague are swollen glands, severe headache, and feeling cold.

The research team learnt that Mr. Hoza believes strongly in *kuvunja vyungu*. Although he had previously said that his mother died of plague, Mr. Hoza later argued that his mother did not die of plague but of *kuvunja vyungu*. He called a traditional healer from Kwamshai to prepare medicine to protect the family. He stressed that if he had not done this the whole family would have been lost. This TH managed to remove *vyungu* from the grave and ensured that other people in the family survived. To make his point Mr. Hoza gave another example where his sister managed to get rid of *kuvunja vyungu* too; her child was an eye witness of the process.

He also told us about the *zombe* who is the guardian of ancestral spirits. If they disobey the *zombe* he can bring rats that can bring plague.

The health worker who accompanied one of the research team to this house reported that the house had been quarantined when Mr. Hoza's mother had plague. He himself and other people from the village were on guard to prevent people from going out or going in. At night the traditional healer who had been called to treat *vyungu* arrived. They allowed him to go in on condition that he should take medicine against plague. The healer agreed and they let him on an informal basis. He then performed his rituals of removing the *vyungu* at the grave.

Hygiene

Mr. Hoza associated hygiene with clean surroundings around the house, clean utensils, clean food and clean children. Having a pit latrine was mentioned last after given a hint, when he also said that water should be available in the latrine for washing after using the latrine. A good housewife, he said, is one who has clean utensils, clean food, clean clothes and a clean body. She also keeps her children's and her husband's clothes clean, and keeps clean bedding materials. Mr Hoza said that only a few houses in Ubiri could be considered as good houses in these terms.

Food preparation, consumption and storage

Beef is eaten in the household about once a month. It is boiled then fried in onion, tomatoes and cooking oil. Cooked food is placed in a plate which people share. Food left overnight is given to their children the next day.

Water

A spring was the main water source for domestic use. Water is collected as often as it is needed and is stored in pots, where it may stay for two days before the containers are refilled. Special drinking water was obtained (purchased) from the Soni water falls.

All members of the household fetch water from the spring.

Rats and cats

The household acknowledges rat infestation as a problem especially during the harvest period when the household has three to four rats at any one time. Informants identified at least two types of rats: house rats and bush rats.

Rats that bring plague are the forest ones and they come to homesteads in search of food when food in the forests becomes scarce. Rats are an indication of filthy conditions and are therefore disliked.

Mr. Hoza has a cat. His children do not play with it.

Fleas

According to Mr. Hoza and his wife, the household has a problem with both fleas and rat infestation during some parts of the year, and had been affected with plague once in year 1990.

Health problems

The most common illnesses affecting the Hoza household are asthma, malaria and chest pain.

UBIRI: HOUSEHOLD NUMBER 10

Household Head:	Salim Omari, Male, 45 years old
Spouse:	Sofia Hamis, 35 years old
Key informant interviewed:	Sofia Hamis
S-E status of household:	High
Main occupation:	Farming
Sub-village:	Nyasa
Education of HH:	Standard 7

General background

There are seven members in the household, of whom three were visiting from Dar Es Salaam. The homestead consists of the main house, which is of high quality with several rooms (sitting room, dining room, storeroom and bed rooms for parents and children). The kitchen is beside the main house. Water is obtained from the river and is stored in both kitchen and storeroom. Foodstuffs are also kept in the storeroom. The house was found to be clean and attractive. The household has four acres of land distributed unevenly among 4 parcels. Maize, beans, cassava, sweet potatoes, and Irish potatoes are the most important food crops. Cash crops grown include tomatoes and sweet peppers.

During her childhood Mrs. Hamis stayed in a *bweni* in which there was a total of ten children. However she wouldn't send her children to *bweni* because there is a room in the house for them. Further their father has refused to send them to *bweni*. When further probed on why she did not want to send her children to *bweni* she said they were young and that they had been sexually abused during the short period when they did stay in a *bweni*.

Plague

When Mrs. Hamis was asked about plague she started by mentioning symptoms like diarrhoea with blood, vomiting blood, stiffness of arms and legs and fever. She said the cause of plague was dirtiness and that the illness started in Maluwati, Lukozi and Mlalo. She said that she had seen patients who were suffering from plague separated from the community and quarantined.

Hygiene

Mrs. Hamis said a hygienic house is well built, has well plastered walls and floor with all the cracks filled in, and is well decorated. A toilet was mentioned after hints were given. A good housewife is one who keeps both her body and her clothes clean, has a well decorated house using nice stencils, and keeps her children clean.

Food preparation, consumption and storage

Beef and chicken is eaten rarely, not as much as twice a week. Cooked food is served into a pot and household members serve themselves from this. Fruit and vegetables are washed using untreated water. Rice, maize, flour and cooking oil are often shared with other households. Leftover food is re-boiled and consumed as breakfast.

Water

Spring water is the main source of water for domestic use, since the availability of water at the nearby village stand pipe is erratic. Water is collected throughout the day and is stored in a drum with a capacity of 12 buckets. The research team observed that the storage containers were refilled before being completely emptied. In 2002 there was a cholera outbreak and now the household is boiling all drinking water.

Rats and cats

The household has no rat problem. As far as Mrs. Hamis can remember only one rat have ever been seen in the houses, and this was killed by the cat which the household keeps.

The respondent identifies two main types of rats: homestead rats called “*ngoshwe*” and field rats called “*ngitu*”. The field rats are larger in size and bite humans, which is never the case with homestead rats.

Fleas

According to the respondent has not experienced flea infestation at all.

Health problems

The most common illnesses affecting Mrs. Hamis’ household are malaria, abdominal pain, chest pain and coughing.

UBIRI: HOUSEHOLD NUMBER 11

Household Head:	Ally Mahanyu, Male, 70 years old
Spouse:	Mama Yasini, 35 years old
Key informants interviewed:	Ally Mahanyu and Mama Yasini
S-E status of household:	High
Main occupation:	Farming
Sub-village:	Kizara
Education of HH:	Standard 2

General background

Mr. Mahanyu is the Imam of Kizara mosque. There are ten members in the household, including the three wives of the household head. There are two houses, one main house with several rooms and another house with three separate rooms, one for each of Mr. Mahanyu’s wives. Water and food are stored in the kitchen and the children sleep in the kitchen room. The kitchen was found to be overcrowded with utensils, firewood, buckets, bags, mattresses, blankets and other things. There was a rough floor and wide cracks in the kitchen walls, suggested that contact between human beings, rats, and fleas was common. Generally, the kitchen environment was dirty and unpleasant. The household has about 12 acres of land distributed among 10 parcels. Maize, sweet potatoes, plantains, beans, and Irish potatoes are the main food crops while coffee, tomatoes, and cabbage are the main cash crops

Plague

Mr. Mahanyu reported that plague is brought by fleas from wild rats and once these fleas bite a person then the person is infected with plaque. Plague is, he said, also infectious. On the origin of plague, he said it started in Mtae and then spread in all the villages of Lushoto. He considers that the people most badly affected are men. He associated the presence of plague with a dirty environment, not using a pit latrine and the cleanliness of the house. Plague is

favoured, he said, by filthy conditions such as sleeping on plantain leaves referred to as '*mashwaho*'. Now, people no longer sleep on these and so they are less likely to get plague.

One member of the household had died of plague. However Mr. Mahanyu said that he had no clear knowledge about what causes plague or about what control measures are required to overcome plague.

Hygiene

Mr. Mahanyu said that hygiene meant clean surroundings around his house, that the house should be well plastered, and that it should be cleaned every day. Although he mentioned the presence of a pit latrine last after being given a hint, he told an interesting story regarding latrines. A sheikh who was his guest at the mosque came and spent a night at his house. Mr. Mahanyu prepared nice food for his visitor. After the meal the visitor asked where the pit latrine was. Mr. Mahanyu told him that he did not have one and thus he sent him to a neighbour's latrine. After using the latrine the Sheikh told him "*fadhila za mgeni huzipati na atapata yule ulikonipeleka*" (the blessing of the visitor goes to the one where you sent me to help myself). He also said that when the Sheikh was coming to inaugurate a mosque at the sub village of Shughuli, when Mr. Mahanyu was the Imam of that mosque, the Sheikh had this to say, "If you had no latrine I couldn't have inaugurated your mosque". A good housewife, for Mr. Mahanyu, is one who cleans the bedding materials, her body and her clothes, cleans her utensils and washes her children and their clothes.

During his childhood he stayed in a *bweni* with five other children. His children are staying in a *bweni* and there are more than six of them sharing it.

Food preparation, consumption and storage

Beef and goat meat is eaten in this household about once or twice a fortnight depending on cash availability. A self service system is used for serving food except for children, who eat together from the separate plate. Untreated water was seen to be used in washing vegetables and fruits; this is said to have been the practice used by their forefathers with no harm to them. Food sharing with neighbours and relatives was common in relation to foods like plantains, yams, rice and meat.

Water

A stand pipe in the village provides water for domestic purposes. The respondent was aware that water can carry micro-organisms that can cause diseases to human. Water is collected three times a day and stored in pots, which are emptied before refilled. Drinking water is said to be boiled in order to avoid the outbreak of water born diseases.

Contact with water apart from water for domestic use is confined to fetching water from the spring and involves all members of the household, irrespective of their sex or age. Bathing is usually done at home using water fetched from the spring. Occasionally, children block the river with a weir and bathe in the river, after which they remove the weir so that the water can flow normally.

Rat and cats

The household acknowledges rat infestation as a problem especially during the harvest period when the household often has three to four rats at any one time. At least two types of rats are recognized: house rats and bush rats.

During the study period Mr. Mahanyu had cat and children were playing with it. This cat had been known to eat household food after which what was left of that food was said to have been thrown away.

Fleas

The household had experienced flea infestation in the past.

Health problems

Mr. Mahanyu cited malaria, abdominal pain, flu and coughing as the most common health problems affecting his household.

UBIRI: HOUSEHOLD NUMBER 12

Household Head:	Bakari Daffa, Male, 48 years old
Spouse:	Mwanaid Kassim
Key informant interviewed:	Mwanaid Kassim
S-E status of household:	High
Main occupation:	Farming
Sub-village:	Kitale
Education of HH:	Standard 4

General background

The household has six members and they have two houses. The main house has bedrooms and a sitting room. The second house has a kitchen and a livestock-shed. Water is stored in the kitchen while food such as flour, beans, sugar, cooking oil, spices etc are stored in the sitting room. Crops such as maize and cassava are stored into the ceiling. The house was clean and attractive. The household has five parcels of land totalling about 4 acres. Maize and beans constitute the main food crops while Irish potatoes are grown predominantly for sale,

During his childhood Mr. Daffa stayed in a *bweni* and they were 8 to 10 in number. His three children stay with their grandmother. In the *bweni* he said that it was dirty and smelly, with little windows. Nobody made sure it was clean.

Plague

Mrs. Kassim reported that plague is brought by rat fleas carrying the plague virus. She said that these rats prefer a dirty environment both in farms and inside the house. She mentioned the following symptoms of plague: high fever, chest pain, swelling of glands. She said plague started at Shume. The people who are affected are, she said, mainly children, followed by women. This may be because children stay with their mothers, the immunity of children is very low, and children collect wild fruits and this exposes them to fleas from wild rats.

Mrs. Kassim also said that at first plague was associated with witchcraft, revenge, and with the *zombe* being angry are not getting the rewards expected after harvest. But she said that many people have changed their minds about this.

Hygiene

Mrs. Kassim said that hygiene meant that the surroundings of a house should be clean and the house should be well plastered both outside and inside. She mentioned a toilet only after hints. A good housewife is a one who cleans the house, cleans both her body and her clothes, has a clean place for sleeping and also keeps the children clean.

Food preparation, consumption and storage

Beef is said to be consumed twice a week, and is boiled before being fried. Food is served on one plate which household members share. Food leftovers are stored in a cupboard overnight.

Water

A stand pipe is the main source of water for domestic use. Fruit and vegetables were washed with unboiled water. Water is collected about 10 times a day. It is stored in buckets and could stay for two days before being used and refilled. According to the informants water can

transmit several diseases but not plague. Drinking water is boiled to prevent diseases such as cholera, diarrhoea, typhoid and dysentery.

Rats and cats

Mrs. Kassim said that rats are a problem. They sometimes use poison but not often as they cannot afford to. The household has no cat of its own but relies on cats that move around in the area. Such cats are not very reliable in controlling rats and instead, they eat food items kept in the houses rather than preying on rats. A reliable way of minimizing rat infestation is plastering the ho uses.

Rats that bring plague are said to be the forest ones which come to homesteads in search of food when food in the forests becomes scarce. Rats are an indication of filthy conditions.

The household did not have a cat during the study period but there were some cats that were moving around and had even entered the kitchen and eaten food. Mr. Daffa reported that the remaining food was thrown away.

Fleas

The household has not experienced flea infestation for the past three years. Mr. Daffa said that application of insecticide and biological control measures has reduced flea infestation as well as rat infestation.

Health problems

Mrs. Kassim mentioned malaria, abdominal pain, flu and coughing as common health problems affecting his household.

UBIRI: HOUSEHOLD NUMBER 13

Household Head:	Hussein Kihiyo, Male, 66 years old
Spouse:	Fatuma Hussein, 35 years old
Key informant interviewed:	Hussein Kihiyo and Fatuma Hussein
S-E status of household:	Low
Main occupation:	Farming
Sub-village:	Kitale
Education of HH:	Standard 3

General background

There are two persons in the household, which has one house. The house consists of two rooms (sleeping room and kitchen room). The kitchen room is overcrowded because it is used for storing water, food and utensils, and one part of it acts as a chicken shed. The house was of low quality and not clean at all. The household has about 2 acres of land in 2 parcels. Maize, beans, and cassava are the main crops grown and among the crops, beans acts as a cash crop while the other crops are for food.

He said that he stayed in a *bweni* during his childhood with three other children. His children were staying in a *bweni* and there were a total of six children in it.

Plague

Mr. Hussein started by saying that plague is caused by an "insect" that stays in utensils if not washed well. The "insect" was similar to a flea. This "insect" is brought by "*panya buku*" (forest rats). He said the disease started at Shume and then spread to all the villages that have been affected with plague. The disease comes during the rainy season. He said that at first it was thought to be *kuvunja vyungu*, when a woman dies suddenly is followed by other members of the household. Some people believed the illness was caused by *usinga*. As with *vyungu*, this causes a string of people to die suddenly in one family, just as plague does too if it is not treated. The other story which he told regarding the origin of plague was that at

Shume the government look a plot belonging to someone from the village and built a school. The owner was angry and in revenge brought rats which had fleas carrying plague, and this caused the death of many people.

Mr. Hussein said the people who are affected with plague are mostly women followed by children. Most of them die because they do not go to the hospital at once. They keep delaying going, saying they will go tomorrow.

To prevent the further spread of plaque he argued that there was a need to maintain hygiene and to go to hospital when one gets sick.

Hygiene

Mr. Hussein said that hygiene meant a house made of bricks, plastered, well roofed and painted with coloured paint, and with a pit latrine. A good housewife is one whose body and clothes are clean, who keeps her utensils clean and decorates her house. Her children are clean and bedding materials both for children and parents are clean.

Food preparation, consumption and storage

Beef is said to be eaten once per week. Meat and beans are boiled first before being fried in onion, tomatoes and cooking oil. Food is served on one plate from which members eat together, except for children who are served separately. Leftover food is stored in a bucket covered with a lid. Fruit is washed using untreated water.

Water

Water is brought from the village stand pipe, and is collected three times a day. Pots and buckets are the main water storage containers used by this household. To avoid health problems related to water borne diseases, the household is said to drink boiled water.

Members of the household normally bathe at home using water drawn from the spring. Occasionally, boys bathe and wash clothes at the river Nyasa and in a pond nearby that is the result of excavation for road construction.

Rats and cats

The household acknowledges rat infestation as a problem especially during the harvest period. It identifies three types of rats, house rats referred to as '*ngoshwe*', forest rats referred to as '*mphuka*', and forest rats referred to as '*ngitu*'. The '*ngitu*' eat everything, including human flesh as well as clothes. The characteristic feature of '*mphuka*' is its long mouth.

The household has a cat and it goes around all the houses in the community nearby. The cat has at times eaten the household's food; what was left was, Mr. Hussein said, thrown away.

Fleas

According to Mr. Hussein, the household has had no flea infestation.

Health problems

Mr. Hussein mentioned headaches, chest pains and malaria as the most common illnesses in his household.

UBIRI: HOUSEHOLD NUMBER 14

Household Head:	Jabbir Waziri, Male, 44 years old
Spouse:	Mwanaisha Jabbir, 30 years old
Key informants interviewed:	Jabbir Waziri and Mwanaisha Jabbir
S-E status of household:	Low
Main occupation:	Farming

**Sub-village:
Education of HH:**

**Sekondari
Standard 7**

General background

There are six people in the household and the homestead has two houses. The main house has bedrooms and a sitting room. The second house has a kitchen and a livestock-shed. Water is stored in the kitchen while food such as flour, beans, sugar, cooking oil, spices etc are stored in sitting room. Crops such as maize and cassava are stored into the ceiling. The household has five parcels of land that add up to about 4 acres. Maize and beans constitute the main food crops while Irish potatoes are predominantly for sale.

During her childhood Mrs. Jabbir stayed in a *bweni*. She intends to send her children to *bweni* when they reach 14 years.

Plague

Mrs. Jabbir said that plague is caused by rats in the house. These rats transmit the plague by biting people.

Hygiene

Mrs. Jabbir said that a good clean house has a good place to sleep both for the children and for the adults, and a clean environment around the house. Hygiene also means not eating cold food. In addition a clean house should have a pit latrine. A good housewife is one who plasters her house, keeps her utensils clean, drinks water which is boiled and has clean bedding materials.

Food preparation, consumption and storage

Beef is eaten once per week. Meat and beans were boiled first before being fried in onion, tomatoes and cooking oil. Food is served on one plate from which household members ate together, except for children, who are served separately. Leftover food is stored in a bucket covered with a lid. Fruit is washed in untreated water.

Water

Water comes from the village stand pipe or the river Dindiri and is normally collected three times a day. Pots and buckets are the main water storage containers used by this household. Women and children are responsible for water fetching water.

Members of the household usually take baths at home using water drawn from the spring. Occasionally, boys take baths as well as washing clothes at the river Dindiri.

Rats and cats

Mrs. Jabbir says that rat infestation is a problem especially during the harvest period. Rats are a problem in the household because they eat stored foods and leftover foods. It is difficult to afford to buy poison to control rats.

The household did not have cat during the study period but there were cats that were moving around. These had eaten the household's food at times, and when this happened the remains was thrown away. We asked if she would throw the remains away even if the food concerned were, for example, a chicken. She said that in that case, no, she would only throw away the part that had been gnawed at.

Fleas

According to the informants, this household has not suffered from flea infestation.

Health problems

Mrs. Jabbir said flu, malaria and chest pain were the most common illnesses in her household.

UBIRI: HOUSEHOLD NUMBER 15

Household Head:	Zanjia Hassan, Male, 52 years old
Spouse:	Halima Hassan, 43 years old
Key informant interviewed:	Halima Hassan
S-E status of household:	Low
Main occupation:	Farming
Sub-village:	Handeni
Education of HH:	Standard 1

General background

The household has six members and one house which has three rooms (parents' bedroom, sitting room and kitchen). Water is stored in the kitchen. Foodstuffs like flour, beans, potatoes, cassava, sugar etc. are also stored in the kitchen. The third room is used as a sitting place at day and a livestock-shed at night, while female and male children sleep together with their grandparents. The household has 4 parcels of land with a total acreage of 3 acres. Maize, cassava, beans, and sweet potatoes are the main food crops grown while sweet pepper and Irish potatoes are the main cash crops grown.

Mrs. Hassan stayed in a *bweni* during her childhood, sharing with five other children. Her children were in a *bweni* during the study period, with seven children sharing.

Plague

Mrs. Hassan said that plague is caused by rats. On how plague is transmitted she said that if a rat eats food and then the same food is eaten by a human being, that person would be infected with plague. On who are the most affected with plague, she said women are the ones who were affected most followed by children. The reason for this is that these are the ones who start to eat first.

Hygiene

Mrs. Hassan said that a hygienic house has a pit latrine, well plastered walls, clean utensils, and a pit for the waste of the house. A good housewife should have a clean body and clothes and family should be clean. She should clean the house and the bedding material should be clean.

Food preparation, consumption and storage

Fruit and vegetables are washed in untreated river water though the respondent knew that treated water was appropriate and recommended. Beef is consumed two times per month, and boiled meat preferred to other types. Cooked food is served on two plates, with children and adults eating separately.

Water

The river is the main water source for domestic use in this household. Water is collected four times in a day, storage is in traditional pots, where it stays for one day and thereafter the pots are emptied and refilled. The household used unboiled drinking water with a belief that water was safe as it has been drunk unboiled by their forefathers without harm.

Household members take baths at home using water drawn from the river. Occasionally, boys take baths as well as washing clothes at the river Nyasa and in the pond that is a result of excavation for road construction.

Rats and cats

Mrs. Hassan said that rats are a problem during the harvest period, but the problem is a minor one as it is temporary. The household says that there are three types of rats: house rats referred to as 'ngoshwe', forest rats referred to as 'mphuka', and forest rats referred to as 'ngitu'.

During the study period Mrs. Hassan did not have a cat but she said there were cats passing by her house and they had sometimes eaten her food. She said that when this happens she throws away the remains.

Fleas

Mrs. Hassan said that the household had not been affected by fleas for more than three years.

Health problems

Mrs. Hassan cited common illnesses in her household as being headache, fever and coughing.

Households in Lukozi

LUKOZI: HOUSEHOLD NUMBER 1

Household Head:	Ally Mohamed, Male, 68 years old
Spouse:	Batule Mohamed, 55 years old
Key informant interviewed:	Ally Mohamed and Batule Mohamed
S-E status of household:	Low
Main occupation:	Farming
Sub-village:	Ndabwa
Education of HH:	None

General background

There are 7 members in the household, including four grandchildren. The homestead consists of one house that has three rooms (bed room, sitting and kitchen rooms). The house is well plastered. Water and food are stored in the kitchen room, while maize kept into the ceiling. Children slept together with their mother, while middle room served as sitting place at day time and cow-shed during the night. The toilet is outside just behind the house, and utensils washed in front of the house. The household's land holding is 2 parcels with a total acreage of 2. Maize, sweet potato and beans constitute the main crops grown.

Plague

In this household a female child aged about 8 or 9 years, her daughter, was infected with plague in 2003 and recovered. Mrs. Mohamed learnt of her daughter's illness when she came back from school. "It is in school that she was infected" she said. The child was sent to the clinic at once and was treated. She stayed in the clinic for one week. The case was recorded officially in the village files.

Mrs. Mohamed said the causes of plague are dirtiness and having forest/shrubs close to the houses. She mentioned symptoms of plague like swelling of the body and rise of temperature.

Mrs. Mohamed seemed to trust modern medicine more than traditional medicine. It is judged likely that if any further cases of plague arise in her household, she will send the patient to modern medicine practitioners. This may be as a result of health education on plague.

Hygiene

A good house, a clean environment, clean utensils, a clean body and clean clothes represent hygiene. A pit latrine was mentioned last. In the pit latrine she said there should always be water.

Food preparation, consumption and storage

Beef is said to be eaten once every week or two depending on the purchasing power of the household, which was low as they have no reliable source of income. Meat is boiled first before being fried with onion, tomatoes and cooking oil. Food is served on one plate which household members share, except for children who eat separately. Food leftovers are kept in the bowl and placed in a cupboard. The food is reboiled and used as breakfast the following day. Due to the low quality of storage containers as well as storage places the contact between rats/cats and food was common.

Water

In this household, a spring and a stream were the main water sources for domestic use. Un-boiled drinking water was used on the basis that it must be safe since their forefathers had always used it with no harm. However the respondent pointed out that they normally boiled drinking water in periods of suspected cholera outbreaks. In spite of the effort made by the village/ward health officers people were observed to wash fruit and green vegetables in untreated water. Water is stored in a locally-made pot with no lid suggesting water contamination was likely.

Contact with water apart from water for domestic use is confined to members of the household who fetch water for the rest of the household members. This is because members of the household take baths at home using water drawn from the spring. Occasionally, boys take baths as well as washing clothes at the stream. As a group therefore, women, by virtue of the fact that they are responsible for fetching water for the rest of members of the household, are more exposed to contact with water than males.

Rats and cats

Rat infestation is recognised as a problem for the household because they eat stored foods and leftover foods. However, the problem is said to be minor because it is said to be temporary. The household identifies three types of rats: house rats referred to as '*ngoshwe*', forest rats referred to as '*mphuka*', and forest rats referred to as '*ngitu*'.

This house did not have a cat during the study period. However Mrs. Mohamed reported that there are some cats which come to her house and have helped her to kill the rats in her house. The study team saw no rats in her house.

Fleas

According to Mrs. Mohamed, the household faced a severe flea infestation in 2002 (it was at this time that her daughter was infected with plague, although she believes that she was infected at school). Members come in contact with fleas within the house, and children are most often bitten because they sleep on the floor. The use of control measures such as application of insecticides and environmental sanitation measures as advised by plague control team contributed greatly to a reduction of flea infestation.

Health problems

The most common illnesses cited by the household include headache, fever, coughing, and malaria

LUKOZI: HOUSEHOLD NUMBER 2

Household Head:	Juma Amiri, Male, 41years old
Spouse:	Ramia Amiri, 34 years old
Key informants interviewed:	Juma Amiri and Ramia Amiri
S-E status of household:	Low
Main occupation:	Farming
Sub-village:	Ndabwa

General background

The household has 5 members and one big house with two rooms; the parents' bedroom and the children's room, which was also used as kitchen. The house was cramped and unpleasant with rough walls with many holes so that rats would be able to pass through easily. The floor was also rough and dusty hence a good place for fleas. The surroundings were generally dirty with dense bushes and a persistent unpleasant smell all around. Utensils were washed outside the house and waste products were disposed of near the dwelling. The mode of disposing of waste, of food storage, food handling and food preparation were poor and unhygienic. The household has about 6 acres that are distributed among 4 parcels. Crops grown include cabbage, plantain, maize, beans, sugarcane, and Irish potatoes.

Plague

The household had a case of plague in mid-2003, one of Mr. Amiri's daughters aged about 8 or 9 years old. She was sent to hospital at once. This case was not part of bigger outbreak.

Mr. Amiri said that plague is caused by fleas from rats that are found in the house. He mentioned the symptoms of plague as being fever, boils to the arm pits and on the private parts. The source of plague in Lushoto, Mr. Amiri said, is Shume. He said that the presence of forests and shrubs near the house attracts rats to come into the houses.

No death has occurred from plague in this household. Mr. Amiri said that the authorities were handling plague positively. He had no suggestions as to how the incidence of plague could be reduced.

Hygiene

A clean environment around the house, and a good house which is well plastered and properly roofed were considered as good hygiene by the informants. Latrine like the other house was mentioned last. A good housewife is one who is clean both in her body and clothes, who cleans the house and the pit latrine, cleans the environment and her utensils.

Mr. Amiri said that they always treat wounds immediately.

The latrine is located outside the house at a corner. The toilet was not clean, and remains of excrement could be seen at the mouth of the pit latrine. Being a Muslim Mr. Amiri emphasised that water was considered important to wash one's hands after using the latrine.

Food preparation, consumption and storage

The household hardly eats beef 2 times a month. Cooked and fried meat is preferred rather than meat roasted directly on the fire. Food is served on one plate which members share. Leftover food was used as breakfast the next morning. It was poorly stored.

Water

A village stand pipe and a river near the homestead provided water for domestic purposes. Water is usually fetched 3 times a day and stored in buckets.

Sometimes boys take baths and wash clothes at the river.

Rats and cats

The household has no rat infestation problem even though sometimes during the dry season a few rats infest the homestead. In situations where rats invade the house, the household uses chemicals to control them. The household identifies three types of rats: house rats referred to as '*ngoshwe*', forest rats referred to as '*mphuka*', and forest rats referred to as '*ngitu*'. Rats are seen as an indication of filthy conditions and are therefore shameful creatures.

Mr. Amiri said that he has a cat and it catches rats. Cats are not treated as pets and are not frequently handled. Children do not play with his cat. He was not sure whether it is clean. The cat buries its faeces and hence he does not think that children come in contact with them.

Fleas

According to the informants, the household has not been affected by fleas for more than three years. Dead rats are sometimes found but only if poison has been used.

Health problems

Mr. Amiri could not identify a common illness among his household members.

LUKOZI: HOUSEHOLD NUMBER 3

Household Head:	John Shusha, Male, 56 years old
Spouse:	Amina Shusha, 40 years old
Key informants interviewed:	John Shusha and Amina Shusha
S-E status of household:	Low
Main occupation:	Farming
Sub-village:	Mkatoni
Education of HH:	Standard 7

General background

This 5-member household has 3 separate houses. The first house is for the parents and has a bedroom and a sitting room. The second house contains a bedroom for the female children and has a kitchen room as well; and the third house is the bedroom for the male children. At the back of the first house, which is the main house, there is a toilet and in front there is an open space near the kitchen that is used as a place for washing utensils. Foodstuffs and some water are stored in the sitting room of the main house and water containers are kept in the kitchen. The 3-acre landholding for the household is divided into 3 parcels of different sizes. Cabbages and tomatoes are grown as cash crops whereas maize and beans are grown for home consumption.

Plague

One of the female children in the household, aged 10, was infected with plague in 2003. Mrs. Shusha believes plague is caused by fleas harboured by forest rats called *ngoshwe puku*. She remembered the symptoms which her daughter had. She said that "*mwili ulivimba*" (her body swelled). She did not know where the child contracted the plague. She only found that her child was swollen when daughter came back from school. Further she was not aware that it was plague until when she went to the clinic. The child was admitted and stayed for seven days. The plague was officially recorded in the village office. She believes that the child caught plague at school.

Mrs. Shusha reported that people's belief that plague should be treated by Traditional Healers (THs) is a bad thing because THs are not able to treat plague. Mr. and Mrs. Shusha believe that plague should be treated with modern medicine, so that the person will recover. The research team judged that it is very likely that in future they would send any future cases of plague to be treated at the clinic. There had been no death caused by plague in the household.

Food preparation, consumption and storage

Beef and chicken meat was said to be consumed about 1-3 times per week depending on availability of cash. Fried and roasted beef/chicken is preferred to meat directly placed on the fire. Vegetables and fruit are usually washed with untreated tap water. Cooked food is placed on plates which household members shared. Leftover food is stored in a cupboard. In this household there is no relationship with other households in terms of food sharing.

Water

The household gets water from a village standpipe. It is collected 12 times a day and used for two days before being collected again. Storage is in big plastic containers, which are cleaned and refilled every two days. Though the woman is mainly responsible for water fetching, assistance from her husband is normally available. The household drinks untreated water; informants said that traditional culture says that water from the Usambara Mountains is clean and safe.

All members of the household take baths at home using water drawn from the standpipe.

Rats and cats

The household is usually infested with rats throughout the year but more so during the harvest period. However informants consider the problem is a minor one as it is temporary. The household identifies three types of rats: house rats referred to as '*ngoshwe*', forest rats referred to as '*mphuka*', and forest rats referred to as '*ngitu*'. Rats are seen as an indication of filthy conditions and are therefore shameful creatures.

Many dead rat bodies were found on the ceiling (under the roof), in the kitchen and around the house in 2002. This suggests that they were dying of plague.

Fleas

The household experienced a severe flea problem in 2002 and a slightly less severe infestation in 2003 between February and March. Children are the ones most affected by being bitten by fleas because they sleep on the floor.

Health problems

The most common illnesses include headache, fever, and coughing.

LUKOZI: HOUSEHOLD NUMBER 4

Household Head:	Andrea Joseph Mandiha, Male, 40 years old
Spouse:	Agness Andrea
Key informants interviewed:	Andrea Joseph Mandiha and Agness Andrea
S-E status of household:	Medium
Main occupation:	Farming
Sub-village:	Mkatoni
Education of HH:	Standard 4

General background

The household has five members and two houses – the main house with 3 rooms (parents' bedroom, sitting and store rooms) and another house with a kitchen and children's bedrooms. In the kitchen house, there also is another room that is used as a storage place for food and water and for farm equipment, while crops such as maize are stored in ceiling. The toilet is located some distance from the main house. The household has a total landholding of 5 acres among its 6 parcels. Maize, sweet potatoes and beans are the main food crops grown while cash crops include cabbage, tomatoes, carrots, and Irish potatoes.

Plague

Mr. Andrea had a child who was infected with plague in 2003. This was a solitary case, not part of a bigger outbreak. He does not know how she got it but it was after returning from school that she became ill. The house was quarantined and was made into a clinic for the plague. The case was recorded officially. The people around his house prefer modern medicine, he said, and are very likely to go to these facilities, possibly following health education on plague. Mr. Andrea remarked that when one sees a child with boils s/he should consult an expert at once or send the child to the hospital.

Mr. Andrea said that the cause of plague is fleas from rats and mainly from the *puku* type of rat. On the origin of plague, he said it was from Shume. One reason why plague has persisted is, he said, the dirty environment where people live.

He said that there are two types of plague, bubonic and pneumonic.

On being asked who was most affected by plague, he said children, because they were dirty, followed by women.

Hygiene

The informants said that a good hygienic environment is one with clean surroundings around the house. The house should be well plastered both outside and inside, and shrubs should be cleared. The house should have a pit latrine, and in the latrine water should be available for use. A good housewife, according to Mr. Andrea, is one who washes clothes, cleans her utensils and cleans the mats, including putting them in the sun to dry.

Food preparation, consumption and storage

Meat is eaten twice in a month. It is boiled for at least 2 hours and is then fried with onions/tomatoes and oil. Cooked food is shared from one plate except for children who are served on separate plates.

Water

Domestic water was usually brought from a river/spring and occasionally from the village standpipe. Storage containers used were buckets of 20 litres. Drinking water is boiled and stored in a small bucket of 10 litres.

Rats and cats

The household acknowledges rat infestation as a problem especially during the harvest period but the problem is a minor one as it is temporary. Three types of rat are identified: house rats referred to as '*ngoshwe*', forest rats referred to as '*mphuka*', and forest rats referred to as '*ngitu*'. Rats are seen as an indication of filthy conditions and are therefore shameful creatures.

Dead rats were found in and outside the house in year 2002; these were buried in the ground.

There was no cat in the house.

Fleas

The household had experienced flea infestation. Household members come in contact with fleas in the house and children are most affected, probably because they sleep on floor. The household has applied insecticides, biological means and environmental sanitation measures as control measures against rats and fleas.

Health problems

The most common illnesses reported by Mr. Andrea in his household were headache, fever and flu.

LUKOZI: HOUSEHOLD NUMBER 5

Household Head:	David Lukindo, Male, 43 years old
Spouse:	Sayuni Yohana
Key informants interviewed:	David Lukindo and Sayuni Yohana
S-E status of household:	Medium
Main occupation:	Farming

**Sub-village:
Education of HH:**

**Kwemunyu
Standard 7**

General background

The household, which has 7 members, has two houses: the main house with sitting room and parents' room, and another house with children's bedroom and storeroom for food and water. The kitchen was separately located, while bathing and toilet huts were behind the children's hut and beside these was the cowshed. Although the surroundings were clean and pleasing still there were little bushes surrounding the house on one side, which could be favourable sites for rodent harbourage and breeding. Farming is the main economic activity and crops grown include maize, sweet potatoes, and beans as food crops and tomatoes, carrots, cabbage, and Irish potatoes as cash crops. The crops are grown on a four-acre landholding split into 4 parcels. The household keeps two head of cattle.

Plague

Mr. Lukindo said the disease is caused by fleas from rats. These rats usually live among shrubs and are red in colour. He seemed to be aware about plague because he even managed to mention three types of plague: pneumonic, bubonic and systemic. Nevertheless he was not sure how one differs with the other.

Mr. Lukindo said at first people thought that it was a disease caused by *kuvunja vyungu*. But now this belief has gone, he said, after receiving health education on plague.

His house was not affected with plague but a nearby house was affected by plague in 2003. A child who was ten years old caught plague. The child was given medicine and the house was quarantined; and the case was recorded in the village files.

Mr. Lukindo reported that there is an association of ecological factors with the presence of plague. For example, where there were shrubs close to the house this made it more likely that people would be infected with plague. The most affected people are children followed by women. A possible explanation is that women and children stay together in the house.

Hygiene

Mr. Lukindo sees hygiene as expressed in having a house which is well-plastered, well-roofed, with a floor and a latrine. A good housewife is one who keeps the house clean by sweeping, washing clothes and sleeping mats, drying the blankets and cleaning the utensils.

Food preparation, consumption and storage

Beef and chicken meat were said to be eaten 2-3 times a week. Fried and roasted meat is preferred compared to meat placed direct on the fire. Beans and meat are boiled for at least 2 hours before being fried with onions, tomatoes and cooking oil. Cooked food is served in pots of various sizes which are placed on the dining table ready for consumption. The household uses a self service system. The household shares food such as sweet potatoes and cassava with nearby households.

Water

There is a household standpipe. Water is kept in buckets for emergencies, and often stays there for more than 3 days before being used. The informants pointed out that water does not carry or transmit plague but could cause diseases like cholera, typhoid, diarrhoea and dysentery; therefore drinking water was treated by boiling and filtering using clean white cotton material.

All members of the household take baths at home using water drawn from the standpipe.

Rats and cats

The household does suffer from rat infestation, especially during harvest, but does not consider this a serious problem. Three types of rat are identified: house rats referred to as 'ngoshwe', forest rats referred to as 'mphuka', and forest rats referred to as 'ngitu'. Rats are seen as an indication of filthy conditions and are therefore shameful creatures.

The household did not have a cat during the study.

Fleas

Mr. Lukindo was aware that fleas from rats are carriers of plague and seemed to have a thorough knowledge about prevention measures.

Health problems

The most common illnesses for members of the household are headaches, abdominal pains, flu and coughing.

LUKOZI: HOUSEHOLD NUMBER 6

Household Head:	William Bakari Mashombo, Male, 74 years
Spouse:	Ruth William
Key informants interviewed:	William Bakari and Ruth William
S-E status of household:	Medium
Main occupation:	Farming
Sub-village:	Chamkwavi
Education of HH:	Standard 7

General background

The 10 members of this household reside in one house and a kitchen house. The main house has three rooms: a sitting room, a children's bedroom and a bedroom for the parents. The kitchen building is located opposite the main house with an open space in front where utensils are washed. The main house has well-plastered walls. Water and food are stored in the children's room, while maize is either stored in the ceiling or in sacks of 50 and 100 kgs. The ceiling is made of wood and seems very strong. The head of the household is an evangelist. The landholding for the household is estimated at 10 acres distributed among 3 parcels. Of the 10 acres, five were obtained as a forest employee in the 1970s. Maize and beans are the main food crops grown while cabbages, cauliflowers, and tomatoes are the main cash crops.

Plague

Mr. William said that plague is brought by fleas from rats. He said that when rats die they leave the fleas on the floor, which begin moving around looking for a host. Then the fleas come in contact with human being and hence infect him or her. Mr. William said that there were three types of rats: *napinje* and *pare* which are domestic rats; and *puku* which are big rats. He said all rats can have fleas that can infect human beings. Poor hygiene and the presence of shrubs can bring plague into houses, he said.

At first many people thought that the disease was caused by witchcraft. This belief is still present in some families, he told the research team, but other people have changed their beliefs regarding the causes of plague.

Hygiene

On hygiene, Mr. William said that the area around the houses should be clean, the house should be well plastered and should be painted with coloured paint, and it should have a latrine. A good housewife is one who cleans her house and pit latrine, cleans utensils, and cleans and washes bedding mats and bed sheets.

Food preparation, consumption and storage

Bean, *makande* and meat are first boiled for at least 2 hours and then fried with cooking oil, onion and tomatoes. Cooked food is served on two plates for the young and for adults separately. Beef is normally consumed 2 times a week. Though the informants were quite aware that treated water was cleaner and safer for washing fruits and vegetables they still used untreated water. Leftover food was seen to be stored in low quality storage containers. Food sharing/exchange between this household and another takes place, especially of raw foods such as flour, beans and potatoes.

Water

A village stand pipe was the main source of water for domestic purposes. About 120 litres of water is collected each day, during a number of trips, and stored in traditional pots. According to the informants the containers are emptied and cleaned before refilled. Mrs. William said that water does not transmit or carry plague although it can carry water borne diseases. Woman and children are the ones responsible for water fetching.

Baths are taken at home.

Rats and cats

There is a problem with rat infestation. Three types of rat are identified: house rats referred to as '*ngoshwe*', forest rats referred to as '*mphuka*', and forest rats referred to as '*ngitu*'. Rats are seen as an indication of filthy conditions and are therefore shameful creatures.

The household has a cat and children play with it. It was not clear whether they considered it to be clean.

Fleas

No flea infestation was reported and this seemed likely since the house and surroundings seemed clean. The household is said to have adopted prevention measures as advised by the village health officer.

Health problems

Mr. William mentioned coughing, flu, fever, and diarrhoea as the most common illnesses among his household members.

LUKOZI: HOUSEHOLD NUMBER 7

Household Head:	Amir Shaaban, Male, 23 years old
Spouse:	Mahaldia Amir, 35 years old
Key informants interviewed:	Amir Shaaban and Mahaldia Amir
S-E status of household:	High
Main occupation:	Farming
Sub-village:	Kwekangaga
Education of HH:	Standard 7

General background

The household has three houses crowded together (kitchen hut, a hut for a married child and his family, and a house for the parents). Cowshed was beside the kitchen hut. Water, and food like beans, flour, sugar, spices are stored in the parents' house while maize and cassava are stored in the ceiling. Utensils are washed outside the house and kept in the kitchen. Crop production and livestock keeping are the two main economic activities among household members. The household has three heads of cattle. While maize, Irish potatoes, and beans constitute the main food crops grown, tomatoes, cabbages, sweet pepper and carrots are the main cash crops grown.

Plague

A member of this household has been affected by plague, but there are no details available as to who this was and whether the person died.

Mr. Shaaban reported that plague is caused by fleas from rats and these rats that bring fleas with plague are from the wild. He said that if fleas bite a person then that person becomes infected with plague. Also Mr. Shaaban felt that there was close relationship between a poor hygienic environment and the presence of shrubs and forests near the house and the prevalence of plague. Further he said most victims of plague are children and women. Children do not report at once when they get sick for immediate action.

Hygiene

On hygiene, Mr. Shaaban argued that this means a clean environment, using use clean water, plastering the house and there should be a latrine and it should be clean. A good housewife is one who cleans the house and its surroundings, who wash the utensils and bedding materials and dries them.

Food preparation, consumption and storage

Beef is eaten once per week and chicken occasionally. Beans and meat are prepared by boiling for at least 2 hours, followed by frying with cooking oil and onion. Meals are served in one plate which adult members share but children are served on another plate. The leftover food is stored in a bucket covered with a lid so as to avoid contamination from rats or cats. The leftover food is served to children as breakfast the next morning.

Water

Water comes from a stream and from the village standpipe. Water is collected 4-6 times in a day and stored in traditional pots.

All members of the household take baths at home using water drawn from the standpipe. Women wash clothes at the standpipe site.

Rats and cats

The household does suffer from rat infestation but does not consider this a major problem. Three types of rat were identified: house rats referred to as '*ngoshwe*', forest rats referred to as '*mphuka*', and forest rats referred to as '*ngitu*'. Rats are seen as an indication of filthy conditions and are therefore shameful creatures.

The household did not have a cat in the house during the time of the study.

Fleas

Currently, there is no flea infestation, though the household faced the problem in past years and this led to one member being affected by plague. According to the informants, application of insecticides, environmental sanitation and biological control measures as advocated by health officers has contributed to reduction of disease.

Health problems

The common illnesses that affect this household include flu and headaches.

LUKOZI: HOUSEHOLD NUMBER 8

Household Head:	Ayoub Ngoma, Male, 64 years old
Spouse:	Mrs Ngoma
Key informantS interviewed:	Ayoub Ngoma and Mrs Ngoma
S-E status of household:	Low
Main occupation:	Farming
Sub-village:	Kwekangaga

General background

This is a small household as it has only 4 members, but it has 3 separate houses, including a kitchen; a house for the parents with two rooms i.e. a bedroom and a store room for water and food; and a third house with a bedroom for children and the kitchen. Behind the kitchen there is an open space utilised for washing utensils, next to it is the toilet and a cow-shed located behind the main house. The household was overcrowded and closely hemmed in by other households. In addition to keeping two heads of cattle, the household grows maize, sweet potatoes, cabbages, tomatoes, onions, and sweet pepper on its 3 -acre farm which is in 3 parcels of land. Maize is usually stored outside the houses on trees.

Plague

He cited the symptoms of plague as being high fever and swelling of glands. He saw such symptoms from his grand child who was infected with plague. The child was seven years and was sent to the health worker who admitted him to the clinic for seven days. "The child got the illness on the road" he said and added that the disease is infectious.

"At first, the disease was thought to be brought by witches, but now things have changed" he said. Mr. Ngoma now believes that plague is brought through small fleas from rats that carry the disease. The rats with plague are black in colour and are from the wild.

Mr. Ngoma recommended that the government should institute stricter measures for those who do not keep their environment clean, to avoid the spread of plague.

Hygiene

Mr. Ngoma believes that hygiene means washing utensils, having a clean sleeping place, cutting down shrubs and bushes because there is a close relationship between and shrubs and poor hygiene and the prevalence of plague. Also the house should be well plastered and water should be available in the latrine for use after using the latrine. A good housewife is a one who has clean utensils, washes her clothes and those of the family and who ensures a clean place for sleeping including putting bedding material out frequently in the sun.

Food preparation, consumption and storage

Beef is normally consumed 2-4 times a month. It is usually boiled first before being fried with onions, tomatoes and cooking oil. Both fruit and green vegetables are washed using untreated water though the informants were quite aware that it was not recommended. Household members share food together on the same plate, except for children who are given a separate plate. Leftover food is left on the table overnight without covering it, and would be easily accessible to rats and cats.

Water

Water is obtained from the village standpipe located 200m away from the household. The wife was the one responsible for water fetching, normally done 3 times a day and this could only be used for one day. Traditional pots with a capacity of about 60 litres are the storage containers used by this household. According to the informants the containers are normally emptied before being refilled. Drinking water is treated by boiling particularly during the rainy season since this is when water-borne diseases are common. Food sharing between households was common for foods like rice and potatoes

All members of the household take baths at home using water drawn from the standpipe. Clothes are washed at the standpipe site.

Rats and cats

Rats are a problem but are not considered a major one. Three types of rat are identified: house rats referred to as 'ngoshwe', forest rats referred to as 'mphuka', and forest rats referred to as 'ngitu'. Rats are seen as an indication of filthy conditions and are therefore shameful creatures.

The household did not have a cat at the time of the study.

Fleas

In 2003, the household faced a flea infestation though not severe as compared to the previous year, that led to one member succumbing to plague. Normally household members come in contact with fleas when in-house rat infestation is high, which occurs when there are no crops in the fields.

Health problems

Mr. Ngoma reported that the common illness that affected his household were malaria, flu, abdominal problems in children, coughing

LUKOZI: HOUSEHOLD NUMBER 9

Household Head:	Iddi Sefu, Male, 41 years old
Spouse:	Mrs Iddi
Key informants interviewed:	Iddi Sefu and Mrs Iddi
S-E status of household:	High
Main occupation:	Farming
Sub-village:	Kwekanga
Education of HH:	Standard 8

General background

This is an 8-member household with two houses and a kitchen. The two houses are constructed of modern materials, including corrugated iron sheets. The homestead is clean enough and looks very decent, save for the cowshed, which is close to the houses. Farming is the most important economic activity of the household, and in fact, the farming is more of a commercial activity rather than subsistence-based. The household deals with specialized farming for selling to hotels in Dar es Salaam. Crops grown include tomatoes, carrots, sweet pepper, and cabbage for the specialized market and maize and beans for home consumption.

Plague

Mr. Sefu said plague is caused by fleas from rats. These rats are from the wild, probably from the forests. He said these rats are white in colour and prefer a dirty environment. Mr. Sefu said that there is a relationship between plague and poor hygiene and the presence of forest and shrubs at the area. At first people thought it was caused by *kuvunja vyungu*, and because of that people went to traditional healers for treatment. Some of the people still believe in *kuvunja vyungu* and *usinga* as the cause of plague.

The victims are mainly children aged 8-12 years, and also adults, mostly women.

Mr. Sefu argued that one of the problems in combating plague in Lushoto and especially Lukozi is that people hide patients for fear of their being sent to an isolated place (quarantined hospital ward). This needs to be addressed during the meeting and in the campaign.

Hygiene

Hygiene means cleanliness of the house both inside and outside, a well plastered, cemented floor painted with coloured paint. Also there should be a latrine. A good housewife is one whose house is clean and well plastered, and who washes utensils and clothes including those of the children. Also bedding materials should be clean.

Food preparation, consumption and storage

Cooked *ugali* is placed on a plate and beans/vegetables in a bowl and then the family members share the food from these. Drinking water is rarely boiled and both fruit and vegetables are washed using untreated water in spite of the fact that the informants knew of the problems associated with untreated water.

Water

Domestic water is obtained from the village standpipe and from a spring. The wife is the one responsible for water fetching, normally done 12 times in a day. Water is stored in buckets and remains there for 2 days before being used. The household boils drinking water to avoid water-borne diseases.

Contact with water apart from water for domestic use is confined to the young, who occasionally take baths in a river. The rest of the household members bathe at home, using water that is fetched and brought home from the spring.

Rats and cats

Rat infestation is a problem but there is little that they can do as they cannot afford to keep buying poison. They recognize three types of rat (see previous household).

The household did not have a cat during the study period.

Fleas

Currently there is no flea infestation, though the household faced the problem in the past years. According to the informants, application of insecticides, environmental sanitation and biological control measures as advocated by health officers have been positive and helpful in reducing disease.

Health problems

The most common illnesses that affect members of the family are headache among the children, abdominal pain and diarrhoea.

LUKOZI: HOUSEHOLD NUMBER 10

Household Head:	Hussein Hasan, Male, 30 years old
Spouse:	Jalia Hussein
Key informants interviewed:	Hussein Hasan and Jalia Hussein
Main occupation:	Farming
Sub-village:	Tiku
Education of HH:	Standard 7

General background

The 6 members of this household live in two houses plus a kitchen building. Household members are the father, mother, and four children. The main house has two rooms (sitting room and parents' sleeping room). Adjacent to the main house is a small room used to store water and raw foods. Next to this is a kitchen, which is also used as the children's sleeping room. The cowshed and toilet are close to the back of the house. Maize and cassava are stored in the ceiling of the main house. Utensils are washed in the open space near the kitchen. The house surroundings are relatively clean and nice-looking. Apart from maize and beans, the household grows cabbage, tomato, and sweet pepper on its 3-acre farm that is made up of 3 parcels of land.

Plague

Mr. Hussein said in 1980 plague was not known and the disease was easily transmitted from one person to another in a household. The disease was killing many people both children and adult. Most of the people believed that it was human malevolence like sorcery and witch activity including *kuvunja vyungu*.

The disease started at Shume. Experts told them that it is the forest rats with fleas which lead to plague – once such a rat bites a person the person becomes infected with plague.

Mr. Hussein also believes that the fact that Irish potatoes are peeled without having been washed is likely to cause plague - it is very likely people could be infected with plague by eating such potatoes.

Mr. Hussein was able to name three types of plague: bubonic, pneumonic and systemic.

He stressed that the disease affects mainly children followed by women. Very few men are infected with plague. The possible explanations he gave include the fact that children and women spent most of the time in the house. Also women tend to co-operate when a baby is being delivered. He reported that for 40 days women surrounding the woman who has given birth to a baby stay with her in her house, helping with most of the domestic work like fetching water and firewood. In the same manner women stay with a bereaved women for forty days. During these periods women sleep on the floor and hence the chance of being bitten by fleas and of contracting plague is likely to be high, he said.

Mr. Hussein said there is relationship between poor hygiene and the presence of forest/shrubs near the house and the prevalence of plague.

On the prevention of plague, Mr. Hussein said people should follow what the experts on prevention tell them to do. In addition each village should have bye-laws on cleanliness and severe punishment should be imposed on those who break the bye-laws.

Hygiene

According to Mr. Hussein a place can be considered hygienic if the floor of the house is clean, it is well plastered with mud or cement, it has a good pit latrine and a clean environment in general.

A good housewife is one who keeps her house clean, the utensils washed and the house neat and tidy. Further it is one who keeps her children well and washes their clothes, she herself should be clean and the bedding materials should be clean and also put in the sun to dry.

Food preparation, consumption and storage

The household hardly ate meat two times per week. The usual meat was beef or chicken. There was no wild meat available. Meat was well cooked to ensure no blood traces could be seen when fried or roasted. Food is served in pots and the self service system is used, except for young children who eat together. Food leftovers are placed on a table overnight, where the food can easily be reached by rats or cats. The household has not recently shared food with other households although in the past they used to share with nearby relatives of the same clan. Fruit and vegetables are washed in untreated water (river and tap water) though the informants were aware that untreated water might cause diseases such as typhoid, diarrhoea, and cholera.

Water

Water comes from the village standpipe located about 300m away from the homestead. The informants believed that water could carry diseases if not treated. The wife and her daughters were responsible for water collection, normally collected 4/5 times per day equivalent to 4-5 buckets of water of 20 litres each and stored in one container. Water stayed for 2 days before the container was emptied. The household boiled drinking water in order to avoid water borne diseases.

All members of the household take baths at home using water drawn from the standpipe.

Rats and cats

The household acknowledges rat infestation as a problem especially during the harvest period but the problem is a minor one as it is temporary. The household contends that there are three types of rats: house rats referred to as '*ngoshwe*', forest rats referred to as '*mphuka*', and forest rats referred to as '*ngitu*'. The '*ngitu*' is distinguished from other forest rats by the fact that they eat everything, including human flesh as well as clothes. On the other hand, the characteristic feature of '*mphuka*' is the long mouth.

The household does not have a cat but there were several cats entering the house. They had eaten the household's fish. What was left was thrown away.

Fleas

The household experienced flea infestation often but has not been affected by plague at all. They controlled fleas by spreading hot water into the floor and improved environmental sanitation measures.

Health problems

Mr. Hassan reported that the most common illnesses which his family were suffering from were malaria, flu and seasonal coughing.

LUKOZI: HOUSEHOLD NUMBER 11

Household Head:	Michael Ngwatu, Male, 46 years old
Spouse:	Hawel Michael
Key informants interviewed:	Michael Ngwatu and Hawel Michael
S-E status of household:	High
Main occupation:	Farming
Sub-village:	Tiku
Education of HH:	Standard 12

General background

The 7 members of this household live in two houses plus a kitchen building. There is a main house with a dining room, sitting room, visitor's bedroom, store, and parents' sleeping rooms. Behind the main house are bath and toilet compartments, followed by a kitchen room. Another house with 3 rooms is opposite the main house. This contains one room serving as a water and food storage room, and others which are children's sleeping rooms. Utensils are washed at an open space in front of the house. A cow-shed is located outside the gate. Generally, the house was clean and attractive. Apart from maize and beans, the household grows cabbage, tomato, and sweet peppers on its 6-acre farm that is made up of 12 parcels of land.

Plague

Mr. Michael began by saying that people tend to associate poor hygiene with plague. But in some cases the place may be clean and yet people are infected with plague.

He said that the source of plague was fleas from rats living in forests and shrubby areas. There is a strong relationship between poor hygiene and shrubs and the presence of plague. He said that the people who are most affected with plague are children followed by the women. Women are affected by plague because they are close to the children and always stay with them. Also during funerals and when a woman is delivering a baby many women come to stay. Mostly such women sleep on the floor, probably on poor sleeping materials. This makes them more likely to be bitten by fleas.

At first, he told us, plague was believed to be *vyungu*, a type of magic which women are able to make. No-one in his house had had plague but the neighbouring houses had had an infection and four people died some years back. These people did not report their sickness as they thought they had fallen sick with *vyungu* or *usinga*. These houses were quarantined once it was realized that they had plague and no person was allowed in and out of the homestead.

He agreed that it started at Shume ward in the 1990s but he was not absolutely sure.

He was able to mention two types of plague - bubonic and pneumonic.

When asked whether he could suggest any measures to control plague, he suggested the following:

- the environment around houses should be cleaned
- the area around houses should be fumigated
- the government should support health workers by fining people who do not keep the environment clean

Hygiene

On hygiene, Mr. Michael started by saying that the surroundings of the house should be clean, it should have a pit for throwing rubbish from the house, the house should be clean and well plastered, there should be clean bedding materials. A good housewife should be clean herself, her clothes should be clean, the utensils should be clean. She should be clean in cooking and she should bathe the children and wash their bedding.

Food preparation, consumption and storage

Beef or chicken is eaten 2 times per week. Food like beans, meat and *makande* is boiled first for 2-3 hours before being fried. Meat was said to be well kept, away from rats or cats, because of its scarcity and the low purchasing power of the household. Boiled and fried meat was mostly eaten rather than meat put direct on fire. Cooked food is served in pots and a self service system is used. Leftover food is kept in a cupboard. However, it was noted that the storage place was not secure from rats and cats.

Water

The village stand pipe and a stream are the main sources of water for domestic purposes. Water is collected 4/5 times a day, which was equivalent to 4-5 buckets of 20 litres each, stored in plastic containers and kept for 2-3 days before the containers are emptied and refilled. The housewife and her two sons are responsible for fetching water. The household believed that water could carry and transmit plague disease if rats or cats got the chance to contaminate the water. Drinking water is boiled and filtered through clean white cotton material. Fruit is washed and peeled before it is consumed; however untreated water from the tap or river is used to wash fruit and green vegetables.

Rats and cats

There is a problem with rat infestation but the household rarely uses poison because they cannot afford it. See previous household for categories of rats.

The household did not have a cat at the time of the study.

Fleas

There was no flea problem in this household and they have not been bitten by fleas in more than 3 years. The informants were aware that rat fleas are different from those found on human beings.

Health problems

The most important illnesses that affect the household are malaria, typhoid, pneumonia, coughing and flu.

LUKOZI: HOUSEHOLD NUMBER 12

Household Head:	Charles Tupa, Male, 48 years old
Spouse:	Neema Charles
Key informants interviewed:	Charles Tupa and Neema Charles
S-E status of household:	High
Main occupation:	Farming
Sub-village:	Kwezizi
Education of HH:	Standard 11

General background

The number of persons in the household is four and the homestead consists of two houses. One is of high quality with several rooms (dining room, sitting room, visitor's room, store, parents' and children's sleeping rooms). Opposite the main house is another house with store and kitchen rooms. The store is used to keep construction materials and equipment, while raw foods and water are stored in the kitchen. The household is quite isolated, bordered with forest bushes. The household has about 5 acres of land in 2 parcels. Maize, beans, and cassava are the main food crops grown while cabbage, tomatoes, and Irish potatoes constitute cash crops.

Plague

Even though the prevalence of plague is high in the village Mr. Charles was not sure how the plague was caused, implying that the problem is not taught in school. However he said the people who are most affected with plague are the children, followed by women. As far as the children are concerned, he said that they do not understand the illness when it starts and hence fail to report in time. He said poor hygiene both inside and outside the house might accelerate plague infection.

Hygiene

On hygiene, Mr. Charles said that the environment should be clean, for example shrubs should be cleared, the house should be plastered, and each household should have a pit latrine. A good housewife, he thought, is one who has clean clothes and a clean body. Also the utensils should be kept clean as well as the sleeping place.

Food preparation, consumption and storage

Foods such as meat and beans are boiled first for about 2-3 hours then fried with onions, tomatoes, carrots, hot pepper and cooking oil. No wild meat was available at all. Beef was the most common meat eaten, normally 1-2 times per week. Prepared food may be left for 1-2 hours before being eaten, but was well placed in a high-quality pot and no rats or cats could get into this. Observation revealed that food accessibility by vermin was relatively low or impossible because food was well kept in a cupboard.

Water

A standpipe in the homestead area is the main source of water for domestic use. Water is stored in a tank with a capacity of 240 litres which is in the kitchen. Water stays in the storage tank for 5 to 7 days before being used. But after one week the containers were emptied and refilled. The household believed that water can carry micro-organisms that cause disease such as cholera, typhoid and dysentery, therefore treated drinking water by boiling.

All members of the household take baths at home using water drawn from the stand pipe.

Rats and cats

Rats are a problem and they recognize three kinds of rat (see previous household).

Mr. Charles reported that they have a cat and children play with it but he was not sure whether they considered it to be a pet.

Fleas

The household had not experienced flea infestation. The fact that the house is clean and of high is a factor keeping the household free from fleas - and plague infection.

LUKOZI: HOUSEHOLD NUMBER 13

Household Head:	Ally Athuman, Male, 45 yearsold
Spouse:	Asha Ramadhani
Key informant interviewed:	Ally Athuman and Asha Ramadhani
S-E status of household:	Medium
Main occupation:	Farming
Sub-village:	Kwezizi
Education of HH:	Standard 7

General background

The household consists of 6 members and they occupy a single house with three rooms, including one bed room for the parents which serves as a storage place for foods like flour, beans etc., while maize is stored in the ceiling. The second room is a sitting room and water storage room; the third room is the kitchen, which also serves as the children's sleeping room. The house is adjacent to the house belonging to the second wife of the household head, and there is a toilet at some distance from the house. Utensils are washed outside in front of the house. It was observed that the house is crowded and unsanitary and the sleeping place for children was not well-kept. The household has about 5 acres of land, consisting of 2 parcels. Maize, beans, Irish potatoes, cassava and plantain are the main food crops grown while cabbage, tomatoes, sweet peppers and Irish potatoes are cash crops.

Plague

This household has experienced plague. In 1992 Mr. Athuman's mother caught plague, but they thought it was either *usinga* or *kuvunja vyungu*. But it was eventually diagnosed as plague. His mother died. Then a month later his young brother got sick. Medical personnel were called and they said it was not plague. Then they went to a traditional healer but his brother too died. In 1997 a female child 15 years old caught plague and died. (According to the village health worker they went to the THS before bringing to the medical personnel). The house was quarantined. Every person who entered was given medicine to prevent him from being infected with plague.

Mr. Athuman said plague is a disease which is infectious and it is bad disease. It is caused by fleas from rats. He said once the fleas from the rats bite a human being then that person is infected with plague. He said there were two types of plague, pneumonic and bubonic. Mr. Ali reported that the plague started at Shume and then spread to other parts of Lushoto district. The story of plague in Lushoto, he said, began when a foreigner who was infected with plague came to Shume (Mrambara) and after completing his/her activities he became ill and then died. Later expert of plague came to the area and found 3 were infected with plague.

Mr. Athuman considers that the people who are infected most often with plague are women followed by children. He said women and children spend most of their time in the kitchen where fleas like to stay because it is warm. In addition, women and children cooperate and are close together. Above all most of the women break the laws of quarantine especially during wedding ceremonies, after delivering and during funerals. In addition when women go out walking most of them tend to walk in groups and in this way they can infect each other.

He said that changes had been minimal in terms of cleanliness in the village.

When asked what strategies could be adopted to combat plague, he suggested that poison for the rats should be used in time and if possible should always be used when cases arise and be used at once. He said during the hungry period wild rats come into the house and this was the time when they infect human beings with plague. Usually the dry period is the time for plague in Lukozi.

Hygiene

On hygiene, Mr. Athuman said that a house should be well constructed with clean surroundings, should be well plastered and have coloured walls, a clean pit latrine and there should be water for use after using the toilet. A good housewife, he said, should have clean utensils, should clean the house, the children and the clothes as well as the bedding and mattresses.

Food preparation, consumption and storage

Food such as beans, meat and *makande* are boiled for 2-3 hours then fried with onions, tomatoes and cooking oil. *Ugali* or *makande* are served in one plate and vegetables and beans in separate bowls which household members share. Beef is eaten once per week, chicken very rarely, only on special occasions, for example Christmas and Eid. The household preferred boiled and fried meat, to meat placed directly on the fire. Food left overnight is placed in a bowl and then kept inside a well-covered plastic bucket so that rats and cats cannot have access to the food.

Water

Water is taken from a village stand pipe located approximately half a kilometre away from the household; normally water is collected 3-4 times per day. Water is stored in plastic containers with a capacity of 20 litres each and kept in the kitchen. Water often stayed there for 1-2 days before being used and the containers were emptied before being refilled. Drinking water is treated by boiling. Fruit and vegetables are washed with untreated water though fruit is peeled before being used. Mr. Ali believed that water could cause water borne diseases such as cholera, dysentery and typhoid, but not plague.

Since it is culturally unacceptable to bathe in rivers in an open space, contact with water apart from water for domestic use is minimum. This is because all members of the household take baths at home using water drawn from the standpipe. Occasionally, boys take a bath and wash clothes at the standpipe site.

Rats and cats

The household has problems with rats and considers that there are three types of rats (see previous household). He uses poison to kill rats. There was a high level of rat infestation during the year 2001/2002, and during this year a lot of dead rats were found outside the house. The dead rats were disposed of in the pit latrine and some were buried on ground.

Mr. Athuman's household did not have a cat during the study period.

Fleas

The household usually experienced flea infestation at some time during the year, especially May to June. They come in contact with fleas within the house, and children were the ones bitten most because their sleeping place is on the floor.

Health problems

Common illnesses reported in Mr. Athuman's household were fever, flu, coughing and abdominal upsets including diarrhea and rumbling of the stomach.

LUKOZI: HOUSEHOLD NUMBER 14

Household Head:	Juma Bakari, Male, 40 years old
Spouse:	Amina Hamza
Key informants interviewed:	Juma Bakari and Amina Hamza
S-E status of household:	Low
Main occupation:	Farming
Sub-village:	Kwezizi
Education of HH:	Standard 7

General background

The 3 member household (*presumably of a wife whose husband, named as the household head and interviewed, has another wife and lives elsewhere*) has a single house with three rooms, one sleeping room for the mother and her daughters, the second opposite to this is the kitchen room and the middle room is a sitting place which serves as a cow-shed at night time. Water and foodstuffs (flour, beans, cassava) are stored in the bedroom. Maize is stored in the ceiling. Utensils are washed outside the house. The house is of low quality, and the walls and floor are relatively rough providing good sites for infestation of fleas and gaps which would facilitate rat movement. Apart from maize, beans, cassava, and Irish potatoes, which are grown as food crops, the household grows cabbage, tomato, Irish potatoes, and and sweet pepper on its 3-acre farm that is made up of 3 parcels of land.

Plague

Even though plague is a problem at Lukozi village, and indeed a member of his household has had plague (no details were gathered regarding this episode but it is referred to under information on fleas), Mr. Juma said that he did not know how it was caused and he could not list the symptoms of plague. When he was pressed he said he heard people say that the disease was caused by fleas from rats.

It seems quite likely that he was unwilling to discuss the illness rather than having no notions regarding it. However, since he appears to reside with another wife most of the time, he may not have been around when the household member had plague, and this could explain why he knows nothing about the symptoms.

Hygiene

On hygiene, he said the house should be well plastered, should have clean utensils and should have a pit latrine with water available for use, and the sleeping place should be clean as well. A good housewife is one who keeps her house clean and plastered, she should be clean herself including her clothes and those of the children, and the surroundings of the house should be clean.

Food preparation, consumption and storage

The household eats meat beef type 1 -2 times per month depending on household income. No wild meat is available. Beef is first boiled then fried. Meals are served on one plate which household members share. Leftover food is kept in the cooking pot which is placed near the cooking stove. The mode of storage attracts rats and cats.

Water

Water is brought from the village stand pipe located 150 metres away from the household. Water collection is done three to five times a day and water is stored in locally made pots with a capacity of 60 litres each. According to the respondent, drinking water is boiled because contaminated water is a potential agent for spreading water-born diseases like typhoid, dysentery and cholera.

All members of the household bathe at home using water drawn from the village standpipe.

Rats and cats

Rats are a problem, especially during the dry season. Mr. Juma reported that he did not have a cat.

Fleas

The household experienced flea infestation in 2002 which caused one of the household members to be infected with plague. According to the respondent, the rate of flea infestation is high in situations where there was movement of rats from the fields/forest to the houses, which mostly occurs during the off-season period when there are no crops in the field. There were no dead rats found in 2003, which is in contrast to 2002 when many rats were found dead in the surroundings and ceiling. These were disposed of in toilets and buried in the ground.

Health problems

He reported that malaria, coughing and flu were the most common illnesses in his house.



Natural Resources Institute
University of Greenwich at Medway
Central Avenue
Chatham Maritime
Kent ME4 4TB

Tel: +44 (0) 1634 880088
Fax: +44 (0) 1634 880066/880077
Website: www.nri.org
E-mail: nri@greenwich.ac.uk

University of Greenwich
Maritime Greenwich campus
Old Royal Naval College
Park Row, Greenwich
London SE10 9LS

