A SURVEY ON WATER USE AND HYGIENE IN A RURAL AREA ON MOUNT ELGON, WEST-KENYA

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Agricultural University Wageningen
Department of Public Health
January 1988

Dolores Brouwer

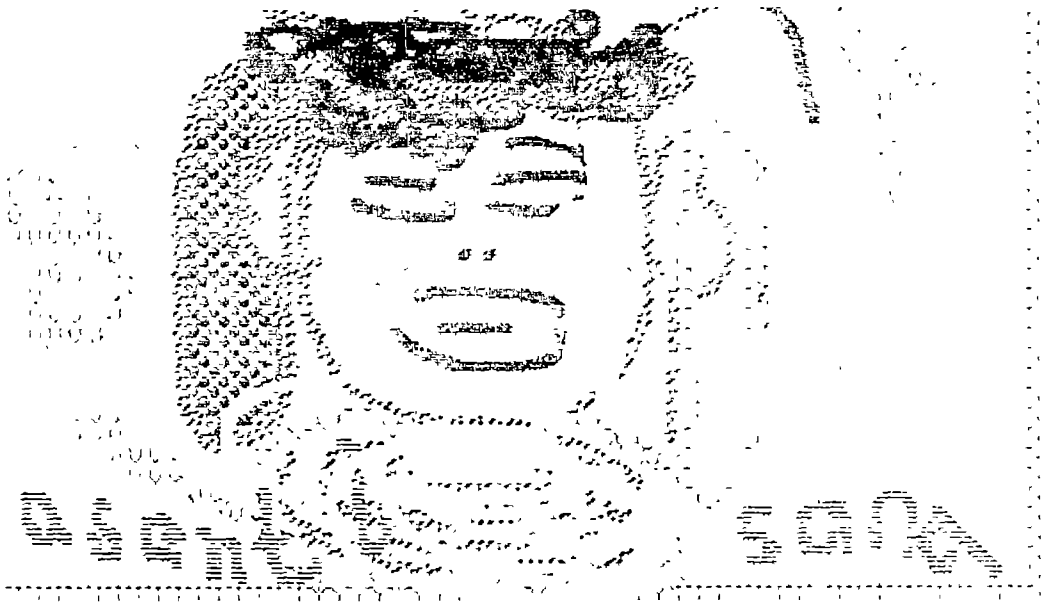
PREFACE

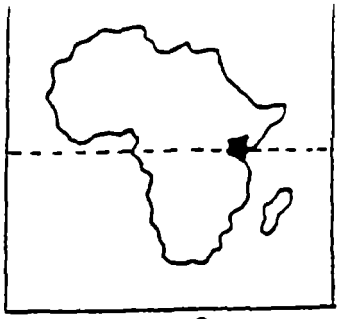
This report is based on a survey that was done by me and my colleague student Alies Bakkum within the framework of our study Human Nutrition (at the Agricultural University of Wageningen) in the period October 1986-March 1987 at Misikhu Mission Hospital, Western Province, Kenya.

This practical period has been a wonderful experience to me and I would like to thank all people who have contributed to it.
First of all I would like thank Alies for her dedication.
Also I am very grateful to Ralf and Jacobien van Overstraten, our supervisors in Kenya (Misikhu Mission Hospital) and to Father Martin de Rijk (Kibuk, Mt Elgon) for his endless hospitality.
I also want to thank the Sisters of Congregation and the members of the Hospital Staff, especially Sister Albina and Sister Sylvia and the nutritionists Mary Correti and Thea Silayo.
I would also like to thank the leaders of the Community Based Health Care project, Cyrilla Munyefu and Maurice Waswa, who introduced us to the people on Mt Elgon by inviting us to join them on some of their missions in the area.
In this respect I also want to thank Chief Hesbon Naibei who gave us permission to carry out our studies, the village elders and the people in Chemoge- and Kapsokwony sublocation who have been helpful either as interviewee, interpreter (Cosmas, Samson, George, Alfred, John, Henry, James, Julius and Isaac) or CBHC-worker.
Nelson and David deserve a special word of thank because they have learned us (in their own personal way) so much about african culture.
Also many thanks to Grace and her lovely son Steven, who has become my special little friend.
Of course this preface would not be complete without thanking Bert Jansen, my supervisor at the Department of Public Health (Wageningen) for his instructive supervision!

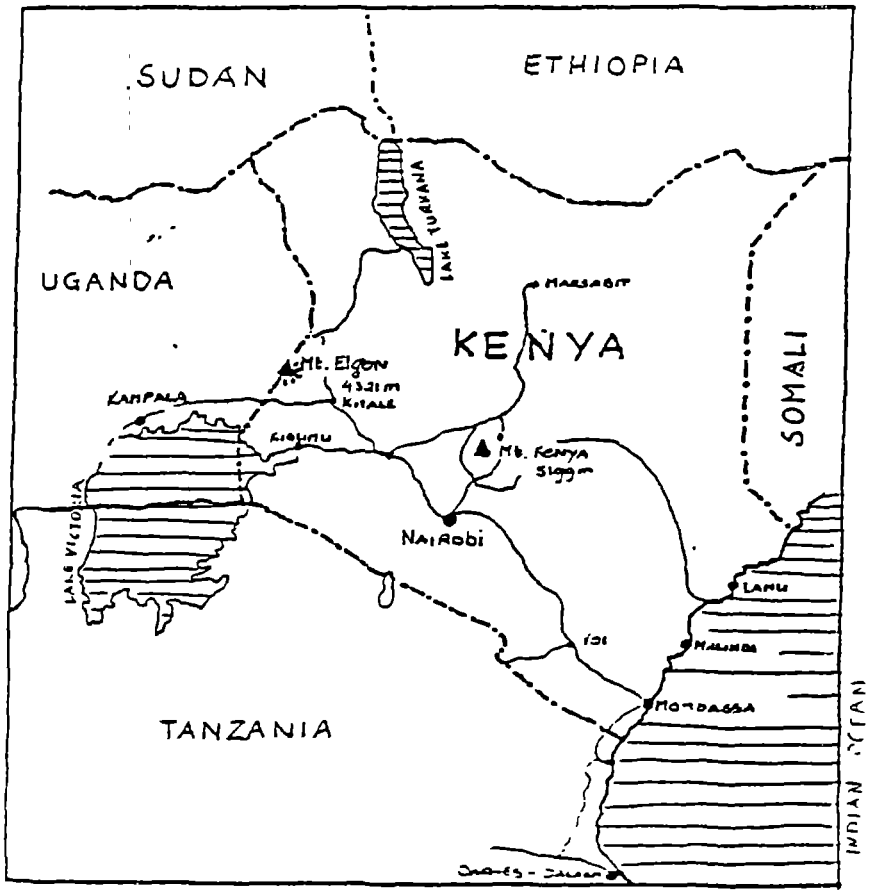
Asanti Sana!

Dolores Brouwer
Wageningen
January 1988

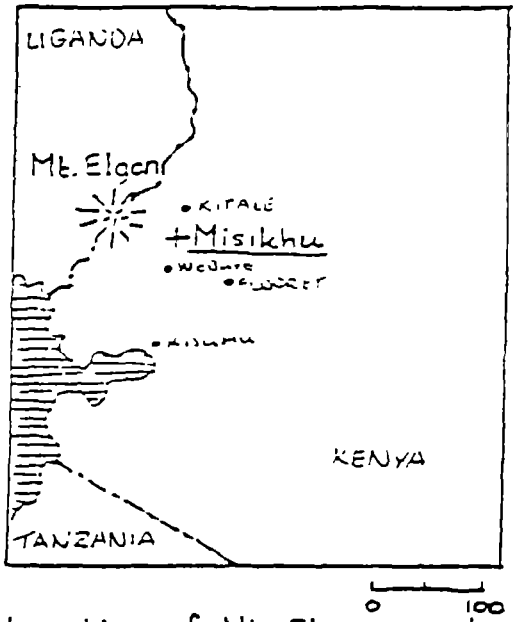




Location of Kenya



MAP OF KENYA



Location of Mt. Elgon and Misikhu

SUMMARY

In the period October 1986 - March 1987 a survey of factors that might contribute to the onset of Typhoid Fever was done in two sublocations on Mt Elgon in Kenya.
The underlying objective was the formulation of recommendations for the hospital in Misikhu that might help to reduce the Typhoid Fever incidence on Mt Elgon in future.

Typhoid Fever is a disease caused by the swallowing of S.Typhi bacteria. Transmission can be by any route which allows fecal material or urine to pass into the mouth (water, food, hands etc). Possible contributors to the spread of the disease are therefore poor hygiene (personal and environmental) especially in relation to drinking-water and excreta disposal.

The survey was done by means of a questionnaire, consisting of 24 questions considering the following topics amongst others:type of water source, water collection and storage, water consumption, health perception and habits in relation to water use and excreta disposal. Not only presence of relevant factors but also knowledge, attitude and behaviour of the studypopulation in respect with these factors were investigated. Means and willingness of the people to cooperate for improvement were investigated in an early phase as well.
In each sublocation 26 households were interviewed in assistance of local interpreters.

Demographic variables such as householdsize, agedistribution, occupation, economic figures and quality of housing do not show any striking differences between both sublocations.

Concerning education; more adults in Chemoge, especially women, have reached a higher educational level than in Kapsokwony sublocation.

Farming is an important source of subsistence and all households own a piece of arable land, although sometimes very small, on which they grow their staplefood maize.

Rivers are the most popular type of water source in both sublocations, followed by springs (in Kapsokwony) and wells (in Chemoge). Rivers are liked because of their abundance and their cold and clean water, but simultaneously disliked because they get dirty. Cleanliness is also the most important reason to like a spring or a well. The choice for a particular water source is based on advice given by (grand)parents rather than on individual preferences.

Watercollection is a task of women and children, which consumes from 10 minutes upto 2 hours of their time daily. In fact men are not allowed near the water source, a tradition (taboo) that should be kept in mind when planning any changes in drinking-water supplies.
Drinking-water is stored in earthen pots covered by a lid. In this manner water can be kept cold and clean (if pots are cleaned

regularly).

Most households consume 10-11 liters of water per capita on average daily. Although this is sufficient to satisfy drinking-needs it is not sure if it is enough to guarantee a certain degree of hygiene. Waterconsumption per capita decreases with increasing householdsize, but not necessarily with increasing distance or spent time.

Most interviewees (more in Kapsokwony as compared to Chemoge) perceive their environment and their drinking-water as being healthy. Especially in Kapsokwony they have come to this conclusion because of absence of diseases. In Chemoge interviewees seem to be more aware of the fact that diseases can be transmitted by their environment and drinking-water. This is probably an effect of the higher educational level or the CBHC-project launched overthere. They ascribe the healthyness of thir drinking-water rather to the fact that they boil it.

Waste water is usually thrown on the ground, 5-8 meters from the house or in the compostpit.
Dishracks, compostpits and latrines are highly recommendable in view of hygiene and easy to construct. Interviewees in Chemoge are ahead of those in Kapsokwony in this light, probably because of the CBHC-project. Once interviewees have constructed a latrine they report to be very content with it.

Although washing of hands is said to be practised by many adults, children often do not. Since hands can be an important transmission route of diseases, especially in countries where it is custom to eat with hands (such as Kenya), attention should be payed to this fact in education or in the CBHC-project.

Most common diseases in both sublocations are said to be malaria, diarrhoea and measles. Except for malaria, knowledge of their causes and prevention is very poor.
Health services are mostly attended for treatment of these common diseases. Striking is that more adults than children seek medical help when ill, probably because they can not afford to be ill and are needed at home. However, it might also indicate that children are not taken to hospital as often as they should be. On th other hand many diseases can be treated at home with tablets available in local shops.

Only few interviewees report Typhoid cases in their midst, whilst it is supposed to be endemic in the Mt Elgon area. This may either be caused by the fact that it is a disease of low incidence and therefore hard to detect in a sample of 52 households, or by the fact that symptoms are hard to distinguish from those of malaria. The results of the survey make clear however, that many factors that can give rise to the onset of the disease are present on Mt Elgon: unprotected water sources, drinking of unboiled water, absence of latrines, dishracks and compostpits, not washing of hands.

More interviewees in Kapsokwony are willing to spend money on improvement of drinking-water quality. A lot can be improved with

simple means and at low cost. Fortunately the willingness to cooperate is in both sublocations a fact.

CONTENTS

1 INTRODUCTION

1.1 Misikhu Mission Hospital and study proposal

Misikhu Mission Hospital* is a small rural Mission Hospital (123 beds) situated in Misikhu, Bungoma District, Western Province in Kenya.** Misikhu is a small village situated in an area that is quite fertile and well watered, not far from the foothills of Mount Elgon (4321 m) (See map at the beginning). The hospital renders its services to about 15,000 people of which the tribal division is as follows: Luhya 86%, Elgon-Maasai 8%, Teso 2%. Kikuyu 2 % and others 2% For most patients (69 procent) the maximum distance to Misikhu Mission Hospital is 15 km, although patients from the Mount Elgon Location have to walk upto 45 km. Therefore the hospital is providing a mobile clinic at two small villages quite high up Mt. Elgon once a week. A Community Based Health Care*** project was started in Chemoge sublocation in June 1986 (Also quite high up the mountain) [1].****

For some years now, the hospital has seen many Typhoid Fever cases coming from Mt Elgon. In 1985 74 adults (persons over 12 years) were admitted with this disease of whom 11 died, as well as 6 children of whom 1 died [2] ; In 1986 138 adults were admitted of whom 11 died, as well as 16 children of whom none died [1]. Therefore the Clinical Officer in charge (Mr. R. van Overstraten) has proposed to investigate why so many people in this mountainous area are attacked by the disease and what contributions can be made in future by the hospital to reduce the number of Typhoid patients in this area. Also he wanted to know if the high number of patients

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*See Appendix A for Health Care Organisation in Kenya

**See Appendix B for Governmental Organisation of Kenya

***See Appendix C for more information on the CBHC-project

****References are numbered in order of appearance. See last page for full description.

was possibly due to poor water facilities in this area. Before discussing the study proposal (see section 1.3) it is useful at this point to look at the main characteristics of Typhoid Fever*.

1.2 Typhoid Fever

There is a considerable Typhoid mortality in developing countries. It is a disease of low incidence rate** which often appears in epidemical form [3].

Typhoid Fever is caused by the swallowing of Salmonella Typhy and belongs officially to the category of water-borne diseases, which are those diseases where water acts as a passive vehicle for the infective agent [4].

Although Typhoid epidemics have often been described as caused by one common water source, the disease is in rural tropical areas often not water-borne in a strict sense [4]. The fact is that Typhoid can be transmitted by any route (water, food, hands etc) which allows fecal material or urine to pass into the mouth (fecal orally / urinary-orally transmitted disease [4,5]) and can therefore also be water-washed. This means that the chance of transmission can be reduced by increasing the water volume used in personal and domestic hygiene [6,4].

In most of the communities with endemic Typhoid the micro organisms are spread by patients and carriers who pass the bacteria in their feces or urine. Carriers are persons who have recovered clinically from the disease, but continue to pass bacteria in their feces or urine for months (temporary carriers) or for years (permanent carriers) [3]. Also some persons may harbour the disease without developing the clinical symptoms (passive carriers) [7]. Persons living in the vicinity of carriers and patients under conditions of poor hygiene are at high risk and frequently contract the disease The presence of urinary carriers in rural areas with much stagnant

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*Appendix D contains a full description of Typhoid Fever

**Incidence rate: number of diagnosed or reported cases of the specified disease during a defined period of time, divided by the population in which the disease occurred. Usually expressed as the number of cases per 100.00 per year for specific populations.

water and poor sanitation can lead to extensive environmental contamination and can therefore increase the risk of infection enormously [8]. According to [3] carriers are the source of water-borne Typhoid Fever. Common-source-epidemics of Typhoid are likely to occur in areas with poor sanitation such as slums, prisons, overcrowded boarding schools and refugee settlements [9]. Lack of cleanliness and flies can speed up contamination of foods, fluids and water-supplies [10,11].
The incubation-period is usually 12-14 days [9] but may range from 7-21 days [7]. The clinical symptoms occur only in about 20% of the persons that are infected. The main symptoms are headache, stomachache and a high fever with relatively slow pulse.
Treatment is possible by chloramphenicol which clears up the symptoms in a few days. This medicine exerts a powerful bacteriostatic action on S. Typhi and controls the multiplication until the defensive mechanism overcomes them [7].
Relapses often occur after treatment [9] and in some cases S. Typhi persists in the gallbladder or kidneys, turning the recovered patient into a fecal or urinary carrier [8,5]. If untreated the disease picture may deteriorate and the two grave and common complications may now occur: intestinal haemorrhage or perforation caused by ulcers. The consequences may be fatal unless surgical aid is available [9].

1.3 Operationalisation

The main objective in the framework of this research was to assess factors that might contribute to the onset of Typhoid Fever on Mt Elgon. From section 1.2 (transmission routes) and the results of a pilotstudy done in Misikhu Mission Hospital (Appendix F), it follows that hygiene (personal and environmental) and the type of drinking-water and excreta disposal in particular are relevant factors to be studied. A subobjective has been to formulate recommendations for the hospital that might help to reduce the Typhoid Fever incidence on Mt Elgon in future. These recommendations should take knowledge, attitude and behaviour of the target population with respect to public health and environmental hygiene into account as

well as ability and willingness for their improvement.
Thus the following operational questions are formulated:

1. How is the hygienic state and behaviour especially in relation to (drinking)-water and excreta disposal?

2. What do people in the study area know about hygiene and diseases and how do they perceive their present-day situation in relation to water-supply, sanitary conditions and health?

3. Is the population willing and able to cooperate with others in order to achieve improvements that can reduce a high Typhoid Fever incidence in the area under study?

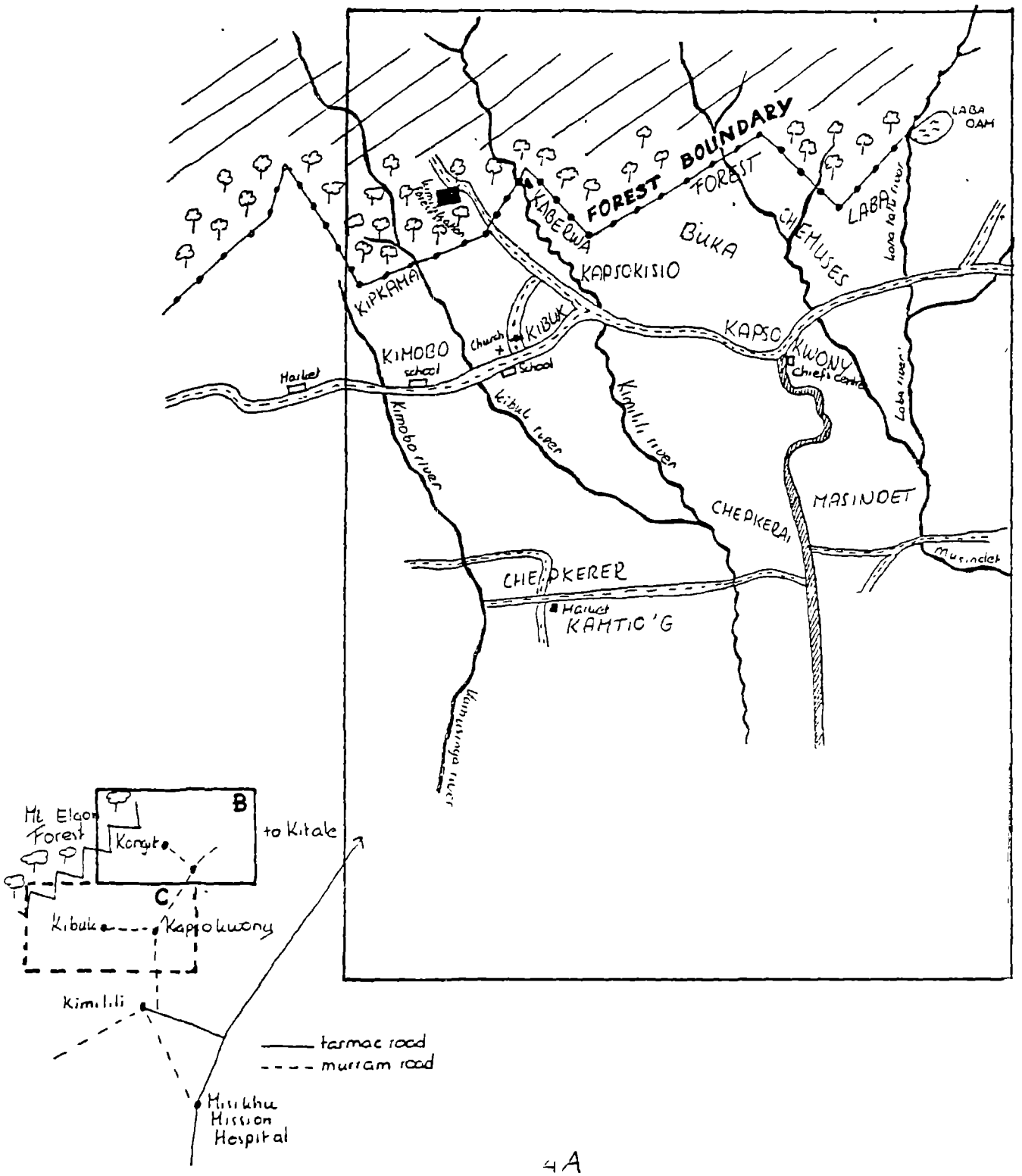
In consultation with the CBHC-team, Mr van Overstraten, Rf M de Rijk and Chief Hesbon Naibei, two sublocations on Mt Elgon were chosen for scrutinizing.
It was decided to gather the necessary information in interviews by means of a questionnaire. Assistance would be given by village workers acting as interpreters.

1.4 Chemoge- and Kapsokwony sublocation

The study areas, which are contiguous, are located on the slopes of Mt Elgon (4321m) at the border of Uganda and Kenya. The areas are very mountainous, quite fertile and in a rainy zone, temperatures ranging between 20° C and 30° C. There are two rainy seasons, short rains from August till November and long rains from March to July.
Chemoge sublocation (see map B, p.6A) is divided into 12 areas: Chemuses, Kongit A, Kongit B, Chepkoya, Kaptalelia, Chemoge, Sabururu, Laba, Kiptiroko, Kipchiria, Masindet and Namboani.
Each area is headed by a village elder (Maguru or Makasa) who is chosen by the villagers. The Government is represented by one Chief and one Subchief.
Chemoge sublocation counts three big rivers (Laba, Namboani and Sosio river) with their branches (streams) as well as many wells and

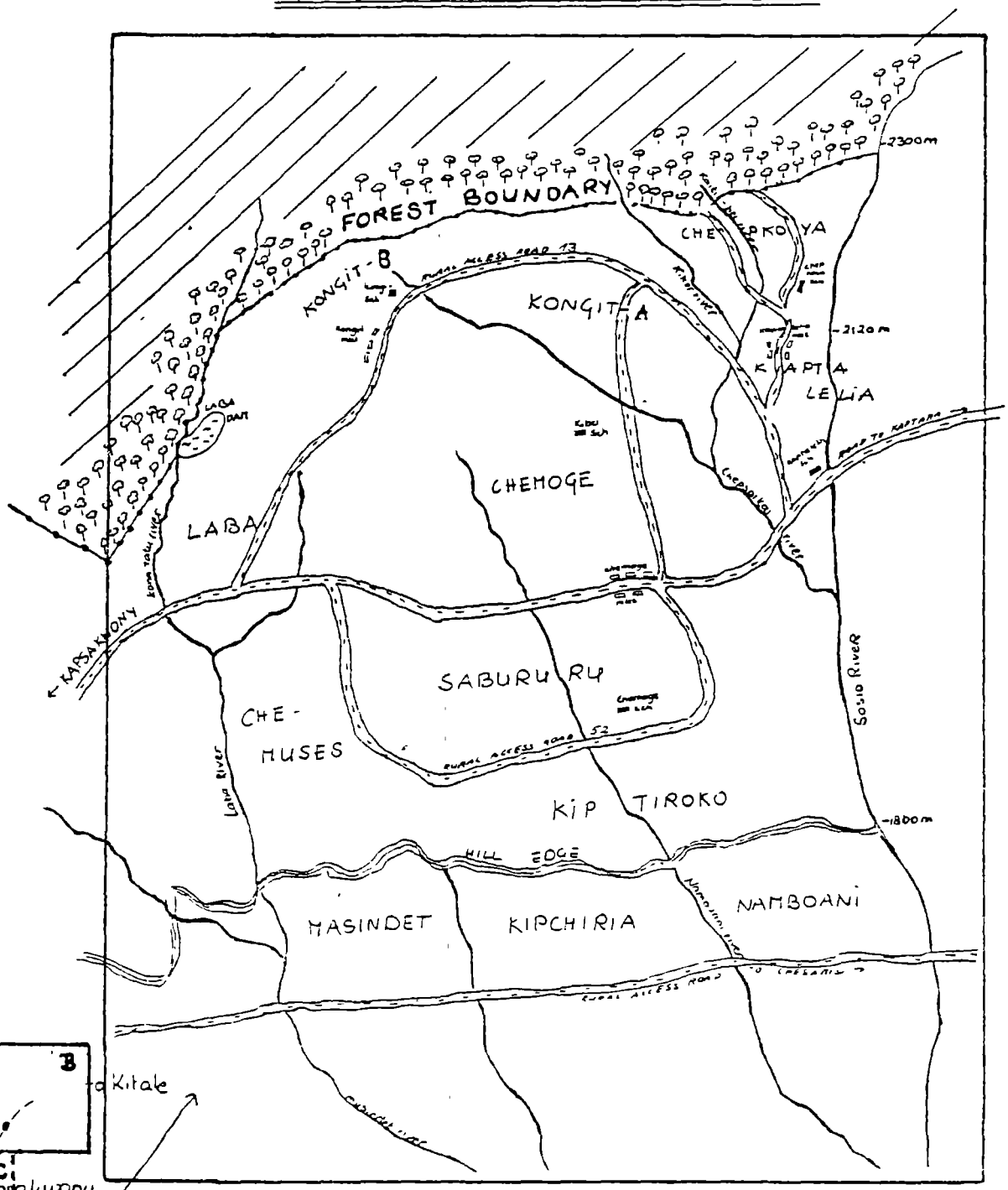
MAP C

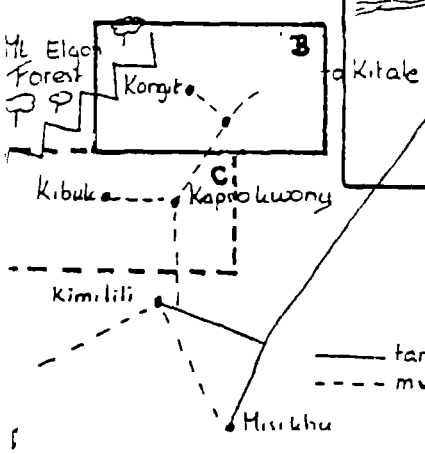
MAP OF KAPSOKWONY SUBLOCATION (1 : 50 000)



MAP B

MAP OF CHEMOGE - SUBLOCATION (1 50,000)





a few springs. At Laba there is a dam, which is out of function at the moment.
High up the mountain the sublocation is bordered by the Forest.
The population consists mainly of Sabaot, but few Bukusu are also living in this area.
There are some dispensaries and a CBHC-project was launched by Misikhu Mission Hospital in this area in 1986.
Kapsokwony sublocation (see map C, p.) which is adjacent to Chemoge at the Laba-, Masindet- and Chemuses side is divided into 14 areas: Kapsokisio, Chepkarai, Buka, Kipkama, Chemuses, Kamtio'g, Omari town (=Kibuk town), Kibuk, Chepkerer, Laba, Masindet, Kaberwa, Kimobo and the Forest.
Also three main rivers are found: Kimobo- Kimilili (Kibuk) and Laba river with their branches. There are quite a number of springs, some wells and in the areas near the Forest (Kaberwa) some public taps were installated. In Kamtio'g a water-supply system is found providing some areas inside but also some areas outside Kapsokwony sublocation with water.
Again the population consists mainly of Sabaot and some Bukusu, but in the Forest area and Kaberwa, people originating from outside the area in the pay of the Government had settled (other tribes such as the Kikuyu).
Also a certain religious group (People of Israel) were living overhere .
There are some dispensaries and one health centre. As for Chemoge sublocation, the nearest hospital (Misikhu) is at a distance of 45 km. This hospital was intended to start a CBHC-project in this sublocation as well.

1.5 The Sabaot

The study population consists mainly of Sabaot (also nick-named `Elgon-Maasai'). They belong to the Kalenjin, one of the biggest tribes in Kenya (long and slender people).
They are small peasants, their main crop being maize, which is harvested once a year, during September and October (this year they harvested quite late: upto the end of December).
Their staple food is `ugali', a thick maize porridge eaten with a

cabbage-like vegetable (`sukuma weaky') and/or meat.
To a lesser extent, bananas, sugarcane, beans, tomatoes and other vegetables are grown.
Although part of the maize is grown as cashcrop, most crops are used for family consumption.
Most Kalenjin also own some chicken, sheep, goats and/or cows.
The population density is high (206/km^2) compared to other parts of Kenya and increasing and farmland is becoming hard to get (the land has to be divided by all sons). On the other hand the land the Sabaot are living on belongs to the category of medium to high potential land [17].
The population increase is 4.6% per year and unfortunately family-planning is hardly practised.

2 METHODS

2.1 Method of data collection (questionnaire and interviews)

As described earlier (section 1.4) it was decided to perform an inventarisation of factors that might contribute to the onset of Typhoid Fever in both sublocations. Data were collected by means of a questionnaire. The questionnaire was based on "The Sociological Questionnaire on Water Supply, Waste Water and Excreta Disposal" used by the World Bank [12] and comprises the operational questions described in section 1.3

Before the final version was made two pilot interviews were done to study feasibility (comprehensibility and duration). The questionnaire* consists of 24 questions covering demographic figures, educational level, occupation and economic figures, quality of housing, type of water source, valuation of water source, water collection and storage, waterconsumption, health perception and habits in relation to water use and excreta disposal, incidence and general knowledge of diseases and willingness and ability to improve.

An average interview took about one hour.

In Chemoge six Community Health Workers (CHW) were willing to assist us as interpreters. In Kapsokwony, which was not yet reached by the CBHC-team of Misikhu and had therefore not yet chosen any CHW's, three volunteers assisted us.

People (assistants and respondents) were very helpful.

Because of the mountainous character of the areas under study and the households being quite far apart, about four to six households could be visited in total on one day. The fieldwork took 3 weeks altogether.

If possible women were questioned. In case people were not at home, the neighbouring household was visited.

Households in Chemoge were visited first, followed by those in Kapsokwony.

The questionnaire has some limitations. At first it is difficult to judge if some answers are based on social desirability rather

*See Appendix G for questionnaire

than reality. Another drawback is, that, although questions about the occurence of Typhoid Fever were asked, it is difficult to judge if somebody has really been suffering from Typhoid Fever (without the results of a bloodtest or clinical check-up). Symptoms like headache, stomacheache and high fever are also seen in other diseases. Another limitation is the fact that the interviews were led by two investigators and interpreted by 9 assistants, which may have biased the results.

2.2 Selection procedure of studypopulation

Considering the expected duration of one interview, the time left for research and the available manpower, it was decided to take a simple random sample of 26 households from each sublocation. The average number of households per area was 80. The samples of 26 households in both sublocations amounted 3.4% of the total number of households listed for Chemoge (Excluding 3 areas) and 2.7% of the total number of households in Kapsokwony sublocation.
This sample size allows for a representation of an inventory of public health and environmental hygiene conditions in the study areas.
To give all households the same chance of being selected, a list of all households in both sublocations had to be composed. After approval of the Chief and the Subchief to start the research in their areas and after an official introduction to all village elders , the selection procedure was started: All village elders were asked to produce a list of households under their supervision. This proved to be a difficult task. Three areas in Chemoge sublocation (Masindet, Kipchiria and Namboani) were excluded from the selection procedure since their village elders could not be reached in time. All lists were gathered and the final list for Chemoge counted 762 households and the final list for Kapsokwony 952 households. All households were numbered and for each sublocation a random sample of 26 households was drawn.

2.3 Processing and analysis of data

The data were processed and analised mainly through one way or two way frequency tables comparing both sublocations.

3 RESULTS, DISCUSSION AND CONCLUSIONS

3.1 Demographic variables and quality of housing

Demographic variables are studied in order to find out if there are any differences between the two sublocations under study in certain variables (such as educationa level etc.) that are not directly related to Typhoid Fever, but that could influence susceptibility indirectly.

3.1.1 Householdsize and age distribution (App. H, fig. 1.)

The results do not give reason to assume that the populations differ in a striking manner with relation to householdsize,sex composition and agedistribution, although the households in Kapsokwony sublocation tend to be slightly larger than those in Chemoge sublocation.

3.1.2 Educational level (App. H, Table 1.)

Striking is the fact that the percentage of uneducated adults in Kapsokwony sublocation is almost twice the percentage of uneducated adults in Chemoge sublocation (App. H, Table 1.). This is mainly caused by the high percentage of uneducated women in Kapsokwony sublocation (50%).
On the whole more adults in Chemoge sublocation have reached a higher educational level as compared to those in Kapsokwony sublocation. It is not clear by which factor this difference is caused and if it has turned out to be of influence on the Typhoid Fever incidence. Since school is an important source of health education it is a great pity that especially women (mainly in Kapsokwony) have lacked it.
When considering youth, there are hardly any differences in the average number of children per household attending primary or secondary school between sublocations, although it is quite disappointing that only few children are sent to secondary school. This is probably because of the high schoolfees that have to be

paid for secondary schools (primary schools are for free in Kenya).

3.1.3 Occupation and economic figures (App. H, Table 2.)

More than 50% of the households in both sublocations are headed by a farmer (App H, Table 3). This is not surprising for a country like Kenya, where most of the people still depend on farming as a means of subsistence and schoolholidays and leaves are adjusted to the period(s) of the year in which the maize can be harvested. Even households in which the man or wife is employed, practise farming as an important contribution to their existence. This is also revealed by the fact that all households in both sublocations harvest maize independent of the occupation of the head of the household (App H, Table 3). [Traditionally a Sabaot divides his (arable) land by his sons. This means that every son will have a piece of arable land, although it can be very small ofcourse. A son will settle near his fathers homestead and when he marries his wife will come to live with him.]

According to Table 3, there are hardly any differences in the number of acres owned and in the distribution of households that harvest a particular number of bags of maize per year, when comparing both sublocations.

The average number of acres per capita is slightly higher in Chemo- (0.75) than in Kapsokwony sublocation (0.63), which can possibly be explained by the slightly larger householdsize in Kapsokwony as compared to Chemoge sublocation (6.8/ vs 6.4 persons). Within each sublocation the number of acres owned differ a lot. It proved to be difficult to find in literature a minimum amount of acres necessary per person for subsistence.

Taken the view that a harvest of 20 bags of maize per year is enough to feed an average household (6.5 persons) ,it can be seen that 57.6% of the households in Chemoge sublocation and 46.2% of those in Kapsokwony meet this criterium. This means that among the households that harvest less than 20 bags at least some households have to spen money on buying maize, since it is their staple-food.

Also the number and type of animals owned by the households in both sublocations does not differ much (App H, Table 4).

Almost all households have chicken and cows and half of them goats and sheep as well. (Chicken are served to special guests as a sign of hospitality).
Taken together, these economic figures do not show many differences between the two sublocations. However the economic position of the households within the sublocations can still differ a lot since there are many other factors that can influence it. Among these factors are the presence of temporary and full-time jobs, the possibility to cultivate other foodcrops than maize and the presence of any excess products (maize, other foodcrops, animal products) which can be sold. Next to these are expenses that have to be made (schoolfees, medical costs, clothes and other things).
On the whole the impression is that the Sabaot are not bad off as compared to other (poorer) sections of Kenya. All Sabaot own at least some (medium to high potential [17]) land which gives them a chance of subsistence farming.

3.1.4 Quality of housing (App. H, Table 5)

The housing conditions do not differ much when comparing both sublocations. However slightly more households in Kapsokwony sublocation have a seperate kitchen.
Most houses are made in the traditional way, with walls consisting of mud and roofs tatched with grass. About 17% of the houses in both sublocations have an iron roof, which is more expensive, but also more hygienic than a grass-made one, since the latter may harbour many insects.
The presence of a seperate kitchen and or windows for ventilation prevents people of sleeping in a smokey room. It is fortunate to find that most of the households have a seperate kitchen and if not, that there are at least some windows in the house.

conclusions: Background variables such as householdsize, age distribution, occupation, economic figures and quality of housing do not show any striking differences between both sublocations. Concerning education more adults in Chemoge, especially women, have reached a higher educational level than in Kapsokwony sublocation.
Farming is an important source of subsistence and all households

own at least some arable land although it can be very little (within sublocations differences can be big). On the whole the land is quite fertile. Compared to other sections of the Kenyan population the Sabaot do not seem to be bad off.

3.2 Health perception and habits in relation to sanitary conditions especially of (drinking-)water and excreta disposal

3.2.1 Type of water source (App. H, Table 6)

Several kinds of water sources are being used in Chemoge- and Kapsokwony sublocation during the dry and wet seasons . In Kapsokwony sublocation most of the households obtain their water from a river or a spring. In Chemoge sublocation most of the households use a river or a well. In Kapsokwony wells are not often used, wahile in Chemoge springs are not often used. Taps are only found in Kapsokwony sublocation (used by 12% of the households).
It is not clear whether these differences in the type of water source used, between both sublocations and within each sublocation are due to preference for or availability of a particular source.

3.2.2 Valuation of water source (App. H, Table 7)

The use of a particular source is accompanied by a varying number of likes and dislikes .
Rivers are mostly liked because of their abundance of water, their cold temperature and their cleanliness. It is remarkable however, that rivers are disliked simultaneously for reasons such as dirtyness, which is mostly said to be caused by people and animals. Most of the time, however, rivers are not disliked.
Springs are mostly liked because of their cleanliness and because of the fact that they `start from there', which probably means that the water is not yet polluted. Most of the time springs are not disliked.
Wells are liked because they are clean and disliked because they become dirty during rainy seasons. The fact that some wells dry up is not mentioned as a reason to dislike them.
Streams are liked for several minor reasons, most of them concerning

cleanliness. Hardly any user dislikes them.
Taps are liked because of the cold temperature and never disliked. Strikingly hardly any factors that are directly related to health (no germs, no diseases etc) are mentioned. On the other hand factors such as `clean', `good', `it starts from there' might implicitly refer to health.
It follows from the above that many interviewees mention dirtyness as a reason to dislike rivers and wells (although they also mention reasons to likes these types of water sources). Dirtyness is indeed a problem. In both sublocations most wells and springs are unprotected, which can give rise to pollution in the rainy seasons because of the mountainous character of the area. On the other hand there are some easy and cheap methods to protect these water sources (see Chapter 4 Recommendations).
Since likes as well as dislikes of a particular water source are expressed simultaneously, it is not clear if a choice for a particular water source is based on preference (such as healthyness of a source) or rather on information passed by others (App H, Table 8). Probably this last aspect has turned the scale. Most interviewees in both sublocations were informed by others , especially by their (grand)parents and have been using the water source till this very day. This is not surprising since by custom, husband and wife come to live on the land of the husband's parents and normally do not move from that place anymore. This implies that the interviewees did not choose the water source because of its cleanliness or healthyness. It is on the other hand very likely that in the past their (grand)parents have built their houses in the neighbourhood of a good water source.

Conclusions Rivers seem to be quite popular in both sublocations, which is not amazing since each sublocation counts three big rivers and their branches. In Kapsokwony springs are next popular and in Chemoge wells. Important is that rivers are most liked because of their abundance and secondly because they are cold and clean. Cleanliness is also the most important reason to like a spring or a well. On the other hand rivers are often said to be dirty as well. The choice for a particular source is probably based on advice given by (grand)parents rather than on individual preferences.

3.2.3 Water collection and storage (App. H, Table 11)

Water collection is a task of women and children, and takes up their time to a bigger or lesser extend, ranging from 10 minutes up to more than 2 hours (App H, Table 12). In both sublocations the number of trips made per day to collect water is 3.5 on average [min 1, max 10 trips], whereby women in Chemoge sublocation spend more time per trip than those in Kapsokwony sublocation (23 respectively 17 minutes on average). This can be explained partly by the longer distance between house and water source in Chemoge sublocation (App H, Table 9).
The type of watercontainer that is used most is a jerrycan or a bucket, both of 20 liters estimated capacity.
Almost every household uses a pot covered by a lid to store the drinking-water. It is not certain though if the storage vessels are regularly rinsed (with soap) and if dippers are kept clean. Boiled water can easily become unreliable again when it is stored in dirty vessels or contaminated by dirty dippers.

3.2.4 Water consumption (App. H, Fig. 3)

The waterconsumption can be most clearly expressed in liters per capita per day and can be related to several factors.
These factors are the householdsize (App H, Table 10,), the amount of time spent per day in fetching water and indirectly the distance between the house and the water source (App H, Table 11).
Figure 3 displays the number of households with a particular mean daily water use per capita in both sublocations. 50% of the households in Kapsokwony sublocation consume 5-10 liters on average per capita per day whereas for Chemoge this percentage is almost half of it (26.9%).
The consumption of 10-15 liters on average per day per capita is found among an almost equal percentage of households in both sublocations (34.6% in Kapsokwony and 38.8% in Chemoge). These results indicate that in Chemoge the mean daily water use per capita is slightly higher, whilst the average distance between house and water source is found to be longer in comparison to Kapsokwony sublocation (App H, Table 9). This means that the mean daily water

use per capita does not necessarily decrease with increasing distance (App H, Fig. 4).

When relating mean daily water use per capita to household size, one might expect the former to decrease when the latter increases. This is the case for both sublocations in a comparable degree: In Chemoge from 18 liters per capita for housholds with less than 5 members, to 11 liters for households with 5-10 members to 7 liters per capita for households with 10 or more members. In Kapsokwony these values are respectively 19, 10 and 7 liters (App H, Table 11) . White, Bradley and White [4] found the same trend when they related household size and mean per capita daily water use for households without piped waterconnections in East Africa.

Most of the households in Chemoge- and Kapsokwony sublocation (50%, respectively 57.7%) consume on average 10-11 liters per capita per day. The same amount is found when calculating the mean daily water use per capita over all households. White, Bradley and White [4] found mean daily water uses per capita per day ranging from 6 to 11.5 liters for 6 rural settlements without piped water connections in Kenya.

According to the WHO (1971) the average daily drinking-water intake of an adult man is 2.5 liters (women and children take less). An average quantity of 10-11 liters per capita per day leaves therefore about 8 liters per person, which can be used for other purposes like cooking, washing food and utensils, bathing and laundry. It is difficult to determine which quantity is used for which purpose and if it is sufficient to guarantee a certain degree of hygiene. Bathing and laundry for example can either be done at home or at the water source.

When relating the mean daily water use per capita to the daily amount of time spent in fetching water (App H, Table 11), it can be seen that a mean daily water use per capita does not necessarily decrease when more time is spent: The mean daily water use per capita first increases and then decreases with the total amount of time spent per day: An increase from 9 liters (≤ 30 minutes spent) to 12 liters (30-60 minutes spent) and further to 13 liters (60-120 minutes spent) and a decrease to 9 liters (≥ 120 minutes spent) in Chemoge sublocation.

In Kapsokwony sublocation an increase from 8 liters to 12 liters

per capita per day is found after which the quantity decreases to 11 and to 10 liters. A large amount of time spent in fetching water can be partly explained by a longer distance between house and water source (Table 11).

Conclusions: Watercollection is a task of women and children which takes from 10 minutes up to over 2 hours of their time daily. Jerrycans or buckets of 20 liters are mostly used as containers while drinking-water is stored in earthen pots covered with a lid. Though water can be kept cold in this manner it was not studied if these pots were cleaned regularly.
Most housholds consume 10-11 liters of water per capita on average. Consumption is slightly higher in Chemoge as compared to Kapsokwony sublocation. Although this is sufficient to satisfy drinking needs, it is not sure if it is enough to guarantee a certain degree of hygiene.
Waterconsumption per capita decreases with increasing householdsize, but not necessarily with increasing distance or spent time.

3.2.5 Health perception of environment

Interviewees were asked whether they consider their present environment to be a healthy place to live or not, in order to find out if they see any relationship between their direct environment and health. Most of the interviewees in both sublocations (~83%) consider their houses to be located in a healthy place.
About half of the interviewees in both sublocations see a direct relation between the `healthiness' of the place and the absence of diseases (`We have not seen any diseases'). Reasons that were mentioned less often might also have an (implicit) relation to health (e.i. `No bushes around', `Free from wind', `No pollution around' etc.)(App H, Table 12).
11.5% of the interviewees in Chemoge sublocation consider their house to be located in an unhealthy place because of diseases or bushes or the absence of a latrine. On the whole one is very positive about the location of his house, which could also be influenced by the fact that one comes to live on the land of ones father, who must have chosen a good place.

3.2.6 Health perception of drinking-water

Interviewees were also asked if they consider their drinking-water to be healthy for themselves and their family in order to find out if they see any relationship between their health and the water they drink (App H, Table 13). 73.1% of the interviewees in Chemoge and all the interviewees in Kapsokwony sublocation consider their drinking-water to be healthy. In Kapsokwony most of them ascribe the healthiness of their drinking-water to the absence of diseases (`We have not been ill'). The interviewees in Chemoge seem to be more sceptical about the healthiness of their drinking-water. Only few ascribe the fact that they have not been ill to the healthiness of their drinking-water. It might be the possibility that they do relate some of their illnesses to the condition of their drinking-water. They have probably learned through the CBHC-project launched in their area (and not yet in Kapsokwony) about the existence of `germs' that may be present in drinking-water and that can be killed by boiling. This is probably also the reason why only interviewees in Chemoge mention boiling of their drinking-water as an explanation for its healthiness. When asked however, almost the same number of the interviewees in both sublocations (~40%) claim to boil the water before they drink it.
Some of the interviewees in both sublocations think that the `healthiness' of their drinking-water is due to its cleanliness However, it is not clear whether this is visible cleanliness or `absence of germs'. This may become a topic to be stressed in future CBHC-projects.

Conclusions: Most interviewees (more in Kapsokwony as compared to Chemoge) perceive their environment and their drinking-water as being healthy. They (especially in Kapsokwony) have often come to this conclusion because of absence of diseases. Another explanation may be the fact that they do not see any possible relation between the diseases they get and the condition of their drinking-water and/or environment ;though interviewees in Chemoge seem to be more awareof this possibility than those in Kapsokwony, which may be an effect of the CBHC-project launched in Chemoge or an effect of the

higher percentage of adults in Chemoge that went to school

3.2.7 Social aspects of water collection

The fetching of water is a social event, since almost all women in both sublocations (~ 90%) meet and talk with other people during this task. According to the women it is good to meet and talk in order to exchange information and ideas with friends, relatives and neighbours.
Five of the women in Chemoge (19.2%) and 1 in Kapsokwony sublocation though, do not consider it to be good to meet and talk with other people when fetching water, because they think it is `a waste of time' or because `they quarrel'.
The fact that men are often not allowed to come near the water source indicates again that fetching water is a women's task. Differences in opinion exist between both sublocations however (App H, Table 14) since twice as many interviewees in Chemoge- as compared to Kapsokwony sublocation share the opinion that men are not allowed to come near the water source (84.6%, resp. 42.3%) for reasons like `It is not their duty' and `They have their own place'.

Conclusions: The fact that the fetching of water is a women's task and that men are often not allowed to come near the water source, this has to be kept in mind when changes in drinking-watersupplies are planned. A public tap in a village for instance might harm this tradition.

3.2.8 Method of waste water disposal (App. H, Table 15)

Interviewees were asked about their methods of waste disposal ;this question was ment to find out whether the direct surroundings of their house are exposed to pollution and if they see any association between those methods and health.
Most interviewees throw their waste water on the ground about 5-8 meters from the house or in the compost pit (App H, Table 15). In view of hygiene it is better to throw waste water into a compost pit since young children often creep and play on the ground near the house.

3.2.9 Dishracks and compost pits (App. H, table 16)

Dishracks are found in almost all households in Chemoge- (92.3%) and in 61.5% of the households in Kapsokwony sublocation. This difference is probably an effect of the CBHC-project launched in Chemoge sublocation.
To find out if interviewees see any relationship between the use of a dishrack and hygiene the reason for using one was asked (App. H, Table 17). In Kapsokwony the main reason for having a dishrack is `To dry utensils', whilst in Chemoge sublocation reasons like `To keep away from animals/children/bacteria' are mentioned, which reveal a more direct link to health and hygiene (CBHC-project).
The reason why households have no dishrack is not unwillingness but misfortune (`No nails', `The old one broke down'etc). When there is no dishrack, people dry their utensils on the ground or on top of bushes, where they are exposed to dirt, animals and insects. The construction of a dishrack (which is simple and cheap) should therefore be encouraged at any time. The same applies to a compost pit, which turns garbage into useful manure and prevents it from rotting all over the compound. More households in Chemoge sublocation have a compost pit as compared to Kapsokwony (65.4%, vs 38.5%), which may again be an effect of the CBHC-project launched in Chemoge.

3.2.10 Method of excreta disposal

All 26 households in Chemoge sublocation state to use a latrine (6 with handwash) compared to 20 households in Kapsokwony (1 with handwash).
Others use the bush, although they consider this to be a bad method (App H, Table 19) and not free from problems (App H, Table 18).
Latrine users consider this sanitation facility to be the best method of excreta disposal and also the healthiest because `It keeps the environment clean' and `It is free from flies and germs'. Furthermore it does not give many problems (App H, Table 18). It is doubtful however that a latrine is used under all circumstances, e.c. during the nights and by young children or when people are away from home. As a consequence the environment and unprotected

water sources may become polluted, since rain can easily wash down this dirt into the water.
In view of hygiene latrines are highly recommendable since they minimize the spread of excreta and reduce the transmission of diseases provided they are used!

Conclusions: Dishracks, compostpits (waste water and garbage) and latrines are easy to construct and highly recommendable in view of hygiene. Interviewees in Chemoge are slightly ahead of those in Kapsokwony in this light, which is probably an effect of instructions given by the CBHC-team.

3.2.11 Washing hands (App. H, Table 20)

Since the transmission of diseases can easily take place via hands, washing habits after using the 'choo', before preparing food and before eating were investigated.
In view of hygiene soap is indispensable, since it helps to remove germs.
Table 20 reveals no differences between both sublocations: ~86% of all interviewees wash hands after using the choo and ~65% of them say that children also do this. The latter means that at least in ~35% of the households, children do not or just sometimes wash their hands after using the choo, which is a regrettable fact since especially children are susceptible to all kinds of diseases.
Almost all interviewees state that they wash hands before preparing food and before eating; Only ~58% of the households claim to use soap and ~29% claims to use it sometimes.
Since it is custom to eat with hands, it is most important to clean hands before eating, which is actually done in most cases.
From personal observations it appeared that people actually often do not use soap and that the same water is used again and again by several household members, thereby increasing the risk of contamination.
It seems that the washing of hands is not so taken for granted as hoped for. Probably one is not aware of the far-reaching effects dirty hands can have. In other words it would be wise to pay much attention to possible transmission routes of diseases (dirty hands,

dirty cutlery, contaminated drinking-water or food) in health extension programmes or in school and to interventions to prevent diseases (dishracks, compostpits, latrines, washing hands) (see also next section).

Conclusions: Although washing of hands is said to be practised by many adults, children often do not (ofcourse especially the very young ones). Attention should be payed to transmission routes of diseases such as dirty hands in Health Extension and lessons in school. The CBHC-project in Chemoge seems to have had some very good influences so far.

3.3 Diseases: incidence and general knowledge

3.3.1 Most common diseases (App. H, Table 21)

According to the interviewees malaria is the most common disease in the villages. Diarrhoea and measles are also very common. This is in accordance with the Annual reports of 1985 and 1986 of Misikhu Mission Hospital [1,2] and with the RAWOO-report (1983) [13] which describes infectuous diseases of the respiratory and intestinal tract and tropical diseases (malaria) as most common diseases in developing countries. Coughing and headache are often seen in Chemoge and not so often in Kapsokwony sublocation. Typhoid Fever is only mentioned by the interviewees in very few cases in both sublocations. Although Typhoid Fever was thought to be a common disease, the samples do not include many cases (se also section 3.3.4).

Any questions about the causes of occuring diseases reveal, that mostly the cause is unknown by the interviewees. An exception in this respects constitutes malaria, of which the cause was known by more than half of the interviewees in both sublocations. Knowledge of its prevention was poor: 42.3% resp. 34.6% of the interviewees in Chemoge- and Kapsokwony sublocation know how to prevent it.

Since diarrhoea and measles also belong to the most common diseases in the area and knowledge about causes or prevention of these diseasesare quite poor it would be good to pay extra attention to

these aspects in health education

3.3.2 Attending health units (App. H, Table 22)

To find out if there had been any persons suffering from diseases, the interviewees were asked if they or any of their household members had attended a doctor, hospital or herbalist in the past year.
This is the case in 88.5% of the households in Chemoge and 69.2% of those in Kapsokwony sublocation. The health service was attended mostly for malaria, measles, coughing and diarrhoea, the diseases that were mentioned to be the most common. A relatively high percentage of adults as compared to children attended some sort of health service when ill (32%, resp 18% in Chemoge and 31% resp 22% in Kapsokwony sublocation. This follows also from Table 23, which shows that children are often not taken to hospital at all when suffering from coughing, malaria, measles or scabies.
The reason why adults rather than children attend a healthservice might be because of a difference in frequence or seriousness of the diseases or a result of the fact that parents can not afford to be ill, because they are needed to keep the household running. It should also be remarked that many diseases or complaints can be treated at home, since all kinds of tablets can be bought in dispensaries and local shops (i.e. for coughing, headache, malaria).

3.3.3 Diarrhoea

Since diarrhoea is one of the most important indicators of the hygienic state and is closely related to the water quality and the sanitation level, an effort was made to get an impression of it's incidence. The interviewees were therefore asked if any of their householdmembers had been suffering of diarrhoea in the past 6 months. The reliability of the answers however is strongly determined by the length of the recall period, which should not exceed two weeks [14]. For this reason the results of this study concerning diarrhoea incidence are not to be considered reliable. Because of the long recall-period it is not clear if absence of diarrhoea is attributable to a real absence or to poor memory. Any estimation

of the hygienic state based on this indicator is therefore impossible.
Since diarrhoea is such an interesting indicator of the hygienic state it is recommended to carry out a diarrhoea incidence survey with a recallperiod of 2 weeks in future research.

3.3.4 Typhoid Fever

Since the high number of Typhoid Fever cases coming from Mt Elgon has given rise to this research, interviewees were asked if any person in their household has been suffering from this disease in the past year.
Before explaining the symptoms (Which are known by two percent in Chemoge and 6% in Kapsokwony sublocation, 2 interviewees in Chemoge and 4 in Kapsokwony replied that Typhoid has been present in their household during the past year.
After explaining the symptoms, 3 interviewees in Chemoge and 5 in Kapsokwony sublocation confirmed. This means that even though Typhoid Fever may not be common indeed on Mt Elgon, it will be difficult to get an idea of its incidence by means of interviews, since the symptoms (headache, stomachache, high fever, slow pulse) are hardly known. Ofcourse this is quite understandable since they resemble symptoms seen in many other diseases (f.i. malaria). Further the disease has a low incidence, although prevalence can be temporarily high, which makes it difficult to detect many cases in such a small group as 52 households. Another point is that it is difficult to judge if anybody has really been suffering from Typhoid Fever, without a clinical research or a bloodtest.
The water sources that are being used by the households in which Typhoid Fever occurred are all unprotected, but so were the water sources of many other households that did not report Typhoid Fever in their midst.
In the households where Typhoid occurred, the main daily water use per capita ranged from 6.7 liters to 14.3 liters. (mean 9.0 l).
When looking at all the households the main daily water use per capita ranged from 2.8 to 33.3 liters with a mean of ~10.5 liters per capita. Also some of the households with Typhoid cases boiled their drinking-water, whilst others did not. From these results

alone, it is difficult to establish a relation between incidence of Typhoid and quality/quantity of watersupply in the sublocations under study. Considering the above (e.i. sections 3.2.1-3.3.4) it is clear that some factors that can give rise to the onset of Typhoid Fever are present on Mt Elgon indeed (unprotected water sources, drinking of unboiled water, absence of latrines, dishracks and compostpits, not washing of hands). Of course transmission of the disease is only possible when S. Typhi are around. Since these are mostly passed with the feces or urine of patients and carriers, care should be taken that they and other people in their vicinity practise good hygiene. It would be good to extend CBHC-activities since it has proven to be quite succesfull and to teach people about transmissionroutes of Typhoid Fever in particular and other (common) diseases (malaria, diarrhoea, measles etc in general. (See Chapter 4 for some recommendations).

3.3.5 Vaccination of under fives

To find out if mothers are concerned about the health of their children, they were asked if they took their children to a hospital for vaccination. 84.0% of those in Chemoge and 88.5% of those in Kapsokwony confirmed this. Most of the under fives are said to be vaccinated. Table 24 displays reasons given by mothers for not vaccinating under-fives.

Conclusions Most common diseases in both areas are malaria, diarrhoea and measles. Except for malaria, knowledge of causes and prevention of these diseases is very poor. Attention should be payed to these aspects in health education (schools, CBHC-project). Health services are mostly attended for malaria, measles, coughing and diarrhoea. More adults than children seek medical help when ill, probably because thay can not afford to be ill because they need to keep the household running. This result can also indicate that children are not as often taken to hospital as they should. On th other hand, many diseases can be treated at home with tablets from local shops.
Concerning Typhoid Fever: only few interviewees reported this disease in their family. This means that although Typhoid may be

common on Mt Elgon (starting-point of this survey) only few cases are found in the samples. This may be caused by the fact that Typhoid has a low incidence, which makes it hard to detect many cases in a sample of 52 households (even though the survey was done at the time of an outbreak of the disease). Also the symptoms of Typhoid resemble those of malaria, which makes the disease hard to recognise. Although the survey did not point out a clear relation between Typhoid Fever and water quality/quantity, it is clear that some factors that can give rise to the disease are present on Mt Elgon: unprotected water sources, drinking of unboiled water, absence of latrines, dishr^Acks and compostpits, not washing of hands.

3.4 Incentives for improvement of the hygienic situation

3.4.1 Willingness and ability to improve watersupply conditions

In view of future changes interviewees were asked if they are willing to spend money in order to obtain a better quality and/ or a closer source of water.
On average almost twice as many households in Kapsokwony as compared to Chemoge sublocation are willing to spend money in order to obtain a better quality of water (84.8% resp. 54.8%). Twelve households in Chemoge sublocation (46.2%) are not willing to spend any money for this purpose, 8 of them because they do not have it.
Only one interviewee (In Chemoge sublocation) does not want to spend money for this purpose because he/she considers the quality of the drinking-water to be good enough. This indicates that although most of the interviewees consider their drinking-water to be healthy for themselves and their families (App H, Table 13+ text) most of them find that the quality can still be improved.
Although the distance between house and water source is on average longer in Chemoge than in Kapsokwony sublocation (App H, Table 9) more households in Kapsokwony are willing to spend money in order to obtain a closer water source (96.1%, resp 65.4%). 8 (30.7%) of the interviewees in Chemoge- and only one in kapsokwony sublocation are not willing to spend any money for this purpose, 4 of them because they do not have the money at all. Only one interviewee (in

Chemoge sublocation) thinks that the water source is close enough. The fact that more people in Kapsokwony- than in Chemoge sublocation are willing to spend money for improvement of their water source (quality and distance) can either be explained by the fact that people in Kapsokwony have enough money for it, whilst people in Chemoge have not, which is not very likely (section 3.1.3) or by the fact that people in Chemoge prefer to spend their money on other things.
Perhaps content with the present-day situation in Chemoge can also be of influence. To estimate the response to a closer water source in future, women were asked how they would use the time saved. (Most of them spend more than 30 minutes in fetching water (App H, Table 11).
As can be seen in Table 25, most of them will spend the time saved in housekeeping (e.i. cleaning the house and compound, washing clothes and utensils and cooking). This might contribute to a better hygiene.

3.4.2 Cooperation : willingness and possibilities (App. H, Table 26)

In view of future improvements (in water supply and sanitation) interviewees were asked if they are used to cooperate with other people and if there is any kind of community organisation which might be useful.
Cooperation in building houses, schools and in agricultural work is very common:~88% of the households in both sublocations take part in this kind of activities (App H, Table 27). The fact that cooperation in building hospitals is mentioned by less interviewees in Chemoge than in Kapsokwony sublocation can be attributed to the fact that there is no hospital in Chemoge.
Cooperation (App H, Table 27) is mostly organised by the people themselves (one of the group, husband, neighbour) or by official leaders (villageleaders, (assistant)chiefs, chairmans) and works out well.
This unanimous willingness to cooperate, which is found in both-

sublocations can be a result of the so-called `Harambee'-spirit* Harambees are considered to be useful and are supported by all interviewees.
In both sublocations people are willing to cooperate with others (preferably neighbours) (Table 28) to improve their water supply and method of excreta disposal.

Conclusions: Interviewees in Kapsokwony are quite willing to spend money in order to improve drinking-water quality or shortening walking distance to water sources. In Chemoge people are less willing to spend money mostly because of financial problems although it is also possible that they have other preferences for spending money. Besides , a lot can be improved with simple means and local manpower. Willingness to cooperate is a fact, probably because of the Harambee tradition.

*Harambee means literally `pull together'and is used in the sense of `combined effort'. The idea was introduced by the late president Jomo Kenyatta to mobilize human resources (manpower, materials, money) and to use these to develop the country. (Presentlymostharambeesare(compulsary)fundraisings.

4 RECOMMENDATIONS

Recommendations with regard to the Hospital that might help to reduce the Typhoid Fever incidence on Mt. Elgon in future:

4.1 Recommendations on environmental hygiene

4.1.1 Recommendations concerning drinking-water sources

From the results it becomes clear that rivers, springs and wells are the type of water sources used by most of the interviewees. Therefore their characteristics will be focused upon in the following as well as easy methods for improvement.

Rivers

Rivers are most of the time contaminated with fecal material from both people and animals. This contamination is most prominent in small streams close to villages. The cleanest water is in the middle of the river.
It can be recommended that special parts of the river will be used for washing, the collection of drinking-water and watering of animals. Rivers and streams should be kept clean upstream from any place where drinking-water is taken.

Springs

Springs are liable to all kinds of contamination if they are not protected. An easy and cheap method to protect a spring is shown in the following figure 1.

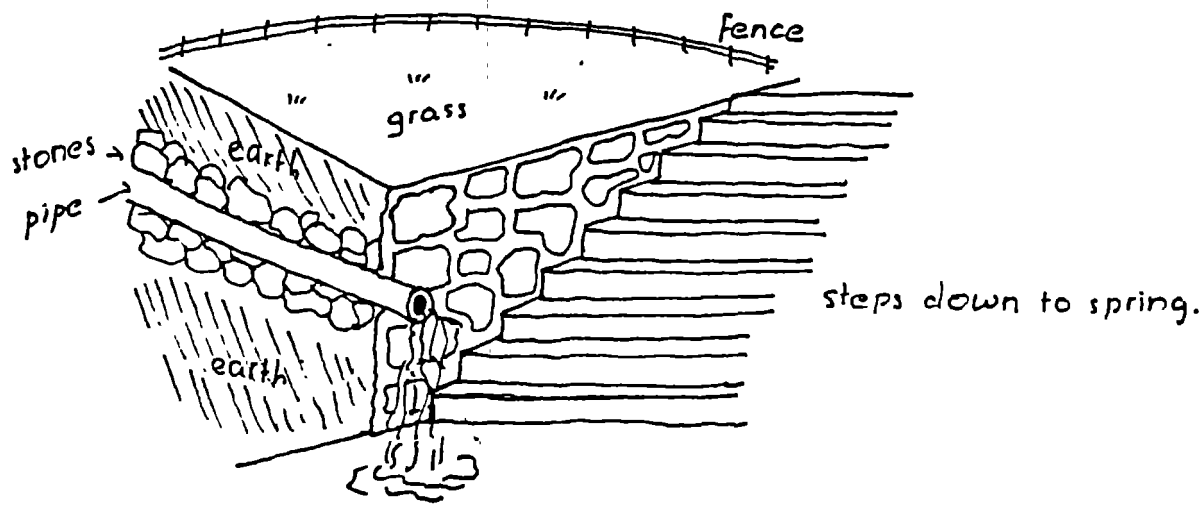


Figure 1 Spring protection

Latrines should not be built in the direct environments of the spring and garbage should not be thrown near the spring.

Wells

Wells are also liable to all kinds of contamination but can be protected with a concrete cover. A (hand)pump or a basket is necessary to collect the water [9].
A disadvantage of wells is that they sometimes dry up during the dry seasons.
There should be no latrines or compost pits within a distance of 15 meters from the well [15].
Ofcourse if the area is mountainous, latrines should be built downstream or on a lower level than the springs or wells.

Influence of (grand)parents on choice of water source

Another point following from this survey is the fact that people choose their water source based on the information of others, (especially (grand)parents) rather than on individual preferences such as health considerations.
If it is necessary to advise people to use a water source that is different from the one that they and their ancestors have been using upto now, it is important to keep this in mind. Power of persuasion might be based on the "dislikes" that are mentioned in section 2.2 of Appendix H. When it is impossible to change people's

habits in this respect, the source should be improved as much as possible according to the above mentioned (which in most cases will be sufficient).

4.1.2 Recommendations on drinking-water storage

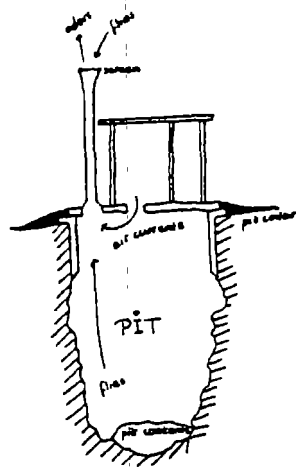
The results of this survey showed that the Sabaot use to store their drinking-water in a pot, but that they do not always boil the water before drinking. Germs can be killed by boiling the water for 10 minutes. Since water will boil below 100°C in mountainous areas, not all germs may be killed. Also because of fuel shortage boiling may become too expensive. There is another simple method of killing germs: many germs can not survive in water for a long time, which makes it possible to kill them by storage. A simple and cheap method is the so-called three pot system. Two pots are used for fetching water on alternate days. When water is fetched in the first pot it is stored for 24 hours (which will also allow dirt to sink to the bottom). The next day the clean top water is carefully poured in the third pot, which is used to keep drinking-water only. The remaining water can be used for washing. After this the first pot is cleaned. Meanwhile water is fetched in the second pot, which is than stored for 24 hours to be used the following day etc. This is a relatively cheap and easy method and should be sufficient.

4.1.3 Recommendations on waste and excreta disposal

Latrines

Latrines are highly recommendable since they reduce the spread of germs and therefore diseases (if they are built at least 20 m from all houses and water sources and downhill). They have to be used however under all circumstances (also when people are away from home). Even urinating should be done in latrines in areas with schistosomiasis (risk of urinary carriers of diseases).
Construction of latrines is quite easy (less easy in rocky areas) and not expensive.
From this study it becomes clear that many people in the areas

prefer a latrine instead of the bush and this should be encouraged. Problems with smell and flies can be reduced with a ventilation system (VIP-latrine= Ventilated Improved Pit latrine)[15].(see Figure 2).



VIP Latrine

If the hole is covered by a lid, flies are prohibited to get in and out the hole. In this way the latrine will not become a breedingplace for flies.
Of course a latrine is only safe when properly built and regularly cleaned. This will make that people will like to use it.
Many small children have difficulties with latrines. It can be recommended to build a small one for them as well.

Waste water

Waste water should not be thrown on the ground close to the house where small children often creep. It is better to throw it in a compost pit or on the ground further away from the house.

4.2 Recommendations on personal hygiene

Improvement of the water source on its own does not guarantee that the water is safe at the time of consumption. On the way from source to mouth contamination can easily occur [16].
In other words, not only environmental hygiene ,but hygienic behaviour in general is important. Before unhygienic behaviour can be changed, it is important to study the prevailing knowledge

of the targetgroup concerning health, personal and environmental hygiene, diseases and their transmission routes (Especially water-borne and water-washed diseases are important in the frame of this study).
The target population in this study did not know much about causes and prevention of the diseases that are common in their areas (apart from malaria) . They apparantly did not realise that hands can be an important transmission vehicle since they did not wash always wash hands after using the latrine. As people eat with their hands it is very important to wash hands (preferably with soap) before eating and after using the choo. The way in which people wash hands should be considered carefully. Often many people use the same (dirty) water. It is better to pour clean water over hands than let all familymembers wash their hands with the same water in the basin.
Although many people see a (in-)direct link between the 'healthiness' of their drinking-water and the absence of diseases it is not known if, when a disease occurs, people consider their drinking-water or a poor hygienic state as possible causes or contributors to the onset of the disease.
The interviewees often ascribed the healthyness of their drinking-water to its visible cleanliness, which is of course no guarantee for the absence of germs. It is therefore necessary to pay attention to the above mentioned aspects in health education. Since the CBHC-project in the area has been quite succesful, it would be good to integrate lessons about treatment of drinking-water and transmission routes of diseases in the teachings. Also the school is a good tool for hygiene education.

Improvement of water quality on its own is not always enough to reduce incidence of a disease since many diseases are water-washed instead of water-borne. Typhoid Fever can be water-washed as well. This implies that by enlarging the water quantity used for personal hygiene the incidence of such a disease can be reduced. According to the results of this study, it is not clear if recommendations on increasing the daily volume of water used per capita should be done or not. Further investigation of water use is necessary.

4.3 A watercommittee

To establish improvements of drinking-water sources, people in the target area should become involved as much as possible and should feel responsable for their own well-being. Participation of the local people is therefore needed, also to make sure that improvements link up with their needs. In this way it will also become more easy to raise funds for materials (Misikhu Mission Hospital has got limited financial capacity). It would be good to choose one or more watercommittees or a watercommitee and subcommittees in consultation with the Chief, village elders and local people. The watercommittee should consist of village representatives; men and women (since watercollection is a women's task) who are interested and motivated and accepted by all. Some should have some technical knowledge (f.i. a plumber or carpenter). (Probably it will not be necessary to dig wells or make bore holes in the Mt Elgon area, which makes detailed technical knowledge superfluous.)

The tasks of this watercommittee will be technical as well as educational. First of all the committee has to take care that sources are improved and remain in good condition. It could also help in selecting sources. Another task could be advising and helping with the construction of latrines.

If funds are necessary for these tasks the committee could stimulate the organisation of an Harambee. Important is also to create community awareness on personal and environmental hygiene, since this will also help to keep the water sources in good condition and prevent diseases.

Of course members of the watercommittee need to be trained, which could become a task of the CBHC-team. Having a watercommittee will give the CBHC-team the opportunity to concentrate on other aspects, such as good nutrition and mother- and child care.

A task of Miskihu Mission Hospital will be to train the CBHC-team (as they have done already) and to supervise the whole system.

The local people can report problems to the watercommittee, which can report to the CBHC-team; subsequently the CBHC-team can consult Misikhu Mission Hospital if necessary.

A problem may be the reward of the members of the watercommittee. From observations it became clear that the village workers for

instance, who had been helping the CBHC-team with their research on the hygienic situation on Mt Elgon on a voluntary bases, were not very happy to receive nothing in return. (Misikhu could not afford any payments). Of course it is good to make clear to them that they will benefit in the end when they and the other villagers will become less often ill. If this is convincing enough is hard to say. Expectations are, however that the work will not be as timeconsuming as it was for the village workers, which especially for women caused some problems. Also, when for instance one watercommittee-member is chosen in each village (to establish one watercommittee in each sublocation) the working-area of this member will not be beyond his/or her capacity.

APPENDICES

Appendix A

ORGANISATION OF HEALTH CARE IN KENYA

Organisation of Health Care in Kenya

The Ministry of Health carries out political, administrative and professional matters concerning health at four levels: central, provincial, district and rural level. The Ministry of Health is headed by the Minister of Health (assisted by some Assistant Ministers), the Permanent Secretary (administrative head) and the Director of Medical Services (professional head).

At central level various sections, departments and subdepartments are dealing with different matters (f.i. training, supplies, epidemiology and statistics, familyplanning etc.), each with its own head.

At the provincial level the Ministry is represented by the Provincial Medical Officer (PMO), a senior medical officer responsable for the organisation and administration of health services in the province and also for coordination of government and nongovernmental health services. He is assisted by professional, technical and administrative staff at provincial level.

At the district level the health services are organised and administered by the District Medical Officer (DMO) (and his team), who is in charge of basic health services, hospital services and other specialised services and programmes in the district. He is responsible to the PMO.

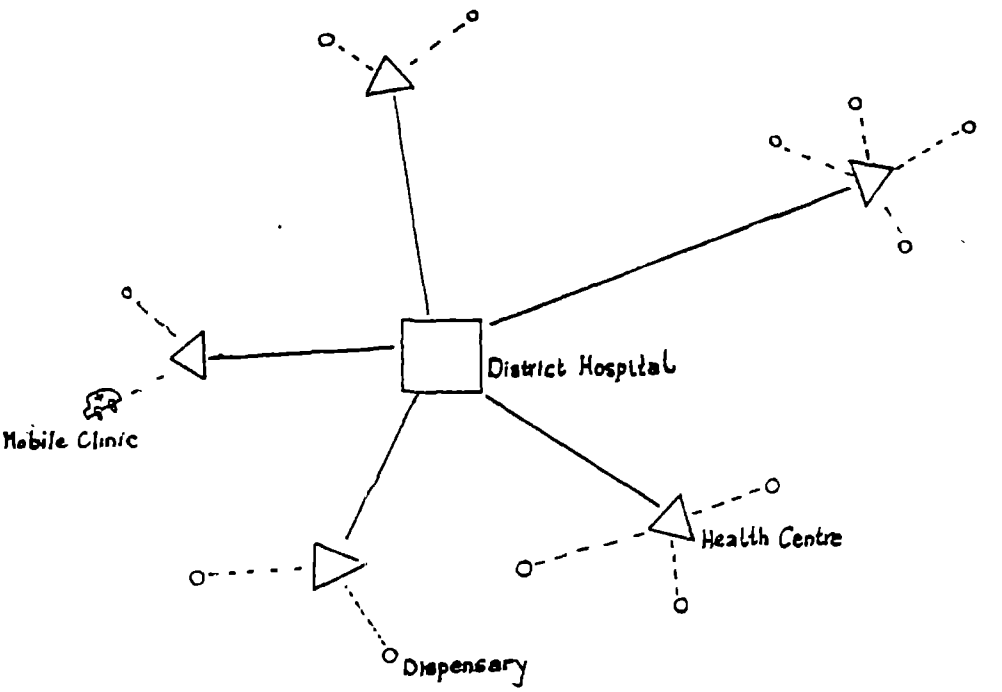
At rural level health services are provided at health units called health centres, health clinics, dispensaries and mobile clinics depending of staffing facilities.

Since the economic growth and social well-being of a nation is dependent on the health of its members, the Kenyan Government is trying to improve health by aiming at an adequate level of free basic medical services [17] (one health centre for every 10.000 persons).

The so-called Pyramid Model/or Referral System as used in kenya is suitable for helping many patients with as little money and manpower and as close to their homes as possible. Only when a patient can not be cared for at a particular unit, he or she is referred higher up the chain.

At districtlevel the system looks as follows [18]:

The Referral System (or Pyramid Model)



In most rural districts (population 200,000-500,000) the following healthservices can be found:

-one 100-200 beds hospital
-five health centres (one for 50,000 inhabitants [WHO])
-ten dispensaries (one for 10,000 inhabitants [WHO]) [17]

A Dispensary which is run by an Enrolled Community Nurse (ECN) and a Health Assistant (HA), provides only curative care. Almost 90% of the patients can be treated here. More difficult cases are referred to a health centre or hospital.
A health centre provides a family with all necessary medical help apart from the type that can only be given in a hospital (surgical help for instance). It is headed by a Medical Assistant (helped by four ECN's and one HA). There is no physician. The function of a health centre is curative as well as promotive and preventive (

promotion of healthy living-conditions, prevention of diseases by immunisation, better environmental sanitation, better child feeding practices and under-five clinics etc.). To achieve these goals the personnel of the centre will actively visit people at home (sometimes by way of a mobile clinic (outpatient-clinic)) to reach people that are living far away [17,18].

If a patient cannot be helped in a health centre he is referred to a District Hospital or even a Provincial or Academic Hospital.

On top of the Pyramid is the Kenyatta Hospital at Nairobi provided with modern equipment.

The following table makes clear how enormously different the running costs of these different health units are:

Health Care facility and treatment-cost in Kenya ($ US) in 1972

FACILITY	Cost of treatment per case ($ US)
National Hospital	54.40
Regional Hospital	25.00
District Hospital	12.35
Health Centre	0.58
Dispensaries	0.30

Source: Mcsegall (1972 The politics of health in Tanzania; development and change Vol 4. Sage, London, [19],p.91.

Appendix B

GOVERNMENTAL ORGANISATION OF KENYA

Governmental Organisation of Kenya

Kenya is divided into 7 provinces (Western, Nyanza, Rift Valley, Central, Eastern, North-Eastern and Coast Province and Nairobi), each consisting of districts headed by a District Commisioner (DC). There are 40 districts in total.
Each district is divided into administrative divisions, headed by Divisional Officers (DO). These divisions are subdivided into locations headed by Chiefs and sublocations headed by Subchiefs. Chiefs and Subchiefs are appointed by the Government, but have to originate from the particular (sub)location.
Sublocations are divided into areas in which amongst others a market, a school and a church can be found and further into villages existing of about 100 huts on average.
At village-level a village elder is chosen by the villagers (Maguru) who arranges meetings in his village when necessary to discuss problems and ideas. He can give relevant and precise information to the Government through the (Sub)chief.

To illustrate:

Country	: Kenya	(President)
Province	: Western	
District	: Bungoma	(DC)
Division	: Elgon	(DO)
Location	: Elgon	(Chief)
Sublocation	: Kapsokwony	(Subchief)
Area/Village	: Kibuk	(Maguru)

Kenya is a republic since 12th of December 1963, headed by president Daniël Arap Moy (Since 14th of October 1978).
The legislature is controlled by the Parliament, consisting of 172 members of which 158 are chosen by the people and 12 appointed by the president.
There is only one Party: the KANU (Kenya African National Union).

Apendix C

CBHC-PROJECT

Appendix C

COMMUNITY BASED HEALTH CARE PROJECT IN ELGON EAST LOCATION

The community Based Health care Project was mainly ment to start in Misikhu sub-location, Bokoli location in Bungoma District, whereby the people of Misikhu sub-location did not respond inspite of our creating awareness to the Ass-Chief, Bakasa* and the communities of the area.

The reason why those people did not respond was that the same project was started in their sub-location few ago by another hospital years and had collapsed.

We reported to the Hospital Management Committee who reported to the Hospital Board of Governors. The board of governors advised that we could try and start the project a fresh in a new place. The hospital management team chose the project to be started in Elgon East Location. The management committee met the Parish Priest (church leader) Rev. father Martin of Kibuk Catholic Mission with a plea of being introduced to the local leaders so as to enable us introduce the project in the location. Rev. father Martin was interested to meet the train of trainers (T.O.T) group and after their discussion about the project he promised to introduce them to the local leaders.

On 23-5-1986 we were invited to meet with the local leaders, whereby we started to create awareness of the project to them. The local leaders were grateful and accepted the project to be started in their location. The chief Mr. Hesbon Naibei further invited us on 26-5-1986 to his Barasa*** at Kapsakwony chief's centre where he introduced us to the Locational leaders. We were able to create more awareness to the community leaders (Bakasa) who included the M.P.** of the area Hon. Wilberforce Kisiero, Ass-Chiefs and the area Communities.

We were allowed to visit each sub-location through Ass-Chief's Barasa's so as to know the people of each area and create more awareness. We agreed with the chief, ass-chiefs and Bakasa to deal with each sub-location separately.

Elgon East Location consists of five sub-locations, these are:- Kaboywa sub-location, Kaptama sub-location, Chemoge sub-location, Kapsakwony sub-location and Namorio sub-location.
So we started with Chemoge sub-location which consists of eleven areas; Thus Chemoge area, Kongit A area, Kongit B area, Kaptalelia area, Chepkwoya area, Sabururu area Kipchiria area, Laba area, Kiptiroko area, Chemuses area and Masindet area.

We visited Chemoge sub-location several times and created awareness to the villagers through ass-chief's Barasa Mr. Joseph Kamaina and discussed about the chosing of their Community Health Workers (C.H.Ws). Twenty two (22) C.H.W.S were by their communities and eight (8) Traditional Birth Attendance were identified by their communities through Ass-chief's Barasa, which included all Bakasa of the sub-location.

We later on had meetings with C.H.Ws and T.B.A on discussion about the venue of their training. They chose Chemoge Market as their training centre as it was in the middle of both areas. The Counsellor of the place gave us one of his buildings to use as classroom. He suggested with the C.H.Ws to start their training in one weeks time.

This was so because they had to make arrangement about their families care when they are out, and we also had to prepare our lessons plans. The training started on 21/7/1986 by introduction in class. By this introduction each community health worker was registered followed by their expections, problems and priorities:- malaria, diarrhoea, vomitting, kwashiorkor, worms, tetanus, measles, (water problems).

On 22/7/1986 C.H.Ws plus their trainers discussed on how to deal priorities. On 23/7/1986 C.H.Ws started their lessons and the teaching continued for one week. After one weeks training they then agreed to go to the field for action on what they had gathered, and we went for our Primary Health Care (P.H.C)- T.O.T. Phase III.

* Community leader ** Member of Parliament *** Meeting

After our 3rd phase we wrote to Ass-chief to invite C.H.Ws to come to our usual centre on 12/9/1986 so as to discuss on how they are getting on. When we went there on 12/9/1986 we did not get any C.H.Ws so we decided to go to the home of one of them who told us that the information had not reached them. We told her to inform the others so that we meet on 15/9/1986 at 10 a.m.

On 15/9/1986 we went and met with few C.H.ws who had heard the information and they gave us the report of their field work. We agreed with them to start survey on their areas so we started on 19/9/1986 till 19/11/1986. As we continued surveying the rest of C.H.Ws came and joined us. So far we had only surveyed six areas when the C.H.Ws requested to a leave so that they could harvest their maize and we were also to have our annual leave.

During our survey, we surveyed the following things:- number of people per home, fertile women of bearing age 12 to 45 years. Ante-natal mothers attending and not attending clinic, children under 5 years attending and not attending clinic. Those children who completed vaccinations , malnourished children, General cleanliness of the compound for example if they have the following things:- latrines, dish racks, kitchen garden, composit pit, source of water and how they kept it. (List is added)

Generally we found out that many people take their drinking water from rivers and unprotected wells. We also found out that most people do not have latrines for example in the area of 203 homes only 18 have latrines. Most children do not attend the clinic and those who attend don't complete vaccinations . We have not set our target since we have not completed to survey the sub-location.

We had difficulties during our survey too. We had agreed with C.H.Ws to be meeting in our classes and also start work at 9 a.m and if possible to stop at 2 p.m. We had problems on transportation since we used public means and there are not many vehicles going that side so we could reach there late like at 11 a.m. or 12 midday. This also made the C.H.Ws complain and loose interest in the work since they were to wait for us for a long time.

Hunger was also another problem since after 2 p.m we were to wait for matatu to kimilili then from kimilili we again wait the other one to take us to misikhu and we could reach home late.

Communication barrier due to language since we do not understand their language and they don't also understand ours. Kiswahili is used but it is hard to express on the things to be improved.

Before we clos ed for our holiday we had a meeting with C.H.Ws, T.B.As elected chairman, secretary and treasurer.

We shall resume our duty again on 15/1/1987.

Wishing you Merry Christmass.

By Maurice and Cyrilla*

*Employees at Misikhu Mission Hospital in charge of this project.

COMMUNITY BASED HEALTH CARE PROGRAMME DATA COLLECTION

CHEMOGE SUB-LOCATION KAPSAKWANY LOCATION ELGON

NO. OF THE HOME	NO. OF HOUSES	NO. OF PEOPLE PER HSE	WOMEN 12-45yrs	A/N MOTHERS ATT. CLINIC	A/N MOTHERS NOT ATT CLINIC	CHILDREN UNDER 5 YRS	ATTENDING CLINIC	NOT ATT. CLINIC	COMPLETED VACCINATION	MALNOURISHED	COMPOUND GENERAL CLEANLINESS	LATRINE PRESENT IN USE	DISH RACK GOOD	NO DISH RACK	KITCHEN GARDEN	FOOD ENOUGH	NOT ENOUGH	COMPOST PIT	WATER SOURCE	STORAGE OF WATER (POT)

CHEMOGE SUB-LOCATION RULES OF C.H.W.S.

1. To be punctual to save useful time.
2. No beer drinking during working hours as this makes people to loose respect for one another.
3. Respect one another.
4. Listen and consider your friends' suggestions.
5. Accept your mistakes and corrections.
6. Obey one another's request.
7. Be polite in asking questions.
8. Be free and suggestive during the discussions.
9. Avoid discussions over the problems viewed in people's home' during the visits.
10. One home's problems shouldn't be revealed to another home's members.

Appendix D

TYPHOID FEVER

1 Typhoid Fever

There is a considerable Typhoid mortality in developing countries. Incidence rates* in endemic areas can be 10-150 per 10,000 population, with a mortality rate** of 1-10% (3% on average) [8].
Typhoid Fever is caused by the swallowing of Salmonella Typhy bacteria and restricted to man. The disease belongs officially to the category of water-borne diseases, which are those diseases where water acts as a passive vehicle for the infective agent [4]. Although Typhoid epidemics have often been described as caused by one common water source, the disease is in rural tropical areas often not waterborne in a strict sense. The fact is that Typhoid can be transmitted by any route which allows fecal material or urine to pass into the mouth (water, food, hands etc.) and is therefore a fecal-orally transmitted and occassionally a urinary-orally transmitted disease [4,5].
The disease can therefore also be water-washed in some cases, which means that increasing the water volume used in personal and domestic hygiene can reduce the chance of transmission [6,4].

2 Transmission, inefective dose and susceptibility

2.1 Infective dose

The swallowing of 1000 to 10,000 Salmonella Typhy bacteria can result in the disease, although in nature the infectious dose may be lower. In fact as little as one excreta containing S.Typhy can by contaminating a water supply system cause several hundred cases [9].
Contraction of the disease however not only depends on infective

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*Incidence rate: number of diagnosed or reported cases of the specified disease during a defined period of time, divided by the population in which the disease occurred. Usually expressed as the number of cases per 100,000 per year for specific populations.

**mortality rate: number of persons that have died because of a disease in a population, divided by the total number of persons in that population, for a certain period.

dose but also on age, personal hygiene, nutritional status and health at the time of exposure.
Furthermore persons who have suffered from the disease in the past few years, or those who were vaccinated recently, will be less susceptible [8,9].

2.2 Transmission

In most of the communities with endemic Typhoid the m.o. are spread by patients and carriers that pass the bacteria in their feces or urine [3].
Transmission is by any fecal-orally or urinary-orally possible route, which means that bacteria can be passed directly (from person to person) or indirectly with water or fluid or solid food-stuffs (milk etc.) contaminated by the feces or urine of these hosts [10,11].
Persons living in their vicinity under poor conditions are at high risk and frequently contract the disease [8]. Lack of cleanliness and flies can speed up contamination of foods, fluids and water-suplies. Typhoid bacteria survive well in water but do not multiply there. They can survive in seawater and can therefore also be transmitted by eating shellfish [10,11].
Carriers and patients may excrete 10^4 to 10^{11} S. Typhi per gram of feces and constitute therefore a major source of infection within a community [5].
Carriers are those who have recovered clinically from the disease, but continue to pass bacteria in their feces or urine for months (temporary carriers) or for years (permanent carriers) [8]. Some persons may harbour the disease without developing the clinical symptoms (passive carriers) [7]. (Fact is that clinical symptoms only occur in 20% of those that are infected [8]). For Typhoid the rate of temporary and chronic carriers*** after an illness is usually about 10%, resp. 2-5 % [5], although the chronic carrier rate in the older people has been as high as 10% [8]. Since the

***Chronic carriers may excrete the pathogens for a year, but a small proportion will keep on excreting the bacteria for 10, 20, 30 years or a lifetime (permanent carriers).

standard of personal hygiene deteriorates with increasing age, especially those elder carriers become a dangerous source of infection [8].
The gallbladder is the organ that typically remains infected and gallstones therefore predispose to the carrier state (fecal Typhoid carrier) . Schistosomiasis predisposes to the urinary carrier state [3,5]. The presence of urinary carriers in rural areas with much stagnant water and poor sanitation can lead to extensive environmental contamination and therefore increases the risk of infection enormously. According to [3] carriers are the source of water-borne Typhoid Fever. Common-source epidemics of Typhoid are likely to occur in areas with poor sanitation such as slums, prisons, overcrowded boarding schools and refugee settlements.

3 Symptoms

As described before, the clinical symptoms occur only in about 20% of the persons that are infected.
The incubation-period is usually 12-14 days [9], but may range from 7-21 days [7].
If untreated the disease picture is as follows:
The onset is gradual over 4 to 5 days with fever, headache, pains in the limbs, back and abdomen, nausea or vomiting, diarrhoea or constipation [9].
In the first week the patient may be suffering of a rise in temperature up to 39.5°C or 40.0°C by the end of the week. The pulse is 80 to 100, which is relatively slow for this temperature. By the end of the week the patient usually suffers from diarrhoea [10].
In the second week the temperature is maintained at a high level with relatively slow pulse. The patient feels very ill and the abdomen may be extended. Sometimes a skinrash occurs, which is difficult to distinguish on a dark skin.
In the third week the situation deteriorates. The patient is very ill and in semicoma and may be delirious. The heart may be damaged

(toxic myocarditis*) and there is a rapid and feeble pulse. This is the most dangerous state since the two grave and common complications may now occur:intestinal haemorrhage or perforation caused by ulcers. The consequences may be fatal unless surgical aid is available.
In the fourth week -if the patient has survived (case fatility rate 1-10%, average 3%)- a gradual improvement gets going. The symptoms disappear very slowly and over several weeks whereby relapses are common (3%on average)[9].
Duration of the disease can range from 14 up to 55 days [7].

4 Diagnosis

To diagnose the disease a blood sample to grow the organism should be taken during the first 14 days. After about the 10th day of the disease the Widal(agglutination)test, which is within the competence of a small hospital laboratorium, becomes positive and will show a rise in antityphoid bodies untill the disease ends [7].
There are however some drawbacks. First of all, if the disease is found in an endemic area, many people will have high titers. Some of them because they have been in contact with the bacteria, although they have not developed the clinical symptoms, others because of recent recovery from the disease. Also those vaccinated will have high titers. It is therefore suggested to base a positive reaction on a fourfold or higher rise in titer of antibodies, although half of all cases may fail to demonstrate such a rise [5]. In Misikhu the Widaltest was performed twice during hospital admission to detect a recent rise in titer.
For a differential diagnosis the bloodpicture is useful as there are changes in the number of particular white bloodcells. At first a reduction in the number of polymorphonuclear leucocytes is found with a relative increase in the number of lymphocytes during the first 10 days of the Typhoid attack. Thereafter secondary bacterial infection of the intestinal lesions usually causes a reduction in the number of polymorphonuclear leucocytes. Perforation is followed by a rapid rise in polymorphonuclear leucocytes and thus should be

*infection of the heartmuscle

watched for [7].

5 Treatment

The administration of chloramphenicol clears up the symptoms in a few days. The medicine exerts a powerful bacteriostatic action on S. Typhi and controls the multiplication until the defensive mechanism overcomes them. A nourishing diet and adequate fluid intake should accompany administration [7].
Relapses often occur after treatment [9]. The other problem, as described earlier, is that S. Typhi in some cases persists in the gallbladder or kidneys turning the recovered patient into a fecal or urinary carrier.

6 Prevention

There are two main ways of preventing the disease. One is immunisation and the other is improving personal and environmental hygiene.
Prevention by immunisation is possible. The vaccine is not expensive and protection lasts for 3 to 4 years. However, absolute immunity is not achieved. After two doses, given at an interval of 2-4 weeks, protection is 70-85% To maintain immunity at a high level, revaccination is required every 2 to 4 years [5,7].
Taken into account these two facts, immunisation does not seem very suitable for developing countries, since it will be difficult to vaccinate all familymembers for several years, and even if this would be possible, immunity would not be absolute.
Emphasis should therefore be put on improving personal and environmental hygiene.
It is thereby important to keep in mind that the disease can be transmitted by any fecal-orally/urinary-orally route.
As one of the possible transmissionroutes is water, water-quality should be improved or protected. Typhoid bacteria can be removed by standard slow sandfiltration and killed by chlorination [3]. If this kind of treatment is impossible, water should be drawn from boreholes or protected springs and be boiled [9]. Improvement of water-quality on its own however, will not always lead to a reduction of Typhoid incidence. Increasing the watervolume used in

personal hygiene may affect some reduction (water-washed character of the disease) [4].

In general there will be no widespread health benefits unless a country has an efficient and effective rural waterprogramme and if water-supplies once built are maintained properly, thereby providing a continuus waterflow. It should be remarked however that the provision of public taps or sufficient safe water does not necessarily lead to an increase in waterconsumption per capita [3].

Another study revealed that even if the source is providing safe water, the water can become subsistantly polluted on the way to the storagevessel [16]. It is therefore clear that the reduction in Typhoid Fever incidence may be disappointingly small if no health-education is given [3].

Since the S.Typhi bacteria are excreted by patients and carriers in their urine or feces, the construction of pit-latrines should be encouraged. When used continuusly, transmission of infection from carriers and patients can be reduced upto 50% [8]. Also care should be taken that carriers and patients do not handle food and practice good hygiene, which will be difficult since not all patients are seen and not all carriers are known. In general it should be stressed that washing hands after using the latrine and before preparing and eating food should be practiced by everybody in order to reduce transmission.

Since flies can act as vehicles for fecal contamination of food-stuffs and fluids, breedingplaces in the vicinity of houses should be attacked [7].

Taken together: improving water-quality, waterquantity and sanitary conditions as well as improving personal hygiene stressed in Health Education Programmes, should be efficient to reduce Typhoid Fever incidence to 80%

Appendix E

A PILOT STUDY IN MISIKHU MISSION HOSPITAL

A pilot study in Misikhu Mission Hospital

Around Cristmass, which is at the end of the wet period, an epidemic of *Typhoid* had started on Mt Elgon and in its environs.
A small pilot study was done among 24 cases, admitted to the hospital. Since there are two other hospitals in the district and many dispensaries, this `sample' will not be representative for the geographical spread of the disease.
The following questions were asked:

1. From which sublocation are you? From which area/village?
2. What are your complaints?
3. When did it start?
4. How many days did you wait before you went to hospital?
5. Where do you get your water from?
6. Do you boil the water before you drink it?
7. How do you dispose of excreta?
8. Do you wash your hands after using the choo?

The results show that:

- Patients had come from Kimilili (14), Misikhu (6) (both in Bokoli sublocation), Kapsokwony (1) (Kapsokwony sublocation) and other areas (3) (Elgon-East sublocation). All areas are situated on Mt Elgon as well at its foothills.
- Twenty-one patients complained of abdominal pains, 17 of headache, 10 of diarrhoea, 7 of fever and vomiting. Other minor complaints were dizzyness, pain in ribs, chest-pain, joint-pains, loss of appetite, blood in urine, strengthlessness, backache and sideache.
- Some patients had fallen ill as early as the 2nd of December, while most of them had started suffering near the 15th.
- Most of the patients went to hospital for treatment within a week (10) , others waited 1-2 weeks (7) or even upto 3 weeks (7).
- Three patients used a spring, 4 a river, and 17 a tap (which was supposed to provide them with safe water).
- None of the patients boiled their drinking-water and all said to use a pit-latrine.

- Washing hands after using the latrine was done consistently by 2 patients, whilst 7 did sometimes and 13 did not (2 patients were not asked about this).

Appendix F

Articles in the 'Nation'

APPENDIX F

①

DAILY NATION, TUESDAY, JANUARY 6, 1987

NATIONAL NEWS

Cause of typhoid outbreak explained

By BUONG ARUNDA

The contaminated water that caused typhoid fever and killed 16 people in Bungoma District came from two water schemes managed by the Ministry of Water Development

The Western Provincial medical officer, Dr M O Kayo, told the *Nation* in his office yesterday that those who drank the contaminated water contracted typhoid and 16 died Earlier reports said 20 had died He said that the two water schemes were faulty

"We suspect these water projects were not functioning well Filtration system was faulty and the water treatment was not being done properly", Dr Kayo said

He said there were 170 people suspected to have cases of typhoid Some with serious cases were being admitted at Bungoma, Misikhu and Lugulu Hospital

The disease broke out on December 14 and reached its peak during Christmas and the New Year festivities

Dr Kayo said tha the disease had now been brought under control

He said the water at Kaptioni and Gichori was contaminated and was the cause of typhoid — a disease which causes diarrhoea, vomitting and headache

The areas affected were Kimilili, Lugulu, Misikhu Kabuchai, Ndivisi, Bokoli and Mt Elgon

Dr Kayo said the Bungoma District medical officer had formed three teams to deal with the disease Three treatment centres have been created at Lugulu, Bungoma and Misikhu

The contaminated water has since been improved when the Ministry of Water Development moved in immediately to mend the filtration system and improve the water treatment

Dr Kayo advised wananchi not to panic and continue using the piped water after boiling it They should also use toilets instead of going to the bush as this might make the situation worse He said that the situation has now improved since last week and that no more cases were being reported

②

Ministry denies dirty water claim

Wednesday 7-1-87 Nation.

By NATION Correspondent

The Ministry of Water Development yesterday denied claims that it supplied contaminated water in Bungoma District which has caused typhoid fever that left 16 people dead

The Western Provincial Water Development engineer, Mr Wilfred Matagaro said 'Never in the history of water supply have we given contaminated water to consumers We have and are always treating our water before consumption"

Mr Matagaro was reacting to claims by the Western Medical Officer of Health Dr Kayo that the typhoid outbreak in Bungoma District had its roots in a water scheme managed by the Ministry of Water Development

"The problem is purely hygienic People in the affected areas are not appearing to adhere to health care regulations," Mr Matagaro said

He took the Press to Kimilili-Ndivisi water supply project which is alleged to be supplying contaminated water to the wananchi

"What reasons can the Ministry of Health give to areas like Chepkwabi and Kimalewa which were not being supplied with such water but the people there died?" he asked.

"Even Kimilili town which is a few kilometres from the water works would have been affected, yet there are no cases of death so far reported," Mr Matagaro said

Appendix F (continued)

③

School term hit by typhoid

jan. 11-'87

Schools in Ndivisi, Bokoli and Kimilili locations, Bungoma District, will not reopen tomorrow following an outbreak of typhoid fever in the area

They will reopen on January 19 The decision was reached during a meeting of senior Government officials at the Bungoma DC's ofice Those present included the Director of Communicable Diseases, Dr T. K arap Siongok, the Provincial Medical Officer, Dr Martin Kayo, and the Bungoma acting DC, Mr Michael Momanyi

Others were the Provincial Water Engineer, Mr W Watagero and the Bungoma Medical Officer of Health, Dr George Adiya.

Dr Siongok said he feared that the epidemic would spread fast among schoolchildren if preventive measures were not taken before the schools reopened

Dr Adiya disclosed that 24 people had died at Misikhu, Lugulu and Bungoma hospitals since the outbreak of the disease last December 10. Another 245 had been admitted to the three hospitals, 193 proving positive on the typhoid test

The team of medical officers appealed to wananchi in the district to inform health officials whenever they suspected any person suffering from the disease The people were urged to maintain high standards of hygiene to stop the disease from spreading

Schools likely to be affected most by the change of opening date include Kamusinga Boys, Kamusinga Girls', Lugulu and Misikhu High schools, which admit students from all over the country

According to earlier reports, the disease was formally identified on January 2 Dr Odiya reported that the cause of the outbreak was drinking water from Ndivisi and Makutelwa rivers He said the disease had spread out to Mt Elgon area

On January 5, the acting Bungoma DC urged wananchi not to drink untreated water He told them to boil water first before drinking it

And Dr Kayo said he suspected that two water schemes operated by the Ministry of Water Development — Kaptioi and Gichori — were faulty

— KNA and SUNDAY NATION Reporter

④

Water shortage thwarts fight against typhoid

By NATION Correspondent

A water shortage at Lugulu Mission Hospital is thwarting its efforts to deal with cases of typhoid fever

The officer in charge of the hospital, Dr Robert Carter, said they were forced to draw water from a borehole in the hospital compound Members of staff fear they could get the disease, he said

The doctor was speaking to newsmen in his office "We appeal to the Ministry of Water Development to assist us connect the water from the main pipeline so that we can get clean water," Dr Carter said

He said two members of his staff had been treated after complaining of headaches and stomach problems, which are symptoms of the disease

Officials from the Ministry of Health have visited the hospital and assessed the situation Dr Carter told them he was getting more typhoid cases and that the beds in the hospital were not enough

"We have about 34 patients in admission now nine of them in isolation One died on Monday night after being transferred from Misikhu Hospital" the doctor said

He said the patients had been drinking water from unprotected springs and wells

According to the Provincial Medical Officer of Health, Dr M O Kayo, the disease broke out on December 14 and intensified during Christmas and New Year festivities The areas affected are Kimilili, Bokoli, Ndivisi and Mt Elgon 16-1-'87

⑤

Typhoid: Schools may still be closed

Some of the Bungoma primary schools which failed to open last week due to a typhoid outbreak many remain closed next week unless they meet certain health conditions

The Director of communicable Diseases in the Ministry of Health, Dr Timothy Siongok announced on Friday that some of the boarding schools in Kilihli, Bokoli and Ndivisi locations might not open beacuse they were congested and the killer disease could spread easily among the students.

Some schools heads in others parts of the country refusing to admit pupils from Bungoma District for fear of the epidemic disease, he said.

But the authorities were fighting the disease, he said, and the headteachers could only refuse the students on the recommendation of a medical officer of health

Dr Siongok also addressed staff of Lugulu Mission Hospital and praised the staff of misikhu and Lugulu missions for the efforts to bring the killer disease under control.

The officer in charge of Lugulu Hospital, Dr Robert Carter, said the hospital admitted between 40 and 50 patients during the first week of the outbreak, 35 to 40 in the second week and 25 to 30 in the third week.

— KNA

Appendix G

Questionnaire

Questions 1,2,3 Objective: To find out about demographic figures, the quality of housing and the economic situation of the household.

Question 1.	A. Number of persons per household (include the interviewed)	( ) men ( ) women
	B. Age	( ) 0-5 years ( ) 5-15 years ( ) above 14 years
Question 2.	For how long have you been living together?	( ) years
Question 3.	A. How many acres do you own?	( ) acres
	B. How many animals do you own ?	( ) chicken ( ) goats ( ) sheep ( ) cows
	B. How many do you own yourself?	( ) cows
Question 4.	A. Educational level of the head of the household	- - - - - - - - - - - - -
	B. Educational level partner	- - - - - - - - - - - - -
	C. Number of children going to school	( ) to primary school ( ) to secondary school
	D. Occupation of head of household	- - - - - - - - - - - - -
Question 5.	A. Number of houses	( ) houses
	B. Separate kitchen	( ) yes ( ) no
	C. Roof material (s) (iron, grass)	- - - - - - - - - - - - -
	D. Wall matarial (s) (mud, stone, clay)	- - - - - - - - - - - - -
	E. Windows	( ) windows

Questions 6,7 and 8. Objective: Determine what are the water sources and how they are used. Who carries the water? Investigate wether the concerned watersupply is considered good or bad to the interviewed person (Use table I).

Question 6. A. From where do you obtain most of your water during the dry seasons?
B. Is it enough?
C. During the wet seasons?
D. Is it enough?
(Once you have completed the first water source, ask if they obtain water from another source as well. Mention uses and water sources you think are available) (For the main source of water write 1 in parenthesis and 2 for the source next in importance).

Question 7. A. For wat purpose do you use this water?
B. How did you find out that this water source existed?
C. Why do you get your water from this place?
D. When did you start to use this water source?
E. Approximate distance from house to water source (km!)
F. How long does it take round trip to get water?
G. How do you store your water? Observe (Lid or not, mosquitoes, clean or dirty etc)
H. What do you like about the water from this source? (color, taste, smell, free, inexpensive, close, no problems with others)
I. What do you dislike about the water from this source? (colr, taste, smell, too far, expensive, problems with others).
(Repeat the same for other sources)

Question 8. A. Who usually bring(s) water to the house? - - - - - - - - - - - - - - - -
B. Every day? ( ) Yes ( ) No

Question 8. C. How many trips per day must this person make in order to obtain water? _____

D. In what type of container(s)? _____

E. Estimated capacity of container(s)? ( ) liters

Questions 9, 10, 11 and 12. Objective: To find out if the interviewed associates water use with health and if she/he would be willing to spend money or work in order to obtain improvements.

Question 9. A. Do you think your house is located in a healthy place? ( ) Yes ( ) No ( ) Don't know

B. Why? _____

_____

_____

Question 10.A. Do you believe the water you drink is healthy for you and your family? ( ) Yes ( ) No ( ) Don't know

B. Why? _____

C. Do you treat the water before you drink it? ( ) Yes ( ) No ( ) Don't know

D. If the answer is Yes, ask in which way _____

Question 11.A. If you would be able to spend less time in obtaining water, in what activity would you use the time saved? _____

B. Would you be willing to spend money in order to obtain a better quality of water for drinking and other purposes? ( ) Yes ( ) No

Question 11. C. If the answer is No, ask why not? _____

D. Would you be willing to spend money in order to obtain a closer source of water for drinking and other purposes? ( ) Yes ( ) No

E. If the answer is No, ask why not _____

Question 12. (For those who carry water only:)

A. Do you meet and talk with other people when you fetch the water? ( ) Yes ( ) No

B. Do you think this is good? ( ) Yes ( ) No

C. Why? _____

In case only women fetch water ask:

F. Are men allowed to come near the watersource(s)? ( ) Yes ( ) No ( ) Don't know

E. If the answer is No, ask why not _____

Question 13. Objective: To determine if the wastewater disposal method is harmful for health.

Question 13. How do you dispose of wastewater?

( ) Throw it on the ground
( ) Throw it into drainage ditch
( ) Use it for animals
( ) sewerage system
( ) other (specify) _____

B. Distance of the house? _____ meters

Question 14 and 15. Objective: To find out about dishracks, compost pits and excreta disposal and if the interviewed observe any relationship between the disposal method and health.

Question 14. A. Do you have a dishrack? (Check) ( ) Yes ( ) No

B. Why/Why not?

C. Do you have a compost pit? (Check) ( ) Yes ( ) No

Question 15. A. What system do you use to dispose of excreta?
(Use local name and check)

( ) Latrine with handwash
( ) Latrine without handwash
( ) Leave it on the ground
( ) Bucket nightsoil collection
( ) Other (specify)_____

B. Since when do you use this? ( ) Years

C. What did you use before?

D. Are there any problems concerned to this method?

( ) Flies and mosquitoes
( ) Smell
( ) Flooding in rainy season
( ) Difficult for young children
( ) Other reasons _____

E. Do you think this is the healhiest and best method of disposal?

( ) Yes ( ) No
( ) Don't know

F. Why?

G. Do you wash hands after using the choo? ( ) Yes ( ) No ( )sometim
(Even the childern?) ( ) Yes ( ) ( ) sometim

H. Do you wash hands before preparing food? ( ) Yes ( ) No ( ) sometimes

I. Do all of you wash hands before eating? ( ) Yes ( ) No ( ) sometimes

F. If Yes, ask with soap? ( ) Yes ( ) No ( ) sometimes

(If necessary advise about hand washing with soap or hot water)

Questions 16 and 17. Objective: To find out if they are used to cooperating with other people and if there is a community organization that they can use in order to improve their methods of water supply and waste disposal.

Question 16. A. Do you sometimes work with other people in things such as:

1. Building houses?	( ) Yes	( ) No	( ) Don't know
2. Building schools?	( ) Yes	( ) No	( ) Don't know
3. Building hospitals?	( ) Yes	( ) No	( ) Don't know
4. Agricultural work?	( ) Yes	( ) No	( ) Don't know
5. Other (specify)			
B. Did this cooperation work out well?	( ) Yes	( ) No	( ) Don't know
C. Who organised it?			
D. Would you ask this person again if you wanted something to be organised?	( ) Yes	( ) NO	( ) Don't know
E. Do you think 'Harambee's'* are useful?	( ) Yes	( ) No	( ) Don't know
F. Do you support them?	( ) Yes	( ) No	( ) Don't know

Questions 17.A. Do you think you can work together with other people to improve the water supply and excreta disposal? ( ) Yes ( ) No ( ) Don't know

(If answer is Yes, ask:)

B. With whom would you be willing to work?

Questions 18,19, 20. Objective: To find out wether there have been any persons suffering from diseases and particularly from Typhoid Fever in the past year .

Question 18. A. Did any person in your household attend a doctor, hopital or herbalist in the past year? ( ) Yes ( ) No ( )Don't kno

*Harambee means literaly 'pull together' and is used in the sense of 'combined effort'. The idea has arised at the time of the first president, Jomo Kenyatta, to mobilize human resources (manpower, materials, money etc) and to use these resources to develop the country. At present most of the Harambees are in th →

form of compulsory fund-raising.

(If the answer is Yes, ask:)

Question 18B. Who? ( ) mother ( ) father ( ) children

C. For what reason (diseases) did they go there?

mother:_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

father:_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

children:_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

D. Can you tell what the causes of these diseases are? _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

E. If they didn't attend a hospital or doctor, ask Why not? _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

Question 19. Which are the most common diseases in your village?

1. _ _ _ _ _ _
2. _ _ _ _ _ _
3. _ _ _ _ _ _
4. _ _ _ _ _ _

Question 20. Did any person of your household suffer from diarrhoea during the past 6 months? (diarrhoea (kuhara)= watery stools more than 3 times a day for a period of more than 2 or 3 days) ( )Yes ( ) No ( ) Don't know

B. If the answer is Yes, ask how many persons and their age.

1. _ _ _ _ _ 0-5 years
2. _ _ _ _ _ 5-14 years
3. _ _ _ _ _ above 14 years

C. How often did they suffer from diarrhoea? ( )times

(Give advice afterwards about how to prevent diarrhoea: hygiene, boiling water, washing hands before cooking and eating and after toilet).

Question 21. A. Do you know the causes of Maleria? ( ) Yes ( ) No

B. Do you know how to prevent Maleria? ( ) Yes ( ) No

(If answer is No, give information: Maleria is caused by mosquitoes. Prevention: cleaning the direct surroundings of the house from broken pots, dirt, bushes. Also prevnet water to make a puddle).

Question 22. A. Did any person of your household suffer from Typhoid Fever in the past year? ( ) Yes ( ) No ( ) Don't know

B. If answer is Yes, ask: Can you explain to me what the symptoms are?

_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

6 _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

C. If answer is No, or don't know explain what the symptoms are: high fever for more than a week, headache, stomacheache, sometimes patient seems getting mad, sometimes diarrhoea and vomiting. Ask again if anybody suffered from Typhoid ( ) Yes ( ) No ( ) Don't know

Question 23. Objective : To find out if mothers are concerned about the health of their children.

A. Did you go to hospital with your children for vaccination? ( ) Yes ( ) No

B. Are all children under 5 vaccinated? ( ) Yes ( ) No

C. If answer is No, ask Why not? _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

(Advise mother to go there)

Question 24.(To assess the wealth)

How many bags of maize do you harvest each year? ( ) less than 20 ( ) more than 20

(applicable observations.

of

	Dry Seasons	Is it enough	Wet Seasons	Is it enough	USES: Drinking	Cooking	Bathing	Laundry	Animals	Shamba	Washing food & utensils	How did you find out about this place?	What made you decide to obtain water from this place?	Years using this source / Distance to house (km) / Time spent to and from source	Way to store water	What do you like about the water from this source?	What is it you don't like about the water from this source?
River																	
Spring																	
Shallow Well																	
Deep Well																	
Rain																	
Creek																	
Dam																	
Puddle																	
Other (specify)																	

TABLE I

APPENDIX H

RESULTS

1. Demographic figures and quality of housing

1.1 Householdsize and agedistribution

The number of households* with a particular number of persons is given in Figure 1 for Chemoge- and Kapsokwony sublocation.

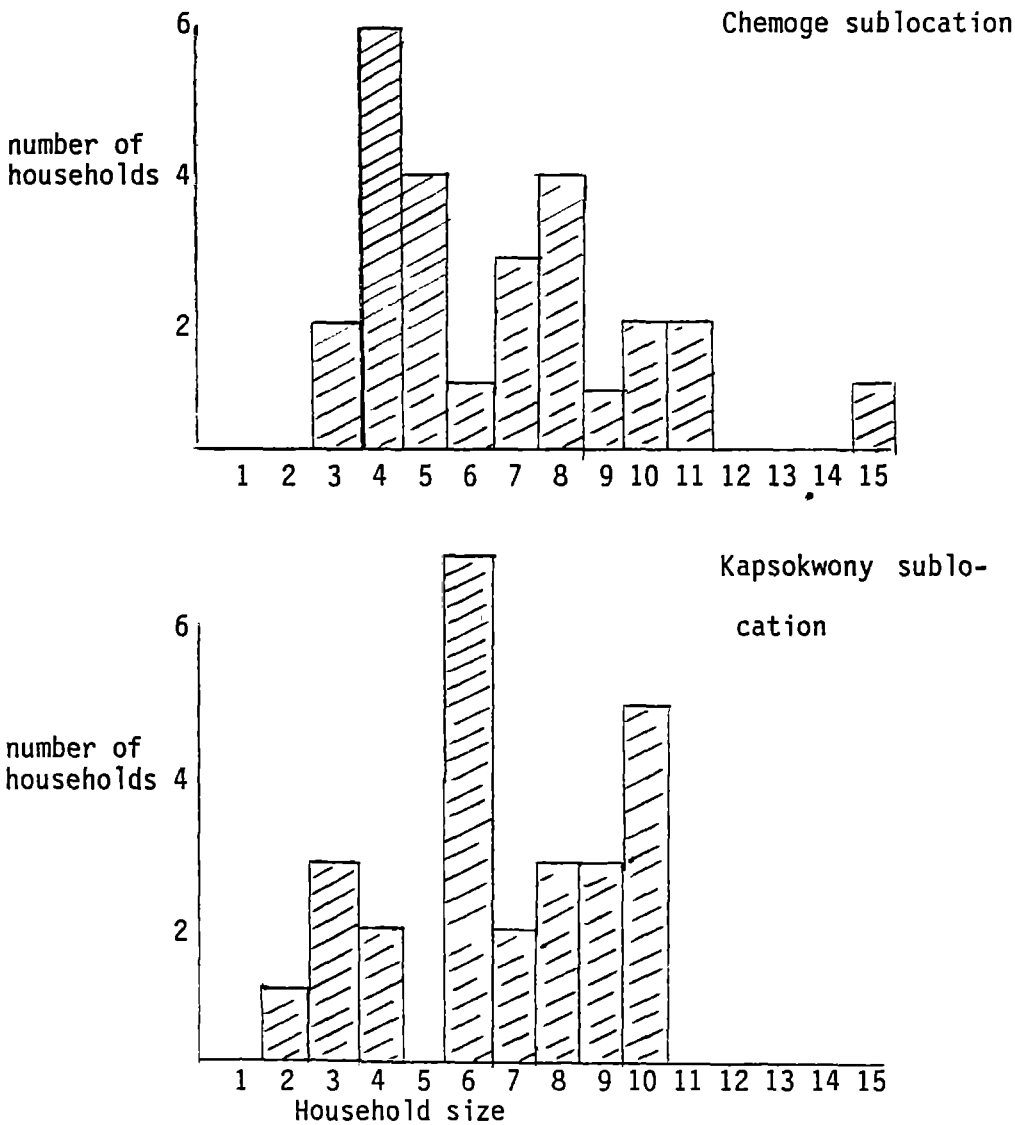

Figure 1: The number of households with a particular household size.

* A household consists of the number of persons who are daily cooked for by one and the same woman.

The average number of persons per household is 6.4 persons in Chemoge- and 6.8 persons in Kapsokwony sublocation. The distribution of sexes per household is 3.4 males on average (minimum 1 male, maximum 7 males) and 3.1 females (minimum 1 female, maximum 8 females) in Chemoge sublocation. For Kapsokwony sublocation an average number of 3.2 males (minimum 1 male, maximum 7 males) and 3.5 females (minimum 1 female, maximum 8 females) is found. The cumulative age distribution of the 26 households in both sublocations is given in Figure 2.

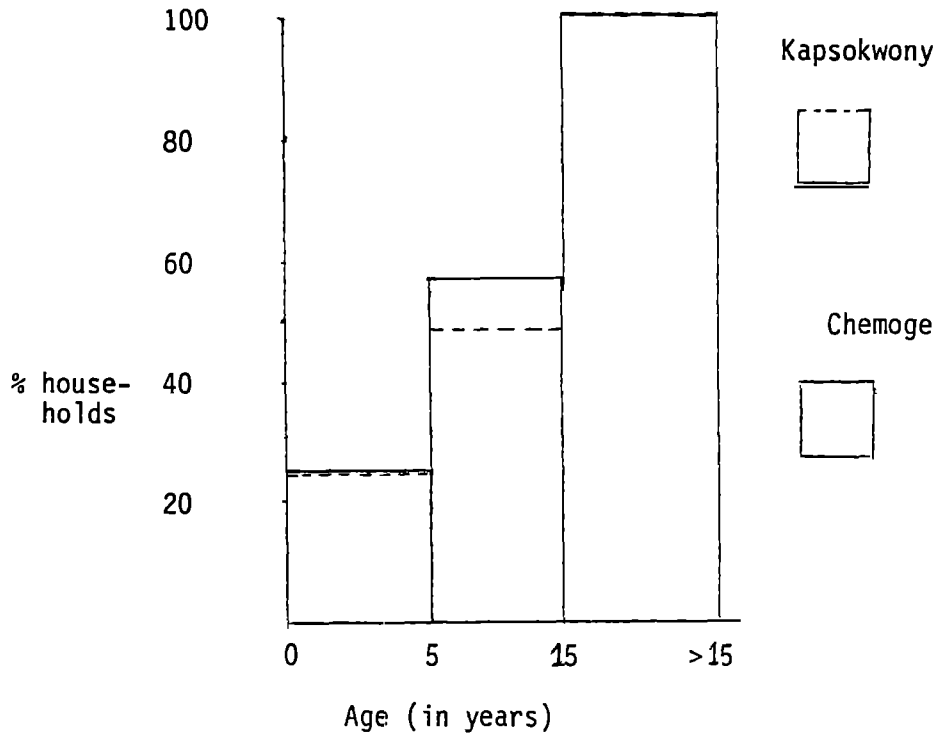

Figure 2: Cumulative age distribution of 26 households in Chemoge and 26 households in Kapsokwony sublocation.

The head of the household is in all cases a man, except for one household which was headed by an unmarried woman.The question "For how long have you been living here" was-if possible- put to the wife in order to find out when the couple had started their household. Since this question was rather confusing it was excluded from the results.According to custom, men build their house on the land of their father and women move to the land of their husband, as soon as they are married.

1.2 Educational level

The educational level of the adults is given in Table 1.

Table 1

The percentage of men and women that went to primary and secondary school or did not go to school at all, among 26 households in Chemoge- and 26 households in Kapsokwony sublocation

	CHEMOGE			KAPSOKWONY		
	men	women	total	men	women	total
never	11.5	26.9	19.2	20.0	50.0	35.5
Primary	61.5	53.8	57.7	44.0	42.3	43.1
Secondary	26.9	19.2	23.1	36.0	7.7	21.4

In Chemoge sublocation 17 housholds have children at schooling age (5 years and older) whereby on average 3.0 children per household go to primary school and 0.4 to secondary school.
In Kapsokwony sublocation there are 20 households with children at schooling age, whereby on average 3.3 children per household go to primary and 0.2 to secondary school.

1.3. Occupation and economic figures

Table 2 gives the occupation of the head of the household.

Table 2

The number of household-heads with a certain occupation among 26 households in Chemoge- and 26 households in Kapsokwony sublocation.

Occupation	CHEMOGE	KAPSOKWONY
Farmer	17 (65.4%)	14 (53.8%)
Teacher	4	3
Policeman	2	2
Clerck	0	2
Tradesman	0	2
Stockkeeper	0	1
Cereal Board	2	0
Forest Department	0	2
Unemployed	1	0

Table 3 and 4 show economic figures considering the yearly harvest

of maize and the ownership of animals and arable land.

Table 3

The number of households that own a particular number of acres, the average number of acres per capita and the number of households that harvest a particular number of bags of maize per year among 26 households in Chemoge- and 26 households in Kapsokwony sublocation.

	Number of acres per household					Average number of acres per capita	Number of bags of maize per year*		
	<1	1-2	2-5	5-20	>20		<20	20	>20
CHEMOGE	4	4	10	6	2	0.75	11 (42.4%)	4 (15.2%)	11 (42.4%)
KAPSOKWONY	1	4	11	10	0	0.63	14 (53.8%)	2 (7.7%)	10 (38.5%)

*: A harvest of 20 bags of maize per year is considered to be enough for an average household (6.5 persons) to feed itself.

All households harvested maize.

Table 4

The average number (min.,max.) and the type of animal owned by 26 households in Chemoge- and 26 households in Kapsokwony sublocation.

Type of animal	CHEMOGE Average number per household*	min	max	KAPSOKWONY Average number per household	min	max
Chicken	7.9(24)	1	20	8.5(21)**	1	20
Goat	4.1(15)	1	12	3.3(15)	1	10
Sheep	4.2(14)	1	9	4.2(13)	1	10
Cow	5.4(22)	1	15	5.1(20)***	1	12

*: The average is calculated for the number of households (in parentheses) that own that particular animal.
**: A farmer owning 156 chicken is excluded.
***: A farmer owning 30 cows is excluded.

One household in Chemoge- and 2 households in Kapsokwony sublocation do not own any chicken, goats, sheep or cows at all. Two of these households are headed by a farmer and 1 by a man working at the

Cereal Board.

1.4. Quality of housing

Table 5 gives the housing conditions.

Table 5

The average number of houses per household, the precense of a seperate kitchen, the type of wall- and roof material and the average number of windows of the main house of 26 households in Chemoge- and 26 households in Kapsokwony sublocation.

	Average number of houses per household	Seperate kitchen		Wall material		Roof* material		Average number of windows
		yes	no	mud	wood	grass	iron	
CHEMOGE	1.8	17	9	26	0	22	4	2.6
KAPSOKWONY	2.0	21	5	25	1	20	5	2.7

*: One household in Kapsokwony has a roof consisting of banana leaves.

2. Health perception and habits in relation to sanitary conditions especially of (drinking-) water and excreta disposal

2.1. Type of water source

Table 6 shows the use of different water sources during dry and wet seasons.

Table 6

The number of households that use a particular water source during the dry and wet seasons among 26 households in Chemoge- and 26 households in Kapsokwony sublocation.

Type of watersource	CHEMOGE Dry seasons	CHEMOGE Wet seasons	KAPSOKWONY Dry seasons	KAPSOKWONY Wet seasons
River	7(26.9%)	7(26.9%)	12(46.2%)	9(34.6%)
Well	6(23.0%)	7(26.9%)	0	1
(deep)	3	3	0	1
(shallow)	3	4	0	0
Spring	3(11.5%)	4(15.4%)	9(34.6%)	8(30.7%)
(protected)	0	0	2	2
(unprotected)	3	4	7	6
Stream	2	2	0	0
Rain	0	0	0	0
Tap(public)	0	0	3(11.5%)	3(11.5%)
Shallow well + river	4	3	1	3
Spring + stream	0	0	0	0
Spring + rain	0	1	0	0
Spring + river	2	1	0	1
River + stream	2	1	1	1
	26	26	26	26

In Chemoge sublocation 17 households use one and the same water source during all seasons; 5 use one and the same combination of 2 watersources during all seasons; 3 use an additional source during the dry seasons (because of shortage) and one uses an additional source during the wet seasons.
In Kapsokwony sublocation 20 households use one and the same water source during all seasons; 1 uses another source during the wet than during the dry seasons; 2 use one and the same combination of 2 watersources during all seasons and 3 use an additional source during the wet seasons.
When a combination of sources is used, one is used for drinking, cooking and washing food and utensils and the other for bathing and laundry. (A well, spring or stream is used for drinking, cooking and washing food and utensils and a river for bathing and laundry).

All households water their cattle in the river and irrigation of shamba's (kitchen gardens) is not found to be practised.

2.2. Valuation of water source

Different reasons for liking or disliking the watersource that is used are given in Table 7.

Table 7

The number of times that a particular reason is given for liking or disliking the water from the source that is used by 52 households in Kapsokwony- and Chemoge sublocation.

Source	LIKE reason		DISLIKE reason	
River	enough	7	nothing	6
	cold	5	dirty	6
	clean	5	people go there	6
	near	4	animals go there	6
	good	2	dirty during rai-	
	running	3	ny season	1
	road is good	1	far	1
	taste	1	worms	1
	soft	1	diseases	2
	no problems	3	you never know what is in water	1
Spring	clean	11	nothing	9
	it starts there	6	green plants	2
	cold	4	not well protected	1
	running	4	not enough	1
	good	1	far	1
	no germs	1	worms	1
	enough	1	dirty	1
			insects	1
			muddy during rainy season	1
Well	clean	7	nothing	3
	taste	3	dirty during rainy	
	not expensive	2	seasons	6
	no animals	2	dirty during day	2
	near	3	animals go there	2
	no diseases	2	people bath there	2
	water comes out		stagnant	1
	of the ground	2	leafs during dry	
	colour	1	seasons	1
	cold	1		
	heavy	1		

Stream	water comes out of the ground	1	nothing	3
	clean	1		
	near	1		
	no diseases	1		
	no animals	1		
Tap	cold	3	nothing	3
	near	1		
	clean	1		
Rain	clean	1	dirty for the first time	1

Table 8 gives the number of times that a particular answer is given to the question:"How did you find out that this watersource existed?".

Table 8

Ways of discovering the used watersource as mentioned by 26 households in Chemoge and 26 households in Kapsokwony sublocation.

Answer	CHEMOGE	KAPSOKWONY
(Grand)parents	9	6
Other people	5	4
We dug it ourselves	4	1
It was there naturally	3	5
It is the only place	2	0
I found it myself	2	4
It will not dry up	0	4
I do not know	1	0
It was easily noticed because of water outlet	0	1
I was told to go there because of diseases	0	1
Government	0	1

The question "Why do you obtain your water from this place?" was difficult to distinguish from the question "How did you find out that this watersource existed?". Therefore the former question was excluded.
In Chemoge sublocation 22 households have been using the same watersource for as long as they have been living there, whilst 4 households have changed from one watersource to another.
In Kapsokwony sublocation 24 households have been using the same watersource from the beginning, whilst 2 households have changed.

2.3. Water collection and storage

In Chemoge- and Kapsokwony sublocation the mother usually brings water to the house, either alone (13 resp. 11 households) or helped by her child(ren) (13 resp. 15 households).
In all households the water is fetched daily in 1 up to 10 trips. The average number of trips is 3.5 (on average 23 minutes per trip) in Chemoge and 3.6 trips (on average 17 minutes per trip) in Kapsokwony.
The approximate distance between house and watersource is given in Table 9.

Table 9

The approximate distance between house and watersource for 26 households in Chemoge and 26 households in Kapsokwony sublocation.

Appr. dist.(m)*	CHEMOGE	KAPSOKWONY
0-250	3(11.5%)	9(34.6%)
250-500	10	7
500-1000	7	8
>1000	5(19.2%)	2(7.7%)
unknown	1	0

*When a combination of sources is used the average distance is taken.

In Chemoge sublocation 13 households use a jerrican, 10 a bucket and 3 a saucepan to fetch water. In 20 cases the estimated capacity of the watercontainer is 20 litres.
In Kapsokwony sublocation 20 households use a jerrican, 4 a bucket, 1 a pot and 1 a saucepan for fetching water. In 22 cases the estimated capacity of the container measures 20 liters.
Other households use containers of 7, 10, 15, 25 and 30 liters.
In Chemoge sublocation 25 households store their drinkingwater in 1 or more pots and 1 household uses a jerrican.
In Kapsokwony sublocation 24 households store their drinkingwater in pots and 2 households use a jerrican.
In all cases the pots are covered with a lid.

2.4. Water consumption

Figure 3 gives the number of households with a particular mean daily water use per capita.

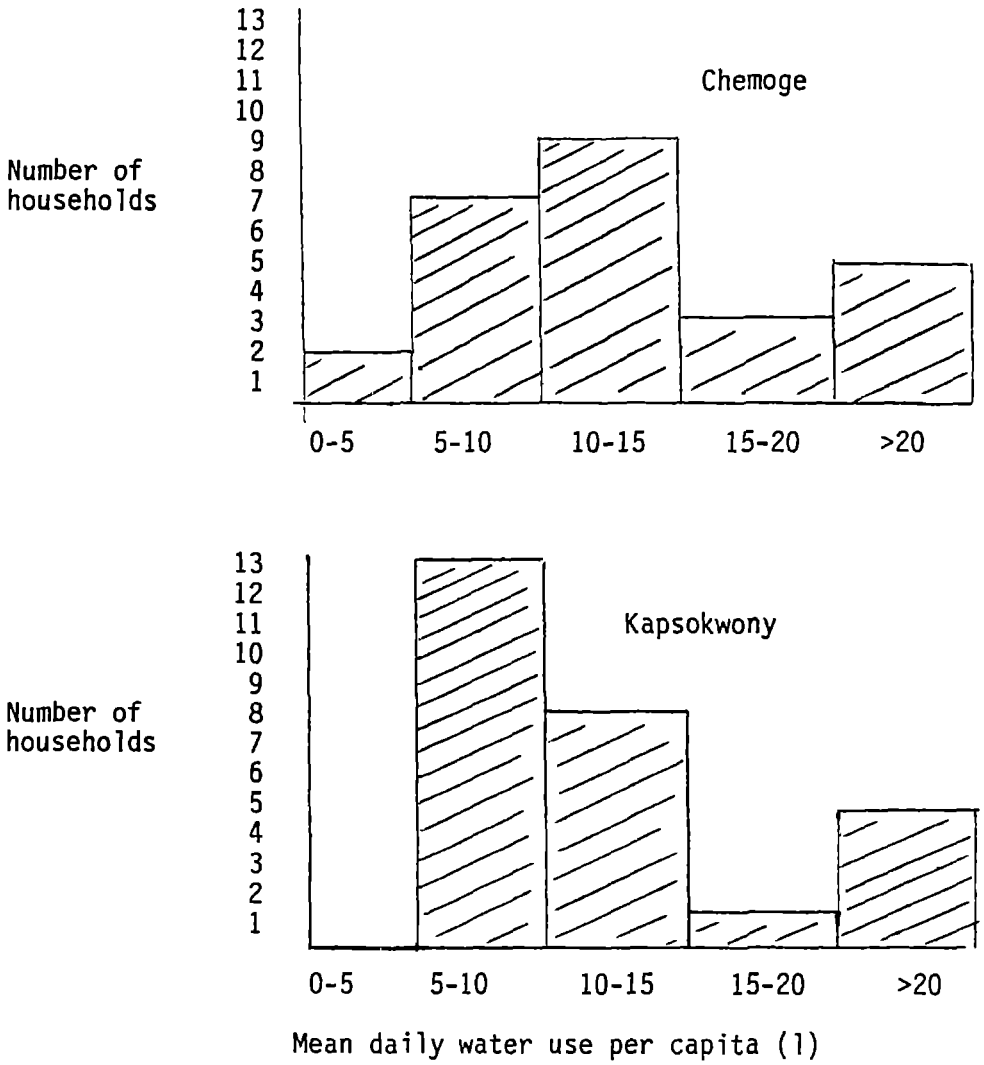

Figure 3: The number of households with a particular mean daily wateruse per capita* in Chemoge and Kapsokwony sublocation.

*: As calculated from the total amount of water fetched per household (number of trips x capacity of container(s)) and the household size.

Table 10 shows the householdsize in relation to the mean daily water use per capita.

Table 10

The number of households with a particular household size and their mean daily water use per capita.

	Household size (members)	Number of households	Mean daily water use per capita(l)	Mean (l)
CHEMOGE	1-5	9	18	11
	5-10	13	11	
	>10	4	7	
KAPSOKWONY	1-5	6	19	10
	5-10	15	10	
	>10	5	7	

Table 11 relates the total amount of time spent per day in fetching water to the mean daily water use per capita.

Table 11

The number of households in which a particular amount of time per day is spent in fetching water in relation to the mean daily water use per capita (The mean covered distance is given in parentheses).

	Daily amount of time (minutes)	Distance (m)	Number of households	Mean daily water use per capita
CHEMOGE	0-30	(183)	2(7.7%)	9
	30-60	(421)	8(30.8%)	12
	60-120	(425)	10(38.5%)	13
	>120	(950)	6(23.1%)	9
KAPSOKWONY	0-30	(136)	8(30.8%)	8
	30-60	(378)	9(34.6%)	12
	60-120	(696)	7(26.9%)	11
	>120	(625)	2(7.7%)	10

The relation between the mean daily water use per capita and the distance while fetching water is given in Figure 3.

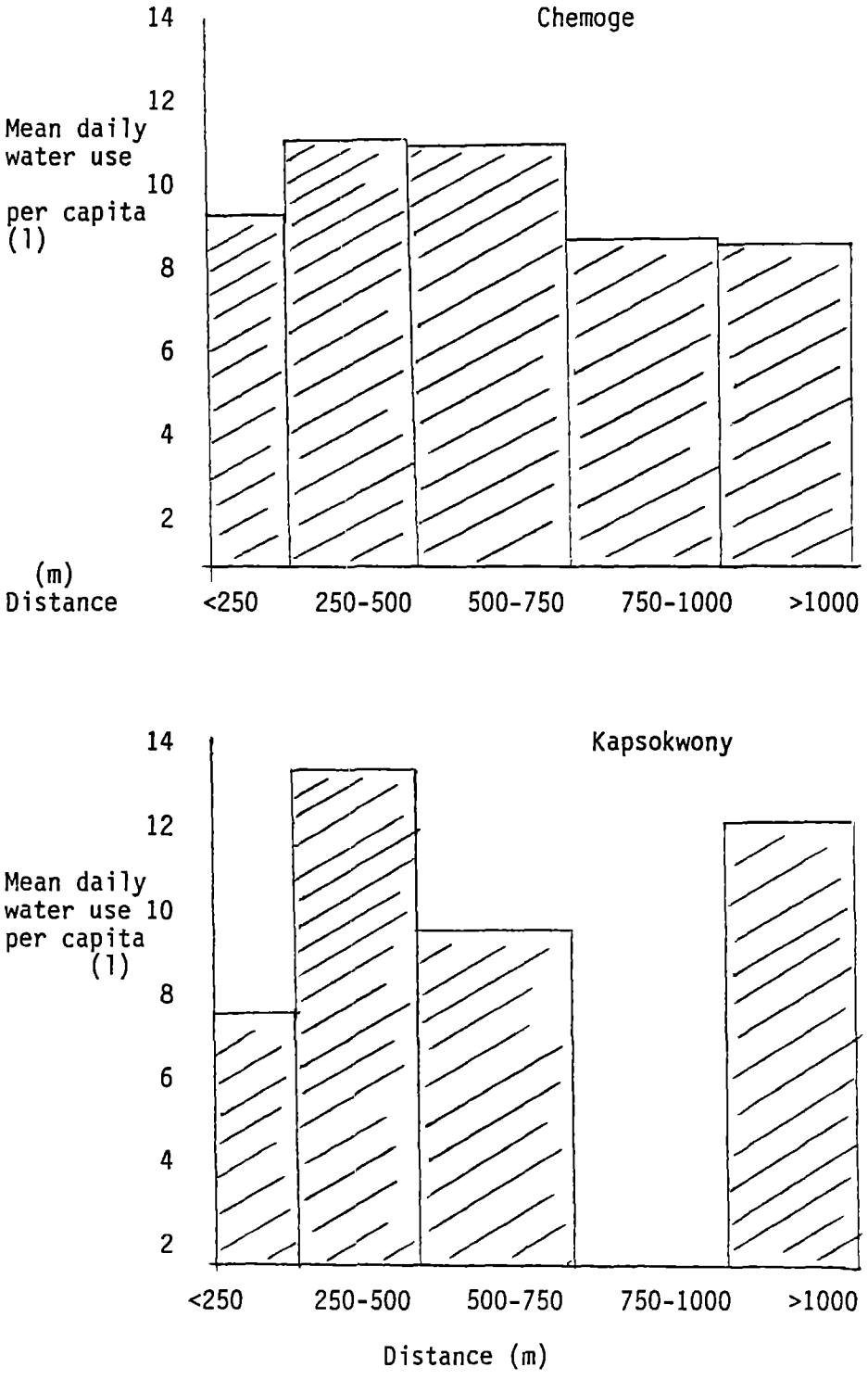

Figure 4: Mean daily water use per capita at different distances

from source for 26 households in Chemoge and 26 households in Kapsokwony sublocation.

2.5. Health perception of environment

In Chemoge sublocation 20 interviewees consider their house to be located in a healthy place, whilst 3 interviewees consider this not to be the case. Two interviewees do not know wether their house is located in a healthy place or not and one says the place is allright except for periods when malaria is around.
In Kapsokwony sublocation 23 interviewees consider their houses to be located in a healthy place, whilst 3 do not know. The reasons for these statements are given in Table 12.

Table 12

The number of times that a particular reason is given by an interviewee for considering his/her house to be located in a healthy or unhealthy place for 26 households in Chemoge- and 26 households in Kapsokwony sublocation.

Reason why place is healthy	CHEMOGE	KAPSOKWONY
No diseases around	8	13
Water is near	4	0
Because it is flat	2	1
The climate is nice	1	2
No bushes around	1	1
Far from the road so no dust	1	0
Not rocky	1	0
There are toilets	1	0
Free from wind	2	0
No pollution around	1	0
It is on the boundary of our land	1	0
There is a rocky place for building houses and soft ground for shambas	2	0
It is healthy apart from dusty road	0	1
Water does not stay during rainy season	0	1
The atmosphere is allright	0	3
No swamps around	0	1
Because the old man built it here	0	1
It is cool and shady	0	3
Because it is my place	0	1
I looked at it and said "This is a good place for a house"	0	1
Reason why place is unhealthy		
Because we have diseases in the family	2	0
It is too bushy and most people around do not have latrines	1	0
Reason why unknown		
I do not know	2	2
Nobody has told me about health	0	1

2.6. Health perception of drinking-water

In Chemoge sublocation 19 interviewees consider their drinking-water to be healthy for themselves and their family and 3 do not. Four interviewees do not know if their drinking-water is healthy or not.
In Kapsokwony sublocation all 26 interviewees consider their drinking-water to be healthy for themselves and their family. The reasons for these statements are given in Table 13.

Table 13

The number of times that a particular reason is given by an interviewee to explain why he/she considers the drinking-water to be healthy for him/herself and his/her family or not, among 26 households in Chemoge- and 26 households in Kapsokwony sublocation.

Reason why drinking-water is healthy	CHEMOGE	KAPSOKWONY
Because I boil it	6	0
We have not been ill	5	17
It is clean	6	5
It is cold	1	3
It comes out of the ground so I think it does not contain germs	1	0
It is fresh	0	1
The old people have been drinking it and since then nothing has been wrong	0	1
We fetch it early when it is still clean	0	1
It is healthy though there might be some germs	0	1
It contains good minerals	0	1
Reason why drinking-water is unhealthy		
It is an open source	1	0
There are some particles in the water	1	0
We do not boil it	1	0
Reason why unknown		
These days there are so many diseases that you can not detect	1	0
It is sometimes dirty and sometimes clean	1	0
I do not know	1	0
Because we share it with animals	1	0

In Chemoge sublocation 11 households boil their drinking-water. In 14 households the drinking-water remains untreated and 1 interviewee says that he does not know wether the drinking-water is boiled.
In Kapsokwony sublocation the drinking-water is boiled in 10 house-

2.7. Social aspects of water collection

In Chemoge sublocation 23 women meet and talk with others while fetching the water, whilst 3 do not. Twenty-one of them consider this to be good for the following reasons:" To meet friends, relatives and neighbours and to exchange information and ideas" (17x), "It is good to meet but if you want to talk you invite them home" (3x), "It is okay provided that they do not quarrel" (1x). Five interviewees do not consider it to be good to meet and talk with other people while fetching water, because "It is a waste of time" (4x) and beause "They quarrel" (1x).
In Kapsokwony sublocation 24 women meet and talk with others while fetching water, whilst 2 do not. Twenty-three interviewees consider this to be good for the following reasons: "To meet friends, relatives and neighbours and to exchange information and ideas" (19x), "It is an African tradition" (2x), "It is good depending on what they discuss" (1x) and "It is a way to kill time" (1x). One interviewee does not consider it to be good to meet and talk with other people while fetching water because "They quarrel and fight to be the first at the tap". Two interviewees do not know wether this is a good habit or not.
In Chemoge sublocation 22 interviewees say that men are not allowed to come near the watersource and 4 say that they are allowed.
In Kapsokwony sublocation 11 interviewees say that men are not allowed near the watersource, while 15 interviewees say they are.
The reasons for these statements are given in Table 14.

Table 14

The number of times that a particular reason is given for the fact that men are not allowed near the watersource for 26 households in Chemoge and 26 households in Kapsokwony sublocation.

Reason	CHEMOGE	KAPSOKWONY
It is not their duty to go there	11	2
They have their own place	4	7
I do not know	2	0
Only when they are thirsty	1	0
Only when the wife is sick or when they are single	2	0
They have bad manners	1	0
They come and spoil the water	0	1
It is an African law	0	1
No answer	1	0

2.8. Methods of waste water disposal

Different methods of waste water disposal are used. The results are given in Table 15.

Table 15

The number of times that a particular method of waste water disposal is mentioned among 26 households in Chemoge- and 26 households in Kapsokwony sublocation.

Method of waste water disposal	CHEMOGE	KAPSOKWONY
Throw it on the ground	13	19
Irrigation of shamba & vegetables	3	3
Throw it in compost pit	9	4
I use cans to pour near the watersource	1	0

When throwing waste water on the ground the average distance from the house is 8 meters in Chemoge and 5 meters in Kapsokwony sublocation.

2.9. Dishracks and compost pits

Environmental conditions of the houses are given in Table 16

Table 16

Number of households with or without a dishrack and compost pit for 26 households in Chemoge- and 26 households in Kapsokwony sublocation.

	Dishrack		Compost pit	
	yes	no	yes	no
CHEMOGE	24	2	17	9
KAPSOKWONY	16	10	10	16

The reasons for having or not having a dishrack are given in Table 17.

Table 17

The number of times that a particular reason is given for having or not having a dishrack by 26 households in Chemoge- and 26 households in Kapsokwony sublocation.

Reason for having a dishrack	CHEMOGE	KAPSOKWONY
To dry utensils	5	12
To keep from animals (dogs & cows)	11	3
To keep from children	3	0
To keep from dirty ground	3	2
To keep from bacteria	2	0
To keep from insects (flies)	1	1
No answer	1	0
Reason for not having a dishrack		
Too expensive	1	0
I would like one, but it is not yet ready	1	2
The old one broke down	0	4
There is nobody to help me	0	1
There are no nails	0	2
We use the bush	0	1

2.10. Method of excreta disposal

All households in Chemoge- and 20 households in Kapsokwony sublocation have a latrine (6 resp. 1 with handwash).
In Chemoge sublocation 24 households have been using the latrine from the beginning (e.i. when the household was started).
In Kapsokwony sublocation 18 households have been using a latrine from the beginning.
In both sublocations 2 households have been using a latrine since about 3.5 years, before that they used the bush.
Problems concerning the methods of excreta disposal are given in Table 18.

Table 18

The number of times that a particular problem is mentioned concerning the use of a latrine or the bush among 26 households in Chemoge- and 26 households in Kapsokwony sublocation.

Problems concerning latrine	CHEMOGE	KAPSOKWONY
Flies and mosquitoes	1	2
Smell	0	1
Flooding in rainy season	2	0
Difficult for young children	2	0
No roof/door	2	0
Snakes	1	1
Rocky place, difficult to dig	1	2
It is not a permanent one	0	1
Many people are using it	0	1
Animals can enter and make holes	1	0
No problems	18	16
Problems concerning bush		
Flies	0	1
Thorns, snakes, stepping on excreta	0	3
It is difficult to hide	0	1

All latrine users consider a latrine to be the healthiest and best method of excreta disposal. Among the 6 households that use the bush, 4 consider this not to be the healthiest and best method of excreta disposal whilst 2 do not know.
The reasons for these statements are given in Table 19.

Table 19

The number of times that a particular reason is given for considering a latrine as the best method and the bush as a bad method of excreta disposal among 26 households in Chemoge- and 26 households in Kapsokwony sublocation.

Reason why latrine is best method	CHEMOGE	KAPSOKWONY
Keeps environment (shamba, bush, river, compound, air) clean	9	8
Keeps away germs/prevents diseases	4	4
Nice for visitors	1	1
Saves time compared to bush	1	0
No flies	1	7
It is a private place	1	0
Seperate from compound where children and animals walk	5	0
Prevents to step on excreta	1	1
Not expensive	2	0
There is no bush	1	2
I do not know	1	0
No problems	1	0
No answer	0	1
Reason why bush is bad method		
Flies go there and easily cause diarrhoea	0	1
Snakes, stepping on excreta, getting diseases	0	2
Too many people these days	0	1
No answer	0	2

2.11. Washing hands

Habits concerning `washing of hands' are given in Table 20.

Table 20

The number of households in which hands are being washed (with or without soap) after using the `choo', before preparing food and before eating, among 26 households in Chemoge- and 26 households in Kapsokwony sublocation.

	CHEMOGE			KAPSOKWONY		
	yes	no	sometimes	yes	no	sometimes
After `choo'	22	3	1	23	1	2
Children after choo	16	5	3	18	3	2
Before preparing food	25	0	1	23	2	1
Before eating	25	0	1	26	0	0
Soap	15	4	7	15	3	8

3. Diseases: Incidence and general knowledge

3.1 Most common diseases

The most common diseases in both sublocations are given in Table 21.

Table 21

The number of times that a particular disease is mentioned to be among the most common diseases in Chemoge- and Kapsokwony sublocation.

Disease	CHEMOGE	KAPSOKWONY	TOTAL
Malaria	24	23	47
Coughing	10	12	22
Diarrhoea	16	2	18
Measles	9	8	17
Headache	7	1	8
Vomiting	5	0	5
Stomach ache	5	1	6
Whooping cough	5	0	5
Backache	1	0	1
Typhoid fever	2	4	6
Pneumonia	1	3	4
Fever	2	0	2
Scabies	2	1	3
Bilharzia	1	0	1
Dysenteria	1	0	1
Gonorrhoea	0	1	1
Flu	0	1	1

Fourteen interviewees in Chemoge sublocation know the cause of malaria and 12 do not. Eleven know how to prevent malaria, whilst 15 do not.
In Kapsokwony sublocation 18 interviewees know the cause of malaria and 8 do not. Nine know how to prevent malaria, whilst 17 do not.

3.2. Attending health units

The question "Did any person in your household attend a doctor, hospital or herbalist in the past year" is answered affirmative by 23 interviewees in Chemoge sublocation. Among those who visited a health service were 7 mothers (27% of all mothers), 10 fathers (38% of all fathers), and 22 children (18% of all children).
In Kapsokwony sublocation the same question is answered affirmative by 18 interviewees. Among those who visited a health service were 10 mothers (38% of all mothers), 6 fathers (23% of all fathers) and 27 children (22% of all children).
Table 22 shows the diseases or reasons for attending a certain

health service as mentioned by the interviewees.

Table 22

The number of times that a particular reason is mentioned for attending a hospital, doctor or herbalist among 26 households in Chemoge- and 26 households in Kapsokwony sublocation.

	CHEMOGE			KAPSOKWONY		
Disease/reason*	mother	father	children	mother	father	children
Malaria	5	3	9	5	4	15
Measles	0	0	6	0	0	4
Coughing	0	1	2	0	0	3
Diarrhoea	0	0	2	0	0	3
Typhoid fever	0	0	0	1	1	2
Swollen back/back-ache	0	0	1	0	0	1
Pregnancy/delivary	1	0	0	2	0	0
Vomiting	0	0	1	0	0	1
Stomachache	0	0	0	1	0	1
Injuries	0	1	0	0	0	1
Pain in side/hips	1	0	0	0	0	0
Chestpain	0	0	0	1	0	0
Eyeache	0	0	0	0	0	1
Headache	0	0	0	1	0	0
Hepatitis	0	1	0	0	0	0
Anemia	0	1	0	0	0	0
Table 22 continued:						
Tumors	0	1	0	0	0	0
Painful legs	0	1	0	0	0	0
Skin disease	0	0	0	0	1	0
Vaccination	0	0	1	0	0	0
Unknown	0	0	0	1	1	2

*: The cause of painful legs is thought to be sugar; The swollen back was thought to be caused by witchcraft. In all other cases the cause of the disease is unknown.

Apart from the diseases for which they attended some sort of health service, the interviewees mentioned some other diseases that have been troubeling their householdmembers. (17.3% of the adults and 53.0% of the children in Chemoge; In Kapsokwony 11.5% of the adults were troubled and 30.8% of the children). These diseases are given in Table 23.

Table 23

The number of times that a particular disease is mentioned for which interviewees did not attend any doctor, hospital or herbalist among 26 households in Chemoge- and 26 households in Kapsokwony sublocation.

	CHEMOGE			KAPSOKWONY		
	mother	father	children	mother	father	children
Disease						
Coughing	2	2	42	2	2	16
Fever	1	1	2	0	0	0
Headache	1	0	9	0	0	0
Abdominal pains	1	0	0	0	0	0
Diarrhoea	0	1	0	0	0	0
Heartproblems	0	0	1	0	0	1
Measles	0	0	1	0	0	11
Malaria	0	0	5	0	0	2
Stomachache	0	0	1	0	0	2
Swollen head	0	0	1	0	0	0
Backache	0	0	0	1	0	0
Itching of body	0	0	0	0	1	0
Scabies	0	0	0	0	0	4

3.3 Diarrhoea

The question "Did any person of your household suffer from diarrhoea during the past six months" is answered affirmative by 12 interviewees in Chemoge sublocation. Among those who suffered were 7 children younger than 5 years, 7 children in the age of 5 up to 14 years and 6 persons older than 14 years. Nine of them suffered 2 times from diarrhoea during the above mentioned period. One suffered 12 times, 1 continuously and 1 for a whole month.
Fourteen interviewees answered that nobody in their household has been suffering from diarrhoea during the past six months.

The same question put to the interviewees in Kapsokwony sublocation is answered affirmative by 8 of them. Among those who suffered from diarrhoea were 6 children younger than 5 years, 1 in the age of 5up to 14 years and 2 older than 14 years.
Four of them suffered once from diarrhoea during the above mentioned period. One suffered several times, 2 sometimes and 1 during a month.
In both sublocations the interviewees that did not attend a hospital, doctor or herbalist argued that this was because they had been healthy, apart from one interviewee who believes that one might die when receiving injections.

3.4. Typhoid fever

The question "Did any person of your household suffer from typhoid fever in the past year?" is confirmed by 2 interviewees in Chemoge sublocation. Twenty-four did not confirm. After explaining the symptoms 3 interviewees thought to have seen typhoid fever within their household and 23 had not. Only two interviewees were able to describe the symptoms of typhoid themselves.
The same question put to the interviewees of Kapsokwony sublocation resulted in the following answers: 4 interviewees thought to have seen typhoid within their household, whilst 22 did not. Six interviewees were able to mention the symptoms themselves. The households in which typhoid fever is found use a shallow well (2x), and an unprotected spring (1x) in Chemoge sublocation.
A combination of a river and a spring (1x), a combination of a spring and a well (1x), an unprotected spring (2x) and a river (1x) in Kapsokwony sublocation.

3.5. Vaccination of under-fives

In Chemoge sublocation 21 interviewees took their children to hospital for vaccination, 4 did not and 1 did not have any children. All under-fives are said to be vaccinated in 18 households, in 6 not all of them and in 2 there are no under-fives at all.
In Kapsokwony sublocation 21 interviewees took their children to hospital for vaccination, 2 did not and 3 did not have any children. All under-fives were said to be vaccinated in 18 households, in 3 not all of them and in 5 there were no under-fives at all.
The reasons for not vaccinating under-fives are given in Table 24.

Table 24

The number of times that a particular reason is given to explain why under-fives are not vaccinated among 26 households in Chemoge- and 26 households in Kapsokwony sublocation.

Reason for not vaccinating	CHEMOGE	KAPSOKWONY
I only take the child to hospital when it is sick	1	1
I will go	1	1
There are no hospitals near	1	0
We believe that one can become disabled when vaccinated	0	1
The child was ill all the time	1	0
I fear because I did not go there when I was pregnant	1	0
No answer	1	0

4. Incentives for change

4.1 Willingness and ability to improve

In Chemoge sublocation 12 households are willing to spend money in order to obtain a better quality of water for dinking and other purposes; Two households are willing depending on the amount of money that they will have to spend; 12 households do not want to spend any money at all for this purpose, for the following reasons: "Too expensive, no money" (8x), "Only if I get assistance" (2x), "There is enough clean water" (1x), "We are living on a rock: Digging a hole will not work" (1x).
In Kapsokwony sublocation 22 households are willing to spend money in order to obtain a better quality of water for drinking and other purposes; 3 households are willing provided they will have the money and one household does not want to spend money at all because they can be transferred at any time.

In Chemoge sublocation 14 households are willing to spend money in order to obtain a closer source of water for drinking and other purposes; 2 households are willing provided that they will get assistance and one household is willing provided that they will have the money. Eight households are not willing to spend any money at all for the following reasons: "No money, too expensive" (4x), "It is not possible because of the rock" (2x), "I am going to move soon" (1x), "It is already close enough" (1x). One household does not know wether it likes to spend money for a closer water source or not.
In Kapsokwony sublocation 24 households are willing to spend money in order to obtain a closer water source for drinking and other purposes, one is willing if they have the money and 1 is not willing because they can be transferred at any time.
The things that an interviewee will do if he/she is able to save time in obtaining water are displayed in Table 25.

Table 25

The number of times that a particular answer is given to the question: "If you would be able to spend less time in obtaining water in what activity would you use the time saved?" as mentioned by 26 interviewees in Chemoge- and 26 interviewees in Kapsokwony sublocation.

Answer	CHEMOGE	KAPSOKWONY
Cleaning the house & compound	10	11
Washing clothes & utensils	8	13
Cooking	5	9
Work in the garden	4	1
Farming (milking & looking after cattle)	6	1
Fetching more water	3	0
Looking for firewood	1	0
Resting	2	1
Shopping	1	0
I do not spend much time in fetching water	0	1
Teaching at school	1	0
It is impossible	2	0
Getting vegetables	0	1
Any work that is available	0	3

4.2. Cooperation: Willingness and possibilities

Cooperation with others is displayed in Table 26.

Table 26

The number of interviewees that respond to have cooperated in things such as building houses, schools, hospitals and agricultural work among 26 households in Chemoge- and 26 households in Kapsokwony sublocation.

	CHEMOGE		KAPSOKWONY	
	yes	no	yes	no
Building houses	21	5	25	1
Building schools	23	3	24	2
Building hospitals	16	10	25	1
Agricultural work	22	4	23	3

Other activities in which is cooperated are ceremonies, women groups, brewing beer, fund raising, constructing roads and cattle-dips, constructing a drainage system, transport, supporting sick people and `anything'.
In both sublocations the cooperation worked out well in 24 households. In each sublocation there is one household in which the cooperation did not work out well and 1 household that did not cooperate with others at all.
Table 27 shows by whom the above mentioned cooperations were organised.

Table 27

The number of times that a particular person is mentioned to have organised any cooperation among 26 households in Chemoge- and 26 households in Kapsokwony sublocation.

Organizer	CHEMOGE	KAPSOKWONY
One of the group	8	7
Village elder	6	8
Husband	5	6
(Assistant-)chief	4	1
Neighbour	1	3
Chairman	3	0
Head of the forest	0	1

In Chemoge sublocation 19 interviewees will ask the same person if they want something to be organised; 2 interviewees do not know and 5 interviewees organised the cooperation themselves.
In Kapsokwony sublocation 11 interviewees will ask the same person if they want something to be organised; 2 interviewees will not ask the same person and 1 interviewee does not know.
Twelve interviewees organised it themselves.
In both sublocations all interviewees consider `Harambees'* to be useful and support them. Furthermore, all interviewees are willing to work with other people in order to improve their water supply and excreta disposal. Table 28 lists the persons with whom they want to cooperate.

Table 28

The number of times particular persons are mentioned with whom the interviewees would like to cooperate in improving the water supply and excreta disposal among 26 households in Chemoge- and 26 households in Kapsokwony sublocation.

Persons	CHEMOGE	KAPSOKWONY
Neighbours	20	19
Family & relatives	2	2
Friends	2	1
Village elder	1	1
Those who are willing	1	5
Health officer	0	1
Table 28 continued:		
Government	0	1
With those who are chosen to be responsible for the water	1	0

*: Harambee means literaly `pull toghether' and is used in the sense of combined effort. The idea has arisen at the time of the first president Jomo Kenyatta to mobilize human resources (manpower, materials, money etc.) and to use these resources to develop the country.
Presently most of the Harambees are in the form of (compulsory) fund-raising.

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