THE INFLUENCE OF WATER AND SANITATION USE KNOWLEDGE, PRACTICES AND PERCEPTIONS ON HEALTH STATUS OF RESIDENTS OF MARAGUA TOWN, KENYA

BY
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A Thesis Submitted in Partial Fulfillment for the Requirements of the Degree of Master of Arts (Sociology), Kenyatta University.

KENYATTA UNIVERSITY
DEPARTMENT OF SOCIOLOGY

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DECLARATION

This Thesis consists of my original ideas and to the best of my knowledge, it has not been submitted or presented at any University or Institution of Higher learning for the award of a Master of Arts degree.

Signed: Doris Wairimu Njomo (Candidate)

This Thesis has been submitted with our approval as the candidate's supervisors.

Signed: Dr. Philip K. Koskey, Date: 11th June, 2003
Signed: Prof. Paul P. W. Achola, Date: 11th June, 2003
This thesis is dedicated to my sister, Dr. Njeri Wamae of Kenya Medical Research Institute, (KEMRI) without whose financial and moral support would have been just but a mere dream.

It is also dedicated to my loving husband, Mr. J. Njomo; daughter, Cynthia; and son, Jonathan, all who in immeasurable ways helped me to meet my needs throughout the academic years.

To my parents, Mr. Francis Kanyiri Wamae and Mrs. Justina Wangui, who have been my sources of support and encouragement since my childhood.
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TO GOD IS THE GLORY.
ABSTRACT

This study was undertaken to find out whether knowledge, practices and perceptions of safe use of water and sanitation influence health status. It was carried out in Maragua town, an area characterized by high rate of water and sanitation-related illnesses compared to other districts in Central Province.

Specifically, the study had the following objectives:

- To determine whether those residents with adequate knowledge of safe use of water and sanitation have better health status than those with inadequate knowledge.
- To assess whether those residents with good practices of safe use of water and sanitation have better health status than those with poor practices.
- To examine whether those residents with positive perceptions of safe use of water and sanitation have better health status than those with negative perceptions.

The study was carried out using a sample of 266 respondents, while data collection was done through survey method, structured interviews, questionnaires and supplementary data from documents. Forty-six observations were also carried out and photographs taken.

The data were analysed using descriptive statistics and the chi-square technique for relationships.
The study established that lack of adequate knowledge of safe water use was associated with frequent experience of diarrhoea and lack of adequate knowledge of sanitation use was associated with frequent experience of typhoid.

The study also established that among those residents with poor practices of water use (treatment and storage) there was more frequent experience of typhoid and among those with poor practices of sanitation use (inadequate use of toilet facility, use of open places as toilet facilities and lack of washing hands after toilet use) there were more frequent experiences of stomachache, skin disease, diarrhoea and typhoid.

The results also indicated that adequacy of amount of water fetched (a water use perception) does not influence the health status of the residents and that more of those residents who perceive baby waste to be risky to health wash their hands more frequently after disposing off baby waste.

The study concluded that those residents with adequate knowledge, good practices and positive perceptions of water and sanitation use have better health status.

The study made the following recommendations based on key findings:

- The government should recruit additional qualified health personnel whose duty would be to provide regular health education on water and sanitation use.
- Maragua Town Council should install water storage tanks and provide treated water to residents in order to minimize water and sanitation related illnesses.
• The District Development Committee should put in place measures that help rehabilitate and preserve local water sources and should also encourage residents to construct and maintain their own water facilities.
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<td>AMREF</td>
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<tr>
<td>CBO</td>
<td>Community Based Organization.</td>
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<td>GOK</td>
<td>Government of Kenya.</td>
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<tr>
<td>ICDDR</td>
<td>International Center for Diarrhoea Disease Research.</td>
</tr>
<tr>
<td>IDRC</td>
<td>International Development Research Center.</td>
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<tr>
<td>KEMRI</td>
<td>Kenya Medical Research Institute.</td>
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<tr>
<td>MOH</td>
<td>Ministry of Health.</td>
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<td>MLRRWD</td>
<td>Ministry of Land Reclamation, Regional and Water Development.</td>
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<td>NGO</td>
<td>Non-Governmental Organization.</td>
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<td>SIDA</td>
<td>Swedish International Development Agency.</td>
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<td>VIP</td>
<td>Ventilation Improved Pit.</td>
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<td>World Health Organization.</td>
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DEFINITION OF TERMS

Water Use: Refers to habitual actions, established methods and customs of utilizing water for various purposes by members of a community, group or sub-group.

Sanitation Use: Refers to methods and techniques of use and means for protecting public health especially by removal and treatment of waste or refuse.

Practices: These are habitual actions, established methods and customs of members of a community, group or subgroup. They serve as standard acts or courses of action.

Perceptions: These are ways of seeing, hearing or understanding social phenomena. They are the qualities and insights of understanding and they influence behaviour and practices.

Knowledge: This is the understanding or cognition that one has gained especially through learning and experience. It is the state of being informed and aware about something.

Health Status: WHO’s definition of this concept will be used to refer to the presence of psychological, physical, emotional, economic and social well being and not merely the absence of disease or infirmity.

Influence: The power of producing an effect, often hidden or inexplicable.
Household: A residential unit whose members share ‘domestic’ functions and activities also- a group of people who eat out of the same pot.

Typhoid: A fever that is life threatening and is caused by bacterium *Salmonella Typhi*. One can get typhoid by eating or drinking beverages that have been handled by infected people or if sewage contaminated with the bacteria gets into the water that one uses for drinking or washing food. Typhoid, is therefore, more common in areas of the world where hand washing is less frequent and water is likely to be contaminated with sewage and can be avoided by boiling drinking water, eating foods that have been thoroughly cooked, washing and peeling fruits before eating and not eating foods from street vendors (UNICEF, 1990).

Diarrhoea: The passing of loose, watery stools more than three times in one day and is often accompanied by stomachache. It is a bacterial infection caused by consumption of contaminated food or water. Diarrhea can cause dehydration, which means that the body lacks enough fluid to function properly (UNICEF, 1999). To reduce the incidence of diarrhea, hygienic practices must be followed, particularly the washing of hands after defaecation and before handling food (WHO, 1983).

Stomat cach: A pain in the lower abdomen, which is nonspecific and maybe associated with a multitude of conditions requiring more information regarding the
time of onset, duration, location, severity and nature of pain. Common causes of stomachache are food allergies, food poisoning, indigestion and consumption of contaminated food or water. The cause of stomachache may be based on age and gender of the person (WHO, 1983).

**Skin infection:** An abnormality of the skin appearance and is caused by several factors such as by bacteria, fungal or allergy. An allergic contact is an itchy skin condition caused by allergic reaction to material in contact with the skin. The skin condition is caused by excessive contact with irritants, which include water, detergents, solvents, acids, alkalis and friction (WHO, 1983).
CHAPTER ONE

INTRODUCTION

1.1 Background to the Research Problem

It is estimated that 60% of persons in developing countries live without an adequate supply of drinking water, and 75% without any kind of sanitation facility (Dangerfield 1988). These problems have been attributed to the occurrence of diarrhoeal diseases, amebiosis, typhoid, roundworms and other infections introduced or spread by insufficient and polluted water supplies and poor sanitation. Unsafe water brings high infant and child mortality rates and for those who survive into adulthood, poor health, loss of productivity and shortened life span. On average, more than 25,000 people die per day in the developing world due to inadequate water supply and sanitation, while millions more suffer the consequent debilitating effects (Dangerfield, 1988).

Kenyan regions are water scarce, as evidenced by the fact that only 30% of total available water is being utilized (UNICEF, 1998). The projected annual water demand for the year 2010 will comprise only 29% of the overall national annual water volume, potentially estimated at 20.2 million m$^3$ (Kenya, 1997). Surface water potential from the perennial rivers has been estimated at 19.6 million m$^3$, which represents 6% of the national annual rainfall. Rivers form the largest source (40%), while others such as ground water form 30%, dams and lakes 20% and 10%, respectively (UNICEF, 1998). In Kenya, economic and population pressures have rendered most of the rural people to have little access to safe water. In 1980, some 90% of these rural people did not have access to safe water.
This led to the government's interest in low cost water technologies including hand-pumps (Rhodda, 1994).

The National Water Master Plan outlines a strategy for urban sewerage development, but makes very little reference to rural sanitation, where close to 80% of Kenya's population lives (UNICEF, 1998). As such many Kenyan communities have no adequate sanitation facilities and are, therefore, exposed to sanitation related illnesses.

Knowledge, practices and perceptions on safe water and sanitation use have been found to influence health status of the residents. In knowledge, for example, the appropriate technology required is generally less well known. Necessary technical skills are also often lacking among the majority of users. There is need to give the communities concerned the technical and organizational skills that proper operation and maintenance require (Jones, 1983). Lack of knowledge of water and sanitation use means that available facilities may be used inadequately and, therefore, pose danger to the health of the users.

Perceptions of the users also affect safe water and sanitation use and therefore influence their health status. For water and sanitation use to have the desired effects, for instance, significant changes in the perceptions of the people should be effected (Rhodda, 1994).
The people’s practices are also important in safe water and sanitation use, especially in operating and maintaining water and sanitation systems once installed and in their daily use of water and sanitation facilities available to them.

The implications of knowledge, practices and perceptions on safe water and sanitation use and how these in turn affect health status of Maragua Town residents is unknown. This study was undertaken to investigate such implications.

1.2 Statement of the Research Problem

Inadequate knowledge about safe water and sanitation use by Maragua residents raises a number of problems: first, the use of water and sanitation facilities available is minimal, inefficient and ineffective yet this is critical as it influences the health status of the residents. Second, they may be using water and sanitation resources in an unsafe manner, hence affecting their health status. Poor perceptions on water and sanitation use means that Maragua residents may be having poor practices and using the resources unsustainably leading to wastage, unsound waste disposal measures including that of human excreta, hence, risking serious health problems.

Though information available is that the common diseases in Maragua district are malaria, skin ailments, amoebiosis and typhoid (Kenya, 1997-2001), there is little knowledge on their epidemiology in this area. This makes it difficult to plan control measures concerning these diseases. Little is also known about the extent of the incidence of these diseases, how they affect the health status of the residents and what can be done to sensitize the residents on the action they can take to prevent them. The residents also
need to be made aware through imparting knowledge of how to properly use water and sanitation facilities. In view of the above, there was need for this kind of study to impart knowledge and inculcate better practices and perceptions on safe water and sanitation use all of which should help in reducing the existing health problems facing residents of Maragua Town.

1.3 Purpose of the Study
This study intended to find out the influence of knowledge, practices and perceptions of safe use of water and sanitation on health status of residents of Maragua Town. This was done by investigating use of water and sanitation facilities by Maragua residents based on their knowledge, practices and perceptions. The study thus investigated ways in which water and sanitation use promote or adversely affect the health of Maragua town residents. The ultimate intention was to create awareness among the people about the use of safe water and sanitation and their effect on health. The objectives specified below guided the study.

1.4 Objectives of the Study
The specific objectives of the study were to:

(a) Determine whether those residents with adequate knowledge of safe use of water and sanitation have better health status than those with inadequate knowledge.

(b) Assess whether those residents with good practices of safe use of water and sanitation have better health status than those with poor practices.
(c) Examine whether those residents with positive perceptions on safe use of water and sanitation have better health status than those with negative perceptions.

1.5 Research Hypotheses

The following hypotheses have been tested in this study:

H1: Adequate knowledge of the respondents on safe use of water and sanitation will have a positive relationship with their health status.

H3: Good practices of the respondents on safe use of water and sanitation will be positively related to their health status.

H2: Correct perceptions of the respondents on safe use of water and sanitation will have a positive relationship with their health status.

1.6 Justification for the Study

Maragua Township was chosen for the study because as compared to other districts of Central Province it has the highest population growth (Kenya 1999) which affects the use of water and sanitation facilities (Rhodda, 1994). Secondly, Maragua Division has the highest incidence of water and sanitation related illnesses (Kenya, 1997-2001). Thirdly, Maragua Town is close to Nairobi in terms of distance and therefore the cost of travel and of subsistence for the researcher was minimal. Fourthly, is the fact that the study area lacks piped water, a facility that is very common in a town setting. Lastly, I chose to study knowledge, practices and perceptions since they are the main variables which have been found to influence water and sanitation use and health status of the concerned residents.
1.7 Significance of the Study

This study may be important for the Government’s policy on water and sanitation as it can make the Government realize that people’s knowledge, practices and perceptions affect water and sanitation use. The Government may thus restructure its policy on water and sanitation use to focus on people’s knowledge, practices and perceptions.

Second, Maragua inhabitants and, indeed all Kenyans may benefit from the study as they may become aware of the need to use safe water and adequate waste disposal methods as a way to curb water and sanitation-related illnesses. The study may also help them enhance knowledge, improve practices and change perceptions on use of water and sanitation. Lastly, the study’s results will add to the literature on water and sanitation, especially on the implications of knowledge, practices and perceptions on use of water and sanitation and how this affects people’s health.

1.8 Scope and Limits of the Study

This study limited itself to knowledge, practices and perceptions of the residents on water and sanitation use and how these influence health status of Maragua Town residents. Secondly, the study limited the area where the research was carried out to Maragua Township and its environs. A sample size of 266 respondents was utilized and not the whole population.
1.9 Study Area

This study was conducted in the newly created Maragua District, which is one of the seven districts in Central Province of Kenya. The district is bordered to the north by Muranga District, to the south, Thika District and to the east, by Eastern Province (Kenya 1997-2001). Figure 1.1 shows Maragua District, as it is located on the Kenyan map.

Specifically, the study was carried out among the residents of Maragua Town Council which is made up of two locations, namely; Gakoigi to the north and Ichagaki to the south.

Figure 1.2 shows Maragua Town Council as it is located on the map of Maragua District.
Figure 1.1: Maragua District in Central Province of Kenya

1.10 Chapter Outline

This work is organized into five chapters. Chapter one discusses background to the problem, statement of the research problem, purpose of the study, objectives of the study, research hypotheses, justification for the study, significance of the study, scope and limits of the study and study area. Chapter two discusses the review of relevant literature that is relationship between water and sanitation, status of water and sanitation in Kenya, the Kenya Policy on water and sanitation, water-borne diseases, knowledge on water and sanitation use, perceptions on water and sanitation use and practices on water and sanitation use. The theoretic and the conceptual framework are also discussed in this chapter. Chapter three deals with the research design, nature and sources of data, study population and sample, methods of sampling, sample size, the research instruments, methods of data collection and methods of data analysis. The research constraints, limitations and piloting are also dealt with in this chapter. Chapter four of the work deals with demographic and socio-economic characteristics of the respondents, knowledge, practices and perceptions of water and sanitation use and health status. The relationships between various variables of water and sanitation use and health status are also discussed in this chapter. Lastly, chapter five presents a summary of findings, conclusions and recommendations for possible action. Suggestions for further research are finally discussed in this chapter.
CHAPTER TWO

REVIEW OF LITERATURE

2.1 Introduction

This chapter presents results of the review of literature focusing on the relationship between water and sanitation, the status of water and sanitation in Kenya, the Kenya policy on water and sanitation, waterborne diseases, knowledge on water and sanitation use, perceptions on water and sanitation use and practices on water and sanitation use. The theoretical framework and conceptual model are also presented and discussed.

2.2 Relationship between Water and Sanitation

Sanitation has links with water supply. Particularly, those who promote them and improve health have seen the two as necessary adjuncts of one another for a long time. Any plan to provide water for domestic use, if it does not ensure that households also have adequate methods to dispose off waste water, can endanger health rather than improve it. The links between water supply and sanitation relate both to the benefits and to the technology itself. Sanitation schemes have floundered when water was not available to operate flushing systems. Equally important, the period of construction of water system is an outstanding opportunity to stimulate demand for improved sanitation (Cairncross, 1992).

Water supplies and sanitation are not always mutually beneficial. On-site sanitation can pollute local ground water and contaminate on-site water supplies. Water pollution is inevitable where stagnant water abounds or in streams, where people fill their containers,
wash clothes and at the same time utensils and due to animal and human waste (Feachem, 1978). Some of the solutions to these problems are local community involvement and targeting, encouraging self-reliance and giving priority to the poorest members of the community.

Many of the lessons to be learned from water supply programmes are relevant to sanitation schemes and vice versa. Rural water supply has taught many that systems planned without user participation are likely to be inappropriate to the user’s needs, but this important lesson is yet to be learned by many in the rural areas (Cairncross, 1992). The local people need education and training in order to understand the need for improved water and sanitation facilities and how to construct them (Feachem, 1978). Besides the villagers must also be taught how to maintain the equipment so as to ensure a trouble-free supply of clean water and sanitation facilities.

The principal purpose of improving water supply and waste disposal is to help overcome the scourge of debilitating and killing diseases that afflict developing countries. Water and human excreta are prominent factors in the transmission of most of the more serious diseases of the developing world (Jones, 1983). Among these diseases are dysentery, diarrhea, malaria, typhoid and cholera which all result from unclean or insufficient water.

Sanitary disposal of human wastes is generally necessary if contamination of water and food is to be eliminated and if people are to avoid direct contact with disease-producing organisms. In tropical areas where conditions for multiplication of these organisms are
ideal, good personal and household hygiene are critical to control of diseases that result from inadequate sanitation. The Maragua residents need to be given health education on sanitary disposal of human waste so as avoid sanitation-related illnesses and improve their health status.

2.3 The Status of Water and Sanitation in Kenya

In Kenya, access to safe water has declined. According to the Ministry of Health (Health Sector Status Analysis of 2001), for example, there has been a slight decline in access to safe water, from 48% to 45% between 1992 and 1996 at National level (Kenya, 1997). Demographic and indicator profiles for access to safe water and sanitation by the Ministry of Health, reveal that access to these facilities at household level in both urban and rural areas is yet to be enjoyed by all households (Kenya 1997). The National estimates from Ministry of Land Reclamation, Regional and Water Development, indicate that 52% of the rural population do not have access to adequate and safe water (Kenya 1997-2001). At present, the majority of the rural population depends on unsafe water sources such as unprotected shallow wells, springs, rainwater, rivers, lakes, ponds and dams (Kenya and UNICEF, 1998).

2.4 The Kenya Policy on Water and Sanitation

The policy framework guiding environmental sanitation programmes in Kenya is reflected in the health policy where water and sanitation are part of promotive and preventive health services. The Ministry of Health is an actor mandated to deal with all sanitation issues in the country. The health policy framework addresses the promotion of
both preventive and promotive health services, under which adequate sanitation is a major component. The Ministry's objective on sanitation as implied in the health policy is to provide, promote and assist communities to achieve adequate sanitation for all by the year 2010 (Kenya and UNICEF, 1998). The policy objectives are to plan, utilize and conserve water resources, develop and distribute sufficient safe water to all rural and urban areas of the country, monitor and assess water quality in order to protect consumers from dangers of pollution and maintenance of water resources. The policy also intends to encourage the beneficiaries to be involved in the planning, implementation, operation and maintenance of water and sanitation facilities (Kenya 1997-2001).

2.5 Water-borne Diseases

The Kenya National Development Plan for the period 1997-2001 shows that waterborne diseases such as malaria cause more than 30% of all illnesses countrywide. Back in 1990, the annual outpatient morbidity statistics revealed that malaria cases countrywide were 4,718,092, skin ailments 1,587,654, intestinal worms 793,194 and diarrhea diseases 777,116. All these diseases top the list as major causes of morbidity and mortality and result from poor and inadequate water supply and sanitation (Kenya, 1997-2001).

According to the Maragua District Development Plan for the period 1997-2001, the major diseases in 1995 were respiratory tract infections and malaria (Table 2.1).
Table 2.1: Prevalence of Disease by Magnitude in 1995 in Maragua

<table>
<thead>
<tr>
<th>Disease</th>
<th>Cases</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory tract infections</td>
<td>189,143</td>
<td>31.9</td>
</tr>
<tr>
<td>Malaria</td>
<td>136,502</td>
<td>23.0</td>
</tr>
<tr>
<td>Diseases of the skin</td>
<td>65,731</td>
<td>11.1</td>
</tr>
<tr>
<td>Intestinal worms</td>
<td>40,664</td>
<td>6.8</td>
</tr>
<tr>
<td>Infections of the eyes</td>
<td>21,465</td>
<td>3.6</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>13,793</td>
<td>2.3</td>
</tr>
<tr>
<td>Infections of urinary tract</td>
<td>10,453</td>
<td>1.7</td>
</tr>
<tr>
<td>Rheumatism</td>
<td>7,703</td>
<td>1.3</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>7,607</td>
<td>1.28</td>
</tr>
</tbody>
</table>

Source: Kenya (1998)

Table 2.1 above shows that some of the prevalent diseases in Maragua District are malaria, skin ailments, intestinal worms and diarrhea all of which result poor and inadequate water and sanitation facilities. Winblad and Kilama (1980) have noted that human faeces are potentially dangerous, surrounded by taboos and also expensive to dispose of. A large number of diseases are spread directly through man’s contact with human excreta, indirectly via water, food, and soil or via carriers and vectors like flies and cockroaches (Nyagechi, 1982).

Health effects of excreta-related diseases revolve around high infant mortality and morbidity caused by diarrhoeal diseases, malnutrition, anaemia and reduced resistance to other diseases. These health problems related to water and sanitation have been persistent due to rapid population growth. Cairncross (1992), points out that rapid population growth in most developing countries mean that the ever-increasing population must be provided with water supplies and sanitation facilities. This requires huge resources to contain the situation that cannot be met by the Ministry that is seriously under funded. As such poor and inadequate water and sanitation facilities may mean that Maragua Town
residents are in danger of being exposed to water and sanitation-related illnesses and hence risk serious health problems.

2.6 Knowledge on Water and Sanitation Use

Knowledge on safe water and sanitation use is important in ensuring good public health. Secondly, low-cost technologies for water supply and sanitation require increased emphasis on the development of human resources to impart them with the necessary knowledge on safe use of water and sanitation. Users, for example, can be easily trained to install and maintain pit latrines, maintain and repair hand pumps at the village level. A few villagers must then be trained to provide this maintenance and repair services. Water and sanitation use knowledge is necessary for the maintenance of facilities after they are installed. Training to impart the knowledge and, in particular the training of women is critical. Women and girls are responsible for preparing food, cleaning utensils, washing children, disposing of babies’ faeces and scrubbing latrines. The women and girls must learn how dirty water brings suffering, disease and death (Feachem, 1978). Training of women in health and hygiene, in community participation and decision-making and in the maintenance and repair of hand pumps and latrines is therefore critical (Dangerfield, 1988). This study will target, besides other populations, the women group members in order to find out their knowledge on water and sanitation use and its influence on the health status of their dependants.

Education in health and hygiene that is tailored to local beliefs and conditions can contribute to knowledge for the improvement of hygiene. A combined approach is thus
required that includes ample water supplies, hygienic disposal of excreta and education as to safe use of water and household hygiene wherever people have been unaccustomed to good water supply and sanitation (Jones, 1983). Furthermore, there is a lack of awareness on the dangers posed by poor quality water and unsanitary habits. To most people food and water safe or contaminated, come before their health (Nyagechi, 1982). Majority of the population in developing countries are poor and tend to rely on basic survival rather than on quality where basic resources count. Maragua Town is a fast growing town with a high population growth but with limited water and sanitation facilities (Kenya, 1997-2001).

2.7 Perceptions on Water and Sanitation Use

The use of safe water and sanitation facilities requires positive perceptions for the user to have good health status. Women are major stakeholders where water and sanitation facilities are used. Their roles, although crucial in society, are often “invisible and taken for granted”. Together with men and children, women are active partners in health improvement. As home managers and mothers who make important decisions, women are responsible for the family’s choice of water for cooking, drinking, laundry, bathing, and other needs (WHO, 1983). Unfortunately, planners and engineer’s perceptions make them fail to see women’s active roles in the community, as though projects are primarily male concerns. These perceptions subtly reflect the social structure itself. In most communities, men hold positions of authority whereas women wield domestic decision-making powers, a clear delineation of “public” and “private” roles (Briscoe, Feachem and Rahaman).
This delineation, however, is blurred when one sees the scope of the so-called domestic domain of women. Gachukia (1984) states “women who make up 60% of the total rural population in many developing countries are collectors, transporters, storers and distributors of water. They play the dominant role in introducing children to hygienic practices and habits related to water and sanitation.” Gachukia identifies some constraints hindering women’s full participation in all stages of water supply and sanitation programmes, and what needs to be done to ensure their increased participation. She cites the Kenyan policy of Harambee (self-help) as a useful vehicle for promoting women’s participation. The Harambee movement was launched by Mzee Jomo Kenyatta, the first president of the republic of Kenya, as a development strategy in the sixties. Kenyan women have been enthusiastic in mobilizing support for water projects. It may be that Maragua women are not well involved in issues of support for water projects yet they are the main users of water. When asked about changes they would want for the United Nations Decade for Women, they identified water as their first priority. Their enthusiasm spills over to fund raising, mobilization, motivation, lobbying for support, and volunteer work (Gachukia, 1984).

There is, however, a hidden constraint. Although they have been willing to raise funds and provide free labour, Kenyan women, due to the perceptions they have on themselves, have not thought of themselves as being capable of gaining technical skills needed for actually managing and maintaining water projects. When a technical system breaks down, they do not seem to know what to do and think that this is a man’s domain.
Gachukia says that the important thing is to mobilize women, get them involved, but at the same time break down the perception that females are inferior. Training women as water technicians will inspire other women to overcome their sense of inadequacy (International Development Research Centre, 1985).

2.8 Practices on Water and Sanitation Use

Difficulties in the implementation of water and sanitation programmes arise from the fact that their improvements are interventions in the domestic domain. A latrine, for example, is regarded as a domestic undertaking, largely built at the owners’ expense and labour. Its use requires change in people’s most private habits. In most poor communities, by contrast, the water supply is very public, often a well in the center of the village or a tap on the street. This difference means that greater commitment by the user is needed for a latrine to be installed than for a water supply (Nyagechi 1986).

Most of the initial investment in sanitation must usually come from the users, whereas investments in water supply can more easily be recouped subsequently through the water tariff. The latrine user will often be expected to acquire most of the materials required for its construction, although this is not required in even the most participatory “self-help” water supply schemes. Commitment by the householder is required not only to build a latrine, but also to ensure its use by all members of the family. Very probably, the mother is the only collector of water in the household, so she need not influence the behaviour of anyone else to change their source of drinking water.
To change the defecation habits of everyone in the family is far harder to achieve, however willing she may be to try. Moreover, user commitment to sanitation is less likely to be present than commitment to a water supply. The convenience and aesthetic advantages of a ready source of clean water are usually apparent to all, and desire for them needs little stimulation. Any developing-country politician knows how popular water supplies can be. Not everyone is convinced, however, of the advantages of latrines (Cairncross 1992). As such many residents may use available sanitation facilities inadequately or due to lack of these facilities may prefer to use open places for their natural calls rather than damp, smelly precarious cubicles. The promotion of sanitation generally requires a cadre of well-trained people in the field. They should have the same cultural roots as those they serve, and they must understand the technical aspects of low-cost sanitation. Above all, they must be sensitive to the perception of the communities and able to win their confidence, deal with their doubts, and stir their enthusiasm (Cairncross, 1992).

2.9 Theoretical Framework
Health varies according to socio-economic status. People in lower socio-economic classes are most at risk of ill health, and least likely to use preventive services and adopt healthier lifestyles (Cockerham, 1995). A number of theories have been advanced to examine the relationship between health and socio-economic status. One such theory, employed by sociologists is the *Culture of poverty explanation* (Rundall and Wheeler, 1979).
According to this theory, communities that experience poverty and low status develop a response based on powerlessness, passivity and fatalism, and health is a low priority in the face of other life problems related to poverty (McKinlay and MacKinlay, 1972). This theory suggests that poorer people do not have a positive image of society’s organizations, including professional services, partly owing to the relative powerlessness within the social system. They develop a mistrust of modern medicine and are therefore more reluctant than other social groups to use health and preventive services in relation to the volume that they need.

Poor people are also less knowledgeable than middle-class patients about how to gain access to services and to communicate effectively with doctors. Such groups accept low levels of health, as their culture is incompatible with a future-oriented, preventive view of health. The social and cultural distance between doctors and patients in lower socio-economic groups reinforces this reluctance (Friedson, 1970). Poorer people are more likely to have a continued functioning, rather than rest, due to loss of income if they take time off work.

One other theory on health-related action is 'The health belief model'. It postulates that people’s behaviour in relation to health is related to their perceptions of the severity of an illness, their susceptibility to it and the costs and benefits incurred in following a particular course of action. Behaviour may also depend on a trigger, such as a symptom of ill health (Rosentock 1966, 1974; Becker, 1974). This model is used to understand people’s use of preventive health measures and services, as well as their response to
symptoms and adherence with prescribed therapies. The model holds that socio-
demographic, social and psychological factors are likely to modify health beliefs. The
criticisms of the health belief model include its focus on rationality and the exclusion of
emotions such as fear and denial.

*The protection motivation model* postulates that the motivation or intention to engage in
health-protecting behaviour depends on the multiplicative concepts of perceived severity
of ill health, the perceived probability of the occurrence of ill health and the likelihood of
the protective behaviour in averting ill health (Rogers and Mewborn 1976). The central
hypothesis of this theory is that motivation to protect vulnerability; the ability to carry out
the behaviour, the effectiveness of the behaviour in reducing the threat of ill health. It
also incorporates the notion that motivation will be negatively influenced by the costs of
protective behaviour and the rewards associated with not undertaking it. The protection
motivation model refers to rationalized motivation which makes it a component of the
health belief model which equally relies on cognition.

In summary, the culture of poverty explanation theory will be used among the household
heads and members of women groups. Poverty is the main problem among these two
groups of people as it makes them handle water and sanitation facilities carelessly. These
two groups worry only about basic survival and not about the quality of water and
sanitation available to them. They tend to use the resources as they are, since to them
water for household use is more important than the safeness of the source of this water
and so is the availability of a toilet facility regardless of its cleanliness.
The health belief theory, on the other hand, will be used among the students. Students have more aspirations than their parents since in most cases they are likely to be more educated. Education achievements and literacy are strongly related to an understanding of the ways to achieve health improvement. Those communities with higher levels of literacy and educational achievement have a greater potential for achieving health benefits from water supply and sanitation facilities (WHO, 1983). Unlike household heads who might look down on themselves as poor, students have aspirations and hope to break out of poverty when they accomplish their educational goals.

The protection motivation model will also be used among the students to enrich the health belief model. In order to be motivated, one has to be rational about health and behave in a way that will protect one from ill health.

2.10 Conceptual Framework

The flow chart in fig 2.1 shows the links between various factors and health status of Maragua Town Residents. It is based on the theories in the preceding section. The independent variables of the study as shown in the chart are knowledge, practices and perceptions whereas the dependant variable is health status. The intervening variables are water and sanitation use.
It was stipulated that there was an indirect relationship between knowledge and health status through water and sanitation use. Adequate knowledge of health risks of drinking raw water and of correct distance between water and toilet facility would have a positive relationship with the health status of residents. Those residents with proper knowledge of health risks of drinking raw water and on correct distance between water and toilet facility would have better health status.

Also stipulated was the existence of an indirect relationship between practices and health status through water and sanitation use. Practices of water use such as treatment and
method of storing drinking water would have an influence on the health status of the residents. Those residents with correct practices of water treatment and storage would have good health status. Sanitation practices namely, adequate use of toilet facility, washing hands after toilet use and use of open places as toilets would also have a relationship with the health status of the residents. Residents with correct sanitation practices would also have good health status.

It was also expected that there was an indirect relationship between perceptions and health status through water and sanitation use. Perceptions of water use such as adequacy of the amount of water fetched would have an influence on health status. Those residents with positive perceptions of water use would be in a better health status. Sanitation use perceptions such as health risks of baby waste would also have a relationship with the health status of the residents. Residents with positive perceptions on sanitation use would also be in a better health status.

There was, however, a direct relationship between knowledge of safe water and sanitation use and health status of the residents. The more the residents know about proper water and sanitation use, the better should be their health status.

Also expected was a direct relationship between practices related to water and sanitation use and health status of the residents. The better the practices that the residents have about water and sanitation, the better should be their health status.
Similarly, there was an expected direct relationship between perceptions of water and sanitation use and health status of the residents. The better the perceptions that the residents have regarding water and sanitation requirements, the better should be their health status.
CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction
This section discusses the research design and methodology that focuses on nature and sources of data, study population and sample, methods of sampling, sample size, research instruments, methods of data collection, methods of data analysis, and research difficulties.

3.2 Research Design
This study adopted a social survey design which involved systematic gathering of facts about people, especially demographic characteristics, the social environment, activities, opinions or attitudes of some group of people (Moser, 1971). Specifically knowledge, practices and perceptions of safe water and sanitation use and their influence on health status were examined.

3.3 Nature and Sources of Data
The data utilized by the study were both primary and secondary. The primary data was obtained from the respondents in the field through direct interviews, questionnaire administration, observations and photographs. The secondary data was collected from published and unpublished literature such as books, journals, reports, articles, newspapers, magazines and health and water records. The latter included information on reported cases of common water and sanitation related illnesses, their rate and incidence, among others.
3.4 Study Population and Sample

The study population comprised of all the household members: the affluent, middle and low class in the study area. From the above population a sample was drawn and from it, information on knowledge and perceptions on water and sanitation use was obtained. How such knowledge and perceptions affect the health status of those sampled was examined.

Another group from which a sample was drawn was the public health officials at Maragua District Hospital. They provided both primary and secondary information on the common water-related illnesses, their rate and incidence. Alongside the public health officials was the population of heads/proprietors of clinics within Maragua Town. The other population was that of students from both primary and secondary schools.

Women groups also formed a special population of the study. It was necessary to talk to a sub-sample of women because it is women who fetch water for domestic consumption and are concerned with sanitation and waste disposal at the household level. It was important therefore, to find out what they know about water and sanitation use and related illnesses. The other important population was that of the Provincial administrators, especially chiefs and their assistants. Water Officers and leaders of Community Based Organizations (CBOs) were also another population. These people are important, as they are involved in water and sanitation use and management practices.
3.5 Methods of Sampling

Sampling is essential to make social scientific analysis possible. Through sampling, a small representative sample can provide ‘accurate’ data on large populations. In this study, different methods of sampling were adopted. These included purposive, stratified, systematic random, simple random and availability sampling.

3.5.1 Purposive Sampling

In purposive sampling, one has a rational basis to select the sample. This method was used to select the two primary and secondary schools since they are the only schools in the study area. Standard 6 and 7 classes of the two primary schools were purposively selected since the two are senior classes and it was expected that they would have had more understanding of the questions. Standard 8 was exempted because being an examination class it was expected that they would be loaded with other work. Form 3 classes of the two secondary schools were also purposively selected as a senior class and Form 4 exempted for the same reason as Standard 8.

Purposive sampling was also used for the heads/proprietors of private clinics and public health officials, local councilors, leaders of CBOs, the water officials and provincial administrators. In this method anyone who was available, can be reached and was willing to be questioned or interviewed became part of the sample (Harvey and MacDonald 1994).
3.5.2 Simple Random Sampling

In order to select the class that is either standard 6A or 6B for example, simple random method of sampling was used. Simple random sampling involves taking a random sample directly from the population, i.e. each member of a population has an equal chance of being selected (Black, 1994). Papers written 6A and 6B, 7A and 7B and 3A and 3B were neatly folded and put into a basket and then picked randomly.

3.5.3 Systematic Random Sampling

To select the students who constituted the sample group, systematic random sampling was used with the help of a class list where (every k\textsuperscript{th} student) was sampled. Allocated time and funds could not allow every student in the class to form a sample group. As such every student had an equal chance of being selected.

3.5.4 Stratified Random Sampling

Stratified sampling was adopted to focus on households and women groups. The three sample groups of each of the two populations were obtained by stratifying the members into affluent, middle and low class. Stratified random sampling was then carried out to get a sample group from each class since it was not possible to interview everybody due to time limitations. This method consists of taking various strata in society, such as men and women, employed and unemployed etc. Some strata are obviously more relevant than others and thus possible relations were worth investigating, this is actually the result of defining different sub-populations within a larger population (Black, 1994).
3.6 Sample Size

The total population of the study area (Ichagaki and Gakoigoi Locations) is 12,623 people and the total number of households is 3,069 (Kenya 1999). Based on this a sample size of 18% (266) respondents and 15% (46) household heads were utilized. These percentages were found to be adequate since one-tenth of the entire population is appropriate for statistical testing and for making meaningful comparisons (Hammond and McCullagh 1978). Table 3.1 shows the number of respondents from each category.

Table 3.1: Number of Respondents from each Cluster Group

<table>
<thead>
<tr>
<th>Respondents</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Health Officials</td>
<td>10</td>
</tr>
<tr>
<td>Heads/Proprietors of Private Clinics</td>
<td>10</td>
</tr>
<tr>
<td>Students</td>
<td>121</td>
</tr>
<tr>
<td>Women:</td>
<td></td>
</tr>
<tr>
<td>• affluent class</td>
<td>15</td>
</tr>
<tr>
<td>• middle class</td>
<td>15</td>
</tr>
<tr>
<td>• poor class</td>
<td>14</td>
</tr>
<tr>
<td>Households:</td>
<td></td>
</tr>
<tr>
<td>• affluent class</td>
<td>20</td>
</tr>
<tr>
<td>• middle class</td>
<td>13</td>
</tr>
<tr>
<td>• poor class</td>
<td>13</td>
</tr>
<tr>
<td>CBOs</td>
<td>24</td>
</tr>
<tr>
<td>Local Councilors</td>
<td>05</td>
</tr>
<tr>
<td>Provincial Administration</td>
<td>05</td>
</tr>
<tr>
<td>Water Officials</td>
<td>01</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>266</strong></td>
</tr>
</tbody>
</table>

The researcher using observation a guide on obvious conditions of situations for example that of the water source and the toilet facility carried out a total of 46 observations. Photographs were also taken to verify the conditions. It is important to mention here that the stratification of the women groups and households were done on the basis of type of occupation and income level.
3.7 Research Instruments

The following research instruments were used.

3.7.1 Questionnaire

Questionnaires were used among the heads/proprietors of clinics, local councilors, the public health officials, provincial administrators, water officials, community based organization members and students. They contained written questions, which the respondents responded to directly by filling in the answers to the questions asked.

3.7.2 Interview Schedules

For the women and household members, group interview schedules were used. Interviews are advantageous because of face-to-face interpersonal interactions that helped in clarification of issues and enhanced body language readings. This involved the interviewer reading questions to the respondents and then recording the answers.

3.7.3 Observation Sheets

The researcher and her assistant also utilized observation sheets in collecting data on sources of water used for domestic purposes, methods of water treatment and storage. Observation sheets were also used to collect data on availability and conditions of toilet facilities for each household, methods used to dispose off waste water and human waste and all other activities which reflect knowledge, perceptions and practices on water and sanitation use. The information gathered was used to verify the information from the respondents. Photographs for observation were obtained by the use of cameras.
3.8 Methods of Data Collection

The following methods were used for data collection:

3.8.1 Questionnaire Administration

Questionnaires were administered to a sample of the students drawn from the two primary and secondary schools, heads/proprietors of clinics, local councilors, public health officials, provincial administrators, the water officials and leaders of CBOs.

Questionnaires were advantageous as they saved on time and money since the researcher sent them by mail and did not have to be present during the time that the respondents were filling in their answers. Their disadvantage, however, was that clarification of issues could not be made due to absence of the researcher during the filling in of answers.

3.8.2 Interviews

This method of data collection was used to collect data from the 46 households, that is, 13 affluent, 13 middle and 20 low class households. The same method was used in collecting data from 44 women who are members of women’s groups which were stratified into three classes, that is 15 affluent, 15 middle and 14 low.

3.8.3 Observations

In this method, the researcher and her assistant observed all behaviours that reflect knowledge, practices and perceptions on water and sanitation use. This included methods of collection, storage and treatment of water used for human consumption, and excreta
disposal etc. Peil (1982) states that observation increases the range of relevance and reliability of data obtained. In observations, an impression of many aspects of the subjects’ behaviour that could not be contained in a series of questions no matter how well devised is gained.

3.8.4  Review of Documents
This method was used to get documented information relevant to the research. This included reviewed documents on knowledge, perceptions and practices on water and sanitation use and their implications on health status. It also included recorded information on patients’ report on water-related illnesses. This was then used to judge their knowledge and perceptions on safe use of water and sanitation and how these can or do affect their health.

3.9  Methods of Data Analysis
After the data had been collected, it was computer-coded using a codebook that had been developed for this purpose. Quantitative method of data processing and analysis were then used. Quantitative data deals with counts and measures of things and relies heavily on statistical and mathematical techniques to answer questions about social behaviour (Curry, 1999). Quantitative techniques of data presentation were thus used where reasons or factors were clustered and their frequencies counted to see which reasons emerge more frequently. The association or correlation between factors was also determined. The following methods of data analysis were used:
3.9.1 Likert's Method and Possible Statistical Measures

Likert's method was used to measure the resident's knowledge and perceptions towards water and sanitation use. In this method, the informants rate each item on a five-point scale of response i.e. strongly agree (5), agree (4), undecided (3), disagree (2), strongly disagree (1). Scales on two measures can be correlated using Pearson correlation coefficient (r). This is possible because the scales are assumed to be interval in nature.

Where there is an interest in examining differences between groups, and where a dependent variable is measured using a Likert's Scale, an analysis of variance (ANOVA) is possible; and perhaps to find out differences between pairs of groups one can undertake a test of differences between means. All these possibilities were attempted in this study.

Finally, where both the independent variable and dependent variable are measured at nominal scales, $\chi^2$ was used to find if there is a relationship between two variables.

3.9.2 Chi-square

Chi-square was used as a method of data analysis to tell whether two variables have a relationship or not, but not whether the relationship is negative or positive. It was used to measure association between knowledge, perceptions and practices of water and sanitation use on the one hand and health status on the other hand. It is based on absolute cell frequencies (numbers) and not percentages.
Chi-square = \[ \frac{(\text{observed frequency} - \text{expected frequency})^2}{\text{expected frequency}} \]

Chi-square is a simple technique, which works by testing a distribution actually observed in the field against some other distribution determined by null hypothesis (Dey, 1995). Chi-square is, therefore, a measure of the aggregate differences between observed frequencies and those expected under null hypothesis \( (H_0) \), so that the greater its value, the less likely it is that the null hypothesis is correct (Maxwell, 1961). Simple frequencies were then used to categorize variables. In this study, chi-square test was used to find out if there was any significant association between the pair of cross-tabulated variables. The maximum level of significance accepted was 0.05.

3.10 Research Constraints and Limitations

First, the condition of the roads within Maragua town is poor as a result of damages caused by the El-Nino rains. This slowed down movement as some sections of the roads were impassible and vehicles had to diverge along the sides of the roads while trying to avoid the potholes thus consuming a lot of time. Secondly, Maragua is a newly created district and some of the offices had not yet been relocated to Maragua town. The Water and District Commissioners’ offices, for example, are at Kigumo, which is many kilometers away from the study area. A lot of time was thus spent traveling to Kigumo on a road, which was quite busy and very narrow. Thirdly, Maragua District is predominantly inhabited by the Gikuyu ethnic community, hence, the findings of the
study are influenced by Gikuyu culture, especially with regard to perceptions and practices and, therefore, do not apply to other ethnic communities. Fourthly, financial expenses exceeded the allocated funds. Finally, some of the respondents were illiterates and semi-literate. This meant translating their responses from vernacular to English, which may have changed their meaning.

3.11 Research Piloting

Piloting was done to bring out problems that could be put right before the full-scale research was done. It consisted of two stages: the pre-pilot and the complete pilot. The pre-pilot was used to test the adequacy of the questionnaires, interview schedules and the observation sheets. The complete pilot involved a small-scale trial run-through of the entire survey from data collection to analysis to see if it would work and whether the right kind of information was going to be collected. This provided an opportunity to assess the reliability and validity of the survey. The research instruments were found to be adequate and therefore no changes were made.
CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter deals with two sections. The results of the findings of the study are first discussed followed the relationships between the residents' knowledge, practices and perceptions of water and sanitation use and their health status.

4.2 Results

The demographic and socio-economic characteristics of the respondents are first discussed, followed by results of the findings of the residents' knowledge, practices and perceptions of water and sanitation use. The prevailing health conditions of the residents are also discussed.

4.2.1 Demographic and Socio-economic Characteristics of the Respondents

This section discusses gender, age, marital status and the level of income of the sample group.

On gender, the sample consisted of both male and female students and adults. The students were drawn from both secondary and primary schools where 71 were female and 50 male giving a total of 121 students. In the adult sample 7 of the 90 respondents were male and the remaining 83, female. The proportion of female respondents in the adult category was much greater as the questionnaire targeted mainly women from women groups. Furthermore, more women at the household level participated in the interview
schedule as both male and female household heads felt that issues pertaining to water and sanitation use at the domestic level were more of a female domain. 'Women are the main providers of child-care; they prepare the family meals and are responsible for cleanliness in the house and compound. They are nearly always the procurers of water as well as the users' (WHO 1983).

In age, grouping was done for both the student and the adult informants. In the student sub-sample group, two age groups were used as majority of the students from upper primary, 61.9% fell in the age group of 11-15 years and those from secondary school 36.4% fell in the age group of 16-20 years. Nearly two-thirds of the students were, thus, in the age group of 11-15 years old accounting for the primary school students of standard 6 and 7 class followed by slightly more than one-third of age group 16-20 years accounting for the secondary students of form 3 classes.

In the adult sub-sample the ages were put into five groups as adults who are household heads have their ages varying from around 20 years and above to 60 years. Table 4.1 shows the age distribution of adults in five groups.

Table 4.1: Age Distribution of the Adult Respondents

<table>
<thead>
<tr>
<th>Grouped Ages</th>
<th>Number of Adults</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 30 years</td>
<td>20</td>
<td>25.6</td>
</tr>
<tr>
<td>31-40 years</td>
<td>20</td>
<td>25.6</td>
</tr>
<tr>
<td>41-50 years</td>
<td>27</td>
<td>34.6</td>
</tr>
<tr>
<td>51-60 years</td>
<td>7</td>
<td>9.0</td>
</tr>
<tr>
<td>61 years and above</td>
<td>4</td>
<td>5.1</td>
</tr>
<tr>
<td>Total</td>
<td>78</td>
<td>100.0</td>
</tr>
</tbody>
</table>
As shown in Table 4.1, over one-third of the adult informants were in the age group of 41-50 years. The age group of 31-40 years and that of up to 30 years were each represented by one-quarter of the sample group. The age group of 51 years and above was represented by less than one-fifth (13.1%) of the respondents. This shows that most active women and household heads are in ages of less than 51 years as ages of up to 40 years accounted for a little over one-half of the adults sample group.

On economic level, only the adults were sampled both from household and women groups because students cannot be given an economic status on their own since they are dependants. Class was used to stratify the adults on the basis of income level and occupation. The nature of businesses conducted by the women from the three classes varied in that those from high class ran businesses such as flour milling, wholesale shops and supermarkets, those from middle class had businesses such as sale of cereals and retail shops. Those from the low class ran businesses in the open-air market that varied from sale of fruits and vegetables to mobile food kiosks. It was on this basis therefore, that the women groups were stratified into three social classes of occupation type, initial source and amount of capital.

The household stratification was done on the basis of income level. This was done according to the type of house in terms of materials used to construct the house, type of assets such as furniture and number of animals, type of water source and toilet facility. Photographs of the conditions of the water source and toilet facility were taken to verify
the situation. Table 4.2 shows the three socio-economic categories of both women groups and household heads.

Table 4.2: Number of Adults by Social Class.

<table>
<thead>
<tr>
<th>Name of Women Group/Household</th>
<th>Low Class</th>
<th>Middle Class</th>
<th>High Class</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Rurago</td>
<td>14</td>
<td>14</td>
<td>15.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Makia Women</td>
<td>15</td>
<td>15</td>
<td>16.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maragwa Highway</td>
<td></td>
<td>15</td>
<td>15</td>
<td>16.7</td>
<td></td>
</tr>
<tr>
<td>Household</td>
<td>20</td>
<td>13</td>
<td>13</td>
<td>46</td>
<td>51.1</td>
</tr>
<tr>
<td>Total</td>
<td>34</td>
<td>28</td>
<td>28</td>
<td>90</td>
<td>100.0</td>
</tr>
</tbody>
</table>

A slightly higher percentage (37.8%) of those adults sampled belonged to the low socio-economic class followed closely by 31.1% of members of each of the other two classes i.e. middle and low.

On marital status, only the adults were considered since marriage is not expected to be a characteristic of students. As shown in table 4.3, almost four-fifths (80%) of the respondents were married leaving the remaining 20% as unmarried. This shows that majority of the Maragua Town residents are married. Table 4.3 shows the marital status of the respondents.

Table 4.3: Marital Status of the Adult Respondents

<table>
<thead>
<tr>
<th>Marital Status</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Married</td>
<td>18</td>
<td>20.5</td>
</tr>
<tr>
<td>Married</td>
<td>70</td>
<td>79.5</td>
</tr>
<tr>
<td>Total</td>
<td>88</td>
<td>100.0</td>
</tr>
</tbody>
</table>
The next section discusses the knowledge, perceptions and current practices of the residents pertaining to water use.

4.2.2 Knowledge, Practices and Perceptions of Water Use

The variables that were examined in relation to water and sanitation use are; knowledge, perceptions and prevailing practices of the residents. The specific variables that were examined were water sources, water treatment methods, water storage methods, the amount of water fetched on a daily basis, the priorities for which the water is used and the amount of additional water that is needed by the residents for household use.

Each of the above variables was then cross tabulated by experience and frequency of some illnesses in the last six months for students and three months for household members. Table 4.4 shows sources of water for students and the households heads and women groups who were sampled.

Table 4.4: Water Sources for Various Residents

<table>
<thead>
<tr>
<th>Type of Water Source</th>
<th>Students</th>
<th>Students</th>
<th>Households/Women Groups</th>
<th>Household/Women Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Bore-hole</td>
<td>69</td>
<td>28.9</td>
<td>65</td>
<td>33.5</td>
</tr>
<tr>
<td>Rain water</td>
<td>66</td>
<td>27.6</td>
<td>41</td>
<td>21.1</td>
</tr>
<tr>
<td>Tap</td>
<td>49</td>
<td>20.5</td>
<td>39</td>
<td>20.1</td>
</tr>
<tr>
<td>Stream</td>
<td>42</td>
<td>17.6</td>
<td>11</td>
<td>5.7</td>
</tr>
<tr>
<td>Other (buying)</td>
<td>13</td>
<td>5.4</td>
<td>38</td>
<td>19.6</td>
</tr>
<tr>
<td>Total</td>
<td>239</td>
<td>100.0</td>
<td>194</td>
<td>100.0</td>
</tr>
</tbody>
</table>
The most common water source for the residents was borehole followed by rainwater and tap water. Streams also provided water to a good proportion to the students. Purchase of water from vendors was reported by almost one-fifth of the adult sample group but was not common among the student population. It would not be wrong, therefore, to conclude that students are not in a position to afford to buy their water. It was also expected that students fetched most of the water for cleaning and washing and not for direct consumption and thus stream water may be taken to be a good alternative source.

Plate 4.1 shows a polluted well used as a source of water by the residents. Most of the water vendors draw water from this source and hawk it to the town residents. This can be a source of illness caused by pollution from human and animal waste.

Plate 4.1: Polluted Well
Plate 4.2 shows a rainwater storage tank, which is a safe water source as the roof is made of corrugated iron sheets. More than 20% of the students and household members use this method to store their drinking water.

Plate 4.2: Rain Water Storage-Tank

Apart from examining the common water sources for both adults and students, information was solicited about the various kinds of treatment given to the water before it is put into use particularly for direct consumption. Some of the sources from which the residents draw water may be contaminated and therefore proper treatment is essential in order to kill disease-causing organisms. Table 4.5 shows the various methods of water treatment used by the residents.
Table 4.5: Methods of Water Treatment.

<table>
<thead>
<tr>
<th>Method of water treatment</th>
<th>Household heads/women groups</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>%</td>
</tr>
<tr>
<td>Boiling</td>
<td>70</td>
<td>76.1</td>
</tr>
<tr>
<td>Chemical additives</td>
<td>20</td>
<td>21.7</td>
</tr>
<tr>
<td>Filtering</td>
<td>2</td>
<td>2.2</td>
</tr>
<tr>
<td>None</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Total</td>
<td>92</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Boiling is a method of water treatment that was most commonly used by the residents; over three-quarters of the household heads and two-thirds of the students use it. Use of chemical additives was another method used by a slightly larger proportion of students than household heads. Filtering is a method used to treat water that was reported by a very small proportion of the residents. For the student sample group a small proportion reported that they did not treat their drinking water but none of the household heads sampled reported not treating their water.

Having looked at the method used for water treatment, the other important factor examined was the method used to store water by the residents. Water may be given treatment but may get contaminated by inappropriate storage measures such as unclean or uncovered containers and thus become unsafe for human consumption. Table 4.4 gives information about the various methods of water storage used by residents of Maragua.
Table 4.6: Methods of Water Storage.

<table>
<thead>
<tr>
<th>Method of treatment</th>
<th>Students</th>
<th></th>
<th>Household Heads</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>%</td>
<td>Number</td>
</tr>
<tr>
<td>In a bottle</td>
<td>17</td>
<td>14.0</td>
<td>0</td>
</tr>
<tr>
<td>In a covered tank</td>
<td>00</td>
<td>0.0</td>
<td>18</td>
</tr>
<tr>
<td>In a clean closed Jeri can</td>
<td>87</td>
<td>71.9</td>
<td>49</td>
</tr>
<tr>
<td>In an open Jeri can</td>
<td>7</td>
<td>5.8</td>
<td>3</td>
</tr>
<tr>
<td>In an uncovered container</td>
<td>6</td>
<td>5.0</td>
<td>6</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
<td>3.3</td>
<td>14</td>
</tr>
<tr>
<td>Total</td>
<td>121</td>
<td>100.0</td>
<td>90</td>
</tr>
</tbody>
</table>

As shown in Table 4.6, storage of water in a clean closed jerican is the most commonly used method by both the students and members of households. Only the students use bottles for water storage whilst only the household members use covered water tanks. The reason for this difference may be that students find it convenient to carry and store their water in bottles for use in school. It was also noted that most of the schools did not have their water tanks accessible to their students. Many of the households store large quantities of water for multiple uses and thus water tanks are an appropriate method of storage. These findings closely tally with observations made at household level by the investigators during fieldwork.

Another important issue examined was the amount of water collected daily by both the household members and students. Knowledge of the amount of water collected by the residents was important for the researcher in order to determine whether it was enough for the tasks for which it was intended. The amount fetched was grouped in litres in units.
10 for students and units of 50 for households bearing in mind that households require larger quantities of water than individual students. It was observed that nearly 60% of the students fetched less than 21 litres of water per day and slightly less than a third fetched between 21-40 litres. The remaining 10% fetch above 40 litres of water in a day. Among the households members, about one fifth fetched between 1-150 liters and more than 80% fetched above 150 liters. Household heads and women group members therefore fetch plenty of water that stands in sharp contrast to demand for water by students. This was expected as household members fetch water for use by the whole household use while students fetch for individual use.

The amount of water fetched by the students and members of households may or may not be adequate for their use. There was need to find out how much more water informants needed beyond what they were able to fetch. According to WHO "Personal and domestic hygiene requires that sufficient quantities of water be readily available to all members of the community. Within practical limits, when water supply is both abundant and convenient to the users, the opportunities for hygienic personal and domestic practices will be greatly enhanced and health benefits can be realized" (WHO 1983: 25). Above 90% of the students responded that the amount of water they fetched met their needs. As expected households and women groups members required plenty of water on a daily basis to adequately meet their water needs.

Table 4.7 presents information on more water that household heads and women group members stated that they need daily.
Table 4.7: Amount of More Water Needed Daily

<table>
<thead>
<tr>
<th>Amount in Litres</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-100</td>
<td>19</td>
<td>21.1</td>
</tr>
<tr>
<td>101-200</td>
<td>18</td>
<td>20.0</td>
</tr>
<tr>
<td>200 and above</td>
<td>7</td>
<td>7.8</td>
</tr>
<tr>
<td>Do not need more</td>
<td>46</td>
<td>51.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>90</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

As shown in Table 4.7 about one half of the household heads reported that they were satisfied with the amount of water that they fetched while the remaining 49% reported that they required more water in order to meet their daily needs. A large proportion reported that they needed between 1-200 more liters daily.

The study also investigated the tasks for which both the household members and students use water, which may be related to the levels of their water needs. The tasks were classified into use for personal hygiene such as bathing and washing clothes, use related to environmental hygiene/sanitation such as flushing of toilet and cleaning of houses and uses related to direct consumption of water such as cooking and drinking. Table 4.8 shows the tasks requiring use of water that are performed by the household heads, women groups and students.
Table 4.8: Tasks which Require Use of Water

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Household heads/Women groups</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>%</td>
</tr>
<tr>
<td>Bathing</td>
<td>82</td>
<td>21.1</td>
</tr>
<tr>
<td>Washing clothes</td>
<td>89</td>
<td>22.9</td>
</tr>
<tr>
<td>Cleaning house/school</td>
<td>56</td>
<td>14.4</td>
</tr>
<tr>
<td>Irrigation</td>
<td>6</td>
<td>1.5</td>
</tr>
<tr>
<td>Cooking</td>
<td>90</td>
<td>23.2</td>
</tr>
<tr>
<td>Drinking</td>
<td>63</td>
<td>16.2</td>
</tr>
<tr>
<td>Flushing toilet</td>
<td>2</td>
<td>0.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>388</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Almost half of the water fetched by students (49.7%) and by adults (44%) was used for personal hygiene. Less than 20% of both household heads and students used the water for environmental hygiene and sanitation. Close to 40% of the household heads and women group members used water for direct consumption (drinking and cooking). Only around 30% of the student informants stated that they use water fetched for direct consumption. As expected the household members used more water for direct consumption than the students.

The informants were also asked to list the tasks for which they used water in order of importance. The interest was to find out whether uses of water for personal hygiene rate highly. Table 4.9 presents information on the use of water according to importance.
Table 4.9: Rating of Purposes for Water Use

<table>
<thead>
<tr>
<th>TASKS</th>
<th>Households/Women groups</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>%</td>
</tr>
<tr>
<td>Cooking</td>
<td>84</td>
<td>27.8</td>
</tr>
<tr>
<td>Drinking</td>
<td>52</td>
<td>17.2</td>
</tr>
<tr>
<td>Washing clothes</td>
<td>72</td>
<td>23.8</td>
</tr>
<tr>
<td>Bathing</td>
<td>67</td>
<td>22.2</td>
</tr>
<tr>
<td>Cleaning house/school</td>
<td>22</td>
<td>7.3</td>
</tr>
<tr>
<td>Flushing toilet</td>
<td>2</td>
<td>0.7</td>
</tr>
<tr>
<td>Irrigation</td>
<td>3</td>
<td>1.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>302</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

As reflected in Table 4.9, cooking was the most important task for which water is used for the household and women group members. Cooking is more of a household activity and thus its importance to members of households. Bathing, a matter of personal hygiene took up most of the water fetched by students, as it is an issue more stressed at the school level. Issues of environmental hygiene such as cleaning the house/school and flushing of toilet were ranked low with less than 10% of both the household members and students reporting them as tasks for which they use water.

In sum, examination of factors related to water use has revealed that:

- Borehole is the main water source for the Maragua residents. Streams provide water to a good proportion of the students and purchase from vendors is an important source of water for household heads and women groups.
Plate 4.3 shows a borehole, which is the main source of water used by Maragua town residents.

Plate 4.3: Borehole

- Boiling is a method of water treatment used by most Maragua residents.
- Majority of the residents store their drinking water in closed Jeri cans.
- Students fetch relatively fewer liters of water as compared to adults.
- About one half of the adults sampled require more water in order to meet their daily needs.
- Over 40% of the adult and student informants used water for personal hygiene and more adults used water direct consumption.
- Cooking and drinking are additional important tasks for which adults fetch water compared to students.
4.2.3 Knowledge, Practices and Perceptions of Sanitation Use

Water and sanitation use are issues that go hand in hand where health of the people is concerned. Water and human excreta are prominent factors in the transmission of most of the serious diseases of developing world (Jones 1983). Sanitary disposal of human wastes is generally necessary if contamination of water and food is to be eliminated and if people are to avoid direct contact with disease- producing organisms. In tropical areas where conditions for multiplication of these organisms are ideal, good personal and household hygiene are critical to control of disease. 'The methods by which people dispose of excreta and the facilities they use for this purpose have a profound effect on their health. Nearly all the diseases that are related to water supply have in fact a much stronger relationship to the unsanitary disposal of excreta coupled with inadequate personal hygiene. In communities where the fecal-oral diseases are a health problem, an intervention to improve excreta disposal facilities will have a high potential for achieving benefits to health' (WHO 1983).

This section discusses issues related to sanitation use that were examined in terms of the prevailing practices by the residents. The specific variables that were examined were; the type and condition of the toilet facility available, the distance between the toilet facility and the water source, the number of times in a week that the toilet is disinfected, the type of disinfectant used, frequency of use of toilet facility by household members, frequency of washing hands after use of toilet and methods used to dispose of baby waste and other sanitary waste.
Each of the specific variables were examined and explained in relation to the experience and frequency of some water and sanitation-related illnesses, at the last six months for the students and at the last three months for household members.

A survey on the types of toilet facility available to the students, household heads and women groups who were sampled was carried out and the following conclusions made.

Over 90% of the students sampled reported that the pit latrine is the toilet facility available to them while the rest reported that they use the flush toilet. For the household heads and women groups sampled, 77% gave pit latrine as their available toilet facility while the rest reported that they use the flush toilet the VIP latrine.

Observations made by the investigator tally with the above findings as three quarters of the residents use the pit latrine and the rest use either the VIP Latrine or the flush toilet. Plate 4.4 shows a VIP latrine a toilet type used by a very small fraction of the residents.

Plate 4.4: VIP Latrine
Plate 4.5 shows a pit latrine, a common toilet facility to the residents. It is important to note that the toilet facility has been built too close to the house.

Plate 4.5: Pit Latrine

The other sanitation issue that was examined was the distance between water source and toilet facility. As cited in the literature review, "water supplies and sanitation are not always mutually beneficial. On-site sanitation can pollute local ground water and contaminate on-site water supplies." Thus it is important that the distance between water source and toilet facility be at least 300 meters. A survey on the distances between the two facilities was carried out among the students and adult population. Table 4.10 gives information on various responses given by the sample groups.
Table 4.10: Distance between Water Source and Toilet Facility

<table>
<thead>
<tr>
<th>Distance</th>
<th>Students</th>
<th>Household heads/women groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Less than 300 mts</td>
<td>79</td>
<td>65.3</td>
</tr>
<tr>
<td>300 mts-1km</td>
<td>24</td>
<td>19.8</td>
</tr>
<tr>
<td>1 km -1.5 kms</td>
<td>11</td>
<td>9.1</td>
</tr>
<tr>
<td>More than1.5 kms</td>
<td>7</td>
<td>5.8</td>
</tr>
<tr>
<td>Total</td>
<td>121</td>
<td>100.0</td>
</tr>
</tbody>
</table>

As observed in the above table almost two-thirds of the students have the distance between their water source and toilet facility less than 300 meters. The remaining one-third of the students has the distance between the two facilities more than 300 meters. For the household heads and women group members, slightly less than one half of this population have the two facilities at a distance less than 300 meters. The remaining more than a half reported that they have the two facilities at a distance greater than 300 meters.

It can thus be concluded that a large proportion of the respondents have the distance between the toilet facility and water source at less than 300 meters and are at risk of getting their water contaminated by toilet waste and likely to suffer water and sanitation illnesses.

Observations made by the investigator on distance at household level reveal that one third of the residents have the distance between the two facilities at less than 300 meters while two thirds at more than 300 meters.

The other variable examined in relation to sanitation use was the frequency of use of toilet facilities by the various residents. Availability of toilet facility goes hand in hand
with its adequate use. Inadequate use such as using it only sometimes may pose a danger to the health of the residents. Table 4.11 gives an account of frequency of use of toilet facilities by the residents, both students and adults.

Table 4.11: Frequency of Use of Toilet Facility

<table>
<thead>
<tr>
<th>Frequency of Toilet use</th>
<th>Students No.</th>
<th>%</th>
<th>Women Groups/Household heads No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Always</td>
<td>95</td>
<td>78.5</td>
<td>61</td>
<td>67.8</td>
</tr>
<tr>
<td>Most of the time</td>
<td>10</td>
<td>8.3</td>
<td>17</td>
<td>18.9</td>
</tr>
<tr>
<td>Sometimes</td>
<td>14</td>
<td>11.6</td>
<td>10</td>
<td>11.1</td>
</tr>
<tr>
<td>Rarely</td>
<td>1</td>
<td>0.8</td>
<td>1</td>
<td>1.1</td>
</tr>
<tr>
<td>Never use at all</td>
<td>1</td>
<td>0.8</td>
<td>1</td>
<td>1.1</td>
</tr>
<tr>
<td>Total</td>
<td>121</td>
<td>100.0</td>
<td>90</td>
<td>100.0</td>
</tr>
</tbody>
</table>

As revealed by the table, over three-quarters of the students always make adequate use of the toilet facility and at least two-thirds of the household heads and women groups also use their toilet facilities adequately. It can be concluded that the remaining slightly less than one-quarter of the students and slightly less than one-third of the adults who do not make adequate use of toilet facilities are a danger to the health of the residents.

Alongside adequate use of toilet facilities, the researcher examined cleaning and disinfecting of the facility as another variable. Lack of proper hygiene standards such as not cleaning and disinfecting the toilet facility can cause environmental health hazard and risk to the residents. The adult respondents were required to state the number of times in a week that they clean and disinfect their toilet facilities. Only the adults were required to respond to this issue, as it is more of a domestic task. The students may be the ones...
cleaning their toilet but disinfecting may be more of an administrative affair as there is subordinate staff employed to carry out this task. Table 4.12 gives a distribution of the frequency of cleaning of toilet facility on weekly basis for the household members and women groups.

Table 4.12: Frequency of Cleaning the Toilet Facility

<table>
<thead>
<tr>
<th>Number of Times</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>2</td>
<td>2.2</td>
</tr>
<tr>
<td>Once</td>
<td>17</td>
<td>18.9</td>
</tr>
<tr>
<td>Twice</td>
<td>14</td>
<td>15.6</td>
</tr>
<tr>
<td>3-6 Times</td>
<td>21</td>
<td>23.3</td>
</tr>
<tr>
<td>7 Times and Above</td>
<td>34</td>
<td>37.8</td>
</tr>
<tr>
<td>No Response</td>
<td>2</td>
<td>2.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>90</td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

As revealed in Table 4.12 slightly over one-third of the adults population sampled clean and disinfect their toilets 7 or more times within a period of one week. Almost 40% clean and disinfect their toilets 2-6 times in a week. Slightly more than one-fifth of the proportion sampled, clean and disinfect their toilet only once a week or never at all. Only 2.2% of the respondents did not respond to this question. The respondents reported that they use ash and old torch cells to disinfect their pit latrines. According to the observations of the investigator a half of the toilets observed were clean, one-third, not clean and the remaining few very dirty.

Another important variable examined was the use of open places as toilet facilities by children of households and of women group members. It was observed that almost three-quarters of the children never used open places as toilet facilities. The remaining one-
quarter reported that they had their children use open places as toilet facilities always, most of the time or some of the time. A small fraction reported that they did not have knowledge of their children using open places as toilets.

Another practice investigated was washing of hands after use of toilet with clean water and soap so as to kill disease-causing organisms. Both the students, the household heads and the women group members were required to give information on frequency of their washing hands after toilet use. Table 4.13 gives a distribution of frequency of washing hands after use of toilet.

<table>
<thead>
<tr>
<th>Frequency of washing hands</th>
<th>Students No.</th>
<th>%</th>
<th>Households/Women Groups No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Always</td>
<td>81</td>
<td>66.9</td>
<td>37</td>
<td>41.1</td>
</tr>
<tr>
<td>Often</td>
<td>13</td>
<td>10.7</td>
<td>27</td>
<td>30.0</td>
</tr>
<tr>
<td>Sometimes</td>
<td>22</td>
<td>18.2</td>
<td>19</td>
<td>21.1</td>
</tr>
<tr>
<td>Rarely</td>
<td>5</td>
<td>4.1</td>
<td>1</td>
<td>1.1</td>
</tr>
<tr>
<td>Never</td>
<td>0</td>
<td>0.0</td>
<td>1</td>
<td>1.1</td>
</tr>
<tr>
<td>Do not know</td>
<td>0</td>
<td>0.0</td>
<td>5</td>
<td>5.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>121</strong></td>
<td><strong>100.0</strong></td>
<td><strong>90</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Over three-quarters of the students reported that they always or often washed their hands after toilet use and slightly below the same fraction of the adults reported the same. Slightly more than one-fifth of both sample groups reported that they sometimes or rarely washed their hands after use of toilet. A small proportion of the adults reported that they never washed their hands or did not know whether they washed them. No students reported not washing or not knowing whether they washed their hands after use of toilet.
It is important to mention that students are more conscious of importance of washing hands after use of toilet being an issue of personal hygiene that is stressed in the school curriculum. Schools should always be provided with adequate sanitary facilities so that both pupils and teachers can follow hygiene practices. Literacy and education are important for creating a broadened understanding of health and also increase the range of technologies for transmitting health education messages. In general water supply and sanitation improvements will yield greater health benefits in literate communities than they will where the literacy rate is low (WHO 1983). Adults may not always wash their hands after toilet use as most of them are away from water sources during the day such as at open-air markets.

Having examined all the variables related to sanitation use the findings reveal that:

- Pit latrine was the most common type of toilet facility available to the residents. A small percent used the flush toilet.

- The distance between the toilet facility and water source for almost a half of the residents was less than 300 mts.

- A large proportion, 75% of the students and two-thirds of the adults made adequate use of toilet facility.

- Over one-third of the adults sampled cleaned and disinfected their toilet facility seven or more times in a period of one week.

- A fraction of three-quarters of the household members and women group members' children never used open places as toilet facilities.

- More students than adults washed their hands after use of toilet.
Having examined the variables on sanitation, the next issue of interest was that of the health status of the residents. The intention was to link use of water and sanitation to health status.

4.2.4 Water and Sanitation Use and Health Status

This study was concerned with finding out the relationship between knowledge and perceptions of water and sanitation use of Maragua residents and their health status. The relationship between prevailing practices regarding water and sanitation use on the one hand and health status of the Maragua residents on the other hand was also examined.

The first issue that was investigated was common illnesses that the residents experienced. The duration for illnesses experienced by the respondents themselves was pegged at the last six months, which was regarded as long enough to capture the prevailing illness trends. Table 4.14 gives information on household heads reporting various illnesses for themselves in the last six months.

<table>
<thead>
<tr>
<th>Type of Illness</th>
<th>Once</th>
<th>Twice</th>
<th>Thrice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diarrhea</td>
<td>08.9</td>
<td>03.3</td>
<td>05.6</td>
</tr>
<tr>
<td>Skin Disease</td>
<td>07.8</td>
<td>01.1</td>
<td>04.4</td>
</tr>
<tr>
<td>Dysentery</td>
<td>02.2</td>
<td>01.1</td>
<td>00.0</td>
</tr>
<tr>
<td>Stomachache</td>
<td>12.2</td>
<td>03.3</td>
<td>15.6</td>
</tr>
<tr>
<td>Malaria</td>
<td>31.2</td>
<td>12.2</td>
<td>18.9</td>
</tr>
<tr>
<td>Typhoid</td>
<td>28.9</td>
<td>10.0</td>
<td>15.6</td>
</tr>
</tbody>
</table>

The most commonly reported illness by household heads was malaria, followed by typhoid. Others were stomachache followed by diarrhea, skin diseases and dysentery.
Examined also were the common illnesses experienced by members of households and the duration of illnesses was pegged at the last three months, which was regarded as not too long enough for the household heads to have forgotten since they were reporting for others (members of households) and also long enough to capture the prevailing illness trends. Table 4.15 gives a distribution of heads reporting illnesses for members of their households in the last three months.

Table 4.15: Household Heads Reporting Illnesses for Members (%) (N= 90)

<table>
<thead>
<tr>
<th>Type of Illness</th>
<th>Once</th>
<th>Twice</th>
<th>Thrice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diarrhea</td>
<td>07.8</td>
<td>02.2</td>
<td>07.8</td>
</tr>
<tr>
<td>Measles</td>
<td>01.1</td>
<td>00.0</td>
<td>00.0</td>
</tr>
<tr>
<td>Skin Disease</td>
<td>15.6</td>
<td>02.2</td>
<td>02.2</td>
</tr>
<tr>
<td>Dysentery</td>
<td>02.2</td>
<td>00.0</td>
<td>03.3</td>
</tr>
<tr>
<td>Stomachache</td>
<td>13.3</td>
<td>02.2</td>
<td>15.6</td>
</tr>
<tr>
<td>Malaria</td>
<td>25.6</td>
<td>08.9</td>
<td>18.9</td>
</tr>
<tr>
<td>Typhoid</td>
<td>24.4</td>
<td>05.6</td>
<td>16.7</td>
</tr>
</tbody>
</table>

Malaria is still the most frequently reported illness followed by typhoid. Small proportions of household heads reported skin disease, stomachache and diarrhea. Dysentery and measles were illnesses reported by very small proportion of the household heads. The students were also required to report the various illnesses that they had suffered in the previous six months. Table 4.16 presents information of various illnesses suffered by students in the last six months.
Table 4.16: Students Reporting Various Illnesses for Themselves (%) (N=121)

<table>
<thead>
<tr>
<th>Type of Illness</th>
<th>Proportion Reporting %</th>
<th>(N=121)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diarrhea</td>
<td>22.3</td>
<td>027</td>
</tr>
<tr>
<td>Measles</td>
<td>02.5</td>
<td>003</td>
</tr>
<tr>
<td>Cholera</td>
<td>04.1</td>
<td>005</td>
</tr>
<tr>
<td>Skin Disease</td>
<td>11.6</td>
<td>014</td>
</tr>
<tr>
<td>Dysentery</td>
<td>03.3</td>
<td>004</td>
</tr>
<tr>
<td>Stomachache</td>
<td>77.7</td>
<td>094</td>
</tr>
<tr>
<td>Malaria</td>
<td>57.9</td>
<td>070</td>
</tr>
<tr>
<td>Typhoid</td>
<td>51.2</td>
<td>061</td>
</tr>
</tbody>
</table>

As shown in Table 4.16, among the student population, stomachache, malaria and typhoid were reported to have high incidence rate. Other common illnesses reported by small proportions were diarrhea, skin problems, cholera, dysentery and measles.

According to the health officials, the disease with the highest rate of incidence is typhoid, 65% followed by malaria, 25%, and 5% for both diarrhea, and intestinal worms.

Having examined the factors related to health status, the findings reveal that:

- Malaria is most frequently reported illness closely followed by typhoid for households and women group members.
- Stomachache is most common among students followed by malaria and typhoid.

4.3 Discussions

In this section, relationships between various variables studied are examined. The variables are knowledge, practices and perceptions of water and sanitation use and their relationship to health status. Variables of water use are discussed separately from those of sanitation use. Typhoid, diarrhea, stomachache and skin infection are illnesses that result
from the consumption or use of raw water and poor sanitation practices and are therefore singed out for investigation.

4.3.1 The Influence of Water Use Knowledge on Health Status

According to the first hypothesis stated in Chapter 1, "Those respondents with better knowledge of safe use of water and sanitation will have better health status." The first component of this hypothesis was tested to show the relationship between the residents' knowledge of safe water use and their health status. Diarrhoea was the first illness tested in relation to water use knowledge among the household members and student informants.

4.3.1.1 Knowledge of Risks of Drinking Raw Water and Diarrhoea among Household Members

The relationship between knowledge of risks of drinking raw water and frequency of experiencing diarrhoea among the household members was not significant, ($\chi^2 = 1.08$, DF = 3, p < 0.78)

The result showed that knowledge about risks of drinking raw water did not influence the frequency of experiencing diarrhoea among household members. Those in the know of risks related to drinking raw water in fact experienced diarrhoea more often. It could be that those household members who reported that they had the knowledge on risks of drinking raw water and whose household members experienced diarrhoea had another
cause for their illness such as consumption of contaminated food which is also a major source of infection as reported by UNICEF (1990).

4.3.1.2 Knowledge of Risks of Drinking Raw Water and Diarrhoea among Students

On the relationship between knowledge of risks of drinking raw water and frequency of experiencing diarrhea among the students, results in Table 4.17 show that there was a significant statistical relationship ($\chi^2=13.7, df=3$ and $p <0.01$).

Table 4.17: Knowledge of Risks of Drinking Raw Water by Diarrhoea

<table>
<thead>
<tr>
<th>Knowledge of Risks</th>
<th>Frequency of Diarrhea in the Last Six Months</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Once</td>
</tr>
<tr>
<td>Yes</td>
<td>32 (38.1)</td>
</tr>
<tr>
<td>No</td>
<td>04 (12.5)</td>
</tr>
<tr>
<td>Total</td>
<td>36</td>
</tr>
</tbody>
</table>

$\chi^2=13.7, DF=3$ and $p <0.01$

Slightly less than three quarters of the 116 students who responded to the question on water use and illness, reported that they had the knowledge that drinking raw water is risky to health while the rest reported that they did not have the knowledge. More than two thirds of those students who reported that they had knowledge of such risks reported that they had experienced diarrhea once, twice or thrice in the last six months, while the rest reported that they had not experienced diarrhea. Among those who reported that they did not know risks linked to drinking raw water, nearly one third reported that they had experienced diarrhea once, twice or thrice, while the remaining 65.6% reported that they had not experienced diarrhea.
The results show that knowledge of risks of drinking raw water is not positively related to frequency of experiencing diarrhea among the students as a high percentage (71.1%) of those students who had knowledge on risks of drinking raw water experienced diarrhea while only a small percentage (34.4%) of those who lacked such knowledge experienced diarrhea. Probably those students who reported that they had knowledge of health risks of drinking raw water and experienced diarrhea had other causes for their illness. The second illness that was examined in relation to water use knowledge was typhoid among the household members and the student informants.

4.3.1.3 Knowledge of Risks of Drinking Raw Water and Typhoid Infection among Household Members

The results of the survey found no significant relationship between knowledge of risks of drinking raw water and frequency of typhoid infections among the household members. A little over three quarters of the 79 household heads that responded to this question reported that they had the knowledge of risks drinking raw water. Some 20% reported that they did not have such knowledge. The surprising result was that many members in households where heads had knowledge of risks of drinking raw water (61.9%) and also in households whose heads lacked such knowledge (56.4%) experienced typhoid.

The result indicates that knowledge of risks of drinking raw water does not influence frequency of experiencing typhoid. It may be that those heads that have knowledge and whose household members experienced typhoid had other causes for their ill health such as poor storage of drinking water. Typhoid could have occurred from drinking raw water
in household whose heads did not perceive such water as risky to health. Typhoid infection also occurs as a result of washing foods with contaminated water UNICEF (1990).

4.3.1.4 Knowledge of Risks of Drinking Raw Water and Typhoid Infection among Students

Knowledge of risks of drinking raw water and frequency of experiencing typhoid among the students were not significantly related ($\chi^2 = 2.9$ df=3 $p<0.4$).

Among the 116 students who responded to this question, slightly less than three quarters of them reported that they knew of risks of drinking raw water while the rest reported that they did not know. About one half of those students who reported that they had knowledge of risks of drinking raw water and their colleagues who did not know reported that they had experienced typhoid once, twice or thrice in the last three months. Thus, knowledge of risks from drinking raw water or lack of such knowledge was not useful in the prevention of typhoid infection. Possibly those students who reported that they knew of risks of drinking raw water and who experienced typhoid were infected through other means such as eating unwashed fruits or washing hands with contaminated water. For those students who reported that they did not have the knowledge of health risks of drinking raw water and who experienced typhoid, careless use of contaminated water was the most likely source of their illness. Stomachache was the next illness examined in relation to water use knowledge among the household members and student informants.
4.3.1.5 Knowledge of Risks of Drinking Raw Water and Stomachache among Household Members

The relationship between knowledge of risks of drinking raw water and the frequency of stomachache for the household members was also examined. The results showed that there was no significant relationship ($\chi^2 = 7.06$, DF= 3, p<0.06).

A total of 61 household heads responded to this question and surprisingly 54(88%) did not know risks related to drinking raw water. Fortunately, only one third of these 54 household heads (18 household heads) reported cases of stomachache among their household members. This contrasts with two household heads who had knowledge of risks that can arise from drinking raw water and who reported cases of stomachache from their dependants.

These results indicate that while knowledge of risks associated with drinking raw water leads to less risks of experiencing stomachache than lack of such knowledge, the differences are not really important.

4.3.1.6 Knowledge of Risks of Drinking Raw Water and Stomachache among Students

The results on the relationship between knowledge of risks of drinking raw water and frequency of experiencing stomachache for the students sample group showed that there was no significant relationship ($\chi^2 = 2.24$, DF= 4, p<0.69).
Eighty-nine students (75%) of the 118 students who responded to this question reported that they knew of risks of drinking raw water while the remaining 29 reported that they do not know. Nonetheless, about 88% of the students who were knowledgeable and an equal proportion of those who lacked such knowledge reported that they had experienced stomachache once, twice or thrice in the last six months. Probably students who had the knowledge of risks of drinking raw water still drank it without giving it any treatment and hence their stomachache experience. It could also be that the students experienced stomachache due to infection from other sources such as consumption of contaminated food, food allergies or indigestion which are reported as other causes by WHO (1983).

Skin ailments were lastly examined in relation to water use knowledge among the household members and student informants.

4.3.1.7 Knowledge of Risks of Drinking Raw Water and Skin Infections among Household Members

Knowledge of risks of drinking raw water and frequency of experiencing skin ailments among the household members were not significantly related ($\chi^2 = 1.07$, DF= 3, p<0.78).

Sixty two (78%) of the 79 household heads interviewed reported that they knew of risks of drinking raw water while remaining did not know. A larger proportion of household heads who did not know about risks linked to use of raw water (80%) than those who knew (75%) reported absence of skin ailments among their household members. It is important to note that there was a larger percentage of household heads who knew risks
linked to raw water attributing skin ailments in their households to water than their colleagues without such knowledge. Thus, knowledge of risks of drinking raw water influences judgment about sources of skin ailments when experienced in households.

4.3.1.8 Knowledge of Risks of Drinking Raw Water and Skin Infections among Students

An examination of the relationship between knowledge of risks of drinking raw water and frequency of experiencing skin ailments among the students revealed lack of any significant relationship.

A total of 114 students responded to this question and 83 of these (73%) knew of risks of drinking raw water while the remaining 31 reported that they did not know. An equal percentage of about 87% of both types of student informants did not experience any skin ailments in the last six months. This confirms lack of relationship between water and skin infections. Apparently a large number of Maragua residents do not associate skin ailments as arising from use of contaminated water, a view that has some merit.

The next section presents results on knowledge of sanitation use and its influence on health status.

4.3.2 The Influence of Sanitation Use Knowledge on Health Status

The second component of the first hypothesis was tested to show the relationship between the residents’ knowledge of sanitation use and their health status. Only the household heads and women group members were expected to respond to this question
since they are the ones concerned with the construction of the toilet facility within the home. Standard recommendations for the distance between toilet and water facility is at least 300 meters (Winblad and Kilama, 1980). In this respect the high typhoid prevalence for those whose two facilities are at a distance of less than 300 meters is expected.

4.3.2.1 Knowledge of Correct Distance between Water and Toilet Facility and Typhoid Infection

On the relationship between knowledge of recommended distance between toilet and water facility and frequency of experiencing typhoid among the household members, results in Table 4.18 show that there was a significant statistical relationship ($\chi^2=12.9, df=3$ and $p<0.01$).

<table>
<thead>
<tr>
<th>Know Correct Distance</th>
<th>Whether Have Had Typhoid</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Know</td>
<td>26 (54.2)</td>
<td>22 (45.8)</td>
</tr>
<tr>
<td>Do not know</td>
<td>23 (71.9)</td>
<td>9 (28.1)</td>
</tr>
<tr>
<td>Total</td>
<td>49</td>
<td>31</td>
</tr>
</tbody>
</table>

$\chi^2=12.9, DF=3$ and $p<0.01$

The responses came from the household heads and women group members who were asked of knowledge of the correct distance between their toilet and water facility. Out of the 80 who responded, three fifths gave the distance between their two facilities to be more than 300 meters. The remaining 32 gave it incorrectly as less than 300 meters. Out of the 32 household heads that gave the distance between the two facilities as less than
300 meters, nearly three quarters reported that their household members had experienced typhoid in the last three months.

Among those household heads who gave the correct distance, a little over one half reported experience of typhoid by their household members in the last three months. These results show that knowledge of correct distance between toilet and water facility reduces risk of typhoid infection. Infection rate is higher (71.9%) among those residents whose distance between the two facilities is less than 300 meters compared to those whose distance between the two facilities is more than 300 meters (infection rate of 54.2%). It may be that those residents who have knowledge about the importance of a safe distance between water and toilet facility also have more knowledge about hygienic issues related to water. It is this more knowledge that can explain why fewer of them are infected by typhoid than their colleagues with less knowledge. Knowledge of correct distance between the two facilities was also examined in relation to experience of diarrhea.

4.3.2.2 Knowledge of Correct Distance Between Water and Toilet Facility and Diarrhoea

The results show that there was no significant relationship between knowledge of recommended distance between water and toilet facility and experience of diarrhea among the household members ($\chi^2 = 2.99, \text{DF}=3, p<0.39$).
Out of the 82 household heads who responded to this question, about 49 (60%) reported that the distance between their toilet and water facility was more than 300 meters while the remaining 33 (40%) reported that the distance between their two facilities was less than 300 meters. Eighty-one percent of the former reported that their household members had not experienced diarrhoea in the last three months. On the other hand about 25 (75.8%) of the latter type of household members had not experienced diarrhoea in the last three months.

Thus knowledge of correct distance between toilet and water facility is not directly related to diarrhoeal infection. It may be that those household members whose distance between the two facilities is more than 300 meters and who still experienced diarrhoea were infected from other sources such as food poisoning. Knowledge of correct distance between the two facilities was also examined in relation to the experience of stomachache.

4.3.2.3 Knowledge of Correct Distance Between Water and Toilet Facility and Stomachache

An examination of the results showed that there was no significant relationship between knowledge of recommended distance between toilet and water facility and experience of stomachache among the household members ($\chi^2 = 4.09, DF=3, p<0.25$).

Forty-eight (60%) of the 80 household heads who responded to this question reported that their water and toilet facility were at a distance of more than 300 meters while the
remaining 32 reported that their two facilities were at a distance of less than 300 meters. Fourteen (39%) of those household heads who reported that their two facilities were at a distance of more than 300 meters stated that their household members experienced stomachache in the last three months. Sixteen (50%) of those household heads who reported that their toilet and water facility was at a distance of less than 300 meters reported that their household members experienced stomachache.

It is important to note that there were fewer cases of stomachache among the household members whose heads had knowledge of correct distance between the two facilities than among household members whose heads lacked such knowledge. Therefore knowledge of correct distance between water and toilet facility is important to experience of stomachache. Possibly those household members who experienced stomachache in spite of their two facilities being correctly spaced had other causes for their stomachache such as food poisoning or indigestion.

The next section examines the relationship between knowledge of correct distance between water and toilet facility and experience of skin infections.

### 4.3.2.4 Knowledge of Correct Distance Between Water and Toilet Facility and Skin Infections

The results of the survey found no significant relationship between the knowledge of correct distance between the toilet and water facility and the experience of skin ailments among the household members ($\chi^2 = 5.55, \text{ DF}= 3, \text{ p}<0.14$).
Forty-nine (62%) of the 79 heads of households who responded to this question reported that the distance between their toilet and water facility was more than 300 meters while the remaining 30 stated that their two facilities were at a distance of less than 300 meters. Sixteen (32.7%) of those who reported a distance of more than 300 meters between the two facilities disclosed that their household members experienced any skin ailment. Only 3 (10%) of those household heads who reported that the distance between their toilet and water facility was less than 300 meters reported that their household members experienced skin ailments.

These results show that knowledge of correct distance between toilet and water facility or lack of such knowledge was not related to skin infection. Possibly those household members who experienced skin diseases in spite of their two facilities being correctly spaced had other sources of their skin infection such as contact with contaminated water or allergic reactions to some materials. Water use practices and their relationship to health status are examined in the next section.

4.3.3 The Influence of Water Use Practices on Health Status

The second hypothesis of the study was: “Those respondents with better practices of safe use of water and sanitation will have better health status.”

This hypothesis was partly tested by showing the relationship between the residents’ practices of water use and their health status. The first water use practice considered was
treatment of drinking water and both students and household heads were expected to respond. Treatment of drinking water helps to kill disease-causing organisms as reported by Briscoe et al (1986). Frequency of typhoid experience was first examined in relation to treatment of drinking water.

4.3.3.1 Treatment of Drinking Water and Typhoid among Household Members

Results in Table 4.19 show that there was a significant statistical relationship between treatment of drinking water and frequency of experiencing typhoid infections among the household members ($\chi^2 = 7.8, df=3$ and $p<0.05$).

Table 4.19: Treatment of Drinking Water by Frequency of Typhoid Infection Among Household Members

<table>
<thead>
<tr>
<th>Whether Treat Drinking Water</th>
<th>Frequency of Typhoid Infection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Once</td>
</tr>
<tr>
<td>Yes</td>
<td>20 (40.0)</td>
</tr>
<tr>
<td>No</td>
<td>02 (18.2)</td>
</tr>
<tr>
<td>Total</td>
<td>22</td>
</tr>
</tbody>
</table>

$\chi^2 = 7.8, DF=3$ and $p<0.05$

Among the 61 household heads who responded to this question, a little more than four fifths reported that they treated their drinking water while the remaining indicated that they did not treat their drinking water. Out of those heads of households who treated their drinking water, slightly more than 75 percent reported that their household members experienced typhoid once, twice or thrice in the last three months. Slightly more than one
third (36.4%) of household heads that did not treat drinking water reported that their household members had experienced typhoid once or thrice in the last three months.

The results show that treatment of drinking water is unrelated to the frequency of experiencing typhoid among the household members. It could be possible that those household heads who treated their drinking water and whose household members still experienced typhoid were infected from other sources such as eating of unwashed fruits or using contaminated water to wash their hands.

The next section examines the relationship between treating drinking water and typhoid infection among students sub-sample.

4.3.3.2 Treatment of Drinking Water and Typhoid Infection among Students

An examination of the relationship between treatment of drinking water and frequency of experiencing typhoid among students showed that there was no significant relationship ($\chi^2 = 2.98, \text{ DF}= 3, p<0.39$).

Out of the 110 students who responded to this question, 88 (80%) reported that they treated their drinking water while the remaining 22 did not treat their drinking water. Among those students who treated their drinking water, about four-tenths (41%) disclosed that they had not suffered from typhoid in the last six months. The remaining 47 (54.3%) had experienced typhoid once, twice or thrice in the last six months. This compares with 43.7% of those who did not treat drinking water and experienced typhoid once or thrice in the same time period.
Thus treatment or non-treatment of drinking water is unrelated to the frequency of typhoid experience among the student informants. It may be that those students who treated their drinking water and still experienced typhoid did not store their water appropriately or got their typhoid infection from other sources such as through consumption of foods which are not thoroughly cooked. The next disease examined in relation to treatment of drinking water was diarrhoea.

4.3.3.3 Treatment of Drinking Water and Diarrhoea among Household Members

Treatment of drinking water and frequency of experiencing diarrhoea among the household members were not significantly related ($\chi^2 = 2.3$ df= 3 p<0.5).

Eighty-six household heads responded to this question and 68 (79%) reported that they treated their drinking water while the rest did not treat their drinking water. Among those household heads who treated their drinking water 14 (21%) had suffered from diarrhoea once, twice or thrice in the last three months compared to 11 percent of the household heads who stated that they did not treat drinking water and whose dependants experienced diarrhoea.

The findings indicate that treating drinking water is not an adequate guarantee for avoiding diarrhoea as infections can come from other sources such as consumption of contaminated food. The next section examines the relationship between treating drinking water and diarrhoeal infection among the students sub-sample.
4.3.3.4 Treatment of Drinking Water and Diarrhoea among Students

The relationship between treatment of drinking water and frequency of experiencing diarrhoea among the students was also examined and the results showed that there was no significant relationship ($\chi^2 = 0.87$, DF = 3, $p<0.8$).

One hundred and fifteen (115) students responded to this question and 92 (80%) stated that they treated their drinking water while the remaining 23 did not treat their drinking water. Among those who treated their drinking water, about 22% reported that they had suffered from diarrhoea once, twice or thrice in the last six months. This contrasts with 31% of students who did not treat their drinking water and who had experienced diarrhoea once or twice in the last six months.

These results show that treatment or non-treatment of drinking water does not influence the frequency of experiencing diarrhoea among students. It is likely that those students who treated their drinking water and suffered from diarrhoea had other causes for their diarrhoeal infection such as consumption of contaminated food. Those sampled were asked whether they treated their drinking water and had experienced stomachache.

4.3.3.5 Treatment of Drinking Water and Stomachache among Household Members

This study found no significant relationship between the treatment of drinking water and the frequency of experiencing stomachache among sampled household members ($\chi^2 = 0.36$, DF = 3, $p<0.94$).
Eighty-three household heads were interviewed and 66 (79.5%) reported that they treated their drinking water while the remaining 14 reported that they did not. Only 22 (33.3%) of those household members who treated their water reported experience of stomachache once, twice or thrice and nearly the same proportion (36%) of those who did not treat their water, experienced stomachache once, twice or thrice in the last three months.

The results show that treatment or non-treatment of drinking water does not strongly influence the frequency of experiencing stomachache among the household members. It is likely that stomachache was caused by other factors apart from drinking unsafe water.

4.3.3.6 Treatment of Drinking Water and Stomachache among Students

There was no significant relationship between treatment of drinking water and frequency of experiencing stomachache among the students ($\chi^2 = 3.37, \text{DF}= 4, p<0.49$).

One hundred and eighteen (118) students responded to this question and 92 (78%) reported that they treated their drinking water while the remaining 26 did not treat their drinking water. Of those students who treated their water about 72 (78.3%) experienced stomachache in the last six months. This compares to 90% students who did not treat their water and experienced stomachache once, twice or thrice in the last six months.

These results show that treatment of drinking water is important to experience of stomachache among students. More of those students who do not treat their water got stomachache compared to their colleagues who treated their water. Possibly those
students who experienced stomachache in spite of treating their drinking water had other sources for their illness such as consumption of water which is contaminated during storage or used contaminated drinking utensils which can be another source of infection, a case found to be so by Dangerfield (1988).

The other water use practice examined was the method used to store drinking water. Drinking water may be treated but then be a source of infection when contaminated due to poor storage as reported by Briscoe et al (1986). This practice was also cross-tabulated with the frequency of experience of typhoid, diarrhoea and stomachache among the students and household heads sub-samples. Firstly, frequency of experience of typhoid was examined in relation to the method used to store drinking water.

4.3.3.7 Methods Used to Store Drinking Water and Typhoid Infection among Household Members

The relationship between the method used to store drinking water and frequency of experiencing typhoid among the household members was also examined. The results in Table 4.20 show that there was a significant statistical relationship ($\chi^2 = 8.5$, DF= 1, p<0.01).

<table>
<thead>
<tr>
<th>Method of Water Storage</th>
<th>Typhoid Infection</th>
<th>No Typhoid Infection</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Covered/closed container</td>
<td>08 (17.8)</td>
<td>37 (82.2)</td>
<td>45 (73.8)</td>
</tr>
<tr>
<td>Uncovered/open container</td>
<td>09 (56.3)</td>
<td>07 (43.7)</td>
<td>16 (26.2)</td>
</tr>
<tr>
<td>Total</td>
<td>17</td>
<td>44</td>
<td>61</td>
</tr>
</tbody>
</table>

$\chi^2 = 8.5$, DF= 1, p<0.01
A little less than three quarters of the household heads interviewed reported that they stored their drinking water in a closed or covered container while the remaining use an uncovered/open container. Slightly less than one fifth of those who use covered/closed containers to store their drinking water got typhoid infection compared to nearly three fifths who use uncovered/open containers.

The results show that the method used to store drinking water does influence the frequency of typhoid infection among household members. The use of covered/closed containers is thus useful to the prevention of typhoid infection. Possibly those household heads who used covered water tanks or closed jericans to store their drinking water and whose household members still experienced typhoid either drew their water from contaminated sources or did not give it adequate treatment before consumption. It is also likely that these household members got their typhoid infection from other sources such as washing of hands with contaminated water which has been reported by WHO (1983) as a cause of infection.

The next section examines the relationships between methods used to store water and health status of the residents. Typhoid is the first illness examined.

4.3.3.8 Methods Used to Store Water and Typhoid Infection among Students

Results in Table 4.21 show that the method used to store drinking water and frequency of experiencing typhoid among the students are significantly related ($\chi^2 = 22.1$, DF = 12 and $p<0.05$).
Table 4.21: Methods Used to Store Water by Typhoid Infection among Students

<table>
<thead>
<tr>
<th>Method of Water Storage</th>
<th>Frequency of Typhoid Infection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Once</td>
</tr>
<tr>
<td>Closed/covered container</td>
<td>18 (19.4%)</td>
</tr>
<tr>
<td>Open/uncovered container</td>
<td>06 (35.3%)</td>
</tr>
<tr>
<td>Total</td>
<td>24</td>
</tr>
</tbody>
</table>

\[ \chi^2 = 22.1, \text{DF} = 12 \text{ and } p < 0.05 \]

More than four fifths of the 110 students interviewed reported that they store their drinking water in closed or covered containers while the remaining 17 stated that they use open or uncovered containers to store their drinking water. A deep analysis regarding those students who store their water in a closed/covered container or an open/uncovered container revealed that about 15% more of those students who store their drinking water in open/uncovered containers got typhoid infection. It could be likely that those students who closed or covered their water storage containers and got typhoid infections had other sources for their illness such as washing of hands with contaminated water or eating unwashed fruits.

Those sampled were also asked how they stored their drinking water and whether they had experienced diarrhoea.
4.3.3.9 Methods used to Store Drinking Water and Diarrhoea among Household Members

The results in Table 4.22 show that there was a significant relationship between the method used to store drinking water and frequency of experiencing diarrhoea among the household members ($\chi^2 = 26.6$, DF = 1, $p<0.001$).

Table 4.22: Methods Used to Store Water by Diarrhoea among Household Members

<table>
<thead>
<tr>
<th>Method Used to store Water</th>
<th>Infected</th>
<th>Not Infected</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Covered/closed container</td>
<td>23 (39.7)</td>
<td>35 (60.3)</td>
<td>58 (71.6)</td>
</tr>
<tr>
<td>Uncovered/open container</td>
<td>00 (0.0)</td>
<td>23 (100.0)</td>
<td>23 (28.4)</td>
</tr>
<tr>
<td>Total</td>
<td>23</td>
<td>58</td>
<td>81</td>
</tr>
</tbody>
</table>

($\chi^2 = 26.6$, DF = 1, $p<0.001$).

A total of 81 household heads responded to this question and slightly less than three quarters reported that they stored their drinking water in a covered water tank or in a closed jerican while the remaining 23 reported that they used an open jerican, an uncovered container or other methods store their drinking water. Among those household heads who reported that they used a covered water tank or a closed jerican to store their water, 23 (39.7%) reported that their household members had experienced diarrhoea once, twice or thrice in the last three months. None of the household members in households where drinking water was stored in an open jerican or in an uncovered container experienced diarrhoea.

These results show that the method used to store drinking water is not sufficient in guaranteeing control of diarrhoea among the household members. Diarrhoea was in fact
experienced more often in those households where appropriate methods (covered water tank/closed jerican) were used to store drinking water. It would not be wrong therefore to conclude that the household members experienced diarrhoea either because they did not treat their drinking water adequately or consumed contaminated food.

4.3.3.10 Methods Used to Store Drinking Water and Diarrhoea among Students

The relationship between the method used to store drinking water and frequency of experiencing diarrhoea among the students, was not significant ($\chi^2 = 7.0 \text{ df} = 12 \text{ p< 0.85}$).

Among the 115 students who were interviewed, 84 (73%) reported that they stored their drinking water in a closed jerican or a covered container while the remaining 31 stated that they used an open jerican, an uncovered container or other methods to store their drinking water. Nearly the same proportions of those students who stored their drinking water in a closed/covered container (27.4%) and those who used an open/unclosed container (22.6%) got diarrhoeal infection in the last three months.

These results show that use of covered/closed is not a guarantee in the prevention of diarrhoeal infection among students. It is likely that those students who used covered/closed container and were infected with diarrhoea either did not treat their drinking water adequately before consumption or had other causes for their diarrhoea infection. Total hygiene and cleanliness are necessary in the prevention of diarrhoeal infections as reported by Falkenmark (1982). Stomachache was also examined in relation to the method used to store drinking water.
4.3.3.11 Methods Used to Store Drinking Water and Stomachache among Household Members

The relationship between the methods used to store drinking water and the frequency of experiencing stomachache among the household members in the last three months was statistically significant ($\chi^2 = 4.6$, DF = 1, $p<0.05$).

A total of 79 household heads were interviewed and 58 (73.4%) stated that they stored their drinking water in a covered water tank or in a closed jerican while the remaining 21 reported that they used an open jerican or an uncovered container to store their drinking water. Thirty five (60.3%) of those household heads who used covered/closed containers reported that their household members had experienced stomachache once, twice or thrice in the last three months. This compares with one third of those household heads who use uncovered/open containers to store their drinking water and who reported that their household members experienced stomachache only once in the last three months.

These results show that the method used to store drinking water is not positively related to the frequency of experiencing stomachache among the household members. In fact 27% more of those household heads who used covered water tanks or closed jericans than those who used uncovered/open containers had their household members experience stomachache. Covering of drinking water alone is unimportant to the prevention of stomachache among household members. It may be that the household members experienced stomachache due to other causes such as drawing water from contaminated or polluted sources which can cause stomach infections a case found to be so by
Nyagechi (1982). This compares with one third of those household heads who use uncovered/open containers to store their drinking water and who reported that their household members experienced stomachache only once in the last three months.

These results show that the method used to store drinking water is not positively related to the frequency of experiencing stomachache among the household members. In fact 27% more of those household heads who used covered water tanks or closed jericans than those who used uncovered containers had their household members experience stomachache. Covering of drinking water alone is unimportant to the prevention of stomachache among household members. It may be that the household members experienced stomachache due to other causes such as drawing water from contaminated sources and not giving it the adequate treatment.

4.3.3.12 Methods Used to Store Drinking Water and Stomachache among Students

The results of the survey found no significant relationship between method used to store drinking water and frequency of experiencing stomachache among the students ($\chi^2 = 25.3$, DF= 16, p<0.06).

One hundred and three (87.3%) of the 118 students who responded to this question reported that they used a bottle or a covered/closed container to store their drinking water while the remaining 15 stated that they used an open jerican, uncovered containers or other methods to store their drinking water. Eighty two (79.6%) of those students who stored their drinking water in a bottle or a closed jerican or covered container reported
that they had experienced stomachache once, twice or thrice in the last six months. Nearly the same proportion (73.3%) of those students who used an open jerican or an uncovered container or other methods to store their drinking water experienced stomachache once, twice or thrice in the last six months.

These results show that the method used to store drinking water is not important to the prevention of stomachache among the students. Probably the students drew their drinking water from contaminated sources and did not treat it adequately before consumption or got their stomachache infections from other sources such as food poisoning a leading cause of infection WHO (1983).

The relationships between sanitation use practices and the health status of Maragua residents were also examined and the findings are presented in the next section.

4.3.4 The Influence of Sanitation Use Practices on Health Status

The second component of the second hypothesis was tested to show the relationship between the residents’ practices of sanitation use and their health status. Adequate use of toilet facility was the first practice examined and both the household heads’ and students’ sub-samples responded to this question. Firstly, typhoid was examined in relation to adequate use of toilet facility.
4.3.4.1 Use of Toilet Facility and Typhoid Infection among Household Members

The relationship between adequate use of toilet facility and typhoid infection among the household members was not significant ($\chi^2 = 0.06$, DF=2, $p<0.97$).

A total of 64 household heads responded to this question and 47 (73.4%) reported that their household members had experienced typhoid in the last three months while the remaining 17 stated that their household members had not experienced typhoid. Thirty four (72.3%) of those heads whose members had experienced typhoid reported that their household members made use of the toilet facility always or most of the times while the remaining 13 reported that their members made use of the toilet facility only sometimes.

These results show that adequacy of use of toilet facility does not influence experience of typhoid among the household members as those members. Typhoid was in fact experienced by high proportions of those household members or always or most of the time made adequate use of the toilet compared to their colleagues who used the toilet only sometimes. Possibly the household members who experienced typhoid in spite of always/most of the time making adequate use of the toilet got their typhoid infection from other sources such as through consumption of contaminated food or water.

4.3.4.2 Use of Toilet Facility and Typhoid Infection among Students

The results in Table 4.23 show that there was a significant statistical relationship between adequate use of toilet facility and frequency of typhoid infection among the students ($\chi^2 = 15.1$, df=4 and $p<0.001$).
Table 4.23: Adequate Use of Toilet Facility by Typhoid Infection among Students

<table>
<thead>
<tr>
<th>Experience of Typhoid</th>
<th>Adequate Use of Toilet</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Always/Most times</td>
</tr>
<tr>
<td>Yes</td>
<td>32 (71.1)</td>
</tr>
<tr>
<td>No</td>
<td>73 (96.0)</td>
</tr>
<tr>
<td>Total</td>
<td>105</td>
</tr>
</tbody>
</table>

\[ \chi^2 = 15.1, \text{DF} = 4 \text{ and } p < 0.001 \]

Nearly two thirds of the 121 students sampled stated that they had not experienced typhoid while the remaining reported that they had experienced typhoid in the last six months. Slightly less than three quarters of those students who disclosed that they had experienced typhoid stated that they always or most of the time made adequate use of the toilet facility while the remaining 13 made use of the toilet facility sometimes or rarely. These results show that adequate use of toilet facility influences typhoid infection. Large numbers of students share the toilet facility and adequate use by all is necessary in the prevention of typhoid infection. Those sampled were also asked about adequate use of toilet facility and experience of diarrhoea.

4.3.4.3 Use of Toilet Facility and Diarrhoea among Household Members

The results show that there was no significant relationship between adequate use of toilet facility and frequency of experiencing diarrhoea among the household members \( (\chi^2 = 5.86, \text{DF}=3, p<0.12) \).

Sixty-three (76.8%) of the 82 household heads who responded to this question and reported that their household members had not experienced diarrhoea while the
remaining 19 stated that their members had experienced diarrhoea in the last three months. Eleven (57.9%) of the 19 heads who stated that their members had experienced diarrhoea reported that their members always or most of the time made adequate use of the toilet facility while the remaining 8 reported that their members made use of the toilet facility sometimes or rarely.

These results show that adequate use of toilet facility always or most of the time alone does not help in diarrhoea prevention among household members. In fact a much lesser proportion (42.1%) of those household members who sometimes or rarely made use of the toilet facility experienced diarrhoea compared to (57.9%) of their colleagues who always or most of the times used the toilet facility adequately. It is likely that those household members who suffered from diarrhoea in spite of always or most of the times using the toilet adequately had other sources of their infection such as consumption of contaminated food or water.

4.3.3.4 Use of Toilet Facility and Diarrhoea among Students

Adequate use of toilet facility and experience of diarrhoea among the students were not significantly related ($\chi^2=2.35$, DF=4, p<0.67).

Eighty-six (74.8%) of the 115 students who responded to this question reported that they had not experienced diarrhoea while the remaining 29 reported that they had experienced diarrhoea in the last six months. Twenty-one (72.4%) of the students who reported that they had experienced diarrhoea reported that they made adequate use of the toilet facility
always or most of the time while the remaining 8 reported that they made use of the toilet facility only sometimes. On the other hand 71 (82.6%) of the students who reported that they had not experienced diarrhoea reported that they always or most of the time made adequate use of the toilet facility. According to this result frequency of use of toilet facility is not important to the frequency of experiencing diarrhoea among the students. Diarrhoea is however more common on infrequent (27.4%) toilet users than on frequent users (17.4%). Inadequate use of toilet facility as reported by Cairncross (1992) causes an increase in infection, as not everyone is convinced of the advantages of frequent toilet use.

4.3.4.5 Use of Toilet Facility and Stomachache among Household Members

The results in Table 4.24 show that there was a significant relationship between adequate use of toilet facility and frequency of experiencing stomachache among the household members ($\chi^2 = 42$, DF=9, p<0.001).

Table 4.24: Adequate Use of Toilet Facility by Stomachache Among Household Members

<table>
<thead>
<tr>
<th>Use of Toilet</th>
<th>Frequency of Stomachache</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Once</td>
</tr>
<tr>
<td>Always/Most times</td>
<td>10 (13.8)</td>
</tr>
<tr>
<td>Sometimes/Rarely</td>
<td>01 (10.0)</td>
</tr>
<tr>
<td>Total</td>
<td>11</td>
</tr>
</tbody>
</table>

\(\chi^2 = 42, \text{DF}=9, p<0.001\)
A total of 82 household heads responded to this question and 88% reported that their household members always or most of the time made adequate use of the toilet facility while the remaining 10 stated that their household members sometimes or rarely made use of the toilet facility. About 28% of the household heads whose members always or most of the time used the toilet facility reported cases of stomachache infections in their households compared to 80% of household heads whose members sometimes or rarely used toilets and had stomachache.

This result indicates that adequate use of toilet facility is important in prevention of stomachache among the household members. Possibly those household members who experienced stomachache in spite of adequately using the toilet facility always or most times got their infection from drinking contaminated water or as a result of indigestion or food poisoning.

4.3.4.6 Use of Toilet Facility and Stomachache among Students

The results in Table 4.25 show that there was a significant relationship between adequate use of toilet facility and frequency of experiencing stomachache among the students sub-sample ($\chi^2 = 38.2, \text{DF} = 16, p<0.01$). This significance is similar to that among household members.
Table 4.25: Adequate use of Toilet Facility by Stomachache among Students

<table>
<thead>
<tr>
<th>Use of toilet</th>
<th>Frequency of Stomachache</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Once</td>
<td>Twice</td>
<td>Thrice</td>
<td>More</td>
<td>None</td>
<td>Total</td>
<td></td>
</tr>
<tr>
<td>Always/Most times</td>
<td>33 (32.4)</td>
<td>15 (14.7)</td>
<td>32 (31.4)</td>
<td>00 (0.0)</td>
<td>22 (21.5)</td>
<td>102 (87.1)</td>
<td></td>
</tr>
<tr>
<td>Sometimes/Rarely</td>
<td>03 (20.0)</td>
<td>06 (40.0)</td>
<td>03 (20.0)</td>
<td>01 (6.6)</td>
<td>02 (13.3)</td>
<td>15 (12.8)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>36</td>
<td>21</td>
<td>32</td>
<td>04</td>
<td>24</td>
<td>117</td>
<td></td>
</tr>
</tbody>
</table>

$\chi^2 = 38.2$, DF= 16, p<0.01

One hundred and two (87.1%) of the 117 students who were interviewed reported that they always or most of the time made adequate use of the toilet facility while the remaining 15 reported that they sometimes or rarely made use of the toilet facility. Eighty out of the 102 (78.4%) informants who always or most of the time made adequate use of the toilet facility experienced stomachache in the last six months. This compares with 13 (86.7%) students who sometimes or rarely made use of the toilet facility and who stated that they experienced stomachache in the last six months.

According to this result adequate use of toilet facility does not necessarily prevent stomachache among the students, but it does reduce the probability of having stomachache. The rational for this statement is that stomachache is slightly more common among those informants who sometimes or rarely use the toilet. It is likely that those informants who suffered from stomachache in spite of always or often making adequate use of the toilet got their infection from other sources such as food poisoning or indigestion which are main causes of infection WHO (1983).
Experience of skin infection was also examined in relation to adequate use of toilet facility among both household members and students. The results are presented in the next section.

4.3.4.7 Use of Toilet Facility and Skin Infections among Household Members

The results show that there was no significant relationship between adequate use of toilet facility and frequency of experiencing skin ailments among the household members ($\chi^2 = 0.85$, DF= 9, $P< 0.99$).

Among those household head who reported that their household members always or most of the time made adequate use of the toilet facility, 13.7% stated that their household members had suffered from skin ailments in the last three months. The comparative figure for those heads whose members infrequently use the toilet facility was 12.5 percent.

This result shows that adequate use of toilet facility is not a guarantee against skin infections. Skin ailments were in fact experienced by nearly the same proportion of both categories of household members. It is likely that those household members who experienced skin diseases in spite of always or most of the time making adequate use of the toilet had other sources of infection such as contact with allergic materials.
4.3.4.8 Use of Toilet Facility and Skin Infections among Students

Adequate use of toilet facility and frequency of experiencing skin ailments among the students were not significantly related ($\chi^2 = 2.69$, DF=12, $p<0.99$).

Among the 91 students who reported that they always or most of the time made adequate use of the toilet, 80 (87.9%) indicated that they had not suffered from skin ailments while the remaining 11 (12.1%) had suffered from skin ailments in the last six months. This compares with 17.4 percent infection rate among the 23 students who reported infrequent use of toilet facility.

This result shows that while adequate use of toilet does not guarantee absence of skin infections this practice is certainly more useful than infrequent use of the toilet facility.

This section examines the use of open spaces as toilet facilities as another sanitation use practice in relation to health status. According to Cairncross (1992) where toilet facilities are lacking residents may use open spaces for their natural calls. This variable was cross-tabulated with the frequency of experience of the four illnesses. The students sample group was not interviewed on this factor as use of open spaces is common among young children who do not attend school or those who are in lower primary. The heads of households were expected to respond on behalf of their young household members. Typhoid was the first illness examined in relation to use of open spaces as toilet facilities.
4.3.4.9 Use of Open Spaces as Toilet Facility and Typhoid Infection

The results of the survey found no significant relationship between frequency of use of open spaces as toilets and typhoid infection ($\chi^2 = 10.4$, DF = 9, p<0.31).

A total of 60 heads of households responded to this question and 48 (80%) stated that their young household members never used open spaces as toilet facilities while the remaining 12 stated that their young household members used open spaces as toilet facilities always, most of the time or sometimes. Thirty six of the 48 (75%) household members who never used open spaces, as toilet facilities got typhoid infection while 11(91.7%) of 12 household members who sometimes, most of the times or always used open spaces as toilet facilities experienced typhoid in the last three months.

According to this result never making use of open spaces as toilet facilities does not guarantee freedom from typhoid infection but it certainly does lower the rate of infection. It is likely that those household members who got typhoid infection in spite of never using open spaces as toilets got their infection from other sources such as drinking contaminated water and eating unwashed fruits.

4.3.4.10 Use of Open Spaces as Toilet Facility and Diarrhoea

The results indicate that there was no significant relationship between frequency of use of open spaces as toilet facilities by frequency of experiencing diarrhoea ($\chi^2 = 9.77$, DF = 9, p<0.37).
Fifty eight (75.3%) of the 77 heads of households who responded to this question disclosed that their household members never used open spaces as toilet facilities while the remaining 19 stated that their household members used open spaces sometimes, most of the times or always. Ten (17.2%) of those household members who never used open spaces as toilet facilities experienced diarrhoea while about 6 (31.6%) of those household members who sometimes, most of the time or always use open spaces as toilet facilities experienced diarrhoea in the last three months.

This result shows that use of open spaces as toilet facilities does not always cause diarrhoeal infection. However non-use of open spaces as toilet can help lower rate of diarrhoea a case also found to be so by Agarwal (1980), as only a small percent of those who never used open spaces experienced diarrhoea compared to those who always, most of the time or sometimes used open spaces as toilets. It could be possible that those household members who got diarrhoeal infection and never used open spaces as toilets got their infection from sources such as food allergies or poisoning.

4.3.4.11 Use of Open Spaces as Toilet Facility and Stomachache

The results in Table 4.26 show that there was a significant relationship between the frequency of use of open spaces as toilet facilities and the frequency of experiencing stomachache ($\chi^2 = 16.1$, DF = 9, p<0.05).
Table 4.26: Use of Open Spaces as Toilets by Stomachache Among Household Members

<table>
<thead>
<tr>
<th>Use of open places</th>
<th>Frequency of Experience of Stomachache</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Once</td>
</tr>
<tr>
<td>Always/ most times/ sometimes</td>
<td>00 (0.0)</td>
</tr>
<tr>
<td>Never</td>
<td>11 (19.0)</td>
</tr>
<tr>
<td>Total</td>
<td>11</td>
</tr>
</tbody>
</table>

χ² = 16.1, DF = 9, p<0.05

A total of 78 heads of households responded to this question and a little less than three quarters reported that their household members never used open spaces as toilet facilities while the remaining 20 stated that their household members used open spaces as toilets sometimes, most of the times or always. Eighteen (31%) of the 58 heads of households whose members never used open spaces as toilets stated that their members had experienced stomachache. This compares with 9 (45%) of those household members who sometimes, most of the times or always used open spaces as toilets and experienced stomachache in the last three months.

This result indicates that non-use of open spaces as toilets is not a guarantee against stomachache infection as a big proportion of both types of household members suffered from stomachache. Non-use of open spaces as toilets however does reduce (14% less) the rate of stomachache infection. It could be possible that those household members who never used open spaces as toilets and still suffered from stomachache had other sources of their illness such as indigestion or consumption of contaminated water or food.
4.3.4.12 Use of Open Spaces as Toilet Facility and of Skin Infections

Frequency of use of open spaces as toilet facilities and the frequency of experiencing skin ailments were not significantly related. \( \chi^2 = 5.84, \text{ DF} = 9, \ p < 0.76 \).

Fifty eight (77.3%) of the 75 household heads who responded to this question, stated that their household members never used open spaces as toilet facilities while the remaining 17 reported that their household members used open spaces as toilet facilities sometimes, most of the times or always. About thirteen (22.4%) of the 58 household members who never used open spaces as toilet facilities suffered from skin ailments. This compares with about 6 (35.3%) of the 17 household members who used open spaces as toilets most of the time, sometimes or always and suffered from skin infections in the last three months.

This result shows that while non-use of open spaces as toilets does not guarantee absence of skin ailments, the practice is more useful than on those who sometimes, always or most of the time use open spaces as toilets. It is likely that those household members who got skin infections and never used open spaces as toilets got their infection from sources such as allergies to materials or chemicals.

The next section examines another sanitation use practice that is, frequency of washing hands after toilet use in relation to the health status of the residents. This variable was cross tabulated with the frequency of experience of the four illnesses and both the
students and heads of household’s sub-samples were expected to respond. Diarrhoea was the first illness examined.

4.3.4.13 Washing Hands after Toilet Use and Diarrhoea among Household Members

The results of the survey found no significant relationship between frequency of washing hands after toilet use and frequency of experiencing diarrhoea among the household members ($\chi^2 = 5.59$, DF= 15, $p<0.98$).

About thirty seven (46.8%) of the 79 household heads who were interviewed reported that their household members always or often washed their hands after toilet use while the remaining 42 stated that their household members sometimes or rarely washed their hands after toilet use. About 8 (21.6%) of those household members who always or often washed their hands after toilet use experienced diarrhoea in the last three months. This compares with 26.2 percent of the 42 household members who sometimes or rarely washed their hands after toilet use and who suffered from diarrhoea.

This result shows that the frequency of washing hands after toilet use is not positively related to experience of diarrhoea among the household members. It is likely that those household members who always or often washed their hands after toilet use and suffered from diarrhoea got their infection from other sources such as through consumption of contaminated food or water.
4.3.4.14 Washing Hands after Toilet Use and Diarrhoea among Students

The results in Table 4.27 show that there was a significant relationship between frequency of washing hands after toilet use and frequency of experience of diarrhoea among the students ($\chi^2 = 15.9$, DF=9, p<0.05).

<table>
<thead>
<tr>
<th>Washing Hands</th>
<th>Frequency of Diarrhoea</th>
<th></th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Once</td>
<td>Twice</td>
<td>Thrice</td>
<td>None</td>
</tr>
<tr>
<td>Always/Often</td>
<td>12 (13.6)</td>
<td>04 (4.5)</td>
<td>01 (1.1)</td>
<td>71 (80.6)</td>
</tr>
<tr>
<td>Sometimes/ Rarely</td>
<td>04 (14.8)</td>
<td>03 (11.1)</td>
<td>03 (11.1)</td>
<td>17 (62.9)</td>
</tr>
<tr>
<td>Total</td>
<td>16</td>
<td>07</td>
<td>04</td>
<td>88</td>
</tr>
</tbody>
</table>

$\chi^2 = 15.9$, DF=9, p<0.05

Slightly more than three quarters of the 115 students who responded to this question stated that they always or often washed their hands after toilet use while the remaining 27 reported that they sometimes or rarely washed their hands after toilet use. Seventeen (19.3%) of the 88 students who reported that they always or often washed their hands after toilet use reported that they had experienced diarrhoea in the last six months while 10 (37%) of those students who reported that they sometimes or rarely washed their hands after toilet use experienced diarrhoea in the last six months.

According to this result frequency of washing hands after toilet use does not necessarily prevent diarrhoeal infection among students but it does reduce the probability of having diarrhoea. The rational for this statement is that diarrhoeal infections are more common
among those informants who sometimes or rarely wash their hands after toilet use. Possibly those students who always or often washed their hands after toilet use and still suffered from diarrhoea got their infection from other sources such as consumption of contaminated food or water.

Experience of typhoid was also examined in relation to the frequency of washing hands after toilet use and the results are presented in the next section.

4.3.4.15 Washing Hands after Use of Toilet and Typhoid Infection among Household Members

The results of the survey found no significant relationship between the frequency of washing hands after toilet use and typhoid infection among the household members ($\chi^2 = 15.0$, DF=15, p<0.45).

About 19 (31.7%) of the 60 household heads who responded to this question stated that their household members always or often washed their hands after toilet use while the remaining 41 reported that their household members sometimes or rarely washed their hands after toilet use. Twelve (63.2%) of those household members who always or often washed their hands after toilet use experienced typhoid in the last three months. This compares with 65.9 percent of the 41 household members who sometimes, rarely or never washed their hands after toilet use and got typhoid infections in the last three months.
This result shows that washing hands after toilet use alone does not help in the prevention of typhoid infection among household members. Probably those household members who always or often washed their hands after toilet use and still got typhoid were infected through other sources such as washing with contaminated water or eating unwashed fruits.

4.3.4.16 Washing Hands after Use of Toilet and Typhoid Infection among Students

The results show that there was no significant relationship between frequency of washing hands after toilet use and frequency of typhoid infection ($\chi^2 = 20.6$, DF= 9, p<0.25).

Eighty-five (77.3%) of the 110 students who were interviewed stated that they always or often washed their hands after toilet use while the remaining 25 indicated that they washed their hands sometimes or rarely after toilet use. About 44 (51.8%) of the 85 students who reported that they always or often washed their hands after toilet use disclosed that they had had typhoid infections in the last six months. Nearly the same proportion (56%) of the 25 students who reported that they sometimes or rarely washed their hands after toilet use stated that they had suffered from typhoid infections in the last six months.

This result shows that the frequency of washing hands after toilet use does not necessarily prevent typhoid infection among the students. Possibly those students who got typhoid infections although they always or often washed their hands after toilet use had other
sources of infection such as the consumption of contaminated food or water UNICEF (1990).

4.3.4.17 Washing Hands after Use of Toilet and Stomachache among Household Members

An examination of the results showed that there was no significant relationship between the frequency of washing hands after toilet use and the frequency of experiencing stomachache among the household members ($\chi^2 = 9.34$, DF= 15, p<0.83).

Thirty one (40.3%) of the 77 household heads who responded to this question stated that their household members always or often washed their hands after toilet use while the remaining 46 reported that their household members sometimes or rarely washed their hands after toilet use. Fifteen (48.4%) of the 31 household members who always or often washed their hands after toilet use experienced stomachache. This compares with 44% of the 46 household members who sometimes or rarely washed their hands after toilet use and experienced stomachache in the last three months.

According to this result the frequency of washing hands after toilet use is not important to the prevention of stomachache among the household members as is the case of students. It is likely that those household members who experienced stomachache in spite of always or often washing their hands after toilet use got their infection from food poisoning or indigestion.
4.3.4.18 Washing Hands after Use of Toilet and Stomachache among Students

The relationship between the frequency of washing hands after use of toilet and the frequency of experiencing stomachache among the student informants was not significant ($\chi^2 = 13.7$, DF= 12, p<0.32).

About eighty (67.8%) of the 118 students who were interviewed disclosed that they always or often washed their hands after toilet use while the remaining 38 stated that they sometimes or rarely washed their hands after toilet use. Sixty-four (80%) of the 80 students who always or often washed their hands after toilet use experienced stomachache while 32 (84.2%) of those students who sometimes or rarely washed their hands after toilet use experienced stomachache in the last six months.

The result shows that washing hands after toilet use is not a guarantee against stomachache among the students. It could be possible that the students who reported that they always or often washed their hands after toilet use, experienced stomachache due to other causes such as indigestion, food poisoning or drinking contaminated water. Experience of skin infections was also examined in relation to frequency of washing hands after toilet use.
4.3.4.19 Washing Hands after Use of Toilet and Skin Infections among Household Members

An examination of the results between frequency of washing hands after toilet use and frequency of experiencing skin ailments among the household members revealed lack of any significant relationship ($\chi^2 = 7.05$, DF= 15, p<0.96).

Among the 77 household heads who responded to this question, about 52 (67.5%) disclosed that their household members always or often washed their hands after toilet use while the remaining 25 stated that their household members sometimes or rarely washed their hands after toilet use. About 11 (21.2%) of those household members who always or often washed their hand after toilet use suffered from skin ailments in the last three months. This compares with 6 (24%) of the 25 household members who sometimes or rarely washed their hands after toilet use and suffered from skin ailments in the last three months.

The findings indicate that frequency of washing hands after toilet use is not sufficient in guaranteeing control of skin ailments among the household members. Probably those household members who always or often washed their hands after toilet use and still got skin ailments had other sources for their infections such as allergies to some chemicals.
4.3.4.20 Washing Hands after Use of Toilet and Skin Infections among Students

The relationship between the frequency of washing hands after toilet use and the frequency of experiencing skin ailments among the students was not significant ($\chi^2 = 6.24, DF=9, p<0.72$).

About 78 (68.4%) of the 114 students who responded to this question reported that they always or often washed their hands after toilet use while the remaining 36 stated that they sometimes or rarely washed their hands after toilet use. Nonetheless about 11% of those students who always or often washed their hands after toilet use and an equal proportion of those students who sometimes or rarely washed their hands after toilet use got skin infections in the last six months.

The findings indicate that frequency of washing hands after toilet use is not important to experience of skin ailments among students. It is likely that those students who always or often washed their hands after toilet use and got skin infections contacted them from other sources such as chemicals or irritants also found to be a cause by WHO (1983).

Results of relationships between water use perceptions and health status are presented in the next section.

4.3.5 The Influence of Water Use Perceptions on Health Status

According to the third hypothesis that was stated in Chapter One, “Those respondents with positive perceptions of safe use of water and sanitation facilities will have better health status.” The first component of this hypothesis was tested to show the relationship
between the residents’ perceptions of safe water use and their health status. This hypothesis was tested only among household heads since perception of adequacy of amount of water fetched for daily tasks is a household issue. Diarrhoea was the first illness examined in relation to adequacy of the amount of water fetched in a day.

4.3.5.1 Adequacy of the amount of Water Fetched in a Day and Diarrhoea

The relationship between the adequacy of the amount of water fetched in a day and the frequency of experiencing diarrhoea among the household members was not significant ($\chi^2 = 1.14$, DF= 3, p<0.77).

A total of 78 household heads were interviewed and 39 (50%) reported that the amount of water that they fetched in a day was adequate for their daily household needs while the other half stated that the amount of water was inadequate. An equal proportion of about 18% of those household heads who disclosed that the amount of water was adequate and those who stated that the amount of was inadequate reported that their household members had suffered from diarrhoea in the last three months.

This result reveals that adequacy of the amount of water fetched in a day is not a guarantee in preventing diarrhoea. Infections can come from other sources such as consumption of contaminated food or water. Results of the relationship between adequacy of the amount of water fetched and experience of typhoid are presented in the next section.
4.3.5.2 Adequacy of the amount of Water Fetched in a Day and Typhoid Infection

An examination of the results showed no significant relationship between the adequacy of the amount of water fetched and the frequency of typhoid infection ($\chi^2 = 3.92$, DF=3, $p<0.27$).

About 28 (46.7%) of the 60 household heads who responded to this question revealed that the amount of water they fetched in a day was adequate for their daily needs while the remaining 32 stated that it was inadequate. Of the 28 household heads who reported that the water was adequate, about 17 (60.7%) revealed that their household members had suffered from typhoid infections compared to 24 (75%) of the 32 household heads who reported that the amount of water was inadequate and whose household members suffered from typhoid infections in the last three months.

These findings show that adequacy of the amount of water fetched in a day is not important to the prevention of typhoid but it does certainly lower the rate of infection. It is likely that those household members who got typhoid and fetched adequate amounts of water in a day got their infection from drinking contaminated water without giving it adequate treatment or eating fruits washed with contaminated water.

Stomachache infection was also examined in relation to the adequacy of the amount of water fetched in a day in households and the results are presented in the next section.
4.3.5.3 Adequacy of the amount of Water Fetched and Stomachache

Adequacy of the amount of water fetched and the frequency of experiencing stomachache were not related ($\chi^2 = 2.92$, DF=3, p<0.40).

Among the 76 household heads who responded to this question, 35 (46.1%) stated that the amount of water they fetched in a day was adequate for their daily household needs while the remaining 41 reported that it was inadequate. About 13 (37.1%) of those household heads who reported that the amount of water was adequate reported that their household members experienced stomachache while 13 (31.7%) of the 41 household heads who reported that the amount of water was inadequate reported that their household members suffered from stomachache in the last three months.

According to this result, adequacy of the amount of water fetched in a day does not strongly influence the frequency of experiencing stomachache. Possibly those household members who suffered from stomachache in spite of fetching adequate amounts of water in a day had other sources for their stomachache such as food poisoning.

An examination of the relationship between adequacy of amounts of water fetched in a day and experience of skin ailments was also carried out. The results are given in the next section.
4.3.5.4 Adequacy of the amount of Water Fetched and Skin Infections

The relationship between the adequacy of the amount of water fetched in a day and the frequency of experiencing skin ailments was not significant ($\chi^2 = 2.30$, DF=3, p<0.51).

A total of 76 household heads were interviewed and 36 (47.4%) stated that the amount of water they fetched in a day was adequate while the remaining 40 reported that the amount was inadequate for their daily needs. About 6 (16.7%) of those heads of households who reported that the amount was adequate disclosed that their household members had experienced skin ailments while about 11 (27.5%) of the 40 household heads who reported that the amount of water they fetched was inadequate for their needs reported that their household members suffered from skin ailments in the last three months.

This result shows that adequacy of the amount of water fetched in a day is not important to the frequency of experience of skin ailments. Skin infections are however about 11% more common among those household members where the amount of water fetched is inadequate. It is likely that those household members who got skin infections although they had adequate amounts of water in their households had other sources of their ailments such as allergies.

Sanitation use perception and its relationship to health status is examined in the next section.
4.3.6 The Influence of Sanitation Use Perception on Health Status

The second component of the third hypothesis was tested to show the relationship between the residents’ perceptions of sanitation use and their influence on the health status of the residents. Perception of health risks of baby waste was tested in relationship to the frequency of washing hands after disposing of the waste. Only the household heads responded to this question since they are more concerned with baby waste disposal.

4.3.6.1 Perception of Health Risks of Baby Waste and Washing Hands after Disposing of Baby Waste

The results in Table 4.28 show that there was a significant relationship between the residents’ perception of health risk of baby waste and the frequency of washing their hands after handling the waste ($\chi^2 = 11.1$, DF= 5, p<0.05).

Table 4.28  Frequency of Washing Hands by Perception of Baby Waste

<table>
<thead>
<tr>
<th>Perception of baby waste</th>
<th>Frequency of Washing Hands</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Always/Often</td>
<td>Sometimes/Rarely</td>
<td>Total</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>50 (91.0%)</td>
<td>05 (09.0%)</td>
<td>55 (66.2)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>18 (64.3%)</td>
<td>10 (35.7%)</td>
<td>28 (33.8)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>68</td>
<td>15</td>
<td>83</td>
<td></td>
</tr>
</tbody>
</table>

$\chi^2 = 11.1$, DF=5, p<0.05

A total of 83 household heads responded to this question and about two thirds of them reported that they perceived baby waste to be as harmful as adult waste while the remaining 28 stated that baby waste was less harmful to health than adult waste. About 5 (9%) of those who reported that baby waste was as harmful as adult waste stated that they sometimes or rarely washed their hands after disposing of baby waste. This compares
with about 10 (35.7%) of the 28 household heads who reported that baby waste was less harmful to health than adult waste and who washed their hands sometimes or rarely after disposing of the waste.

This result indicates that the perception that baby waste is as harmful to health as adult waste increases the frequency of washing hands after disposing of baby waste and thus improves health status. Perceptions greatly influence practices as reported by Cockerham (1995). It is likely that those household heads who perceive baby waste to be as harmful to health as adult waste and who stated that they sometimes or rarely washed their hands after disposing of baby waste were away from water sources most times such as in market places or did not pay much attention to hygienic practices.

The results show that adequate knowledge of water and sanitation use positively influences health status, and that good practices of water and sanitation use have a positive relationship with health status. Lastly, results of the findings also show that positive perceptions of water and sanitation use have a positive relationship with health status. It would be right to conclude that those residents with adequate knowledge, good practices and positive perceptions of safe water and sanitation use have better health status.
CHAPTER FIVE
SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction
This chapter presents a summary of findings, conclusions and recommendations for possible action and suggestions for further research.

5.2 Summary of Findings
Several findings of the study stand out.

5.2.1 Knowledge of Safe Water Use and Health Status
The first component of the first objective was to determine whether those residents with adequate knowledge of safe water use have better health status than those with inadequate knowledge. Chi-square analysis demonstrated that knowledge of risks of drinking raw water did not influence the frequency of experiencing diarrhoea among both household members and students. Those in the know of risks related to drinking raw water in fact experienced diarrhoea more often. The analysis also showed that knowledge of risks of drinking raw water or lack of such knowledge was not useful in the prevention of typhoid infections. Many household members who had knowledge and those who lacked knowledge of risks of drinking raw water suffered from typhoid infections. The results also showed that between knowledge of risks of drinking raw water and lack of such knowledge the differences in stomachache infection are not really important. Also demonstrated by the analysis was the fact that knowledge of risks of drinking raw water and experience of skin ailments were unrelated and that knowledge of risks of raw water
influences judgement about sources of skin ailments when experienced by household members.

5.2.2 Knowledge of Sanitation Use and Health Status

The second component of the first objective was to determine whether those residents with adequate knowledge of sanitation use have better health status than those with inadequate knowledge. The analysis showed that knowledge of correct distance between toilet and water source reduces the risk of typhoid infection among household members but this knowledge is not directly related to prevention of diarrhoeal infections. Knowledge of correct distance between toilet and water source is, however, important to the experience of stomachache. There were fewer cases of stomachache among household members whose heads had the knowledge than among household members whose heads lacked such knowledge. Knowledge of correct distance between the two facilities or lack of such knowledge was not related to skin infections.

5.2.3 Practices of Safe Water Use and Health Status

The first component of the second objective was to assess whether those residents with good practices of safe water use have better health status than those poor practices. The results of the analysis showed that treatment of drinking water is unrelated to the frequency of experiencing typhoid among both students and household members and is not an adequate guarantee for avoiding diarrhoea as infections can come from other sources. On experience of stomachache and water treatment the results of the analysis showed that treatment of drinking water is important to stomachache among students.
More of those students (90%) who do not treat their drinking water compared to those (78%) who treat their drinking water get stomachache. Among the household members treatment of drinking water did not strongly influence the experience of stomachache.

On storage of drinking water, chi-square demonstrated that 15% more of those students who stored their drinking water in open/uncovered containers than those who used closed or covered containers to store their water got typhoid infections. Use of covered/closed containers to store drinking water was also useful in the prevention of typhoid among the household members.

An analysis of the findings also showed that use of covered/closed containers to store drinking water is not a sufficient guarantee in the control of diarrhoeal infections among both students and household members. In fact, more household members in households where water was stored in closed/covered containers experienced diarrhoea. Chi-square also demonstrated that covering of drinking water alone is not important to the prevention of stomachache among the informants.

5.2.4 Practices of Sanitation Use and Health Status

The second component of the second objective was to assess whether those residents with good practices of sanitation use have better health status than those with poor practices.

The analysis indicated that adequate use of toilet influences typhoid infection among students as large numbers share the toilet and thus adequate use by all is useful in typhoid prevention. Adequate use of toilet among household members, however, does not
influence experience of typhoid. More of those household members who always or most of the time used the toilet adequately got typhoid infection. Adequate use of toilet is not important to the experience of diarrhoea among both students and household members. Diarrhoeal infections were however more common (10%) among students who used the toilet infrequently but less common (15.8%) on household members who were infrequent toilet users.

Adequate use of toilet was not important to the prevention of stomachache among students but important among household members since about 52 percent less frequent toilet users reported stomachache experience. The analysis also demonstrated that adequate use of toilet facility does not guarantee absence of skin infections among students but it does reduce the incidence. Among household members adequate use of toilet facility is not useful to the prevention of skin infections. Non-use open spaces as toilets does not prevent typhoid, diarrhoea, stomachache or skin infections but it does certainly lower their rate among household members. Furthermore, the analysis of the results also demonstrated that washing hands after toilet use alone is not important in the prevention of diarrhoea, typhoid, stomachache and skin infections among both household members and students.

5.2.5 Perceptions of Safe Water Use and Health Status

The first component of the third objective was to examine whether those residents with positive perceptions on safe water use have better health status than those negative perceptions. The analysis revealed that adequacy or inadequacy of the amount of water
fetched in a day does not guarantee freedom from typhoid, diarrhoea, stomachache and skin infections among the informants.

5.2.6 Perceptions of Sanitation Use and Health Status

The second component of the third objective was to examine whether those residents with positive perceptions on sanitation use have better health status than those negative perceptions. The analysis showed that perceptions of health risks of baby waste increases frequency of washing hands after disposing of baby waste among the household heads.

5.3 Conclusions

This study concluded that those residents with adequate knowledge of safe water and sanitation use have better health status than those with inadequate knowledge. The study also concluded that those residents with good practices of safe water and sanitation use have better health status than those with poor practices. Lastly, the study concluded that those residents with positive perceptions of safe water and sanitation use have better health status than those with negative perceptions.

5.4 Recommendations

The following recommendations should go a long way in improving the knowledge; practices and perceptions of water and sanitation use of the residents and thus improve their health status.
According to the results of the findings, those residents with adequate knowledge of safe water and sanitation use have better health status than those with inadequate knowledge. This study therefore recommends an addition of qualified health personnel and provision of regular health education to the residents to help impart knowledge and make them aware of the need to properly use and manage available water facilities. Such management should include proper treatment of drinking water. This recommendation can be supported by forty-three percent (43%) of the health officials interviewed who reported that provision of public health education should help improve on knowledge of water use. There is also a need for education on proper sanitation such as distance between water source and toilet facility as a measure to lower sanitation related illnesses. Provision of improved sewerage and sanitation system would be an additional way to cater for sanitation requirements that would help improve the health status of the residents. Construction of toilets and drainage systems, provision of staff as caretakers and election of committees to run issues would help lower sanitation related incidences. Relevant information on sanitation use should be provided to all residents so that they can have adequate awareness of sanitation use.

Results also show that good practices of safe water and sanitation use positively influence health status of the residents. The study recommends that the government water officers together with community leaders should mobilize communities in Maragua to acquire and use safe water storage facilities such as water tanks, drums, jerican and protected wells. In addition Maragua town council should seek the help of NGOs and other private organizations and provide treated piped water to all residents. There also a need for the
Town Council to build more public toilet facilities for which the local leaders should appoint members to manage. This would help improve on practices of water and sanitation use.

Finally, results on perceptions showed that those residents with positive perceptions of safe water and sanitation use have better health status than those with negative perceptions. The study further recommends that, the Maragua Urban Council in collaboration with community leaders should install water points conveniently for groups of households in order to solve the problem of inadequate availability of water to some of the Maragua residents on account of lack of access to safe water sources. This would help the residents to have adequate safe water and therefore improve on perceptions of water and sanitation use.

5.5 Recommendations for Further Research

There are some gaps that the current study has not focused on. Some of these include the following:

- An investigation into socio-economic perspectives that influence knowledge, practices and perceptions of water and sanitation use is required.
- An assessment of the impact of provision of public health education that focuses on knowledge, practices and perceptions related to water and sanitation use of the residents.
BIBLIOGRAPHY


Printer, Nairobi.


APPENDICES

Appendix 1a: Questionnaire for Health Officials and Heads/Proprietors of Private Clinics

Respondents Personal Data

Name (optional) 
Date of birth (age )
Sex Male [ ] Female [ ]

1. Name of clinic/hospital

2. Lists down the common water and sanitation related diseases that are reported to you.

<table>
<thead>
<tr>
<th>Water related</th>
<th>Sanitation related</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Which of the diseases listed in question one above have the highest rate of incidence/outbreak?

4. In your view, what are the direct causes of water and sanitation related diseases?

(a) 

(b) 

5. Do the patients you handle relate their ill health to:

(a) their poor use of water.  
Yes [ ]  No [ ]

(b) their poor use of sanitation facilities?  
Yes [ ]  No [ ]

(c) inadequate availability of water?  
Yes [ ]  No [ ]

(d) inadequate sanitation facilities?  
Yes [ ]  No [ ]

6. How do you make your patients aware of the need to properly use and manage available water and sanitation facilities?

(i) __________________________________________

(ii) __________________________________________

(iii) __________________________________________

(iv) __________________________________________

(v) __________________________________________

7. Propose additional ways through which use of water and sanitation facilities can be improved.

(i) __________________________________________

(ii) __________________________________________

(iii) __________________________________________

(iv) __________________________________________
Appendix 1b: Questionnaire for Local Councilors, Provincial Administrators, Water Officials, NGOs and CBOs

Respondents Personal Data

<table>
<thead>
<tr>
<th>Name (optional)</th>
<th>Date of birth (age)</th>
<th>Sex</th>
<th>Name of organization/ department</th>
<th>Designation</th>
</tr>
</thead>
</table>

Date

1. What services does your office provide to ensure that water supply and sanitation facilities are available to the residents?

(i)

(ii)

(iii)

(iv)

2. What measures do you put in place to ensure that the residents have adequate knowledge about water practices?

(i)

(ii)

(iii)

(iv)
3. What measures do you put in place to ensure that the residents have positive perceptions about water practices?

(i) _____________________________________________

(ii) ____________________________________________

(iii) ____________________________________________

(iv) ____________________________________________

4(a) How do you empower your residents to assume responsibilities for their water supply facilities?

(i) _____________________________________________

(ii) ____________________________________________

(iii) ____________________________________________

(iv) ____________________________________________

4(b) How do you empower your residents to assume responsibilities for their sanitation facilities?

(i) _____________________________________________

(ii) ____________________________________________

(iii) ____________________________________________

(iv) ____________________________________________

5 (a). Do you give your residents relevant information on how they can properly manage their water supply facilities? (tick)

Yes □ No □

5 (b). If yes, how often do you provide the information? (tick)

□
Once a week
Twice a week
Three or more times a week
Once in two weeks
Once a month
Other, specify

6 (a). Do you give your residents relevant information on how they can properly manage their sanitation facilities? (tick)

Yes ☐ No ☐

6 (b). If yes, how often do you provide the information? (tick)

Once a week ☐ Twice a week ☐
Three or more times a week ☐ Once in two weeks ☐
Once a month ☐ Other, specify ☐

(c) What type of information do you provide? (e.g. verbal, pamphlets, chemicals etc.)

7 (a). In, which of the following aspects do you, involve members of the community you serve? Tick as appropriate.
Planning  

Implementation  

Evaluation/monitoring  

Management/administration  

7(b). In those activities above that you do not involve them, why is it so?  

8(a). Compared to men how would you rate women's involvement in the following aspects of handling water in the community you serve? Tick as appropriate.

<table>
<thead>
<tr>
<th></th>
<th>Women are more involved</th>
<th>Women and men equally involved</th>
<th>Men more involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing sources of water supply</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance of water points</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8 (b) Please explain (give reasons for) your answers above

(i)  

(ii)  

(iii)  

(iv)
9 (a) Compared to men, how would you rate women's involvement in the following aspects of sanitation facilities in the communities you serve? (Tick as appropriate)

<table>
<thead>
<tr>
<th></th>
<th>Women more involved</th>
<th>Women and men equally involved</th>
<th>Men more involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing sanitation facilities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance of sanitation facilities</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9 (b) Please explain (give reasons for) your answers above.

(i) .......................................................................................... 

(ii) ..........................................................................................

(iii) ..........................................................................................
Appendix 1c: Questionnaire for Students

Respondents Personal Data
Name (optional) ____________________________ Date _____________
Sex
Male [ ] Female [ ]
Age/ Date of Birth _____________________________
Name of your school ___________________________

1. What is your source of drinking water? (tick )
   - Bore-hole [ ]
   - Stream [ ]
   - Tap [ ]
   - Rainwater [ ]
   - Other (specify) _____________________________

2. Do you treat your drinking water?
   Yes [ ] No [ ]
If yes, what method do you use? (tick)
   - Boiling [ ]
   - Filtering [ ]
   - Chemical additives [ ]
   - Other (explain) ____________________________
3. How do you store your drinking water? (tick)

- In a bottle
- In a closed jerican
- In an open jerican
- In an uncovered container
- Other (explain) ____________________________

4. Do you know of any illnesses (health problem) related to raw drinking water within your school? (tick)

- Yes ☐
- No ☐

If yes, name the illnesses.

(i) ____________________________
(ii) ____________________________
(iii) ____________________________
(iv) ____________________________
(v) ____________________________

5. (a) Have you ever experienced such an illness? (tick)

- Yes ☐
- No ☐

(b) If yes, what steps did you take to treat yourself?

(i) ____________________________
(ii) ____________________________
(iii) ____________________________
(iv) ____________________________
6(a) Do you know of any person in your school who has had such an illness? (tick)

Yes ☐ No ☐

6(b) If yes what did they do for treatment?

(i) ____________________________________________

(ii) ____________________________________________

(iii) ____________________________________________

(iv) ____________________________________________

7(a) How much water do you fetch in a day? (Specify the number of jericans or gallons).

________________________________________________

7(b) How many times in a day do you fetch water? __________________________

8(a) Does the amount you fetch in a day meet your needs?(tick)

Yes ☐ No ☐

(b) If no, how much more would you require for your daily chores?

(State the number of gallons or jericans). ________________________________________

9. List down the number of tasks you perform in a day that require water.

(i) ____________________________________________

(ii) ____________________________________________

(iii) ____________________________________________

(iv) ____________________________________________

(v) ____________________________________________
10. List down in order of importance (beginning with 1\textsuperscript{st}, 2\textsuperscript{nd}, 3\textsuperscript{rd} etc) activities for which you use water on a day-to-day basis.

1\textsuperscript{st} \\

2\textsuperscript{nd} \\

3\textsuperscript{rd} \\

4\textsuperscript{th} \\

11. What toilet facility do you have in your school?
- None
- Pit latrine
- VIP latrine
- Flush toilet
- Other, specify

12. What is the distance between your water source and toilet facility? (tick one)
- Less than 300 meters
- 300 meters to 1 kilometer
- 1 kilometer to 1.5 kilometers
- More than 1.5 kilometers

13. How often do you wash your hands after toilet use? (tick one)
- Always
- Often
- Sometimes
- Rarely
- Never/ not at all
14. Do you make adequate use of the toilet facility within your school? (tick one)

- Always
- Most of the time
- Sometimes
- Rarely
- Never use at all

15. Show by ticking which of the health problems mentioned below you have suffered from and how often in the last six months.

**List of Illnesses by Frequency of Experience by Students**

<table>
<thead>
<tr>
<th>ILLNESS</th>
<th>FREQUENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Diarrhoea</td>
<td></td>
</tr>
<tr>
<td>Measles</td>
<td></td>
</tr>
<tr>
<td>Cholera</td>
<td></td>
</tr>
<tr>
<td>Skin disease</td>
<td></td>
</tr>
<tr>
<td>Dysentery</td>
<td></td>
</tr>
<tr>
<td>Stomachache</td>
<td></td>
</tr>
<tr>
<td>Malaria</td>
<td></td>
</tr>
<tr>
<td>Other (specify)</td>
<td></td>
</tr>
</tbody>
</table>
Appendix 2: Interview Schedule for Women Groups, Members of Households.

Respondents Personal Data

Date ____________________

Name (optional) ____________________________________________________________

Sex  Male □  Female □

Age/Date of Birth ____________________________________________________________

Name of your school ________________________________________________________

1. What is your source of drinking water?

Bore-hole □

Stream □

Tap □

Rainwater □

Other (specify) ____________________________________________________________

2 (a). Do you treat your drinking water?

Yes □  No □

2(b). If yes, what method do you use?

Boiling □

Filtering □

Chemical additives □

Other (explain) ____________________________________________________________
3. How do you store your drinking water?

- In a covered water tank [ ]
- In a closed jerican [ ]
- In an open jerican [ ]
- In an uncovered container [ ]
- Other (explain) ____________________________

4. How much water do you fetch in a day? Specify the number of jericans or gallons.

__________________________________________

5. Please mention what you mainly use water for on a daily basis?

(i) ______________________________________

(ii) _____________________________________

(iii) _____________________________________

(iv) _____________________________________

(v) _____________________________________

6 (a) Does the amount of water you fetch in a day meet your needs?

Yes [ ] No [ ]

(b) If no, how much more would you require for use in your household?

State the number of gallons or jericans ________________________________

7. Mention in order of importance, activities for which you use water on a day-to-day basis? (Start from 1st, 2nd and 3rd.)

(i) ______________________________________

(ii) _____________________________________

(iii) _____________________________________
8. Which of the health problems mentioned below you have suffered from and how often in the last six months (November to April).

List of Illnesses by Frequency of Experience by Household Heads

<table>
<thead>
<tr>
<th>ILLNESS</th>
<th>FREQUENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Diarrhoea</td>
<td></td>
</tr>
<tr>
<td>Measles</td>
<td></td>
</tr>
<tr>
<td>Cholera</td>
<td></td>
</tr>
<tr>
<td>Skin disease</td>
<td></td>
</tr>
<tr>
<td>Dysentery</td>
<td></td>
</tr>
<tr>
<td>Stomachache</td>
<td></td>
</tr>
<tr>
<td>Malaria</td>
<td></td>
</tr>
<tr>
<td>Other (specify)</td>
<td></td>
</tr>
</tbody>
</table>
9. Have any members of your household suffered from the ailments mentioned below and how often in the last three months?

**List of Illnesses by Frequency of Experience by Household Members**

<table>
<thead>
<tr>
<th>ILLNESS</th>
<th>FREQUENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes No Once Twice Thrice</td>
</tr>
<tr>
<td>Diarrhoea</td>
<td></td>
</tr>
<tr>
<td>Measles</td>
<td></td>
</tr>
<tr>
<td>Cholera</td>
<td></td>
</tr>
<tr>
<td>Skin disease</td>
<td></td>
</tr>
<tr>
<td>Dysentery</td>
<td></td>
</tr>
<tr>
<td>Stomachache</td>
<td></td>
</tr>
<tr>
<td>Malaria</td>
<td></td>
</tr>
<tr>
<td>Other (specify)</td>
<td></td>
</tr>
</tbody>
</table>

10. What toilet facilities do you have in your home?

- None
- Pit latrine
- VIP latrine
- Flush toilet
- Other (specify)
11 What is the distance between your water source and toilet facility?

- Less than 300 meters.
- 300 meters to 1 kilometer.
- 1 kilometer to 1.5 kilometers.
- More than 1.5 kilometers.

12. How often do you clean and disinfect your toilet facility in a week?

- Not at all
- Once
- Twice
- Three to six times
- Seven times and above

13. What disinfectant do you use?

14. (a) Do your household members use the toilet facility?

- Yes
- No

(b) If yes, how often do they use the toilet facility?

- Always
- Most of the time
- Sometimes
- Rarely
15 (a) Do you train your young children to wash their hands after toilet use?

Yes ☐  No ☐

(b) If yes, how often do they wash their hands after toilet use?

Always ☐  Often ☐  Some of the time ☐  Rarely ☐  Never ☐

16 (a) Do your young children use open places as toilet facilities?

Yes ☐  No ☐

(b) If yes, how often?

Always ☐  Most of the time ☐  Sometimes ☐  Rarely ☐

17. Do you think that baby waste is just as harmful to health as adult waste is?

19. What method do you use to dispose of your other sanitary waste?

Thank you for your co-operation and time.
### Variable Observation Sheet

<table>
<thead>
<tr>
<th>Variable</th>
<th>Observation</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Water Use Practice</strong></td>
<td>1. Water source: (tick)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bore-hole</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Stream</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Rainwater</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Tap</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Other, specify</td>
<td></td>
</tr>
<tr>
<td>2. Method used to store water: (tick)</td>
<td>Covered water tank</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Jerican</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Uncovered container</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Other, specify</td>
<td></td>
</tr>
<tr>
<td>3. Method of water treatment: (tick)</td>
<td>None</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Boiling</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Filtering</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Chemical additives</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Other, specify</td>
<td></td>
</tr>
<tr>
<td>4. Water source condition: (tick)</td>
<td>Very safe</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Fairly safe</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Unsafe</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Very unsafe</td>
<td>☐</td>
</tr>
<tr>
<td><strong>Sanitation Use Practice</strong></td>
<td>5. Available toilet facility: (tick)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Pit latrine</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>VIP latrine</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Flush toilet</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Other, specify</td>
<td></td>
</tr>
<tr>
<td>6. Condition of toilet facility: (tick)</td>
<td>Very clean</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Clean</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Not clean</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Very dirty</td>
<td>☐</td>
</tr>
</tbody>
</table>
7. Other method of human waste disposal: (tick)
   - Open yard / bush
   - Compost pit
   - Burying
   - Other, specify

8. Distance between water source and toilet facility: (tick)
   - Less than 300 meters
   - 300 meters to 1 kilometer
   - 1 kilometer to 1.5 kilometers
   - More than 1.5 kilometers

Health Status
9. Health status of the household member: (tick)
   - Very healthy
   - Fairly healthy
   - Unhealthy
   - Very unhealthy
Appendix 4: Research Time Frame

<table>
<thead>
<tr>
<th>TIME</th>
<th>ACTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>October-December 1999</td>
<td>Proposal writing and presentation at the Department of Sociology</td>
</tr>
<tr>
<td>December 1999-April 2000</td>
<td>Corrections and presentation of the proposal at the Faculty of Arts</td>
</tr>
<tr>
<td>April-May 2000</td>
<td>Correction and submission of the proposal to the Board of Post-graduate Studies</td>
</tr>
<tr>
<td>May-June 2000</td>
<td>Pre-pilot and complete pilot study</td>
</tr>
<tr>
<td>June -September 2000</td>
<td>Data collection</td>
</tr>
<tr>
<td>September - June 2001</td>
<td>Data analysis</td>
</tr>
<tr>
<td>June 2001- July 2002</td>
<td>Thesis writing, examination and submission</td>
</tr>
</tbody>
</table>
## Appendix 5: Research Budget

<table>
<thead>
<tr>
<th>Item</th>
<th>Charges per day</th>
<th>Duration</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>One graduate research assistant</td>
<td>Kshs 600 per day</td>
<td>30 days</td>
<td>Kshs 18,000</td>
</tr>
<tr>
<td>Transport for the researcher, assistant and a driver for pilot study and for actual research.</td>
<td>Kshs 3,000 per day</td>
<td>12 days</td>
<td>Kshs 36,000</td>
</tr>
<tr>
<td>Subsistence for 3</td>
<td>Kshs 400 per person per day</td>
<td>12 days</td>
<td>Kshs 14,400</td>
</tr>
<tr>
<td>Secretarial services</td>
<td></td>
<td></td>
<td>Kshs 10,000</td>
</tr>
<tr>
<td>Stationary, computer time, toner, ribbon, printing, paper, pencil, photocopied and use of cameras</td>
<td></td>
<td></td>
<td>Kshs 60,000</td>
</tr>
<tr>
<td>Computer, data analysis and binding of the thesis</td>
<td></td>
<td></td>
<td>Kshs 40,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>Kshs 178,400</strong></td>
</tr>
</tbody>
</table>