

“DISEASES ARE A MUST. HUMAN BEINGS MUST GET SICK”

“DISEASES ARE A MUST. HUMAN BEINGS MUST GET SICK”:

A RURAL COMMUNITY’S KNOWLEDGE, ATTITUDES AND
PRACTICES TOWARDS WATER, SANITATION AND HEALTH

By

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A Thesis

Submitted to the School of Graduate Studies

in Partial Fulfillment of the Requirements

for the Degree

Master of Arts

McMaster University

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MASTER OF ARTS (2010)
(Geography)

McMaster University
Hamilton, Ontario

TITLE: "Diseases are a must. Human beings must get sick": A
Rural Community's Knowledge, Attitudes and Practices
towards Water, Sanitation and Health

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NUMBER OF PAGES: ix, 136

Abstract

Over 2.6 billion individuals do not have access to adequate sanitation. Another almost billion individuals do not have access to safe water. Further, water that is available is often laden with chemical and bacteriological contaminants, causing a variety of diseases such as shistosomiasis, cholera, typhoid, dysentery, and hepatitis. Individuals residing in Sub-Saharan Africa are the most greatly affected; approximately 30% of rural residents have limited to no access to water supplies, with women and children bearing the greatest burden. However, while infrastructure may not be easily accessible, the current behaviours of a community may also contribute to the continual spread of water-borne diseases. Therefore, a change in attitudes and practices may be necessary to ensure clean, sustainable sources of water within a community. This study is set in a marginalized community in the Lake Victoria Basin of Kenya. The objectives of this study are threefold: first, to explore the knowledge, attitudes and practices relating to water, sanitation and health; second, to investigate the key facilitators and barriers to facility access at the community level; and third, to investigate the key facilitators and barriers to facility access at the individual level. Results from focus groups (n=4) and in-depth interviews (n=25) indicate that while knowledge of water-health links are present, several contextual, compositional and collective factors interact to create barriers for improved facility access. The results from this study can be used in the creation of a community-based initiative to increase access to safe water and sanitation facilities, and contribute to our understanding of how to implement sustainable solutions to the global water crisis.

Acknowledgements

The completion of this thesis would not have been possible without the multitude of individuals who have enriched my life over the past two years.

First, I would like to give my heart-felt thanks to my supervisor, Dr. Susan Elliott, for giving me the opportunity to work on this incredible project, and supporting me throughout the entire process. I would also like to thank the team at the Kenya Medical Research Institute, and especially Diana and Bernard, who worked with me throughout the field season, welcoming me when I was in a land so far from my home. Thanks must also go to my committee members (Susan and Corinne) for giving valuable feedback and ideas for the future directions for the project, and to the United Nations University Institute for Water, Environment and Health, for funding this research. To the community members of Usoma, who opened up their homes and their hearts to me throughout my time in Kenya, I am eternally grateful. I hope that my work will change your lives as much as your stories have changed mine. Asante sana.

This thesis would not have been possible without the support – both academic and emotional – of all of my friends in BSB 339. Thanks for all of the conversations, fun times – both in and out of the office – and the many amazing memories. Special thanks go to Dan, Jen and Sara for always helping me to find my path in the right direction, and giving me endless support when I was unsure of my next step. Thanks also to Michelle for always seeing when a pep talk was needed, and aiding me through the continual paper work. And to Sarah, who from day one was there with me through all of the ups and downs that I have experienced during this amazing process.

Lastly, I must thank my parents (Joy and David) and my sisters (Jana and Léna) who have always helped me to achieve anything that I dreamed of. Mom and Dad, I would not be the person I am today without all of the love and support that you have always showered upon me. Thank you for providing me with so many wonderful opportunities. Finally, thanks to Drew, for being such an important part of my life.

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CHAPTER ONE

INTRODUCTION

1.1 The Research Problem

Safe water and sanitation facilities are generally accessible to all in most developed nations. However, this is not the case for many developing nations. Globally, approximately one billion individuals do not have access to water free of either microbial or chemical pollutants within a reasonable distance from their home (Millennium Development Goals Report, 2010; UNICEF, 2008b); this contamination can lead to a variety of diseases, including cholera, schistosomiasis, dysentery and typhoid. Women and children are the ones most greatly impacted by the water issue; diarrhoeal disease linked to contaminated water supplies is the cause of over two million child deaths each year (Zwane and Kremer, 2007). The largest proportion of affected individuals reside in Africa (JMP, 2008), with approximately 30% of rural Africans having limited to no access to safe water (Zwane and Kremer, 2007). The story of sanitation is similar: more than two and a half billion individuals do not have access to improved sanitation facilities, such as latrines or toilets (Millennium Development Goals Report, 2010; UNICEF, 2008a), while another quarter of the developing world population does not have access to facilities of any kind (Millennium Development Goals Report, 2010). This deficit serves to facilitate the continuation of water contamination by bacteriological pathogens; when there are no sanitation facilities available, individuals have no choice but to practice open defecation, giving bacteria the opportunity to cycle back into surface and ground water supplies.

Lack of safe water and sanitation can lead to a variety of health and environmental problems. However, it can also present a multitude of social issues and inequalities, affecting women and children most greatly, within a community. For example, when sanitation facilities are not available, women may be restricted in the hours in which defecation can be performed, as some cultures do not permit open defecation by women during daylight hours. This forces women and children to venture out alone at night, leaving them vulnerable to rape and other

forms of abuse (UNICEF, 2009). Also, girls may be forced to abandon their education, especially once reaching the age of menarche, if schools do not have adequate facilities which allow for privacy. Women and girls are also responsible for the care of families, both in terms of collecting water, and taking care of the sick. A lack of sanitation facilities increases the likelihood of disease, and thus burden of care. With decreased available time, women and girls may be forced to collect water at the closest available stream, regardless of its safety, once again allowing the proliferation of disease. Finally, a lack of sanitation facilities can cause complications for women during pregnancy, through increased incidence of hookworm infections (UNICEF, 2009).

In short, lack of access to safe water and adequate sanitation results in health, environmental and social problems and inequities. Further, increased access does not guarantee utilization (Jenkins and Sugden, 2006). Although availability is a key component, knowledge, attitudes and practices are key variables in the water-health equation. This thesis examines the knowledge, attitudes and practices of one rural village in eastern Africa on the shores of Lake Victoria, in order to contribute to our understanding of how to implement sustainable solutions to the global water crisis.

1.2 Research Rationale

In 2000, the United Nations established eight Millennium Development Goals (MDGs), aimed at achieving better global living conditions by 2015 (Millennium Development Goals Report, 2010). The MDGs incorporated a variety of subjects, such as poverty and hunger, universal education, gender equality, child mortality, maternal health, the HIV/AIDs epidemic, environmental sustainability and global partnership. Within the specific goals for environmental sustainability, the UN set a target to halve the number of individuals without sustainable access to basic sanitation and drinking water (Millennium Development Goals Report, 2010). Access to safe water has increased dramatically; programs are currently well on their way to achieving the MDG target to increase water access to eighty-nine percent of the developing world population. However, half of the developing world still does not have access to improved sanitation and one quarter of the developing world population does not have access to sanitation facilities of any kind (Millennium Development Goals Report, 2010). Although access to sanitation in developing nations has improved, increasing from forty-one percent in 1990 to fifty-three percent in 2006, the world is still far from its target of seventy-one percent access by 2015. Indeed, it has

been suggested that to meet the MDG goal for sanitation in 2015, efforts will need to be doubled (Millennium Development Goals Report, 2010).

Sub-Saharan Africa and Southern Asia are the furthest from their access goals of sixty-three and sixty-one percent respectively, with only thirty-one and thirty-three percent of individuals currently able to access sanitation facilities (Millennium Development Goals Report, 2010). Kenya, specifically, is facing considerable issues relating to water, sanitation and health. Over a third of the population does not have access to drinking water, while over half do not have access to improved sanitation facilities (Karanja, 2008). This leads to an increased number of preventable diseases within the population, especially within rural areas; in many of the rural areas, ninety percent of preventable diseases are related to a lack of water and sanitation facilities (Karanja, 2008).

More must be done to make certain that marginalized individuals have increased access to water and sanitation. However, in order for solutions to be successful, interventions must account for local context (beliefs, knowledge, values, behaviour) in order for change not only to occur, but to be sustainable. For example, a study of two rural villages in India (Banda et al., 2007) concluded that although intervention technologies were available, lack of local knowledge of water-health linkages prevented their success. By increasing the understanding of current knowledge, attitudes and practices with respect to water, sanitation and health, interventions can be designed to fit local context, thus enhancing the sustainability of solutions.

1.3 Knowledge, Attitudes, Practices, Empowerment and the Water-Health Nexus

This thesis is the initial step in an on-going research project: *Knowledge, Attitudes, Practices, Empowerment (KAPE)*. This project, headed by the United Nations University Institute for Water, Environment and Health (UNU-INWEH), is being undertaken in collaboration with the Kenya Medical Research Institute (KEMRI), the national body responsible for health research in Kenya. KAPE has three objectives:

- (i) To build capacity of local communities around water and health;
- (ii) To educate local communities on key elements to maintain public and community health in the context of safe water;
- (iii) To improve public health through public education and outreach about water and health.

For these objectives to be achieved, the project will address local challenges with water and health through three steps:

- (i) Begin to understand perceived links between water and health among local populations;
- (ii) Develop interventions to raise awareness of the links between water and health;
- (iii) Evaluate the interventions and transfer learning's to other similar communities.

The research for this thesis is set in the pilot community for step one of the larger KAPE initiative, which explores the knowledge, attitudes and practices towards water, sanitation and health of a rural, marginalized community along the shores of Lake Victoria, Kenya. While multiple participatory and qualitative collection strategies were used to collect data (focus groups, in-depth interviews, community mapping and photovoice) this thesis will focus on the data collected through focus groups and interviews. Results and analysis of the community mapping process and photovoice will be undertaken in future to triangulate with the current findings.

This current research has three specific research objectives:

- (i) To explore knowledge, attitudes and practices regarding current water, sanitation and health behaviours;
- (ii) To investigate the key facilitators and barriers to water and sanitation access at the community level; and
- (iii) To investigate the key facilitators and barriers to water and sanitation access at the individual level.

By addressing these objectives, a clearer understanding of current perceptions of the links between water, sanitation and health, will emerge. Further, the results can be used to first inform the subsequent stages of research in the larger project and to empower the community.

1.4 Research Contributions

This research contributes to the current gap in the literature pertaining to the understanding of water-health links, particularly in the Sub-Saharan Africa region. In addition, knowledge, attitudes and practices are used to understand the facilitators and barriers which can affect individual and community level access to safe, sustainable, water and sanitation facilities. Not only will this research help to

enlighten future researchers of current beliefs and understanding in rural villages, but it also will help to inform the larger project managed by UNU-INWEH. The information gathered through the knowledge, attitudes and practices phase of this study, will help to guide UNU-INWEH in a sustainable intervention project, building capacity and empowering the community to identify and implement their own solutions.

1.5 Chapter Outline

Chapter two of this paper presents a literature review examining past studies involving knowledge, attitudes and practices of rural communities with respect to water, sanitation and health. This review highlights the theoretical, methodological and substantive components of previous work, and looks to examine the gaps in the literature that the current research will help to fill.

Chapter three reviews the study design and the methods used for data collection and analysis. The development of data collection tools (i.e., focus group checklist and interview script), sampling methods, focus group and interview administration, and sample characteristics are also discussed.

Chapter four presents the findings from this research, examining the results from the analysis of focus group and interview transcripts. Chapter five concludes the thesis by reviewing the major findings from the research and how they relate to the overall research objectives, with contributions to the literature noted. The thesis concludes with an examination of the future directions of this research, and the larger research project.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Almost one billion individuals are without access to water free of biological or chemical contaminants, while over two and a half billion lack access to sanitation facilities (UNICEF, 2008b). Lack of access to both water and sanitation within a community allows for the continued spread of water-borne and water-related illness, thereby increasing the burden of disease. Increasing access to safe water and sanitation facilities within communities may be one option for mitigating the spread of disease; however, to ensure sustainable intervention access and use, the daily practices and knowledge base of a community, and cultural nuances must be understood (Montgomery and Elimelech, 2007; Forget and Sanchez-Bain, 1999).

This chapter examines literature pertaining to the knowledge, attitudes and practices of rural communities towards water, sanitation and health. It begins with an overview of health geography, and its use as a contextual lens through which to view the water-health nexus. Next, the theoretical concepts used to guide this research, such as the ecosystem approach to human health (Waltner-Toews and Kay, 2005) and embodied epidemiology (Krieger 2001a), are discussed. The use of previous knowledge, attitudes and practices research will be discussed, as well as methodological approaches used within water and health research. The chapter concludes by identifying the contributions of this research.

2.2 From Medical to Health Geography

Historically, exploration of disease and illness in medical geography had two main areas of focus. The first examined the spatial and temporal distribution of disease (Andrews and Evans, 2008). This information has been used successfully in explorations of disease etiology, specifically with respect to appropriate intervention strategies (Kearns, 1995). These techniques are also applied in studies of landscape epidemiology, which aims to understand the

spread of disease through prospective spatial patterning (Andrews and Moon, 2005). The second stream of focus within medical geography aims to examine the distribution, accessibility and delivery of health care within specific geographies (Rosenberg and Wilson, 2005), with a particular focus on issues of equity and equality (Andrews and Moon, 2005; Andrews et al., 2004). Traditionally, research within these streams has used quantitative methods to demonstrate the spatiality of health within communities, as well as spatial aspects of health care (Kearns and Moon, 2002; Andrews et al., 2004).

While the spatial distribution of disease is important in understanding disease etiology, medical geography has been criticized for its lack of concern with *place* in health research (Luginaah, 2009). That is, *space* was viewed as a passive container for health and health care, without examining the characteristics of that space that may affect health outcomes (Kearns and Moon, 2002; Poland et al., 2005). The social, cultural, economic and political characteristics of places needed to be re-conceptualized as important determinants of the health and well-being of individuals and communities (Andrews et al., 2004). This refocusing to examine place effects on health initiated a shift from the medical, spatially considerate geography, to the geographies of health and health care (Kearns and Moon, 2002).

The current geographies of health and health care have adopted a holistic view of health and wellbeing, encompassing the role of place, society, location, and policy in its analysis (Kearns and Moon, 2002). The shift of focus within health geography to re-emphasize place, along with the “intersection of individual level biological and behavioural variables with social and environmental factors” (Elliott, 1999, p.241) brings together the societal, environmental and individual factors that combine to produce health. Four distinct changes have occurred during the shift to the geography of health and health care. First, as stated previously, there was a need to recognize how characteristics of places shaped the experience of health. To allow for this enhanced understanding of experience, there has been an increase in the use of qualitative and mixed-method approaches. Qualitative methods “provide insights that show us how conditions in particular places are thought to influence health and health related behaviour” (Cummins et al., 2007, p.1826). The shift in methodological approaches has allowed for a deeper understanding of study participants experiences, and their interactions within place (Dyck, 1999). Third, while medical geography implicitly used theories to inform research objectives (Litva and Eyles, 1995), the changing emphasis on methodological approaches required a more explicit, critical use of theories and theoretical frameworks (Cutchin, 2007). Finally, health geography

began to take a more critical approach to the examination of factors involving health (Cutchin, 2007). Social, geographical and individual factors are recognized as shaping the ability of individuals or communities to increase or maintain health, and thus needed to be addressed to help fully comprehend the health issue at hand (Luginaah, 2009).

Due to its holistic exploration of the complex interactions affecting health, the geography of health and healthcare provides an ideal lens through which to explore issues of environmental health generally, and those of water and sanitation more specifically. This holistic approach is central for this research, which aims to examine the social, individual and environmental factors that interact to enable communities to sustainably access safe water and sanitation facilities.

2.3 Health Geography and the Water-Health Nexus

Daily access to clean, safe water, free of biological or chemical contaminants, is not a reality for approximately one billion people, globally (UNICEF, 2008b). Sub-Saharan Africa is the region most greatly affected (JMP, 2008), with thirty percent of rural residents living without access to safe water (Zwane and Kremer, 2007). The use of contaminated water by individuals leads to the spread of multiple diseases and parasites, including *Guardia*, *Cryptosporidium*, schistosomiasis, cholera, *E. coli*, dysentery, typhoid and hepatitis A and E (Batterman et al., 2009; Sharma, Sachdeva and Viridi, 2003). Indeed, it is estimated that almost ten percent of the global burden of disease is related to contaminated water (Prüss-Üstün et al., 2009), with women and children bearing the greatest health burden (UNICEF, 2009). For example, diseases relating to a lack of sanitation facilities cause over five million deaths worldwide each year (Pimentel et al., 2007); in Kenya specifically, ninety percent of preventable diseases are linked to a lack of safe water and sanitation facilities (Karanja, 2008). Increased illness within a household creates further burden on women and children, who must take care of the sick, leaving less time to walk the distance to a safe water source, to attend school, or to contribute to the local economy (UNICEF, 2009).

A lack of safe, usable sanitation facilities also impacts greatly on the health of a community. Open defecation, a result of a lack of facilities, proliferates the biological contamination of ground and surface water, while also raising important social concerns. These concerns include decreased security, dignity, educational opportunities due to cultural taboos towards menstruation, and increased burden of care which disproportionately affects women and young

girls (UNICEF, 2009). A lack of facilities can lead to the perpetual biological contamination of water sources, as water and sanitation practices are intrinsically linked.

Social, cultural and political factors can each have an important impact on a community's ability to install or maintain water provisioning and sanitation facilities. In particular, a community's social capital, described as the benefits accrued to an individual due to membership within a social group or network (Hawe and Shiell, 2000), can affect their ability to cope with related health issues. Indeed, the social capital of a community can affect health in three ways; directly (through increased social support and engagement); indirectly (through economic, environmental and political factors); and lastly through interactions with other determinants of health (Veenstra et al., 2005). It is the first two factors which have the greatest relevance for this research. First, the health knowledge held by a community, along with their ability to prevent the spread of environmentally related diseases (such as malaria and typhoid) is greatly affected by the presence of existing social networks. As reported by Andrzejewski and colleagues (2009), health knowledge at both individual and community levels within a developing nation setting are greatly affected by the social characteristics that make up a community. The presence of a market or meeting place, as well as literacy rates, all affect the ability of a community to gain health knowledge, and subsequently fight the spread of disease. Thus compositional (individual literacy and education level) and collective attributes (presence of markets and other social networks and capital) affect a community's capacity to cope with issues of health.

Second, the political, cultural and ethnic landscape of a community can also affect a community's ability to provide safe water, safe and functioning sanitation facilities and relevant health education (Rheingans, Dreibelbis and Freeman, 2006). This was shown to be especially true in regions of Western Kenya, where conflicts arising from increased ethnic and political diversity caused lower school funding, a decreased ability to maintain safe and functioning wells, and failed to allow for the effective use of group collaboration for participation in health promoting activities (Miguela and Gugerty, 2005).

The effects of physical location and specific environmental characteristics of a community must also be considered. The disparity between geographic location, with respect to water and sanitation accessibility, can be seen clearly in the differences between urban and rural communities. Urban locations within

developing nations are 30% more likely to have improved water sources¹ over rural locales, and are 135% more likely to have access to improved sanitation facilities² (Rheingans, Dreibelbis and Freeman, 2006). The physical geology of the location may also present challenges when trying to implement small-scale infrastructure, such as pit latrines, bore-holes and wells (Dzwaairo et al., 2006). These characteristics of the physical environment interact with the socio-political landscape to affect the health of individuals and communities associated with safe water and sanitation.

It is clear that issues related to the water-health nexus are complex and require explorations of contextual (physical), compositional (individual) and collective (community) factors. The geography of health provides a broad lens for explicitly exploring these interactions. Of particular interest are the knowledge, attitudes and practices at the community and individual level, which will be outlined explicitly in section 2.5.

2.4 Theoretical Context

2.4.1 Ecosystem Approach to Human Health

To increase the understanding of health and wellbeing, the geography of health and healthcare has taken a holistic perspective, which examines all factors that combine to affect health (Kearns and Moon, 2002). Likewise, the ecosystem approach to human health incorporates a view of health that “explicitly anticipates disease and health outcomes within their complex social and ecological contexts, with respect to the ecological and cultural origins, vectors, propagation, response, and natural mitigation” (Arya et al., 2009, 35). It is an approach that aims to increase the health of both the human population, and the environment in which they live, by examining the physical, biological, and social factors that interact within that ecosystem (Forget and Lebel, 2001; Forget and Sanchez-Bain, 1999).

The conceptualization of the ecosystem approach to human health required the evolution of multiple health models, before the notion of *ecosystem*

¹ Improved water sources are technologies or services which provide water which is considered safer than unimproved sources, including such technologies as covered boreholes, household connections to municipal water supplies, public taps, protected dug wells, protected springs, and rainwater collection (WHO, 2010)

² Improved sanitation is defined as the services and technologies which are more likely to provide sanitary defecation locations over unimproved technologies. Improved sanitation facilities include public sewer systems, septic systems, pour-flush latrines and simple or ventilated pit latrines (WHO, 2010).

was incorporated into a functional model for analyzing health. Indeed, as described by VanLeeuwen and others (1999), an evolution occurred from the ecological model of the late 19th century through various models, including the socio-ecological model, wellness model, and community ecosystem model. Many of these models increased the understanding of health and wellness, by illustrating how feedback loops within an environment can influence health outcomes; however, they failed to adequately acknowledge the multiple biological layers of an ecosystem that combine and interact to impact on the health of an individual and community (VanLeeuwen et al., 1999). For example, models such as the mandala of health (Hancock and Perkins, 1985), incorporates three levels of influence on health (community, culture and biosphere), acknowledging that many factors combine to affect overall health. However, it fails to take into account the many ecosystem and environmental factors, both internal and external, that also interact with an individual to determine wellbeing (VanLeeuwen et al., 1999). By drawing upon previous models, and examining ecological conditions (Rapport, 2002), a better understanding of the connections between social, political and environmental conditions and human health was developed. Within their butterfly model of health, VanLeeuwen and colleagues (1999) conceptualized how humans are affected by their environment, both physical and social (See Figure 2.1). This model shows the interconnectedness between the biophysical and socioeconomic environments, while also showing how individual biological filters affects whether an individual will contract a disease. External environments from neighbouring ecosystems, which interact with internal environments, are also taken into consideration (VanLeeuwen et al., 1999).

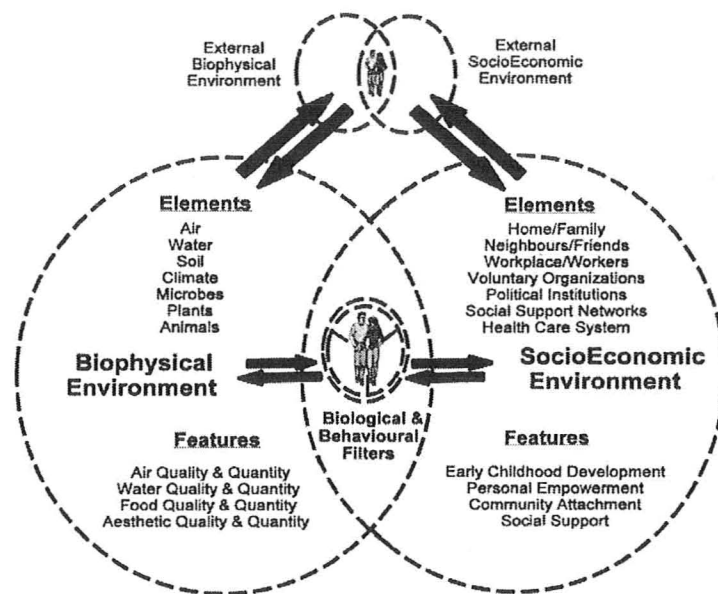


Figure 2.1: Butterfly model of health for an ecosystem context (VanLeeuwen et al., 1999)

The inclusion of ecological systems in explorations of disease and health is necessary for two reasons. First, social and ecological changes such as poverty, inequity, and loss of ecosystem services are drivers for the emergence of disease, and especially so for infectious disease (Parkes et al., 2005). This has been documented in the control of malaria in rural Thailand (Rapport, 2002). Within these areas, increased levels of poverty leads local children to collect the nests of birds and frogs to sell in local markets; this causes a decreased number of these animals, predators of mosquitoes which spread malaria, within the ecosystem (Rapport, 2002) leading to an increased burden of disease. Second, to successfully use disease control as a health promotion strategy, multiple interactions within an ecosystem must be taken into account. Without critically examining the contributions of social, political and environmental factors, implementation of a solution may, in fact, exacerbate and increase the underlying problem leading to adverse health effects (Parkes et al., 2005; Waltner-Toews, 2001). This is highlighted by an example of *E. coli* contamination of a municipal water source in Walkerton, Ontario. In this particular case, a combination of many factors, including decreased budgetary funding, increased rainfall, human error and a misunderstanding of water flow boundaries (Arya et al., 2009), resulted in 2300 illnesses and 7 deaths in 2000 (Holme, 2003). Thus, budgetary cuts made without understanding the full interaction of systems affecting ground water contamination greatly impacted the health of a community as a whole.

While the ecosystem approach to human health conceptualizes the connections and processes that affect health, research informed by this approach

also focuses on the importance of building community capacity, and integration of multiple stakeholders, which allows for the successful implementation of sustainable interventions (Bopp and Bopp, 2004; Arya et al., 2009). It also focuses on the use of participatory methods to ensure increased community involvement (Waltner-Toews and Kay, 2005), allowing for rich, layered accounts from local participants (Pain, 2004). This process is used to fully conceptualize the issues affecting the community (Bopp and Bopp, 2004), and for identifying effective routes of response (Waltner-Toews and Kay, 2005), while also ensuring that proposed solutions are culturally appropriate and economically and environmentally sustainable (Forget and Sanchez-Bain, 1999). Interventions that seem viable within the developed world may be inadequate or unsustainable in the context of the developing world. This disconnect is exemplified by a project in rural Kenya, where indicators for sustainability and health were found to be different between villagers and researchers, a result of differing goals (Waltner-Toews and Kay, 2005). Bopp and Bopp add that “when our goal is the actual improvement of the health and well-being of specific populations, we as professionals cannot deliver that outcome to communities. We can only work together with communities to build that outcome from within” (2004, 25). Community interaction is imperative when trying to assess and improve health, especially within a setting where goals and knowledge of the community may be different than those of the researchers.

The ecosystem approach to human health is not without its critiques. First, while the use of the ecosystem approach for understanding the multifaceted levels of health allows for an in-depth and grounded understanding of the issues, frameworks and disease prevention models founded on these principles may not be feasible in a practical setting, due to hard-to measure, variable factors that are involved in the systems analysis of a problem (Parkes et al., 2005). For example, while an attempt to examine factors currently affecting an ecosystem may occur, changes in the system (both magnitude and timing), as well as resultant health outcomes from these changes, can be difficult to predict (Edge and McAllister, 2009). Second, while an increased understanding of the problem may lead to more sustainable and culturally appropriate interventions (Banda et al., 2007), these interventions are often difficult to implement rapidly, as are policies to be implemented on a larger scale (Parkes et al., 2005). However, by ignoring the complexity of the factors that combine to facilitate or act as a barrier to health, easily implemented interventions or changes within a system may exacerbate issues instead of solving them, as evidenced by the example of malaria in Thailand. Without the full examination of all factors, as well as community

participation and engagement, sustainable solutions to environmental health problems are difficult to both conceive, and implement.

2.4.2 Embodied Epidemiology

While the ecosystem approach to human health will be used as the main theoretical backdrop for this research, embodied epidemiology has also been used to conceptualize how place and environment affect health, particularly at the individual scale. The construct of embodiment is linked closely to various multi-level perspectives, including Krieger's ecosocial theory of epidemiology (Krieger, 2001a; Krieger, 1994), which seeks "to integrate social and biological reasoning and a dynamic, historical and ecological perspective" (Krieger, 2001b, p.674) to explore determinants of the distribution of disease, and inequalities in health. Ecosocial theory views the changing population health, disease and wellbeing at multiple levels (biological, social and ecological) and at various scales (Krieger, 2001b). Embodiment as a construct examines how the biological and social situations in which we live as humans are evidenced on our bodies, produced through health outcomes (Krieger and Davey Smith, 2004; Krieger, 2001b). That is, embodied epidemiology purports three claims; (i) that bodies tell stories about the conditions within which they live; (ii) that bodies tell stories that can verify the oral account from an individual and; (iii) bodies may tell stories which an individual is not willing or able to verbalize (Krieger, 2005). Embodiment posits that as living organisms we incorporate the biological, social and ecological environments in which we live into our bodies, and that these interactions are expressed through our individual health (Krieger and Davey Smith, 2004). For example, connections have been made that link maternal nutrition during famine periods to increased risk of adult disease, including glucose intolerance and obesity (Harding, 2001). Thus, the environment in which one lives and the resources available to them, from in-utero until death, can have a great impact on the health outcomes they experience.

The rationale for the use of embodiment concurrently with the ecosocial theory for the investigation of the water-health nexus is twofold. First, as stated within the ecosystem approach to human health, to fully understand an individual's health and wellbeing, the multiple factors which interact to produce a health outcome (including the social, biological and physical environments) must be taken into account (Krieger, 2001a; Krieger, 1994). These factors are embodied by an individual, and can be viewed by an external individual, and thus may help to give a broader understanding of the current behaviours that affect health status. For example, an individual who has previously incurred a physical

disability due to improper medical treatment (e.g., leg deformation due to improper setting of a fracture) may be restricted by this embodied health outcome to collecting water from sources close to their home, whether or not those sources are free of contaminants. Here, the theory of embodied health outcomes allows for a deeper understanding of the underlying cause of an individual's behaviours, and how these affect health. Secondly, humans are both biological and social beings and both pathways interact simultaneously to produce health outcomes (Krieger and Davey Smith, 2004). Thus both of these factors need to be taken into account when using embodiment as a construct when examining the issues of water, sanitation, and health. Figure 2.2 outlines the biological and social factors that simultaneously interact to produce an embodied health outcome (See Appendix A for a full explanation of these factors). Similar to the ecosystem approach the considerations of these interactions are especially critical within the water-health nexus, as multiple factors interact to produce health outcomes that can be embodied in an individual, and also to facilitate the behaviours that individuals practice due to these embodiments.

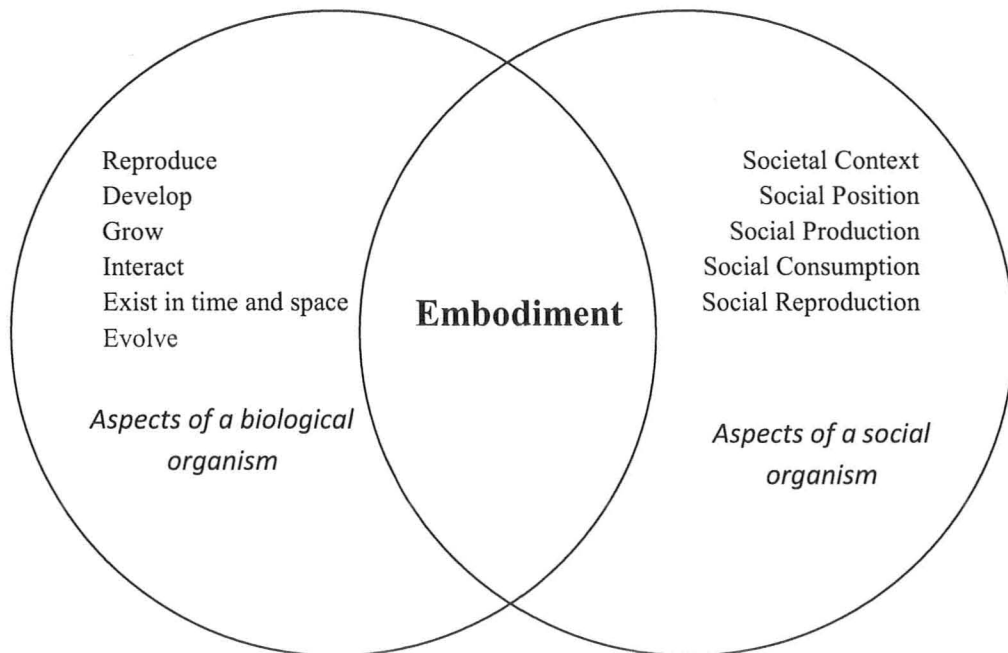


Figure 2.2: The biological and social features that interact to allow for embodiment
(Adapted from Krieger and Smith, 2004)

2.5 Knowledge, Attitudes and Practices Research

As discussed previously, social, political and environmental community contexts have a substantial impact on health and wellbeing. As well, social networks and educational opportunities affect behaviours, and capacity for, change (Andrzejewski et al., 2009). Before appropriate, sustainable intervention strategies can be implemented, greater consideration of current understanding, perceptions and behaviours must occur. It is towards these goals that knowledge, attitude and practices (KAP) studies are particularly valuable.

KAP studies are useful in identifying various factors that affect the health of a community, such as cultural beliefs, behavioural patterns and gaps in knowledge (WHO, 2008). Not only can these studies identify why specific behaviours are practiced and how health is perceived, they can also identify (1) barriers and facilitators to action; (2) areas that may aid in the change of health-related behaviour; and (3) the current health needs of a community (WHO, 2008). By understanding the health knowledge of a community, the attitudes towards specific health outcomes, and current health practices, interventions can be created that are culturally appropriate and sustainable. This is especially important when the knowledge and perceptions held by the community conflict with those held by the researcher (WHO, 2008). For example, when examining the knowledge of diarrhoeal disease and its perceived causes in Northeast Thailand, Pylypa (2009) discovered such a conflict in perceptions. In particular, while some diarrhoeal episodes were viewed as preventable and treatable using biomedical treatment options (i.e., oral rehydration therapy), others were considered to be a natural process that all children needed to experience as a stage in their development. Further, these episodes were viewed as preceding developmental milestones such as crawling, sitting up or walking (Pylypa, 2009), a perception not commonly held by western cultures. This example shows the need to account for the behaviours and perceptions of a community. By understanding these, appropriate interventions and treatment strategies may be put in place, thereby increasing the chance of sustainable community uptake (Dakubo, 2004).

Following a KAP research approach is of paramount importance for research relating to water and sanitation, especially in areas of Sub-Saharan Africa. In these regions cultures, knowledge and behaviours of study participants may differ greatly from researchers and those funding interventions. Past sanitation initiatives and policies have relied heavily on supply-led sanitation models; that is, hardware subsidies were used to initiate latrine installation at the household level by supplementing the cost of building supplies and installation

costs (Jenkins and Sugden, 2006). While this may aid in increased facility *access*, they have rarely led to increase *desire* for sanitation facilities (Jenkins and Sugden, 2006). Other constraints, such as limited space, perceived poor design and performance (Jenkins, 2004), lack of decision-making capacity (Jenkins and Scott, 2005) and a lack of awareness of the links between sanitation and health (Jackson, 2004) instead act against the desire for sanitation, limiting its adoption. By taking the KAP approach *prior* to facility installation, the facilitators and barriers to latrine installation *and* use can be recognized and addressed. Then, community members, researchers and funders can collaborate on appropriate solutions which will ensure sustainable upkeep and use for the future.

2.5.1 Past Knowledge, Attitudes and Practices Research

Many fields of health research such as family planning (Lundgren et al., 2005; Smit et al., 2002), HIV/AIDS (Delobelle et al., 2009), and malaria (Hlongwana et al., 2009; Adebamowo et al., 2006) have utilized KAP models to gain deeper understanding of key issues, particularly those set in the developing world. KAP studies have also been used to explore hygiene practices and their relation to health outcomes, especially in cases where intervention was a primary goal (Rao et al., 2007; Caircross, et al., 2005).

The majority of African KAP literature focuses around the topics of HIV/AIDS and malaria prevention, with a particular emphasis on KAPs related to health outcomes (Hlongwana et al., 2009), as well as the attitudes of health practitioners, and how these perceptions may affect the care of HIV/AIDS patients (Delobelle et al., 2009). In short, a gap in the KAP literature exists around water and sanitation. Further, this gap is particularly pronounced for Africa, despite literature addressing KAPs related to water/health/sanitation in India (Banda et al., 2007), Pakistan (Halvorson, 2004), Lebanon (El Azar et al., 2009) and Bangladesh (Taha et al., 2000). The few exceptions include O'Reilly et al., 2008; Jenkins and Curtis, 2005; Mbonye, 2004; Curtale et al., 1998; Whittington et al., 1993; Dikassa et al., 1993; Kondulule et al., 1992, with O'Reilly et al., 2008 the only example from Kenya. In this study, the authors examine KAPs of a Western Kenyan community in order to assess the success of a health intervention initiative. Although these KAPs shed light on the issues of sanitation in African countries, their focus is limited in respect to water-health linkages. For example, while Mbonye (2004) used diarrhoea prevalence as an indicator of health-seeking behaviours, little emphasis was placed on the knowledge of connections between water and sanitation. Similarly, Dikassa et al. (1993) examined behaviours as determinants of diarrhoea, without examining the

attitudes of individuals towards sanitation need. While preliminary understanding of knowledge and behaviours towards water and sanitation has been explored, little has been done to examine individual and community understanding of water-health linkages in relation to sanitation. Therefore, the purpose of this thesis is to examine the knowledge, attitudes and practices related to water-health in order to begin to address this global crisis.

2.5.2 Methodological Approaches to Knowledge, Attitudes and Practices

KAP studies have used both qualitative (for examples see Banda et al., 2007; Adebamowo et al., 2006; Jenkins and Curtis, 2005), and quantitative (for examples see Manji et al., 2007; Rawlins et al., 2007; Smit et al., 2001) methodologies to understand current knowledge held by research participants. While quantitative methods have been of use for generating a breadth of understanding on the knowledge of health outcomes, particularly at national or regional levels (Hulton et al., 2000), they are limited in gaining the in-depth understanding of perceptions and attitudes held within a specific locale. Alternatively, qualitative methods, such as focus groups and interviews, allow for researchers to provide rich description of a situation that allows for enhanced understanding; understanding which is especially important in early stages of KAP investigation (Sofaer, 1999). The use of qualitative methods can provide the researcher with descriptions and accounts that help to link the full spectrum of issues that react to create knowledge and attitudes towards a subject, and that affect the behaviours practiced by an individual. While quantitative methods allow for a general understanding of knowledge held and behaviours practiced, the ability of qualitative methods to deeply comprehend multiple facets of a situation and their interactions (Hulton et al., 2000) will be particularly useful in the context of this research.

While some KAP studies relating to water and sanitation did utilize qualitative approaches, the majority of the small number of studies identified focused more on the use of household surveys to gain a quantitative knowledge of the practices that people perform, and the knowledge that they hold towards the spread of diarrhoeal diseases (for example El Azar et al., 2009; Taha et al., 2000). As stated previously, while quantitative approaches are useful at gaining breadth of knowledge of a large area or region, for smaller regions, qualitative approaches are useful to understand the nuances and layering of factors that combine to affect the knowledge, perceptions, and behaviours on a household and community level (Hulton et al., 2000). Thus, this research will contribute by using qualitatively derived information on the knowledge, attitudes and practices of a rural,

marginalized community, to understand the facilitators and barriers for water and sanitation access. This work is novel, not only for its use of qualitative methods, but also as few KAP studies relating to water and sanitation have been performed in Africa, or Kenya specifically.

2.6 Increasing Community Knowledge of the Water-Health Link

While few studies have utilized a KAP approach prior to the implementation of new sanitation facilities, past initiatives have recognized the connection between individual's level of sanitation knowledge and health affecting behaviours, such as open defecation. Thus, intervention approaches have aimed to increase knowledge of the links between water, sanitation, and health to initiate behavioural change in marginalized communities.

The first approach that aims to create 'open-defecation free communities' is known as Community Led Total Sanitation (CLTS), a pioneering approach that was taken by WaterAid in India in the late 1990s and early 2000s (Kar, 2005). This approach was first used in Mosmoil, a village in Bangladesh. It has also been employed throughout rural communities within both Asia and Africa, with the focus on mobilizing and empowering communities to eradicate open defecation in their own villages (Lüthi et al., 2009). This approach uses participatory techniques, such as community mapping, along with transect walking to help illustrate areas in a village where defecation occurs, and shows how these sites are helping to contaminate the village and cause illness (Chambers, 2009). CLTS focuses greatly on empowering the community to change their situation, through the visualization of current water and sanitation sites, and urges communities to take action once these patterns have been visualized. The approach focuses not on outside researchers and funding organizations providing the community with hardware subsidies and engineered solutions, but instead on facilitating the community to create sustainable solutions out of the current resources available in the community (Chambers, 2009).

While this innovative approach has shown much promise for increasing community interest in sanitation use in the developing world, its success is dependent on a changing perception towards sanitation need. Communities which had not felt a need for sanitation facilities because of a lack of knowledge of disease spread previous to a CLTS intervention, are prime candidates for the use of this approach. However other barriers, such as the physical characteristics of the soil, and perception that sanitation is a private not a public problem, can also act as barriers for sanitation uptake; these factors have been documented in past sanitation research in Africa (Jenkins, 2004), and Kenya (Jackson, 2004)

specifically. Without having an understanding of community knowledge, attitude towards sanitation, and the culturally accepted defecation practices of a community, it may be difficult to tell whether the CLTS approach will be a viable intervention strategy.

The World Health Organization has also used participatory approaches in their work with water, hygiene and sanitation in the developing world. The Participatory Hygiene and Sanitation Transformation (PHAST) program was employed in the 1990s to help increase knowledge of health outcomes and their transmission routes in relation to sanitation (WHO, 1997). The purpose of this program was to ensure behaviour change within a community so as to decrease rates of transmission of disease; this was accomplished through the conduction of workshops employing a variety of participatory and qualitative techniques, including community mapping, to visualize water supply sources, sanitation facilities, poor drainage systems and areas of open refuse. This helped to expand the communities' knowledge of how sanitation is linked to health and waterborne disease (WHO, 1997). Interestingly, this program did see the value of understanding the knowledge base of the community, with interventions beginning by an initial survey to determine the knowledge base held by community members; this knowledge base could then inform the workshops educational material, suiting it to fit the community in which it was being used. This approach thus supports the goals of this research, particularly with respect to the usefulness of understanding the knowledge, attitudes and practice for successful implementation and behaviour change. Increasing understanding of KAPs will help to identify the factors which act as facilitators and barriers to change, as well as allowing for alterations to intervention initiatives, to ensure they fit the culture and level of knowledge of the community.

2.7 Chapter Summary

This chapter began with a discussion of the shift from medical geography to the geographies of health and healthcare. The shifting perspective from medical to health geography allowed for a place-based lens by which to view this research. The use of health geography within the water-health nexus was deemed a useful foundation for this research.

Also, the theoretical frameworks employed in this research were described. The connections between place, society and health were illustrated through the examination of the ecosystem approach to human health, and the embodied epidemiology approach.

Finally, a substantive and methodological review of knowledge, attitudes, and practices studies was highlighted. While a greater understanding of KAPs in a community can ensure that suitable, sustainable water and sanitation interventions are implemented, little use of this approach has been used in the water-sanitation field. However, past intervention strategies, including CLTS and PHAST, have highlighted the need to increase knowledge of water-health links, to allow for successful behaviour changes which will increase health and well-being.

CHAPTER THREE

STUDY DESIGN AND METHODS

3.1 Introduction

This chapter outlines the study design and methods employed to address the following objectives:

- (i) To explore knowledge, attitudes and practices regarding current water, sanitation and health behaviours;
- (ii) To investigate the key facilitators and barriers to water and sanitation access at the community level; and
- (iii) To investigate the key facilitators and barriers to water and sanitation access at the individual level.

This chapter is divided into four sections. The first gives context to the research, by providing an overview of the on-going research project in which this thesis is based. The Lake Victoria Basin, the location in which this study took place, as well as a description of the research community, is presented. The chapter then outlines the steps involved in research design, participant selection, data collection and analysis. The chapter concludes with an overview of the community report-back process.

3.2 Study Background and Research Setting

As stated previously, this thesis is the initial step of the *Knowledge, Attitudes, Practices, Empowerment (KAPE)* project headed by the United Nations University Institute for Water, Environment and Health in collaboration with the Kenya Medical Research Institute (KEMRI). KAPE has three objectives:

- (i) To build capacity of local communities around water and health;
- (ii) To educate local communities on key elements to maintain public and community health in the context of safe water;

- (iii) To improve public health through public education and outreach about water and health.

The research for this thesis, along with the larger KAPE study, aims to explore the knowledge and behaviours of individuals living within the Lake Victoria Basin region. Lake Victoria is the largest freshwater lake in Africa and the second largest freshwater lake in the world after Lake Superior of the Laurentian Great Lakes of North America. While the shores of Lake Victoria are shared by Kenya, Tanzania, and Uganda, the drainage basin is much larger, covering a total of 258,000km² (Awange and Ong'ang'a, 2006), and flows through five countries which also include Burundi and Rwanda (Verschuren et al., 2002). Not only is the lake an important domestic, agricultural and industrial water source for local communities, Lake Victoria is also the origin of the Nile River, and is an important hydro-electric resource and income generator for the fisheries and tourism industries (Awange and Ong'ang'a, 2006).

Changing environmental and social conditions have transformed local populations' relationship with the lake. For example, contamination of the water with chemical (fertilizers and detergents) and biological pollutants (*E. coli*, schistosomiasis, dysentery) has made the raw lake water unsafe for human consumption. Also, invasive species such as water hyacinth have infiltrated the lake, changing traditional access points and decreasing fisheries productivity due to decreased oxygen levels (Mailu, 2001). Finally, poverty within the Lake Victoria Basin region makes it difficult for local populations to deal with their changing environment; in 1997, the average monthly income of an individual within the Kisumu region was 6,493 Kenyan Shillings, or approximately 80 Canadian dollars³. The combination of these factors makes accessing clean, safe water difficult for local, marginalized communities, as evidenced by the fact that only 62% of individuals have access to safe drinking water (Awange and Ong'ang'a, 2006).

This study took place in the village of Usoma (population approximately 1000) situated along the shores of Lake Victoria. Usoma is adjacent to the town of Kisumu, approximately 15 kilometres outside of the city (Figure 3.1). Usoma is surrounded by three major industries which give definition to the borders of the community: the Kenya Pipeline Company (oil); a Coca-Cola bottling facility; and the Kisumu International Airport. The majority of the village inhabitants are of

³ Note – While average income in Kisumu is the amount stated above, many of the rural individuals spoken to within the area make approximately 150 Kenyan Shillings per day, or 4,500 Kenyan Shillings per month. As a note of comparison, bread sold in the local supermarket is priced at approximately 70 Kenyan shillings per loaf.

Luo ethnicity, and use the Luo language as the main form of communication. Religion has a strong presence in the community, with Christian and Muslim faiths co-existing in the village.

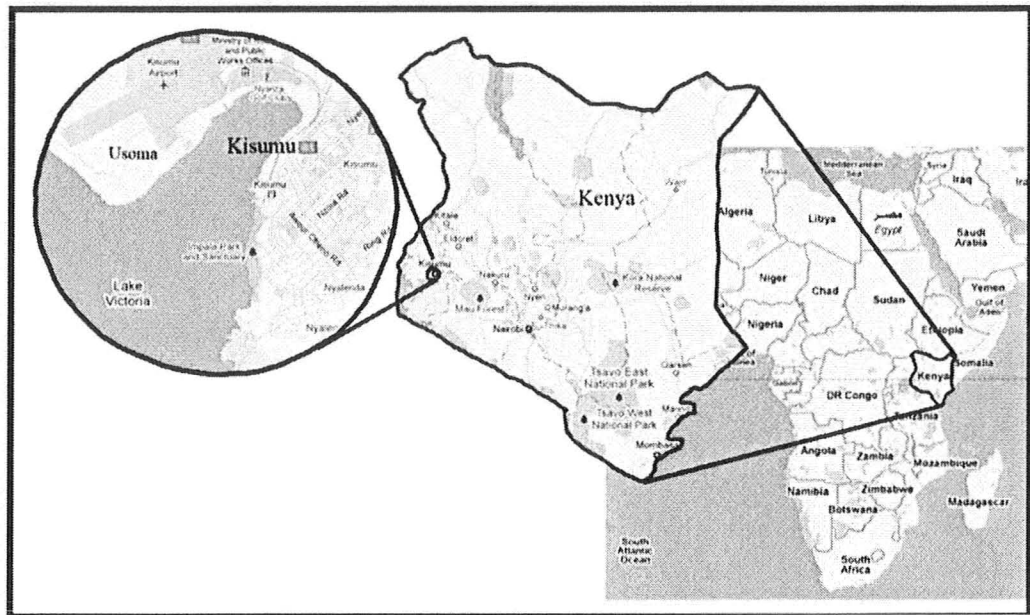


Figure 3.1: Study location (source: Adapted from Google maps)

Health and education facilities are few and far between within the community itself. While its location bordering Kisumu means that community members have access to the Provincial and District hospital for serious cases of illness, healthcare facilities run by the municipal government are non-existent within the actual community. A dispensary⁴ is currently open to community members; however, it is run by a private organization, charging more than government-run facilities for their services, and is unable to perform many of the tests and diagnose illnesses necessary for adequate community healthcare. High rates of HIV/AIDS within the Kisumu region – 25% prevalence (Buvé et al., 2001) as compared to the national average of 7% (Cheluget et al., 2006) – and an estimated national malaria prevalence of 31% (Aregawi, 2008) also act to create a high burden of disease within Usoma. Also, while the community does have educational facilities located within and directly adjacent to the community, the highest level of education available within Usoma is primary education (up to the

⁴ Dispensaries are community out-patient health clinics which can provide care and treatment for minor illnesses (i.e. colds, flues, minor wounds). Some blood testing and pharmaceuticals are also available within these clinics; however, treatment of major health issues occurs within government-run hospitals.

equivalent of grade 8), making it difficult for individuals to gain higher levels of education without having to leave the community.

While the village has representatives within the larger federal government, multiple elected representatives interact between the village and the larger governance structure. Residing in Usoma is the Village Elder; the Elder is an elected representative of the community, and acts as a liaison between community members and the local Chief and Assistant Chiefs. When issues arise in the community (e.g., disease outbreaks) it is the Elder who must inform the Chief and Assistant Chief, who will then act to combat the issue at hand. Above the Chiefs are the elected members of the local and federal governments, who act within the various ministries found in the Kenyan government structure.

Usoma is a rural village that relies heavily on Lake Victoria's natural resources as a source of income. The two main sources of employment are fishing and sand harvesting. While both fish and sand are abundant resources in the area, the focus of employment in these two areas has caused many social and health issues to arise in the community. For example, schistosomiasis, a parasitic disease that causes chronic illness in the host, is rampant in the waters of Lake Victoria, causing chronic health problems for the individuals exposed to the parasite through their jobs. Also, due to the fact that the main employment opportunities do not require an individual to finish their education, dropout rates of youth within the community are high. Alcohol and drug abuse is also high throughout the community, and is especially prevalent in youth.

While the community relies heavily on the Lake as a source of income, it is also the main source of water. Municipal taps, which were previously installed by a non-governmental organization, have been tampered with by the surrounding industries, and have yet to be fixed. While some sanitation facilities are present throughout the community, they are available solely on an individual family basis, with many residents not having access to sanitation facilities of any kind.

Usoma was chosen as the pilot community for the larger KAPE project for two reasons. First, previous research has been performed in this community by the project collaborators from KEMRI; thus, we were able to build upon existing relationships and contacts with the Village Elder and community leaders to initiate the research project in a timely and efficient manner. Second, while this community has access to abundant fresh water supplies, traditional sources of water such as the Lake and local boreholes are heavily contaminated with biological contaminants, making the water unsafe for consumption. Therefore,

while access to fresh water is not an issue for this community, access to *safe* water is.

3.3 Research Design and Methodology

As discussed previously (see section 2.2), this research utilizes a holistic approach to examining health, common in the geographies of health and healthcare, to examine not only the physical factors that influence individual and community health, but also the social and political factors that contribute to well-being (Kearns and Moon, 2002). In order to encompass all of the factors that interact to contribute to health, this research uses qualitative research techniques which allow for a greater exploration of participant experiences of health and healthcare (Dyck, 1999).

Qualitative methodologies are useful for social research, as they “facilitate the researcher's understanding of the meaning assigned to the phenomena by those being studied” (Buston et al., 1998, p.197) and have been used by other researchers in the field of water and sanitation to gain increased understanding of cultural and knowledge affects on behaviours (see Banda et al., 2007; Glöckner et al., 2004). By talking to individuals, listening to their stories, an increased understanding and appreciation of their lives, and the issues which most greatly affect them, emerges. Also, the use of qualitative methods allows for health geographers to produce place-sensitive research (Dyck, 1999), by gaining an increased understanding of the ways in which the social, political and physical environments affect people’s health and their access to resources. As stated by Elliott (1999), by using epistemologies that value the knowledge and voices of the researched, we are able to continue on the “journey from explanation to understanding” (p.242). It is for these reasons that qualitative research methods were adopted for this research, to gain increased insight and understanding into the current perceptions that community members have towards water, health, and sanitation, an understanding that likely would not have occurred through the use of quantitative approaches.

Within the sphere of qualitative research, there are many research methods that can be employed to gain understanding of participant experiences. For the purpose of this research, a suite of qualitative methods was employed. Focus groups and in-depth interviews, were utilized to gain increased understanding of current perceptions held by community members, with each method chosen to gain knowledge from a specific area. Quantitative methods including GPS mapping and water quality testing were also employed to ground truth the qualitative data.

Focus groups were utilized to gain increased understanding of the main issue of concern to the Usoma community. Focus groups generally “can generate a depth of understanding about public health problems, community strengths, and potential interventions that have local meaning and utility” (Stevens, 1996, p.170), while accentuating similarities and differences between community member perceptions (Lambert and Loiselle, 2008). Stevens (1996) continues to discuss the utility of focus groups for learning about communities’ health needs, what motivates their behaviours, and how their perceptions of health and health related issues are shaped. Focus groups are an extremely useful method for gaining insight into community understanding and experiences, while also highlighting the differences between community members and their concerns. Within the field of water and sanitation, past research has successfully utilized focus groups as a viable method of data collection (for examples see Banda et al., 2007; Rao et al., 2007), gaining increased understanding of communities’ perceptions towards hygiene, sanitation, and the barriers and facilitators that allow for new practices towards water and sanitation to occur; an area which is important for addressing the second research objective of this thesis.

Additionally, to meet the third research objective and gain increased understanding of the facilitators and barriers to health and well-being at the individual level, in-depth interviews were used. In-depth interviews are useful when research seeks to gain comprehensive understanding of a particular topic (Miller and Crabtree, 1999). Often, questions pertaining to health issues in the community (waterborne diseases, HIV/AIDS, etc) and problems the community faces on a day-to-day basis may be difficult or embarrassing for some participants to answer in a group setting (Brown, 1999; Stevens, 1996).

Crabtree and Miller (1999) discuss the importance of general introductory questions at the beginning of the interview, helping to build rapport with the interviewee before more difficult or sensitive questions are addressed. Instead of asking questions that may be answered orally, this study chose to use a participatory research strategy, community mapping, which aided in opening the interview. Community mapping is a technique that allows individuals to impart their knowledge on land use, cultural practices and social management (Robiglio et al., 2003), and transform it into more conventional cartographic forms (Herlihy and Knapp, 2003). Although cultural groups have mapped their land use and practices in the past, it is not until recently that this mapping process has been facilitated by outside personnel (Chambers, 2006). While community mapping has been used successfully in sanitation intervention programs to illustrate to *participants* the connections between sanitation and health (Glöckner et al., 2004;

Wood et al., 1998), this exercise utilized the mapping process to illustrate to the *researcher* the perception of community space held by the interviewee, while also allowing the participant to become more comfortable with the topic of water and sanitation before more difficult or personal questions were posed. In addition, photovoice, a methodology which engages participants and allows their experiences of health and place to be described through photography (Dennis Jr. et al., 2009), was performed at the conclusion of the in-depth interviews. Finally, water quality testing of 25 local water sources occurred, examining the fecal and total coliform content of the water. These data were used to ground truth the data collected within the focus groups and in-depth interviews. GPS coordinates of the water sites and important local areas (such as churches, and schools) were also collected for future use within the KAPE project. While these strategies were performed in the in-depth interviews, analysis of the mapping, photovoice and ground truthing data is beyond the scope of this thesis. (See Section 5.5 for future directions of the project).

To ensure that the full spectrum of views and ideas held by the research community were captured within the data collection process, a purposeful maximum variation sampling strategy was employed. Maximum variation is a valuable strategy for hearing a broad range of voices; by allowing for a varied sample, researchers are able to avoid a one-sided representation of the issue being examined (Patton, 2002). Yet due to its diverse sampling of participants it is also useful at identifying common patterns and themes that arise within the community as a whole (Sandelowski, 2000; Kuzel, 1999).

To achieve maximum variation, multiple characteristics of potential participants were considered: marital status and length of marriage; number of children and/or grandchildren; level of education attained; source of income; age; and role in community. Additionally, residential location was taken into consideration. Usoma has been broken down by previous research at KEMRI into geographical quadrants; selection of participants aimed to include community members from all four of the village's quadrants, to include participation from individuals who resided both near and far from common community water sources. This also ensured a diverse religious make-up of selected participants, as Muslim residents generally resided in one geographical area. For ethical reasons, children were excluded from the sampling procedure.

Throughout the research process, the Village Elder acted as a 'gatekeeper' to allow access to community members, and was instrumental in the sampling process. Sampling of participants was facilitated by the Village Elder in two

ways. First, the Elder provided the research team with a list of potential participants (those participants the Elder considered would be willing to participate), including younger women (those of childbearing age (16-40 years)), older women (+40 years) and men of corresponding ages, within the geographical quadrants (n=111). This list was utilized as the basis for participant selection for both the focus groups and in-depth interviews. Second, the Elder continued his role as gatekeeper by aiding the research team in accessing community members to invite them to participate in the study. Once the initial list of potential participants was organized, the research team conducted household visits to each individual, to explain the aim of the study and the prospective aspects in which they could be involved. Any participant not home at the time a household visit was conducted was removed from the list of potential participants. 27 potential participants (24%) were excluded from the study, due to unavailability during time of recruitment, leaving 84 individuals in the pool of potential participants. The Village Elder was compensated for his time for acting in the gatekeeper role.

Once the home visits had been completed, the research team selected participants utilizing a maximum variation strategy, using the previously stated characteristics. The Village Elder was excluded from this selection process to decrease bias towards specific community members. 12 individuals were chosen to participate in each of the four focus groups (men/women, childbearing age or older), with a variety of characteristics present in each grouping (See Appendix B). To arrive at the selected 12 participants, 3 individuals were selected from each of the community quadrants.

The categorization of participants into gender and age based focus groups occurred for two reasons. First, heterogeneous focus groups can help to enrich the information attained due to the participants' diverse experiences (Brown, 1999), a diversity achieved through the maximum variation selection strategy. Second, by categorizing the participants by age and gender, it was anticipated that individuals would feel more comfortable discussing sensitive topics related to water and sanitation (for focus group schedule, see Appendix C), and feel secure in expressing their feelings (Brown, 1999). If men and women, young and old, had been placed in the same focus group, power dynamics between community members may have resulted in an unequal discussion, with the men of the community dominating.

Individuals invited to participate in the in-depth interviews were drawn from the same pool of potential participants as the focus groups. Once the focus groups had been completed, the research team, excluding the Village Elder, met to select participants; participant selection occurred using the same maximum

variation strategy utilized within the focus group selection process (See Appendix D). A purposeful sampling of categories also occurred, with a greater number of women being invited to participate; this approach was taken by the researcher on advisement by the local research collaborators, as water collection and other household chores (washing, cooking, taking care of the sick and elderly) are traditionally woman's duties. However, men were also included in the sample to gain access to a variety of perceptions and beliefs held by village members. A total of 25 interviews were held; however, the younger women's category had the largest number of participants (n=10), with the older women's category having the second largest contingent of participants (n=7). Equal numbers of men were interviewed in both the older and younger categories, with four individuals participating from each (n=8). Geographical quadrants were also taken into account when selecting participants. While focus group participation was not a requirement to participate in the in-depth interview, 3 participants were invited to participate in both aspects of the research.

Data collection occurred in the fall of 2009. Twelve participants were invited to participate in each of the four focus groups conducted, categorized by age and gender, "Younger Women" (n=7), "Younger Men" (n=4), "Older Women" (n=10), and "Older Men" (n=10). Focus groups were conducted at a community meeting location, near the home of the Village Elder. Discussion in the groups was conducted in the language of the participant's choice (Luo, Kiswahili or English); however, most participants conversed in Luo, with the occasional comment occurring in English. A research assistant with previous experience in the community was present throughout all focus groups and interviews, and acted as a translator between the participants and the researcher. The focus groups lasted approximately 1.5 hours, with a variety of topics discussed, including health, water, sanitation, education, and community issues (See Appendix C). Focus groups were digitally recorded with the permission of participants and transcribed verbatim for subsequent thematic analysis.

To gain greater insight into the knowledge, attitudes and practices of individuals in the community, twenty-five in-depth interviews were conducted. Interviews were completed in the participant's home, in the language of their choice (Luo, Kiswahili or English). While most participants completed the interviews in Luo, occasional comments were made in English. The same translator was used for each interview to allow translation to occur between researcher and participant. To open the interview, participants were asked to complete a community mapping exercise in which they were to highlight areas such as latrines, water sources, and any other areas that the interviewee deemed as

important to them. Supplies used during this process (pencil crayons, pens, and a pencil sharpener) were left with participants as a thank you for their time during the interview. While most participants were open to completing this exercise, two participants – both in the ‘Older Women’ category – chose not to complete the map. Although these participants did not complete the community mapping exercise, mapping supplies were still given to these participants.

Interviews lasted from 40 minutes to 2 hours. They covered a variety of topics, including water, health, sanitation, education, and possible solutions (Appendix E). Each interview was digitally recorded with the permission of the participant, and later transcribed verbatim for subsequent thematic analysis.

Every effort was made to ensure that a maximum variation of participant characteristics and geographical location was taken into account when selecting participants. However, in a community the size of Usoma (approximately 200 households), many individuals were not able to be part of the study. Therefore, when both the focus groups and in-depth interviews were completed, the research team made themselves available to the community, and held a *barazas*⁵ where community members could discuss any concerns that they had relating to water, sanitation, and health, allowing their concerns to be voiced. Approximately 20 community members attended this meeting to discuss community problems.

Analysis of focus groups and in-depth interviews were facilitated by a computer-assisted qualitative data analysis software (CAQDAS), NVivo8. Qualitative analysis can be enhanced through the use of CAQDAS, as it allows for improved data management (Lee and Esterhuizen, 2000), especially with larger samples, through increasing organization and presenting a clear and structured tool in which themes and patterns of data can be illustrated (Meadows and Dodendorf, 1999).

Organization and coding of data was completed using the template organizing style, and was guided by the research objectives and interview schedules (See Appendices F and G for respective thematic codes of focus groups and interviews). Template organizing uses a detailed coding manual to help organize the data into related sections (Crabtree and Miller, 1999), an organizational tool useful when utilizing qualitative data management software. Thematic codes were produced inductively and deductively, and were reviewed by members of the research team before coding of the data occurred. Data were coded using a line-by line coding system. Inter-rater reliability was assessed as

⁵ Barazas is the term the community used for a group or community meeting.

part of the coding process. Agreement of codes between the two coders was high, with a 98.03% agreement on codes within the focus groups, and 99.6% agreement of codes within the in-depth interviews. The results of this data analysis are presented in the following chapter.

Rigour in this qualitative analysis was established through the four criteria for qualitative research as outlined by Lincoln and Guba (1985):

Credibility aims to ensure an authentic representation of the research community within the pool of selected participants. In this case, credibility was established through multiple means. First, purposeful sampling of participants to include a wide variety of characteristics ensured the expression of a wide range of community views and perceptions. Also, credibility was gained by ensuring that a variety of methods have been utilized (Schwandt, Lincoln, and Guba, 2007), both multiple qualitative techniques and verification with quantitative methods. Triangulation also occurred through the examination of the thematic coding scheme by multiple team members, and by the testing of code agreement during the coding process (Farmer et al., 2006).

Similar to the quantitative criterion of generalisability, transferability refers to the fit, or transfer of learned knowledge to situations outside of the specific study situation. While this study examines the specific knowledge and attitudes of a single community, the main lessons learned and implementation strategies produced within the larger research initiative may be utilized in other communities with similar educational levels and cultural beliefs, increasing the transferability of study results (Baxter and Eyles, 1997).

The third criterion, dependability, considers the reliability and consistency of the results. This research has gained dependability in two ways. First, through the use of peer examination of coding (Farmer et al., 2006), dependability of the results has been enhanced. Secondly, consistency was maintained throughout data collection (i.e., one researcher performing all interviews, one translator who was familiar with the research community and its culture, mechanical recording of data using an audio recorder for verbatim transcription), which contributes to the dependability of the results (Baxter and Eyles, 1997).

Finally, confirmability examines the extent to which biases may affect the interpretation of the data. For this to occur, the researcher must be reflexive, allowing critical introspection of the partiality of the researcher. This step “is critical to the conduct of fieldwork; it induces self discovery and can lead to insights and new hypotheses about the research questions...allow[ing] the

researcher to be more open to any challenges to their theoretical position that fieldwork almost inevitably raises” (England, 1994, p.82). Although I was exposed to the different cultures and economic disparities of rural African communities at a young age, being a Canadian-born, middleclass white-woman gave me a different lens through which to view the current water and sanitation issues than that of my research participants; I have never had to deal with the challenges of their daily lives, and thus may not be able to truly appreciate their experiences. Also, being an outsider to the community, and one that was educated, meant that many of the community participants held high regard for me, ensuring that I had chairs to sit on even when community elders were without seats; a position of esteem which is not normally given to women in the community. The position which was given to me by community members may have affected their openness and willingness to be honest about the current health and sanitation problems they face. However, by listening to participants’ stories with empathy, consideration, and genuine curiosity, participants felt comfortable opening up their stories and their lives, allowing conversations to continue for up to two hours in some cases. Also, by being a young woman myself, there was a feeling of comradery with many of the younger female participants, which was especially felt within the in-depth interviews, where no other community members - including their own family members - were present, allowing them to feel more comfortable sharing stories with me.

3.4 A Note on the Luo Language and Translation

As stated previously, the mother tongue of most individuals within the community is Luo, and is the main form of communication used between community members. Also, with a low level of post-primary education present throughout the community, most individuals were not fluent in the language of the primary data collector (English). As such, focus groups and in-depth interviews needed the aid of a third-party translator, who was able to act as a liaison between the researcher and the participants. The translator employed throughout the focus groups and interviews was of Luo decent and was born in the area near Kisumu; as such, his mother tongue was that of the research community, Luo. Also, the translator had been a project co-ordinator for previous research performed in the community, and was thus familiar with community members and their local customs.

While without the aid of a translator data collection could not have been possible, issues towards the validity and interpretation of the data can arise when translators are employed. This is especially true when translators attempt to

convey meaning from the language and culture to those researchers for whom they are translating (Larkin et al., 2007). Language has a cultural context, and each language will have different meanings depending on this culture; while translators will try and express this meaning to the researcher, the translators themselves have their own ideas and perceptions that may also become infused into the translation. As stated by Temple and Young (2004):

“The translator always makes her mark on the research, whether this is acknowledged or not, and in effect, some kind of “hybrid” role emerges in that, at the very least, the translator makes assumptions about meaning equivalence that make her an analyst and cultural broker as much as a translator” (p.171).

This was seen in one instance in this study, where the translator used the word ‘empowered’ throughout the final stages of the in-depth interviews. While a literal translation of this word is not present within the Luo language, the translator put his own meaning onto participants’ responses by utilizing this word as the English translation. Although this can alter the meaning of the results, it is difficult to overcome this challenge when cross-cultural and lingual research is being performed.

While issues towards the meaning of results can occur when translators are used, there are ways in which to combat this issue. By viewing the translator as a form of key-informant, instead of the direct role of language translator, conversations about differences in perspectives can begin between the researcher and the translator (Temple and Young, 2004). This was performed in this research, by having conversations following interviews with the translator, who was also a part of the research team, to see what his views of the participants were, and how this may have affected the data which had been translated.

3.5 Community Report Back

The main themes uncovered through this analysis were presented to Usoma residents through a community report-back meeting in June 2010. Reporting results back to community members is important within community-based research for three reasons. First, reporting the results can act as a member-checking process, by which community members can comment on and validate results (Gilchrist and Williams, 1999). Second, reporting back can act as the “critical first step to preserving the relationship beyond data gathering” (Markey et al., 2010, p.172), a step that is important for the future intervention which will be a part of the larger research initiative. Lastly, early reporting of findings can

help to initiate knowledge mobilization (Markey et al., 2010), allowing participants to begin to think of their own solutions to community problems.

The community report-back consisted of a community barazas held for interested community members. The research team from Canada, KEMRI research collaborators, as well as local political figures and NGOs were present at the meeting, along with approximately 100 adults from the community. During this meeting, a summary of the results was presented to the community members (See Appendix H for script of results presented to community). Also, local NGOs working in the field of water and sanitation performed demonstrations on water treatment strategies that could be utilized by community members to decontaminate their water. Finally, at the conclusion of the meeting, bars of soap were distributed to all community members as a thank you for allowing the research team to speak to them about their current water and sanitation issues. Photographs taken during the photovoice activity were also distributed to participants at the conclusion of the meeting.

3.6 Chapter Summary

This chapter has outlined the relevant steps involved in the research design and methodology used in this thesis. In addition, particular challenges (e.g., the use of translator; reflexive role of the researcher) were also discussed in some detail, along with the steps undertaken to ensure rigour with respect to the qualitative approaches used. Results are presented in the following chapter.

CHAPTER FOUR

RESULTS

4.1 Introduction

This chapter reports the results from the analysis of the four focus groups (community level) and twenty-five in-depth interviews (individual level) conducted in the lakeside village of Usoma, near Kisumu, Kenya, designed to address three research objectives:

- (i) To explore knowledge, attitudes and practices regarding current water, sanitation and health behaviours;
- (ii) To investigate the key facilitators and barriers to water and sanitation access at the community level; and
- (iii) To investigate the key facilitators and barriers to water and sanitation access at the individual level.

The results are organized around the three major themes of water, sanitation and health. Changes, challenges, and solutions structured around these three themes are also addressed. Tables are used where appropriate to illustrate frequency of reporting, as are direct quotations from the interview and focus group participants.

4.2 Water

4.2.1 Knowledge, Attitudes and Practices Relating to Local Water Sources

To increase our understanding of how the community utilizes water resources, and why certain resources are used over others, it was first necessary to consider the *meaning* of Lake Victoria to the community. From the focus group discussions, two main themes arose. First, Lake Victoria was seen as an important resource for the community, as the main water and income source. Second, it acts as a meeting place for community members:

She likes the village, because there is development because of the lake...what they really mostly like in their community is the presence of the lake, because it acts as a source of income for so many people. Some young people do sand harvesting, fishing is also done there, and people get their income from fishing. Women are removing the water hyacinth from the lake. They also do use them to weave some things to sell...it is a good natural resource where they are getting their income. (Focus Group 1 - Younger Women)⁶

However, there was also a sense that because of the lake's presence in the community, many young people drop out of school to take jobs in fishing or sand harvesting, instead of finishing their education:

Too many children. They just go to the lake. They get involved in fishing. Some do sand harvesting, and in the evening some start smoking (Focus Group 1 - Younger Women)

Perception of Water Cleanliness

Throughout the focus group discussions, there was talk of the water being 'unsafe' or 'dirty', demonstrating knowledge of water contamination. Participants also indicated in focus group discussions that they perceived the pollution of water sites to have increased over time. That is, water of the past was seen as clean and safe, while local water sources today were seen as being contaminated.

While focus group participants did understand that water contamination had occurred, two methods were utilized to decide whether they considered the water safe to use. The first was through physical observation: are there insects present, is it murky, is there a smell:

R⁷: How do you know when that water is safer or cleaner?

T: First of all the underground water is clean, because of the physical observation and smell. And during the rainy season they look at the colour changes, so it is not clean when the colour changes. (Focus Group 3 - Older Women)

While physical characteristics such as smell and murkiness can be signs that contamination has occurred, this use of physical observation shows a lack of

⁶ Participant quotes from the focus groups and in-depth interviews have been translated into English from Luo. Variations in grammar from the translator have been left in their original form.

⁷ In participant quotes, R refers to questions asked by the researcher, while T refers to the translation of participant answers into English

understanding for the non-visible contaminants, such as parasites and bacteria, which are the main cause of water-borne illness.

The second method used for determining the cleanliness of the water was word-of-mouth:

Since some were born, and since some got married here, they have never heard that the forest water is bad, so they believe it is good. (Focus Group 1 - Younger Women)

Similar to the focus group discussions, when individuals in the interviews were asked about water cleanliness and the ways to determine its safety, a general reliance on the senses was discussed by all participants (Table 4.1). Most participants utilized sight to determine if water was safe:

R: Is your water clean, and how do you know it is clean?

T: It is not really clean, because sometimes when you look at it you see some insects. When you are inside you can see some insects and larvae.

R: So the main way to tell if water is clean is by looking at it.

T: Yes. (In-depth Interview - Younger Woman)

Table 4.1: Sensory determinants of water cleanliness

Perceived Condition for Clear Water	% of Participants Believing Perception (n)
Water free of dirt and particulate matter	40% (10)
Water is clear	40% (10)
Water free of visible insects	20% (5)

Along with these visual aids, the smell of water was also used to determine the cleanliness of water; if water had a smell, it was considered contaminated. Therefore, similar to focus groups, while there is understanding that water sources are contaminated, a lack of knowledge of unseen contaminants was discovered at the individual level.

Community Water Usage, Storage and Treatment

During focus group discussions, participants discussed Lake Victoria as the community's major source of water, especially for domestic use⁸. Another natural source, known to the community as the 'forest water' was also described as a preferred source for drinking water; this site was perceived as being a safer source, as it flows from underground, thereby decreasing the chance of runoff contamination, and is generally clear, without visible insects or particulate matter.

In-depth interviews uncovered an additional four water sources utilized regularly by participants: municipally treated tap water (known as the Bandani tap); industrial sponsored taps (implemented by the Coca-Cola Corporation); community boreholes; and rain water collection. The choice of using one of the sources was dependent on location relative to home, and in the case of the lake, the presence/absence of water hyacinth, an invasive plant species which sits on the top of the water, making it difficult to access the water's surface.

To ground truth the perception of water cleanliness around actual contamination levels, water testing was performed at 25 community water sites. These tests examined the total and fecal coliform levels found in the water, with results stating if the water was potable, or if treatment was required. Out of the 25 samples, only 3 were considered potable, the Bandani municipal tap, the Coca-Cola community taps, and the Forest water (See Appendix I).

Community members were asked where regular water collection occurred, both for domestic use and drinking (Figure 4.1). It must be noted that all participants utilized multiple water sources, with few participants using the same source for every task (domestic or drinking water).

⁸ Domestic water refers to all water collected apart from drinking water (i.e. for washing, cooking, watering animals)

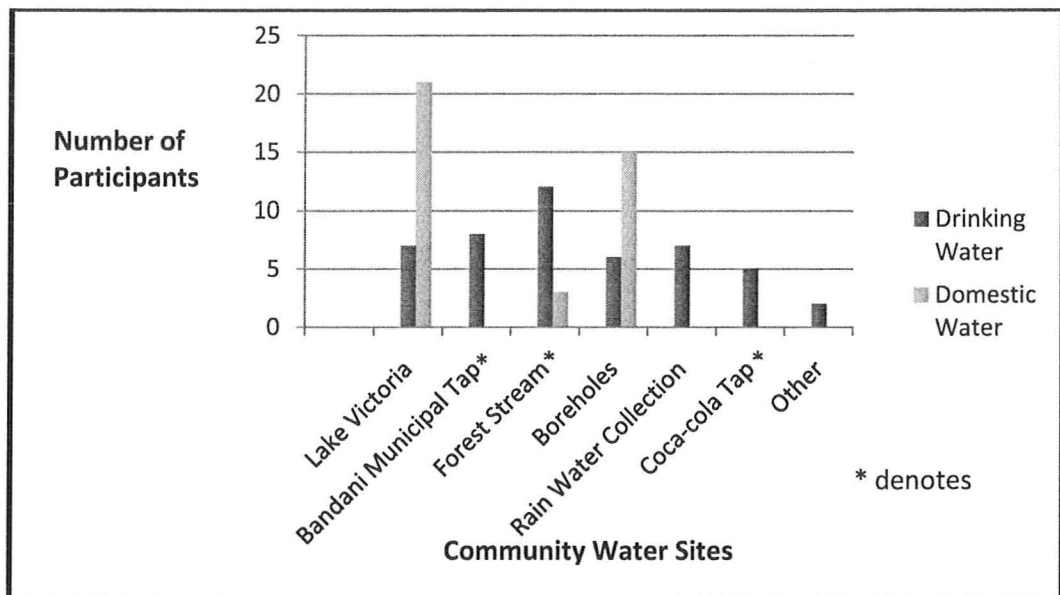


Figure 4.1: Participant utilization of common community water collection points.

As was the case with the focus groups, the majority of interview participants (84%) utilized Lake Victoria as their primary source for domestic water. Various reasons were given for this: e.g., availability during drought; close proximity to the home; easily accessible; free to use:

R: Do you get water from the same sources every day?

T: Sometimes we go to the lake.

R: What makes you change the sources that you get water from?

T: During drought the bore hole seems to dry, and there is no water. So it forces us to get water from the lake. (In-depth Interview - Older Woman)

However, some respondents were deterred from using lake water on occasion, due to its perceived level of cleanliness:

R: When do you use forest water over the lake water for your washing?

T: When the lake water is dirty.

R: So when the water is dirty, then you get from the forest, otherwise you would get your washing water from the lake.

T: Yes. (In-depth Interview - Younger Woman)

The second most common source of domestic water (60% of participants) were boreholes and wells situated within the village; these sources were often used when access to the lake was barred by water hyacinths, or when participants felt the lake was dirty, causing them to search for other sources.

While the lake was the most common domestic source, participants (48%) stated a preference for the forest as a drinking water source. Like the Lake, the forest water source never dries, providing a constant source:

R: Why do you get your water from the same sources every day?

T: That is where there is water. Okay, he says that he knows that that place is where there is water because he does not want to use lake water.

R: So it is a constant source of water other than the lake?

T: Yes. (In-depth Interview - Younger Man)

The second most common drinking water source, the Bandani municipal tap, is utilized by 32% of participants. While preference was shown for this site due to its perceived cleanliness (this water is municipally treated), its location outside of the community – an approximate 15 minute car ride, or 45 minute walk one direction – means that most participants utilizing the source require a boda boda⁹ to transport the water, at an average cost of 20 Kenyan Shillings¹⁰ per 20 litres of water.

The daily practices of collection, storage and transfer of water were discussed in the in-depth interviews. Water collection is performed daily, with self-identified collection times varying by the amount of water needed and distance to the collection site; collection times were as little as 20 minutes up to 300 minutes. The average daily time needed to collect water within the community was 87 minutes per day, or nearly 1.5 hours.

Multiple water storage solutions were identified by participants (Table 4.2). Clay pots¹¹ were preferred for drinking water storage (80%), for two reasons. First, they helped to cool the water making it more palatable for consumption. Secondly, some women stated that it was the strategy used by their mothers, making it desirable in their own homes.

⁹ A boda boda is the local word for a bicycle taxi. It can be used to transport water, people, or any other item.

¹⁰ 20 Kenyan Shillings is approximately \$0.26 CAD. In comparison, to buy 20 litres of tap water from Horizon Utilities in Hamilton would cost approximately \$0.02 CAD.

¹¹ Clay pots are large, jug like containers used to store water. While clay pots are available with spigots attached to the bottom, most pots found within interviewee households had access to water solely from a wide mouth at the top of the pot.

Table 4.2: Storage Solutions Used for Domestic and Drinking Water

Storage Solutions	% of Participants using Solutions for Domestic Water¹² (n)	% of Participants using Solutions for Drinking Water (n)
Clay Pots	-	80% (20)
Jerry Cans	100% (25)	20% (5)
Super Drums	100% (25)	-

Jerry cans and super drums¹³ are the solutions predominantly used for domestic water storage, and are easily accessible in the community. In addition, one participant utilized jerry cans to decrease the contact of hands with the water's surface.

The notion of water-health linkages was evident when discussing water-transfer strategies used to access water from storage containers. The most common strategy used by participants to transfer water from the storage container was that of a cup with a handle. The majority of participants (64%) chose to use the cup to help decrease the chance of water contamination (either of germs from hands, diseases from people):

R: How do you get the water out of the containers?

T: A cup, then can take water with the cup, and pour it in the jar.

R: Why do you get your water out this way?

T: So as not to touch the water with her hand, because sometimes her hand is contaminated. (In-depth Interview - Younger Woman)

As well, this method was used to decrease contamination by particulate matter:

R: And why do you use this method? What is good about it?

T: So even if there is some dirt at the bottom, she doesn't disturb the dirt to make the water dirty.

R: Because you are just getting it from the top.

T: From the top. (In-depth Interview - Young Woman)

¹² Column does not add up to 100% as participants gave multiple responses for their water storage strategies

¹³ Jerry cans are 20 litre plastic containers, similar to gasoline storage containers used in North America, which have a handle and small hole for pouring water. Super drums are large plastic containers similar to rain barrels.

However, while this strategy is useful at decreasing water contamination, some community members did not state the link between their practices and illness prevention as a reason for this behaviour; 2 respondents stated that they utilized a cup as it is the strategy learned from their mother, while 2 other participants utilized cups as they were the easiest way to prevent water spillage from large mouthed containers.

Within the in-depth interviews, participants discussed the two water treatment strategies most often used to purify the water: (i) Chlorine tablets (mainly WaterGuard or PUR tablets) (92%); and (ii) boiling (48%). Along with these processes, sieving is also performed to filter dirt, insects or particulate matter. While chlorine was the most popular treatment strategy employed by participants, the usage of chlorine as a treatment strategy is dependent on the intended usage of the water (domestic or drinking) and whether chlorine tablets are available (Figure 4.2).

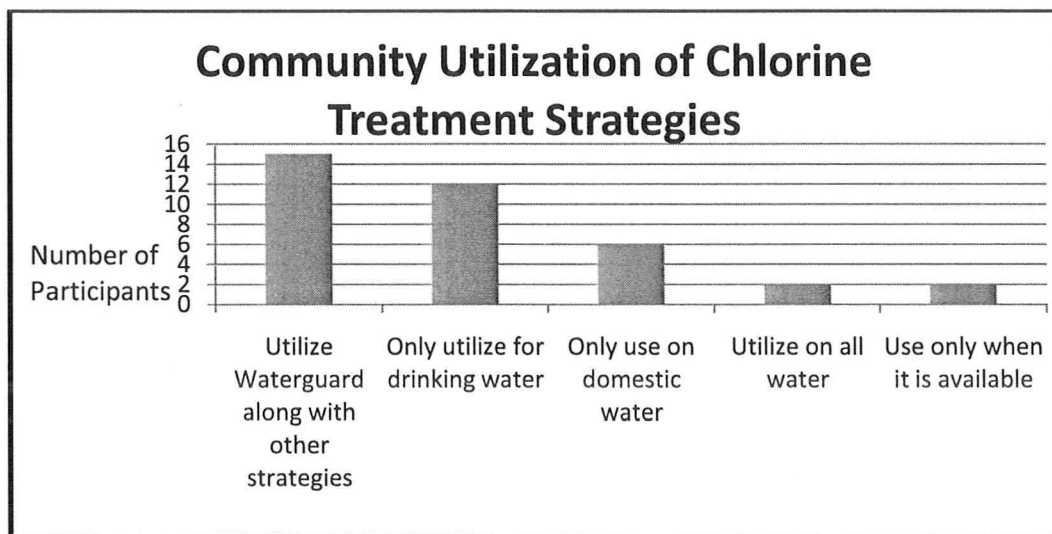


Figure 4.2: Participant usage of chlorine treatment.

Out of those who boil water, 25% stated they would only use this strategy if the water was collected from the Lake; 17% would only boil if chlorine tablets were not available; and 8% would use both chlorine tablets and boiling to treat the same water. While most participants preferred the use of chlorine tablets due to the decreased treatment times, some participants showed a preference for boiling water, as it was felt that this method was more effective than chlorine treatment:

R: If water guard was more easily available, would you like to use it?

T: She doesn't trust WaterGuard, so she prefers boiling.

R: Why do you trust boiling the water?

T: Because water guard doesn't kill all the bacteria and all the germs.

R: And what is good about boiling the water?

T: The heat kills everything. (In-depth Interview - Younger Woman)

4.2.2 Community and Individual Barriers to Accessing Clean Water

When discussing the barriers to accessing clean, safe water, focus group participants spoke of the distance and cost required to access municipally treated water:

There is a water problem. The lake water used to be very clean, but now it is not. They get their water far away, drinking water. The 20 litres are being sold to them at 20 shillings. There is a big water problem. And because of the water problem, they have so many water-borne diseases. (Focus Group 3 - Older Women)

While cost and distance act as immediate barriers to accessing clean water on a daily basis, two themes arose which prevent the community from being able to sustainably access safe, clean water: a lack of unity and control. Regarding the former, not only did participants state that community members were not able to co-operate on solutions, community leaders were not committed to realizing solutions:

So the community leaders in general, they are not doing enough to let the government provide for them water...and people are also not very united. When they came, people used to be united, doing things together for the community. So things are not being done now-a-days as a unit. (Focus Group 3 - Older Women)

Secondly, community members felt a lack of control over their current water problems, partly because of industrial pollution and partly because of the disruption in municipal water supply. When discussing the contamination of Lake Victoria, it was seen as a municipal issue, caused mainly by the industries located around the village:

Initially the lake water used to be good, but because of so many factories, and their actions, they are pouring in the lake, they are contaminating the lake, so the lake water is no longer safe for drinking. The chemicals also from the factories are killing the fish. (Focus Group 4 - Older Men)

Additionally, in the past, water pipelines had been installed by an NGO that provided Usoma residents with access to municipally treated water. However, when the Kenya Pipeline Company (KPC) laid their oil pipes, the water pipes leading to Usoma were cut, taking away the community's access to perceived safe, treated water.

R: What could the community do to improve the water supplies?

T: They used to have piped water, but because of the interference of the Pipeline and Coke, so now nobody from the village has tried to push those people to get them back their water. (Focus Group 3 – Older Women)

This has left the community feeling powerless to bring treated water into the community, as the issue of fixing the pipes remains unresolved, with the KPC not being made accountable to date.

Unlike the focus groups, individuals did not speak of the social barriers, such as unity or lack of control, when discussing water access. Instead, the physical barriers, such as time and distance, were frequently mentioned as the primary barriers to accessing clean water.

While most participants did not explicitly state that distance was a barrier to accessing clean water, many individuals stated that they chose to use contaminated sources, such as Lake Victoria or boreholes, as their domestic water source, as these sources were much closer than those perceived to be cleaner and safer, but located further from home.

Secondly, respondents also spoke of the barriers to water treatment at point of use: time; expense; and accessibility. Boiling water as a treatment strategy takes large amounts of time as it involves the collection of fuel (wood, charcoal), in addition to the boiling process. Moreover, an individual must tend to the fire, putting off other daily chores until all of the water has been boiled. Treatment strategies can also be expensive for participants; both boiling, which because of a decreasing number of bushes and trees in the community, may require the purchase of a fuel supplement; and chlorination, which requires community members to purchase manufactured chlorine tablets. Lastly, even if one has money, it is not always possible to obtain chlorine tables:

R: Do you treat your water before you use it?

T: No.

R: Why not?

T: Because WaterGuard or the PUR are not easy to get in the community for some time. They are given for free sometimes. CDC¹⁴ people sometimes come and distribute the WaterGuard.

R: But you can't buy them in the stores.

T: Yeah. (In-depth Interview - Younger Woman)

4.3 Sanitation

4.3.1 Knowledge, Attitudes and Practices of Sanitation

Participants in all four focus groups agreed that on a community level, access to improved sanitation facilities¹⁵, specifically latrines, is minimal; those that are available have been installed by an individual or family for that family's private use, and thus those without access to their own facility are left to practice open defecation. Participants stated that latrine sharing is very uncommon within the community, and most individuals would not wish to share their facilities with their neighbours, as latrines are seen as a private entity:

R: Where are latrines? Are there community latrines, or only private?

T: If there are, they are personal toilets or private toilets, but they don't have a community toilet.

R: There is no community toilet. A family would build one. But only that family uses it.

T: Yes.

R: If they are present, people will use them, or you said some people prefer the bush.

T: If they have toilets, only the people, the owners, are the ones that use it. Other persons are not allowed. (Focus Group 2 – Younger Men)

Not only was community access to latrines discussed, but also whether all family members, specifically children, would have equal access to latrine use. Participants within the Older Male focus group believed very strongly that any child whose family had access to sanitation facilities would be taught how to use

¹⁴ CDC, or the Center for Disease Control, has worked in the community in collaboration with KEMRI

¹⁵ Improved sanitation is defined as the services and technologies which are more likely to provide sanitary defecation locations over unimproved technologies. Improved sanitation facilities include public sewer systems, septic systems, pour-flush latrines and simple or ventilated pit latrines (WHO, 2010).

latrines, and would use them on a regular basis. While both focus groups of women did state that children would be taught to use latrines, at the age of three or later, the younger men had different views over whether children are permitted access to latrines, believing that children did not use latrines on a regular basis; they believed they would be unable to keep the latrines unsoiled. Thus parents encouraged them to use the bush so as to ensure the facilities were kept clean for adult use:

T: Most children go to the bush. Adults say to the children they mess the toilets, they don't use it properly, so to use the bush and they use the toilets.

R: Most adults tell the children to use the bush, because then the latrine stays cleaner for them.

T: Yes.

R: Are there any other reasons why the children wouldn't use the latrine?

T: Sometimes if they go, they start to play by putting their legs inside the hole. Parents don't encourage that. (Focus Group 2 - Younger Men)

Similar to the focus groups, individual participants stated that access to latrines was minimal throughout the community (Table 4.3).

Table 4.3: Participant Access to Sanitation Facilities

Level of Access	% of Participants With Access (n)
Regular Access to Sanitation Facilities	52% (13)
No Access to Sanitation Facilities	36% (9)
Latrine Building in Process	12% (3)

Participants who resided within residential (i.e., rented) row houses generally had access to latrine facilities that had been installed by the landlords; however, these facilities, while providing participants with increased access to a latrine, cannot be deemed an 'improved sanitation facility' as these individuals are required to share the latrines, decreasing privacy and safety, and increasing exposure to fecal bacteria, especially for women.

Sanitation: Community Perceptions

Traditionally, bushes are used as open defecation sites. These bushes, both their presence and lack in certain areas of the community, played a large role in the discussion of sanitation at the community level, and whether sanitation facilities are needed. Within three of the focus groups (Older Women, Younger Men and Younger Women), participants felt that community members did not perceive sanitation facilities as being a necessary addition to the community, due to the fact that traditional defecation areas are present:

R: Are there many latrines in the community?

T: Not enough. There are few. There are no toilets.

R: Why not?

T: Lack of commitment. Because they are not farming, and bushes is around.

R: There is enough vegetation, you don't need the toilets (Focus Group 2 - Younger Men)

Also, participants in the Younger Men's focus group commented on the preference for using bushes over latrines, especially in times of illness:

T: Some people don't know how to use the toilet.

R: They prefer the woods because they know how to use that.

T: Yes...and sometimes you have diarrhoea so you want to support yourselves in the bush. (Focus Group 2- Younger Men)

The familiarity with traditional defecation practices decreases the perception of latrine need within the community.

While the older male participants also stated that people prefer to use the bushes due to a lack of knowledge of sanitation facilities, they did express a changing perception towards sanitation need due to changing environmental pressures:

People long to have toilets, because the bushes have been getting clear, and now because of the embarrassment they get from town visitors, and they don't have toilets, they now see the sense of having toilets. (Focus Group 4 - Older Men)

This quote further highlights the increasing embarrassment felt when individuals are unable to offer sanitation facilities to their guests, a factor acting as a facilitator for latrine installation.

4.3.2 *Community Level Barriers to Latrine Installation and Use*

When discussing the main barriers to latrine installation at the community level, two main themes arose from the focus groups: (i) physical characteristics of the region; and (ii) lack of funds. Due to the flooding that occurs during the rainy season, and the presence of a high water table, many of the latrines built in the community ‘sink’, or collapse in on themselves due to soil saturation. This causes fear in some residents, and thus affects latrine usage:

So during the rainy season this place is always flooded, so the type of soil doesn't allow so many people to sink¹⁶ one, because it will sink, and I think that is the fear you are seeing. He has seen when the toilets are there, and people still go to use the bush. Some people go and show them the toilet, but they just want to go to the bush. (Focus Group 4 - Older Men)

This collapsing is especially common in latrines that are inadequately built, which has occurred when governments require the building of latrines without enforcing building standards:

So another reason why people don't use the toilet, because sometimes the provincial administrators, they enforce the laws that each and every home there must be a toilet. So sometimes people just put them for the sake of but they are not well built to be used (Focus Group 4 - Older Men)

As stated by this participant, past initiatives have tried to force latrine installation, without taking into account the available resources and constraints (e.g., flooding, sandy soil, lack of funds), to build adequate and sustainable facilities. Thus, while there may be the physical appearance of a latrine, they are inadequate to use by the family or community.

Also, a stigma towards latrine use was discussed by the participants in the Older Men's focus group. Because latrines are used solely as a place of urination and defecation, some participants felt that it can be embarrassing for an individual to come out of a latrine, and have their family members and neighbours know exactly what they were doing. Until this stigma against latrine usage is broken, some members of the community may continue to practice traditional behaviours of open defecation, as this is seen as the normal or acceptable behaviour.

¹⁶ In this context, the word ‘sink’ was used to describe the act of installing a pit-latrine

Finally, while the community has an understanding that open defecation can lead to the contamination of water sources, they are unable to unite to implement a solution:

He is requesting if we can, even build one toilet for the community at the beach, because so many people work at the beach, and they go to the bush, and during rainy season then everything is taken into the lake. (Focus Group 2 - Younger Men)

While the community understands there is a need, especially for those many individuals working close to the community's main water supply, they are unable to work together to implement a solution that would benefit the community as a whole.

4.3.3 Individual Level Facilitators and Barriers to Latrine Installation

Facilitators for Latrine Installation

Four themes – health, aesthetics, privacy and stigma – help to facilitate latrine installation, based on individual perceptions (Table 4.4).

Table 4.4: Individual level factors facilitating latrine demand

Facilitator for Latrine Installation	% of Participants Stating Facilitator (n)
Health and Disease Prevention	28% (7)
Aesthetics and Ease of Access	20% (5)
Privacy	12% (3)
Embarrassment and Stigma	8% (2)

Health and disease prevention were the primary facilitators for desiring latrine access:

R: What made you want to put a latrine in?

T: He built it because he felt that there was not any latrine around, and he needed a latrine to help him.

R: So how does the latrine help you?

T: He feels that the latrine is very important because it prevents infections, and also it prevents him from going to the bush. (In-depth Interview - Younger Man)

R: So what is making you put the latrine in?

T: So as to observe hygiene, because when you have the toilet, now waste is properly disposed of. (In-depth Interview - Older Woman)

The need to ‘observe hygiene’ or ‘keeping hygiene’ was expressed by many participants throughout the interview process. This refers to actions that increase health.

As well, participants spoke of the feeling of unpleasantness that occurs when viewing a defecation site:

R: What made you put the latrine in? Why did you want the latrine?

T: Because it is not good to go to the bush.

R: Why isn't it good to go into the bush?

T: It is not good to see, because in the rainy season you go to the bush, and you also find all the waste scattered. So it is not a good scene. (In-depth Interview - Younger Woman)

While proper waste disposal for both decreased disease spread and aesthetics were important for many participants, increased privacy also helped to facilitate a desire for latrine access, especially during times of illness:

R: Why would you like a latrine?

T: If she has visitors, she can use the toilet, like if there is also a cholera outbreak, when there is cholera outbreak, you need toilets next to you. Sometimes you cannot run to the bush, because you can't control. (In-depth Interview - Younger Woman)

Finally, stigma affected the perception of sanitation need. Embarrassment related to sanitation manifested feelings of degradation and shame which occurred when facilities were not available to offer guests:

R: What made you put a latrine in? What made you want a latrine?

T: So like people who are enlightened, she had to have a toilet, because if she gets visitors, she doesn't get embarrassment, and also the toilet prevents diseases. So she is use to toilets. She cannot stay without a toilet. (In-depth Interview - Older Woman)

These feelings of embarrassment help to increase the perceived need of sanitation facilities within the community, therefore acting as a facilitator to change.

Barriers to Latrine Installation

Similar to those discussed within the focus groups, physical barriers, such as cost and soil characteristics, act as barriers for individuals wishing to install latrines near their homes. On top of these physical factors, socially constructed barriers, including a lack of social capital, presented challenges for latrine installation.

The lack of social capital was evident in two forms. The first, a lack of unity, was voiced by many participants, especially when discussing the inability for individuals to share latrines with their neighbours:

R: Do community members share latrines often, share the cost of building it?

T: No.

R: Why not?

T: It is just difficult. Because there is no unity.

R: So people just don't like working together.

T: Yes. (In-depth Interview - Younger Woman)

While most individuals in the community find the cost of latrines too high to overcome, 68% of participants did not feel that sharing latrines was a feasible option for latrine implementation. Various reasons were voiced as to why participants did not want to share latrines, including the feeling that latrines are a private entity for use by one family only (28%), and that the latrines would fill up too quickly if shared by multiple individuals (20%). As well, 3 participants with their own facilities stated that they did not share their latrine with neighbours, as they felt that they would make it unclean, and it would be the owner who was responsible for its maintenance. All of these reasons can be traced back to a lack of unity and social cohesion within the community.

The second form of decreased social capital was the stigma that accompanies individuals without access to latrines. While stigma and embarrassment can act as a facilitator, in this case it also acted as a barrier to individuals utilizing latrines:

R: Do community members often share latrines?

T: No. It is embarrassment because people will come to use other people's toilet. People see them, and they feel they are degraded because they can't build their own toilets. They have to go and use other people's toilets.

R: Use other peoples. So some people, instead of being embarrassed, they would go to the bush. (In-depth Interview - Younger Woman)

Even though open defecation itself can be degrading for an individual, the need to ask permission to use a neighbour's latrine is felt to be more degrading, acting to propagate open defecation. As well, there was a stigma amongst individuals with access to latrines that individuals without facilities did not understand the need for them, and it was for this reason that latrine installation did not occur. Individuals looked down on those without access, and did not take into account the various factors acting as barriers to an individual's ability to install a latrine. This stigma may help to increase the lack of unity within the community, as there is contempt between those with access, and those without.

4.4 Health

4.4.1 Knowledge, Attitudes and Practices relating to Health

Perceived Disease Burden

Focus group participants stated that an array of diseases and illnesses are prevalent within Usoma, including a variety of water-related and water-borne diseases such as schistosomiasis, typhoid, cholera and dysentery. Participants also felt that high rates of malaria were present, especially among children. In addition, in close proximity to a major trucking route, HIV/AIDS was seen as a major health issue plaguing the adolescent/youth population:

Too many people sick in the village, especially due to HIV infection. Waterborne diseases like bilharzias¹⁷... in terms of waterborne related diseases, because the lake is the only source of income around, so sand harvest for men and even women who get hyacinth out of the lake, they get exposed to waterborne diseases, and they get infected (Focus Group 1 - Younger Women)

While many of the major diseases present are infectious, participants also spoke of alcoholism; alcoholism was seen not only as a disease itself, but also a condition which indirectly leads to the spread of disease:

So many young people drink a lot...Because of too much alcohol and young men involvement... Most young people are dying because of that careless lifestyle...Because there are so many young people get money around, and schools are getting sexual activity with men who get money from the beach and sand harvesting, so it is a big problem. (Focus Group 2 - Younger Men)

¹⁷ Bilharzias is the common local term used for schistosomiasis.

As in the focus groups, in-depth interview participants were asked to describe what the main health issues were for their children, themselves, and for the community (Table 4.5). The perceived health issues described by the participants changed dependent on the group being discussed. Generally, participants spoke of multiple diseases which affect their families on a regular basis, and were not able to pinpoint one issue as being the most detrimental to their health, as it is a combination of factors which lead to their lack of well-being.

Table 4.5: Perceived Common Health Issues

	Perceived Common Disease – Children (%) (n=x)	Perceived Common Disease – Adults (%) (n=x)	Perceived Common Disease – Community (%) (n=x)
Waterborne Disease (typhoid, dysentery, cholera)	16% (4)	24% (6)	20% (5)
“Stomach Problems”	4% (1)	20% (5)	28% (7)
Schistosomiasis	8% (2)	8% (2)	12% (3)
Bloody Diarrhoea	-	4% (1)	20% (5)
Malaria	56% (14)	60% (15)	44% (11)
HIV/AIDS	12% (3)	8% (2)	24% (6)
Other (including eye problems, pneumonia, flu/colds, measles, joint pains, miscarriage, prolapsed anus)	32% (8)	44% (11)	24% (6)

Interestingly, individuals did not state that waterborne diseases were a common illness within their households, with only 24% of participants stating it as an issue for adults, and an even smaller number (16%) stating it as an issue for children; however, symptoms of enteric bacteria, which can be transmitted through water and/or food (e.g., bloody diarrhoea) were mentioned as a health concern:

R: What are some of the main health issues that affect you?

T: Headaches. Sometimes she gets bloody diarrhoea. She is saying they have been treating people here, but we have not been treating women.

R: So headaches and bloody diarrhoea. (In-depth Interview - Younger Woman)

This may indicate that while the symptoms of water-borne diseases are seen as a major health concern for the participants, there is a disconnect between the knowledge of the cause of the disease and its symptom. However, those individuals that did mention waterborne disease tended to have knowledge both on the possible contagions that are causing the sickness, and the methods in which these pathogens enter the body:

R: What are some of the main health issues that affect your children and grandchildren?

T: Bilharzias, malaria, typhoid. Measles. HIV.

R: So it is very similar to the problems that you suffer from?

T: Yes. Because of the lake water. Because people get their water from the lake, and they also enter in the water. (In-depth Interview - Older Woman)

When asked of the main health concerns for the community, a change of the perceived prevalence of disease occurred. While 20% of participants stated they believed that waterborne diseases were the main concern of the community, another 12% stated that they believed it was the second most prevalent health concern. Also, while some individuals recognized specific diseases, such as cholera, dysentery etc, many of the participants (28%) said that it was ‘stomach issues’, a local term for intestinal distress (i.e., diarrhoea) that was a main cause for concern. While they did not make connections between the source of the disease – contaminated food or water – and the outcome/symptoms, this illness was still seen as important at the community level:

R: What are the major concerns for the community as a whole?

T: Abdominal problems for the community, and also sometimes she feels that she cannot know what the concern of the community as far as health is concerned, because sometimes she knows that when somebody is sick, he goes to the hospital, where he or she will know that the type of sickness that he or she has, but for her, she knows very well the major problem in the community is abdominal problems. (In-depth Interview - Older Woman)

Respondents were also asked to describe the frequency of disease, and common symptoms which the children expressed during illness. Although a variety of frequencies were discussed (Table 4.6), a general consensus occurred within the interviews that the frequency of illness (i.e., diarrhoea) increases during the cold¹⁸, or rainy, season:

R: How often are your children sick from diarrhoea?

T: During the rainy season.

R: It is not as common in other times of the year?

T: It is there, but not as bad as during the rainy season.

During the rainy season it is really common. (In-depth Interview - Older Man)

When asked to describe the common symptoms which occur when a child is sick, a variety of symptoms were described, including; symptoms of flu/colds and malaria (vomiting, fever, chills, shivering) (56%), lack of appetite (24%), and diarrhoea (20%).

Table 4.6: Frequency of Childhood Disease

Frequency of Childhood Disease	Percentage of Participants (n)
1 or more times/week	12% (3)
1-2 times/month	44% (11)
1-2 times/year	16% (4)
Unable to Comment	28% (7)

When asked what causes illness within the children, interview participants described three categories of causes, including: (i) Insects/parasites/bacteria; (ii) Cold weather; and (iii) Water. The most common (44%) perceived cause of disease was that of insects and parasites. This region has had past education on malaria and its transmission; thus, mosquitoes dominated this discussion, with parasites and bacteria being mentioned secondarily:

¹⁸ During the rainy season, temperatures range between 10-25 °C, temperatures which feel quite cold for this equatorial country.

T: Like now it is raining, and there are bushes. There are a lot of bushes. Plants grow, and there is stagnant water all over. So mosquitoes hide there. And then the dirty water, also the waste goes into the lake, and the people use the lake water, and then the water gets polluted. (In-depth Interview - Older Woman)

Two participants spoke of parasites in the water that can affect humans; most specifically, the schistosomiasis parasite, for which KEMRI has previously provided health education and treatment programs.

The second most prevalent (32%) perceived cause of disease was the weather, specifically, cold temperatures:

R: Do you know what makes her sick?

T: Cold.

R: How do you know that it is the cold that makes her sick?

T: Because she believes that young children, they are afraid of cold, so when they are exposed to cold, they get sick. (In-depth Interview - Younger Woman)

This perception may be based in actuality; due to breeding habits of disease vectors (i.e mosquitoes), many of the common illnesses in the community (e.g., malaria, waterborne disease) are more prevalent during the colder, rainier months:

R: What makes them sick? Do you know what it is that causes the sickness?

T: The cold.

R: How do you know that it is this that makes them sick?

T: Because they only get sick during cold season. (In-depth Interview - Younger Man)

The final perceived cause of illness in the community was water. 28% of participants stated that they believed the water within the community was the sole or partial cause of children's illnesses:

R: Why do you think that the diseases change at different times of the year?

T: Because during rainy season rain collects all the waste, and they are taken to the lake, and in the lake where children are playing, and with them they don't care, they can even drink that dirty water. That is why during rainy season, there are so many diseases. (In-depth Interview - Older Man)

R: How often are your children sick from diarrhoea?

T: Like this one, like even now, she is playing, and sometimes she is playing like she is making tea, she drinks this dirty water, so that is when she can get diarrhoea. (In-depth Interview - Younger Woman)

Many interview participants did have some knowledge or understanding that the water in the community is the cause of illness; 88% of participants either directly or indirectly made a connection between water and a resultant disease. Of these participants, 41% made direct linkages between water-borne pathogens and illness, by either stating a specific disease (such as schistosomiasis, dysentery or cholera), or by stating that germs and parasites are present in the water. The remaining 59% of participants indirectly made connections between their health and the water they are consuming by discussing water contamination or hygiene. However, while these individuals did make a connection between contaminated water and their health, most did not have a full grasp of what exactly it is that is causing illness:

R: Do you find the preventions you take for your water help to prevent diarrhoea?

T: Yes.

R: How do they help?

T: When you sieve the dirt remains on the clothes, so the dirt which causes people to have diarrhoea, don't go into the water.

R: So it is the dirt in the water that causes the diarrhoea.

T: Yes. (In-depth Interview - Older Man)

As illustrated by the above participant, there is knowledge that the water is the cause of disease; however, in many cases, individuals believe that it is the particles which can be seen, not the microscopic organisms, which are the true cause of disease. It is this misunderstanding which may lead individuals to believe that water which is clear, is clean and safe.

While the majority of participants made connections between contaminated water and their health, 2 participants stated that they believed that you cannot tell what causes illness:

R: What normally makes them sick?

T: So the diseases just come abruptly. Because they have nets, they cannot say it is malaria.

R: So can you ever tell what makes them sick?

T: Diseases are a must. Human beings must get sick.

R: So it is difficult to tell what it is that is making them sick. Like the cause of it is food or water, or disease.

T: It is difficult to tell. (In-depth Interview - Older Man)

This quote exemplifies the feeling of many participants; while they practice prevention methods, sickness still occurs, leaving them to believe that illness is an inevitability.

When discussing the water quality in the village, there was a general consensus in each focus group that the water from Lake Victoria is contaminated, and that it is the cause of many water-borne diseases in the community:

Most of them get their water from the lake, and that is why you don't have so many old men, because many die from water borne diseases... It is contaminated, so they have a real problem. So many people use lake water, and so many people get diseases from lake water (Focus Group 4 - Older Men)

All groups made reference to the water as being a cause of illness, especially schistosomiasis, the parasitic disease with which KEMRI has performed previous research. Although contamination of the lake was discussed at length within all focus groups, few participants commented on the possible contamination of other community sources, such as bore holes and wells. While the community does have knowledge of the linkages between water and health, there is little awareness of source water contamination away from the lake.

Although waterborne disease was not perceived as a major health concern at the household level, respondents still practiced preventative measures, such as water treatment, to help decrease the burden of disease. Many participants (56%) stated that prevention of water-borne disease is possible, the most popular methods for prevention being chlorine tablets, or boiling. However, there was confusion by one young female participant who stated she used Oral Rehydration Salts (ORS) as a way to prevent diarrhoea. ORS can only be used a treatment for diarrhoea and dehydration, not as a preventative measure.

While some participants (36%) stated they practice disease prevention, due to a lack of proper facilities and clean water, the preventions are inadequate at preventing diarrhoeal disease, leaving a feeling of resignation towards disease incidence:

R: How do you try and prevent diarrhoea?

T: It is difficult to prevent it because it comes when it wants. So what they do is when somebody is sick, they just give a lot of water, and take to the hospital.

R: Do you find any of the treating of water, and things that you do, helps to prevent diarrhoea at all?

T: Yes, but you see some children don't use the boiled or treated water, so sometimes to them this prevention doesn't help.

R: It is difficult to prevent. You just have to treat.

T: Yes. (In-depth Interview - Older Man)

Lastly, a few participants (16%) believed that preventing diarrhoeal disease is not possible:

R: How do you try and prevent diarrhoea, and other diseases? What do you do?

T: You cannot prevent a disease. You only treat diseases when they occur.

R: There is no way to prevent diseases from happening.

T: Yes.

R: Why can't you prevent diseases?

T: You don't know when they are coming. (In-depth Interview - Older Woman)

While most of these individuals did still practice preventative methods, the attitude towards them was that they did not work, as they were still getting sick, leaving a feeling of powerlessness towards the health of their families:

R: The boiling of the water, how does that help?

T: So boiling water, she doesn't trust boiling water, because she always boils water, and she has typhoid most of the time she goes to the hospital.

R: Okay. So then why do you still use boiling water for your drinking water, if you don't trust it?

T: So that is her dilemma. She doesn't know what else to do. (In-depth Interview - Older Woman)

Access to Health Care

Access and availability of healthcare facilities was discussed in the interviews, with participants showing a variety of preferences for the facility used for treatment (Table 4.7). The first clinic, the village dispensary, was built by the municipal government; however, an individual has rented out the space and treats community members privately:

R: First, do you have access to a health clinic?

T: The dispensary.

R: That is down by the beach.

T: Yes.

R: Is it free?

T: Okay, the municipality built it, but they have not sold it to people. So the nurse who is there, when you go, you pay some things more for treatment and medication.

R: So when the municipality starts to run it, it will be free?

T: Not completely free, but maybe smaller amount, like 20 shillings. (In-depth Interview - Older Man)

Table 4.7: Participant Usage of Local Health Care Facilities

Health Care Facility	% Participants Using Clinic (n)
Village Dispensary	68% (17)
District Hospital	68% (17)
Other (Airport dispensary & Catholic Mission)	12% (3)

The cost of the visit is dependent on the severity of the health issue, and the required treatment, ranging from 100 to 250 Kenyan Shillings¹⁹, or approximately a day's wages for labourers; a cost which can act as a barrier to some.

The second facility utilized by the majority of participants (68%) was the government-run district hospital, located in Kisumu. Patients with severe illnesses

¹⁹ 100-250 Kenyan shillings is approximately 1.29-3.22 Canadian Dollars.

are either referred to the hospital from a dispensary, or can choose to go to the hospital directly:

R: What about the district hospital? Do you ever use it?

T: Yes.

R: When do you go to the district hospital?

T: If the disease gets worse.

R: So first you would try things at home, then dispensary, then district hospital.

T: Yes. (In-depth Interview - Younger Woman)

While fees are charged for accessing this care, participants were in agreement that the care cost less than privately run clinics for common illnesses. However, treatment at the hospital does not include the price for prescriptions which must be bought at a pharmacy, which can reach upwards of 1000 Kenyan Shillings, or approximately 13 Canadian Dollars. Also, wait times and lines at the hospital can be quite long, making it a large time commitment to take the ill for treatment.

Finally, 12% of participants stated that they would use other locations, including a clinic by the airport and a Catholic mission which treats HIV/AIDS patients. However, these clinics were not discussed by any other participants, and are not regularly used healthcare facilities for the majority of respondents.

Access to Health Education

The various opportunities for accessing health knowledge and the availability of learning new healthy strategies were discussed by interview participants (Table 4.8).

Table 4.8: Route for Increasing Health Education

Route for Accessing Health Education	% of Participants Using Route (n)
Parents (especially Mothers)	84% (21)
Non-Governmental Organizations	44% (11)
Children	40% (10)
Previously Established Community Groups	16% (4)

Participants stated that they had learned about health, water and sanitation from non-governmental organizations (NGO), including groups such as the Red Cross. However, NGOs do not come to the community on a regular basis, forcing community members to leave the community if they wish to regularly attend any health seminars, decreasing access for many:

R: So where did you see some of the things you learned?

T: Workshops. They taught her about clean water, and sanitation in the workshops. HIV training and teaching. Even for those people who are HIV, cleanliness is very important.

R: So you had people come in to the community and give workshops.

T: No, not here. It is very rare anyways, but sometimes we get the NGOs.

R: So the workshops that you went to with hygiene and sanitation, that was in the community, or was that somewhere else.

T: It was in town. (In-depth Interview - Older Woman)

While the children are learning about health and hygiene in school, participants were divided on whether the children could pass this knowledge on to their parents, with 44% of participants stating they had yet to learn anything that would advance their health knowledge from their children. Alternatively, 40% of participants stated they were able to learn new ways to stay healthy from their children:

R: Have your children taught you anything about health that you didn't already know?

T: Every time they are taught things on cleanliness, they come back and tell her, so some of the things she knows, some of the things she doesn't know.

R: Can you give me an example of something that they would have taught you that you didn't already know?

T: Always they are telling her that they are being encouraged to build toilets, and after washing utensils they should dry in the sun until they are dry, before they eat they encourage always to wash their hands. (In-depth Interview - Younger Woman)

While many community members wish to learn about health, and how to stay healthier, there was a large divide as to whether residents could teach each other about health. Many participants (52%) did not believe that community members would be able to work together to teach each other about health; the main reason for this was a lack of unity and trust between community and family members. This lack of unity means that people feel demeaned when their neighbours try to teach them, feeling those teaching them are looking down on

them:

R: Do you think that community members can teach each other about health and health problems?

T: It is difficult.

R: Why is it difficult?

T: Because she has also explained that because people sometimes they not take advice from other people, so people will just be saying so and so is really dirty, but should you advise them, they would not be happy.

R: So people in the community don't like to hear what other people think.

T: Yes, they think that you are looking down upon them. (In-depth Interview - Younger Woman)

Also, community members spend much of their time earning an income, and thus are unable to work with community members to learn:

T: Community members, nobody can unite them and can teach them, unless people from outside come, and unite them and teach them.

R: So it is difficult for someone within the community to start groups, and to unite them.

T: Yes.

R: Why does this happen do you think?

T: Because people are individualistic in their lifestyles, and people are busy doing different things, looking for money and nobody has time for such. (In-depth Interview - Younger Woman)

However, there were some participants who felt that those within the community can work together to improve health. 32% of respondents stated they believed residents could teach each other, and that it would be a viable way for the community to increase their health knowledge. However, for this to be done, it had to occur in a group setting to create a safe space for learning:

R: Do you think that community members can teach each other about health and health problems?

T: Yes, when they are at seminars.

R: So it can only be done in a group setting. Why?

T: Because when people are in groups they have different ideas which people float around.

R: They are willing to listen to each other more.

T: Yes.

R: So when people are in their homes, they don't like people telling them things about health.

T: It is difficult, that is why the seminar is the only option. (In-depth Interview - Older Man)

In addition, 16% of participants spoke of community groups already set up within the community to teach each other about health:

T: So it is good, people can learn, even the villagers themselves can learn, and once some people are examples in the village, some people can also copy from them, because cleanliness is next to godliness.

R: So do the community members teach each other often? Do they form groups and teach each other?

T: Yes, and she is one of them. Through Undugu Society of Kenya. And they are also teaching themselves how to get rid of poverty...if you are economically empowered, you will also start getting clean and better than other members, so through that people also learn. (In-depth Interview - Older Woman)

However, while there was mention of the Undugu Society²⁰, most participants stated that it was not a useful group, as community members were not willing to work together and learn from each other.

Finally, 16% of individuals stated that community members could teach each other about health, but only if they were mobilized or empowered by outside individuals; these individuals believed that it was impossible, due to the current lack of social capital, for community members to mobilize themselves:

R: Do you think community members can teach each other about health and health problems?

T: If there is somebody who is mobilizing them.

R: How can they be mobilized?

T: Somebody who explains to them first of all the importance of hygiene and how people can be clean, and then through that people can be put in groups.

R: What stops community members from teaching each other?

T: Unless there is somebody who can teach them, and help them be in the groups.

R: Can that person be from the community, or does it have to be an outside person?

T: A person from outside, and I asked her why not from within. She is saying they don't trust from within, they just say so and so cannot teach us anything. (In-depth Interview - Younger Woman)

²⁰ The Undugu Society of Kenya is a developmental organization that aims to help street children while building community capacity and empowerment in marginalized rural and urban communities.

4.4.2 Community Level Barriers to Increased Health

While close access to useful health care providers and the cost of treatment acted as the main physical barriers to accessing care on an immediate basis, three main themes arose which inhibit the community from increasing their overall health and wellbeing, including: (i) lack of education; (ii) blame and disassociation from the problem; and (iii) lack of unity. As well, a general feeling of despondency towards the situation was also implicitly integrated into many responses discussing health, access to care, and the aid given by community leaders for responding to health crises:

R: So does the government often act once they find out about new diseases or outbreaks.

T: Only when people start dying, but they don't act immediately. But in olden days they used to act faster. He is saying that even though people go to the community health workers, sometimes they are not properly trained, so they can also make the diseases worse, because the people are living near, sometimes people just have no alternative. (Focus Group 4 - Older Men)

In general, the community felt that a lack of knowledge over disease prevention and treatment methods increased the spread of disease, thus decreasing their overall health:

They are lacking health education. Some diseases you can prevent if you have the education. Because so many people are ignorant about disease prevention. Because of the public attitude and the lack of commitment by the relevant authorities, to come and give proper health education...(Focus Group 4 - Older Men)

Secondly, within each focus group, blame was placed on the leaders of the community, and on local politicians, stating that they were not doing enough to decrease the daily burdens:

The problem keeps getting worse by day, and according to her can really blame the leaders, the elected politicians that are here, because they don't do their work well. They have bad roads, they have water problems, and sanitation issues, and these people don't help them. (Focus Group 1 - Younger Women)

Lastly, a lack of unity dissuades individuals from action; that is, due to the lack of unity and social capital, individuals that are educated in certain areas can find it difficult to pass on this knowledge to other community members:

There is nothing they can do to solve these problems. They try to teach the gospel to teach them about God to make behaviour changes, especially young men. The problem is like sometimes in one's family somebody has dropped out of school, and you have not managed to let him go back to school, so it is difficult for you to go to the next home, and start advising the children to go to school, if you have not even succeeded with your brother or sister. So it is a big challenge. (Focus Group 2 - Younger Men)

The older women also stated that a lack of unity has been growing over the years, and that is why the community's issues have become more pronounced:

...People are also not very united. When they came, people use to be united, doing things together for the community. So things are not being done now-a-days as a unit. (Focus Group 3 - Older Women)

Because of this lack of 'togetherness', community members find it very difficult to both come up with viable solutions, and implement them.

4.4.3 Individual Level Facilitators and Barriers to Increased Health

Facilitators and Solutions to Increased Health

When interview participants were asked what they believed would be the main ways in which health of their families and of the community could be improved, four main themes/solutions arose (Table 4.9), including: (i) increased health education; (ii) increased treatment of current water sources; (iii) increased latrine implementation; and (iv) access to piped water.

Table 4.9: Solutions for Increased Health

Solution for Increased Health	% of Participants stating solution (n)
Access to Health Education	72% (18)
Increase Access to Water Treatment Strategies	48% (12)
Increased Latrine Access	44% (11)
Increased Access to Municipal Water	20% (5)

Similar to the focus groups, participants stated that increasing access to health education is required to allow for improved health and wellbeing:

R: What would you like to see in the community to help make you healthier?

T: Health education, because it is through health education which people can be healthy, and it is through education also when people can be empowered, people can know how to get money, where to get the money, and also do small businesses, and in general the life of the community will be better. (In-depth Interview - Older Woman)

Many participants focused on educating not only the adults, but also the children; the focus for children was not only to increase their health education, but to increase enrolment in school so as to use education as a way to give them better opportunities in the future:

R: What would you like to see in your community to help make you healthy?

T: There should be schools. It is good that they go to school, and are taught a lot and they have better lives. (In-depth Interview - Younger Man)

Not only was formal education emphasized, but also small group meetings which would allow for individuals to learn how to appropriately deal with the community's water issues, as well as ways to gain income outside of the traditional employment opportunities:

R: What other things would you like to see in your community to help make you healthy?

T: If they can get NGO's to come and talk to young people, youths, and the youth, the young men also taught the ones even without the jobs, they are taught on how to become self-employed. Even young ladies who do not have jobs, if they are talked to, and are advised on how to empower themselves where they can get money, which kind of employment, how they can be self-assured through empowerment. Teaching to empower the community. (In-depth Interview - Older Woman)

Many participants believed that the key to increasing health would be to enhance their ability to treat the water, either by providing education on how to treat water within homes, or by treating the source specifically:

R: What about the water? Is there anything you would do about the water issues?

T: Yea, if she can do something like treating the water for people to have clean water.

R: Would you just treat it at the source, or in the homes?

T: It is good for water to be treated at the source, because sometimes you can send somebody to bring you water, and he or she tells you that the water is treated, and it is not treated. And if it is treated at the source, then it can be very good. (In-depth Interview - Older Woman)

R: What would you do about the water problems in the community?

T: So because they have a lake, if they can find ways if she is the leader, she can look for ways to get water to a central point, just like the dispensary, and build big tanks there, and treat water for the community. (In-depth Interview - Older Woman)

By stating that there is a need to treat water to improve health, participants demonstrated their understanding of the water-health link.

Thirdly, 44% of participants stated that to ensure community health, latrine installation needed to increase:

R: What things would you like to see in your community to make it healthier?

T: They should have toilets. They should have a clean source of water. They should have health facilities. They should have a source of income generating activities for the community members, so that they can get enough money to buy food, because food also contributes to one's health. (In-depth Interview - Older Woman)

As stated by this participant, many of the wishing of community members are not extravagant, but are just the facilities required to live their daily lives.

Finally, the fourth solution to increase health was to expand the access to piped, municipally treated water (20%):

R: If you were in charge of the community, how would you make sure that everyone stayed healthy?

T: He has no power and financial help, so without those ones, there is nothing you can do.

R: So if you had power and financial help, what would you do? Is there any solution you can think of?

T: He can build a lot of latrines in this community, and then he can bring tap water, flowing water. (In-depth Interview - Older Man)

While this solution may be useful in decreasing the disease burden from water-borne pathogens, the community currently feels that this solution is out of their control.

Individual Barriers to Increased Health

Interview participants identified a lack of healthcare access as the main difficulty for increasing their health, stating three main barriers to accessing healthcare facilities and treatment for their families: (i) cost; (ii) distance; and (iii) time (Table 4.10).

Table 4.10: Factors acting as barriers to healthcare access

Barrier to Healthcare Access	% of Participants Stating Factor as a Barrier (n)
Cost	60% (15)
Distance	20% (5)
Time	8% (2)

The majority of participants stated that a lack of funds was a large barrier that they faced in terms of accessing medical treatment. Not only can the initial cost to see a healthcare professional be inhibiting, the cost of subsequent tests to further treat an illness might be prohibitive for many community members:

R: What are the main health issues that affect you?

T: A lot of diseases. Bilharzias first of all, has really disturbed her for quite some time. Malaria, typhoid, and eye problems. And all the body aches. Even now the head, it is a lot of noise with the background. So she doesn't know what is going on. She has even planned to go for a head scan. And for them to do that, she needs 6,000 shillings. So that is why she has not gone. (In-depth Interview - Older Woman)

Additionally, not only is the cost of treatment prohibitive, but accessing care can also reduce the ability to earn money, making the decision to access care difficult:

R: How does your daily routine change when you have a sick family member?

T: She cannot go and look for money, because she has to look on ways to help the sick one.

R: So it affects your ability to have an income.

T: Yes. (In-depth Interview - Older Woman)

Lastly, a lack of money can decrease an individual's ability to access food, leaving some medications to be ineffective:

And there are also some people there in poverty, which is a big problem. Due to poverty, there are some people who are sick. They go to the hospital, and they are given drugs, and these drugs you are suppose to take with food, and because they are not working because they are sick, they don't have enough energy, so it is a big problem. (In-depth Interview - Older Woman)

Some participants also stated that distance can act as a barrier to accessing treatment. Due to the fact that only minor illnesses can be addressed at the dispensary, many health issues must be addressed at the district hospital, located in Kisumu, a distance which requires individuals to use a means of transport (car, boda boda or tuk tuk²¹) to bring the ill to town, acting as a barrier to accessing appropriate and timely care:

R: Is distance a problem to go to the hospital when you need to go into town, or is that fairly easy?

T: Yea in town you have to use a motor car or boda boda or tuk tuk. (In-depth Interview - Older Man)

Lastly, a lack of time was also mentioned as a barrier to use. However, the majority of participants stated that when a family member is ill, time must be freed up from everyday chores to take that individual to get treatment, which will need to be completed later in the day.

4.5 Changes, Challenges, and Community Solutions

4.5.1 Changes to the Community

Throughout each focus group, participants highlighted the fact that they believed Usoma's problems have changed dramatically over time, with each

²¹ A tuk tuk is three-wheeled, motorized rickshaw.

challenge becoming more pronounced. This was especially common when discussing water contamination and disease burden. Participants spoke of times when water sources were safe to drink; this fact was especially emphasized for the lake water:

T: When they got married, people use to get lake water, and use it for almost anything.

R: Because it was clean.

T: It was clean.

R: So now you no longer can drink the lake water.

T: Yes because it is dirty, and they have the wells and the forest water (Focus Group 3 -Older Women)

Many of these changes were attributed to the industries in town, and the lack of unity between community members. Also, participants stated that they believed that health had decreased over time, with traditional diseases becoming more prevalent, and newer diseases emerging:

T: They never used to have cholera. People used to have diarrhoea. Malaria use to be there but not prevalent.

R: It is worse now.

T: It is worse now. They are saying even the malaria strain, they use to have it, they use to cure it using the herbal medicine, but now-a-days you have to go to the hospital to get cured. Small pox also use to be there.

R: It is not as common any more. (Focus Group 4 - Older Men)

Many different reasons were proposed as to why health had deteriorated. First, urbanization was spoken of in relation to health; individuals spoke not only of the increased contamination of water sources which caused increased illness, but also of increasing chances of being exposed to illness:

Initially there never use to be so many diseases around, because people also never use to walk a lot, so interaction was minimal, because now these people interact a lot. (Focus Group 4 -Older Men)

Because of trucks. The truckers are also interfering in the community and luring women and young children are spreading HIV. (Focus Group 3 - Older Women)

As well, nutrition and poverty were discussed as barriers to fighting illness. While environmental pressures also were highlighted, the participants in the older women's focus group put great emphasis on the younger generation, blaming them for the detrimental changes:

When they got married, they found that the old people were the ones you used to drink, and they never use to have a lot of fighting, but now the small children they drink a lot, and like fighting most of the time. So things have really changed. (Focus Group 3 - Older Women)

R: Are there any other reasons why the community doesn't address the health issues, other than alcohol?

T: Most people use to be very responsible died, so the remaining lot just get drunker.

R: So the people

T: They use to be very responsible.

R: They are no longer in the community.

T: They died, and because alcoholism is taking toll on each and every person, they become hopeless. (Focus Group 3 - Older Women)

In many cases, the older participants tended to hold the younger generation responsible for the community's issues, and disassociate themselves from both the problem, and the solution.

4.5.2 Community Challenges

The overall challenges were also discussed with focus group participants, with each group highlighting challenges relating to water, sanitation, and health. However, there were underlying concerns mentioned throughout the focus groups, which affect all three of these larger themes; the first being urbanization. Urban encroachment on the village was stated to most greatly affect the issues relating to water and health. The community felt that its water supply was affected in three ways, with the first being industrial contamination. Many participants spoke of industries within town and the municipal sewage systems, and that these organizations contaminate the water through dumping untreated material directly into Lake Victoria:

There are water problems in Usoma village. Initially the lake water use to be good, but because of so many factories, and their actions, they are pouring in the lake, they are contaminating the lake, so the lake water is no longer safe for drinking. The chemicals also from the factories are killing the fish. (Focus Group 4 - Older Men)

Secondly, it was felt that a main challenge due to urbanization was the little control residents held over the actions of industries; this was specifically

strong when discussing past actions of the Pipeline Company which had disturbed the water pipe carrying municipally treated water into the community:

They are always trying to report this problem to the leaders, but they do very little. From groups, and CBO's. There was a time through the UNICEF, they had piped water here, but when the pipeline was being built, it interfered with the line. But they are still trying. (Focus Group 4 - Older Men)

They use to have piped water, but because of the interference of the pipeline and Coke, so now nobody from the village has tried to push those people to get them back their water. (Focus Group 3 - Older Women)

Lastly, the community felt there was little they could to prevent contamination of other sources, such as the forest water, because of the industry's actions:

T: They tell the government, and they wait for the action. Because it is a Coca-Cola issue, they built their toilets next to the forest water, and they informed the local administrator, so they are suppose to take the matter to the government, so then there is nothing they can do.

R: So the coke plant has built their toilets beside the forest water?

T: Yes. Just next to the source... At some point they were given water, but now the taps are dry, they are not getting the water, but they are not sure, where the flowing water is coming from, whether it is also getting contaminated by the toilets which are built next to it, or what. (Focus Group 4 - Older Men)

The health of the community was also seen to be affected by urbanization. Participants in the focus groups believed that the high local rates of HIV/AIDS were due to the proximity to the Kenya Pipeline Corporation and its trucking route:

T: The community is sick, and because even the children bring diseases from all the various areas, and they spread them around.

R: And by children, does she mean little children, or adolescents?

T: Adolescents. Yes. Because of trucks. The truckers are also interfering in the community and luring women and young children and spreading HIV. (Focus Group 3 - Older Women)

A lack of resources, both monetary and in the form of social capital, were also expressed to occur concomitantly with the problems associated with urbanization:

T: Because so many people are poor, they cannot afford money, nearly each and everything to be done requires money. And not just say, and do it without money, and because so many people don't have money, so it is difficult for them to overcome the health issues. (Focus Group 4- Older Men)

Also, there was a feeling that they weren't receiving the same support from the government as other communities:

T: Another problem they are saying, most of this relief aid is being given to different parts. They don't always receive.

R: So the community isn't getting the aid from the government that other parts are getting?

T: Yes.

R: So you have fewer resources than other communities.

T: Yes. That is a challenge they are facing. (Focus Group 3 - Older Women)

Finally, as has been common throughout each theme, a lack of community unity was seen as a challenge. Participants in each focus group discussed the issue of unity within the village, and the ways in which it prohibits the creation of solutions:

R: So how does your community cope with the challenges that you have all presented here? What does the community do to help overcome them?

T: There is nothing. That is why the problems are getting worse and worse.

R: Because the community just doesn't do anything.

R: So the community as a whole just kind of lets it go.

T: Yes. (Focus Group 3 - Older Women)

This lack of unity permeated discussions of water, sanitation, health, education, and resources, showing its extreme importance for combating these challenges in the future.

The barriers that exist that impede the spread of knowledge were also discussed as creating many challenges for community members. First, many of the older community members did not attend formal education, resulting in low literacy rates for the elder population. While these community members have learned about health and healthy behaviour from their parents, due to the changing environment (both from climate change and encroaching industrialization), the knowledge which they attained in the past may not be valid in this new environment. Without continued education for older residents, there

are few avenues for these individuals to change their knowledge or behaviours to increase their health:

They have one big problem in the community. Most older elderly people are not learned, so they have a big wish, they are planning to build even one room where they can conduct adult education, so that they can request the government may be to give them one teacher ... because they are seeing so many elderly people not know how to read and write, but they want to improve on that. (In-depth Interview - Older Woman)

Not only can the lack of educational opportunities for the older generation act as a barrier, but the high drop-out rates for the younger generation can also affect their ability to stay healthy:

He would want to see more education, because now young people, they drop out of school, and there are so many diseases around, and they don't know how to handle themselves once they are out of school. So he wishes to ask to come and give more education to people, and teach people so that people can really take care of themselves, especially the young people the way they use to be united in school. If people can be united and properly educated on issues and healthy issues on diseases. (In-depth Interview - Younger Man)

4.5.3 Solutions

While the participants face many challenges relating to their water supplies, sanitation facilities, and access to health care, there are very few existing strategies to allow for better coping and problem solving. When asked what coping strategies and solutions the community could offer to help fight against the challenges, participants stated that very few solutions have been presented. The reason for this focused on the leaders, and their lack of leadership towards uniting the community to come up with appropriate coping strategies:

They are always trying to report this problem to the leaders, but they do very little. From groups, and CBO's. There was a time through the UNICEF, they had piped water here, but when the pipeline was being built, it interfered with the line... They also talk to coca-cola people because they interfered with their forest water, and they have accepted to come and sink three bore holes, but unfortunately the human resource manager that was handling that case died, but still they are following that matter. (Focus Group 4 - Older Men)

Because of a lack of strong community leadership, participants felt that dealing with their challenges was out of their control. Even for local water sources, participants felt that they had little control over decreasing contamination:

R: Is there anything that you can do in the community to make sure some of your natural water sources are cleaner?

T: It is difficult, the lake, the people, they defecate around the lake, and washes in the lake, nobody takes care of the lake, and even the open wells, some cattle use them for drinking, they also urinate in those waters.

R: So it is difficult for the community to stop those things from happening.

T: Yes. (Focus Group 3 - Older Women)

Also, while there had been attempts to bring community members together to teach them about health and healthy living, participants stated that it was difficult to express the importance of this knowledge to their neighbours:

She is saying because the leaders aren't really enforcing this, so people are relaxed. First of all, through Undugo society, the Undugo society is a self-help society, they brought people together, taught them good ways of living, like building racks for utensils, but not everybody managed to get that. So she is also partly blaming the community members who haven't tried to go out to those groups. Out of twenty only two people managed to get those teachings. (Focus Group 1 - Younger Women)

Because it is difficult to encourage individuals to be interested in the problem, coming up with solutions has become increasingly complicated. However, there were times where the community did try to overcome their issues with the local industries:

They also approached the pipeline guys, and they accepted also to help organize for piped water into the community, but they are also still following that matter. He is saying, even though they have tried to approach this other organization to help them get water, but they have not been successful, but we ask the question, "What are they doing to live with this", but they are forced to admit, so far, even though they have not succeeded in getting their demands met, but they are still trying. (Focus Group 4 - Older Men)

While past attempts have been made to overcome the current challenges, a lack of empowerment has prevented the community from being able to overcome these issues.

Whereas the four strategies mentioned above were the technical solutions that participants spoke of for decreasing disease burden, community unity, or a lack thereof, was an important issue. 64% of interview participants believed that increasing social capital, by creating groups that can work together to come up with solutions for the community's issues, was the key to improving wellbeing:

R: What would you like to see done with the resources that the community already has?

T: First of all by uniting the community members, so that if people can be united and then, for example, fishermen, they could be encouraged to form a co-operative society, so that it is through the society, that they sell their fish, and get the benefit from them. (In-depth Interview - Older Woman)

While the majority of participants stated that they believed the key to diminishing their health problems was through increased unity, there was disagreement as to whose responsibility it was to unite the community. Some participants stated that it was the responsibility of the leaders; however, the leaders stated that when trying to unite groups, no one would listen:

R: What would you like to see done with the resources that your community currently has?

T: People, even fishermen and also sand harvesters should form groups, and through the groups they can get loans.

R: How do you think the community can make this happen?

T: It is difficult because he has always even tried with sand harvesters to call them and let them know that they can be united and sell even their sand at a given price, because sometimes when they don't have money, they even sell their sand cheaper.

R: Cheaper, so that they can get that money.

T: Yes.

R: Is it just difficult getting everyone united though in the community?

T: Yes it is difficult uniting people. (In-depth Interview - Older Man)

Therefore, while there is recognition that an increase in social cohesion needs to occur, they have difficulty initiating it without the support of outside, nonpartisan individuals. This has created a feeling of disempowerment among participants, especially when their attempts to better their situation have been met with disinterest from the local industries:

T: So the other day, we went, and the tap was running, so since they demonstrated now they have closed the tap, so now they are collecting the running one²².

R: So you can no longer get water from the taps?

T: So now because of the demonstrations, they decided to block the tap, and let the water run the way it use to run. Before they built that company there, the forest water is water from under the ground, and I think they had their taps, but because of the building, it interfered with the taps, but there was an agreement that they were to put tap water at the building, but this one took longer. Even after they managed to get the taps, the water was not coming out frequently, so they demonstrated

R: So you protested. Okay.

T: Protested. So now these people say, okay now we let the water flow the way it use to flow, and you collect it from the forest (Focus Group 1 - Younger Women)

In this instance, community members were upset with the interference of the local ‘forest water’ by the Coca-Cola bottling facility, and the ability to get water from the Coca-Cola taps. While the community tried to be empowered and inform the company of their issues, the industry was nonresponsive, and instead of creating a viable solution for the locals, the company shut off the water supply to their outside community taps. Because of situations like this, the focus groups members felt like they are never able to come up with solutions, because anything that they do feel is appropriate, is not supported by the local industries or governments.

As was a common theme in other sections of these results, a lack of unity also created a feeling of disempowerment among the community members; without the social capital to support each other, participants felt that no solutions would be able to be implemented, causing them to feel even more helpless:

T: Yes. Because of lack of unity of the community members. Because of lack of commitment by the community members, if they are united they can build community wells and holes and make sure it is treated. So that people get water from there.

R: But the community isn’t together.

T: Yes. (Focus Group 2 - Younger Men)

With the decreased ability to work together, it is more and more difficult for community members to become empowered to create solutions for the issues which they face.

²² Here, the ‘running water’ referred to by the participant was the naturally flowing forest water.

Much of this feeling of disempowerment was linked to the governance of the community, or the lack-there-of. Many participants stated that they believed it was the responsibility of the government (the community leaders, the assistant chief and the chief – all part of the larger municipal and federal government structure), to provide them with solutions for their water, sanitation, and health problems:

T: so the community leaders in general, they are not doing enough to let the government provide for them water, because now there is a lot of pollution, and the pollution is not being checked, so that they can retain their level of cleanliness of the lake when they found it, and people are also not very united. When they came, people use to be united, doing things together for the community. So things are not being done now-a-days as a unit. (Focus Group 3 - Older Women)

T: They are lacking health education. Some diseases you can prevent if you have the education. Because so many people are ignorant about disease prevention. Because of the public attitude and the lack of commitment by the relevant authorities, to come and give proper health education. So this gives it a good way for diseases to spread, and even for leaders, and even the administrative leaders, they are not enforcing laws for sanitation, and health diseases, so this one gives a loop hole to diseases. Because people look a lot to politicians, and they don't help. People want politicians to help in doing the educating, but they don't. (Focus Group 4 - Older Men)

While the community believes it is the responsibility of the government to create solutions for their problems, they remain disassociated from being empowered to create their own solutions, allowing for the daily challenges to continue. As well, the community felt that the government was less responsive to their issues and health concerns now than they had been in the past:

T: What they normally do in case of any outbreak, people come and inform the village elder, and the assistant chief, who is supposed to inform the government to bring help. So once the expected channel people is supposed to report for any new disease or outbreak, so that the government can act...

R: So does the government often act once they find out about new diseases or outbreaks.

T: Only when people start dying, but they don't act immediately. But in olden days they use to act faster... (In-depth Interview - Older Man)

4.6 Chapter Summary

This chapter summarized the results of this research, as they pertain to the three research objectives. First, knowledge, attitudes and perceptions related to water contamination were reported, as well as practices, along with the facilitators and barriers to accessing safe water. While there is knowledge of water contamination, due to barriers of distance and cost, most individuals continue to utilize contaminated water for both drinking and domestic chores. Also, urbanization and industrialization were seen as key factors in the community's ability to access water in the future.

Second, access to sanitation, as well as community perceptions of its need, were discussed. While some individuals wish to increase their access to sanitation facilities, the physical geography of the area and cost appear as insurmountable barriers. As well, fear of the structures collapsing, as well as stigma, can act to prevent individuals from utilizing the facilities, even when access is not restricted.

Third, health at the individual, household, and community level was discussed. When asked about primary illness experiences, participants stated that malaria was the main cause of concern, both for adults and children. However, when the main health concerns of the community were discussed, the majority of participants felt that issues relating to the 'stomach' caused the greatest burden of disease. While preventative measures for diarrhoeal disease are practiced, many individuals felt that they were not useful, as waterborne disease affects their families, even when preventative measures are taken.

Finally, community changes and possible solutions to their problems were discussed. The majority of individuals felt that to improve health in the community, increased access to health education, as well as safe water sources and latrine access needed to be addressed. While the majority of individuals felt these solutions would act to increase health, both of their families and the community, they did not believe that the community could initiate these changes; instead, an outside facilitator to unite the community and realize sustainable solutions was required.

This summarizes the key findings of this research. A discussion of these findings, as well as conclusions and future directions of the research program, will be discussed in the following chapter.

CHAPTER FIVE

DISCUSSION AND CONCLUSIONS

5.1 Introduction

The final chapter summarizes the key findings of this research within the broader context of the literature. Contributions and limitations of the work, and directions for future investigation, are discussed.

5.2 Key Findings and Interpretations

5.2.1 Knowledge, Attitudes and Practices toward Water, Sanitation and Health

Results indicate that community members have some basic understanding of the linkages between water and health. This is especially the case when discussing schistosomiasis, a parasitic disease around which the Kenya Medical Research Institute has previously undertaken research and interventions in Usoma. The community is acutely aware that water from Lake Victoria is contaminated, and that by consuming raw lake water they risk exposure to disease. Furthermore, use of Lake Victoria as a primary water source is historically engrained in this lakeside community, which contributes to its sustained use. As a result, exposure to contaminants continues unabated. Given that lake water is perceived as the cheapest, most readily available source of fresh water, as well as a positive asset for development, it is difficult to imagine any different scenario.

While the community is aware of the potential health effects from consuming lake water, there was little discussion of the contamination of alternative sources (e.g., wells, boreholes, rainwater catchment systems). Indeed, only one group (younger males) mentioned their lack of knowledge as to whether sources other than the lake (e.g., forest water) are safe, perhaps in part stemming from previous schistosomiasis educational campaigns which focused on the lake's contamination.

Although the community understands that traditional sources (i.e., the lake) are contaminated, practices have not changed to accommodate this knowledge. This is contradictory to the beliefs of some intervention approaches, such as Community-Led Total Sanitation and Participatory Hygiene and Sanitation Transformation, which rely on the principle that knowledge of a disease-health link results in subsequent action by community members (Chambers, 2009; WHO, 1997).

While knowledge of water-health links is apparent, lacking is a true understanding of the cause of waterborne disease. Participants rely extensively on their senses, especially sight, to assess water potability, illustrating a knowledge-gap of bacteriological and parasitic contaminants. This is further illustrated by the belief that visible particulate matter, such as dirt and insects, are the primary causes of illness. While sensory observations can help to decrease the use of sources contaminated by fecal bacteria and particulate matter, community members may continue to utilize unsafe sites when visible contamination is absent.

When discussing waterborne disease burden, there was a dichotomy between community and individual perceptions. While at the community level participants were cognizant of the prevalence and experience of waterborne disease such as cholera, typhoid, and dysentery, the majority of interview participants did not perceive waterborne disease, or ‘stomach issues’, as a major source of personal illness, despite the fact that symptoms (e.g., bloody diarrhoea) were discussed. Therefore, while waterborne disease is seen as a pressing health issue at the community level, individuals are not making the connection between waterborne contaminants and symptoms. Instead, symptoms of illness are often perceived as the disease itself. As well, diarrhoea and other symptoms are perceived to be caused by non-water factors such as cold temperatures. This view is consistent with previous research, which showed that individuals believed diarrhoea occurred for a variety of reasons, such as supernatural causation and as a requirement for natural development (Kauchali et al., 2004; Pylypa, 2004). While weather events act as a mediating factor in disease spread (Hunter, 2003), many participants believe it was the cold specifically that cause the symptoms associated with waterborne illness. Thus, increased education on the bacteriological cause of disease is a necessary first step in village based health promotion to overcome these perceptions (Kar, 2005).

The community generally has a pessimistic attitude towards the state of their water, sanitation and health. While they are aware of the issues, they feel

they do not have the capacity to create solutions. For instance, participants believe the lake's degraded quality is primarily from shoreline industrialization and urbanization. Also, much blame is placed on the local industries such as the Kenya Pipeline Company, for the community's lack of municipally-treated tap water. While the KPC has not been held accountable for the destruction of the water pipeline, the community focuses its blame towards the company, instead of placing their efforts into finding other solutions which could improve their safe water access. Although this development does negatively affect water quality and thus health, the diarrhoeal diseases most commonly cited in the community (e.g., cholera, dysentery) have little to do with industrial contamination and are more likely caused by a lack of access to adequate sanitation facilities (Pokhrel and Viraraghavan, 2004). An examination of the health effects from chemical contaminants was beyond the scope of this thesis.

Along with water, the community had negative perceptions about their overall health. Participants stated an increased burden of disease (e.g., water-related diseases, HIV/AIDS, alcoholism) coupled with a lack of resources to combat illness. The community blames the 'youths' – those individuals who have dropped out of school to begin working in the fishing and sand harvesting industries – particularly for the increased burden of social disease (HIV/AIDS, alcoholism). This attitude creates further community division and limits the propensity of older members to perceive their role in decreasing disease spread. Consequently, elders and those with the most respect and power in the community have disassociated themselves from the problem and refuse to look for viable, sustainable solutions.

Participants also exhibited an attitude of resignation towards the diseases found in the community. That is, while community members know their actions can affect health, they feel they lack the ability or opportunity to create change. The perception of lacking control, a bi-product of decreased social capital (Cattell, 2001), may further contribute to the propensity to blame or place emphasis on the actions of 'others' (e.g., industrial activity and youth behaviour) instead of undertaking efforts to change individual practices, especially when no alternatives are readily apparent.

With respect to sanitation, the community feels the installation and use of latrines is a private matter. That is, they are installed by a family and are only to be used by that family and their guests. Thus, the sharing of latrines between neighbours was not viewed as a viable solution to the community's sanitation problems, a belief also held in other regions of Kenya (Jackson, 2004).

A disconnect between community level perceptions, and individual wants was expressed when discussing sanitation installation. That is, while focus group participants believed that sanitation was not desired by individuals, many reasons for wanting a latrine were discussed in interviews (e.g. increased health, privacy, proper waste disposal). However, while individuals wished to increase health through the use of latrines, health benefits from the abolishment of open defecation in a village are generally seen on a community scale. That is, one individual changing their practices may not result in increased health, if the community around them continues to defecate in the open (Jenkins and Sugden, 2006). Even with increased latrine access, two practices will likely enable continued water contamination. First, not all children are encouraged by parents to utilize latrines, in order to ensure their cleanliness. Second, many individuals, including sand harvesters and fishermen, spend their days at the lake away from sanitation facilities and their only option is to perform open defecation. Therefore, a lack of facilities combined with an unwillingness to share, perpetuates the practice of open defecation.

Although the majority of participants stated they regularly treated their drinking water with either chlorine or by boiling, symptoms of waterborne disease are still present in the community. This has created a feeling of futility and powerlessness towards their efforts to improve health. While consumption of contaminated water is a main cause of enteric disease spread, there are a number of other fecal-oral transmission pathways (e.g., contamination of food and utensils) which also spread illness (Prüss et al., 2002). While drinking water treatment is performed, cost prevents the treatment of domestic water in many cases. The practice of only treating drinking water, along with the other poor sanitation practices previously discussed, may allow for waterborne disease to continue.

5.2.2 Facilitators and Barriers for Increased Health and Facility Access

Discussions at the community-level uncovered very few facilitators for increased water and sanitation access. This is noteworthy, since past research has discussed many society-based facilitators which assist community acceptance and implementation of latrines, such as reduced excreta-related disease, increased attendance by girls at school, and reduced environmental damage (Jenkins and Sugden, 2006). Those facilitators that were discussed by participants (e.g., feeling embarrassed when unable to offer facilities to guests) echo results presented in past literature (Jenkins and Curtis, 2005). However, this embarrassment is generally perceived by individuals, and not at the community level (Jenkins and

Sugden, 2006). Little was said of feeling embarrassment when community members, themselves, must perform open defecation. Therefore, while latrines are viewed as an important entity to have for guests, it was not perceived as a fundamental need for community members themselves.

For individuals, adequate funds are the main facilitator for safe water and sanitation access. This allows individuals to pay for water from sites which are perceived to be safe such as the forest and Bandani municipal tap water. Access to funds is also essential for individuals to have the ability to adequately treat water and build a latrine.

Three additional themes were expressed as facilitators for individual latrine installation. First, was the assumption that decreasing open defecation is linked to lower rates of diarrhoeal disease. While decreased disease spread has been linked to increased sanitation access (Agarwal and Taneja, 2005), the construction of latrines in Usoma still allows for the flow of fecal material out of the latrine. Therefore, while individuals perceive latrine installation as a method by which to decrease disease burden, the way in which latrines are constructed may undermine efforts to increase water safety. This is especially true in areas with high water tables (Mireri et al., 2007). Second, individuals wanted to install latrines to increase the aesthetics of the community and decrease the visibility of feces. Finally, increased access and privacy, especially during times of illness (i.e., diarrhoea) acted as a driver for latrine installation. This is congruent with previous research, which found convenience and privacy as demand drivers for latrine installation, especially for female participants (Jackson, 2004).

When examining the barriers presented at both the community and individual levels, it is clear that contextual, compositional and collective factors combine to decrease health and wellbeing.

Barriers such as distance and cost were viewed as inhibitors to accessing perceived safe water, as were the physical attributes of the environment by participants (e.g. sandy soil) and the human factors (i.e., social and political influences). Results indicate the importance and fundamental link of direct and indirect effects of social capital to this community's ability to facilitate increased health and wellbeing, as postulated by Veenstra and colleagues (2005). For example, practices, such as open defecation and allowing livestock to access water sources, allows for the continued spread of enteric bacteria (Fong and Lipp, 2005). While viable solutions to these problems were mentioned by participants (e.g., providing sanitation facilities, restricting animal access to surface water),

the community believed they had little capacity to implement these solutions. A lack of unity and social cohesion was always mentioned as the reason behind this lack of action. Therefore, the establishment of community groups in Usoma may enhance unity, while creating discussion and decision-making forums that facilitate behavioural changes and implementation of initiatives through community engagement (Hyman, 2002). In addition, they will ensure resources are utilized in a way that is sustainable and equitable for the whole community.

Secondly, the current political and economic context acts as a barrier to increasing community health (Veenstra et al., 2005). In the case of Usoma, a lack of political action, both by community residents and the government ministries responsible for increasing facility access, has created a standstill on development. The community believes it is the responsibility of the government to provide facilities, and thus does not create their own solutions; however, little government support has occurred. As well, economic barriers prohibit community members from implementing solutions that are proposed without the support from local governments or external funding agencies. This leaves the community feeling powerless, causing more divides in social cohesion between community members and their elders and leaders.

Lastly, the inability to create social capital, because of a lack of unity, affects the community's ability to educate themselves on how to increase health and initiate change. Community context, more specifically social networks, has been shown to appreciably increase the spread of health knowledge within a developing country setting (Andrzejewski et al., 2009). In Usoma, few community groups or other social networks such as markets have been established, providing little opportunity to increase health knowledge. While the majority of participants stated that they wished for education, and saw this as the first step to creating positive change in their community, jealousy towards neighbours prevented knowledge exchange. Therefore, while the community recognized the value of education for increasing health and wellbeing, a lack of functional social support networks decreases their ability to provide education on health, and its link to their water and sanitation practices.

5.3 Major Contributions

The Lake Victoria Basin region of Kenya is an area with plentiful fresh water, yet much of the water is polluted with biological and/or chemical contaminants (Awange and Ong'ang'a, 2006). While the majority of preventable illness in Kenya can be linked to decreased access to water and sanitation (Karanja, 2008), little is known about the knowledge, attitudes and behaviours of

local communities. While studies examining KAPs of marginalized communities have been conducted, only a few have occurred within Africa. Even fewer have utilized qualitative techniques to gain increased understanding of a community's experiences with water, sanitation and health (see Adebamowo et al., 2006; Jenkins and Curtis, 2005). Thus, while quantitative methodology has been employed to increase the understanding of KAPs, few studies have gained the in-depth understanding that can occur from the use of qualitative research methods (Hulton et al, 2000).

This research provides an increased understanding of what rural communities know, their attitudes towards the problems they face, and what their daily practices are in relation to water, sanitation, and health. Through examining KAPs, as well as facilitators and barriers for increased facility access, a greater understanding of the connections between environmental, social and political context was discovered. By increasing the understanding of how a community functions, and what their beliefs are towards disease and disease spread, culturally appropriate, sustainable interventions can be implemented (Bopp and Bopp, 2004; Forget and Sanchez-Bain, 1999).

While past approaches, such as Community-Led Total Sanitation (Kar, 2005) and Participatory Hygiene and Sanitation Transformation (WHO, 1997) have been successful in initiating change away from the practice of open defecation in some regions, the approaches rely on increasing knowledge of water-health links to create demand. However, this research has taken a different approach, by first examining the KAPs utilizing an ecosystem approach to human health (Waltner-Toews and Kay, 2005). By examining not only the knowledge held, but also the social, political and environmental context, facilitators and barriers to change are fully conceptualized. This theoretical backdrop also champions taking a community-based approach (Waltner-Toews and Kay, 2005), enabling the researcher to gain understanding of challenges, while also allowing the community to take responsibility for creating solutions. This can lead to more culturally appropriate and sustainable solutions than the historically used subsidy-based sanitation interventions (Arya et al., 2009; Bopp and Bopp, 2004). Thus, this study contributes not only the findings from one village, but also a method by which to further investigate the issue of water, sanitation and health within any impoverished community lacking improved facilities.

5.4 Limitations

This research is not without limitations. First, this research was conducted in a language and culture different to any that the researcher had previously

experienced; thus the use of a translator was required. The translator had previous experience in the village, and was from the local area. However, as can occur when utilizing a translator, some words and expressions may not be transferrable between languages, which can cause the meanings of what was expressed during the focus groups and interviews to change (Temple and Young, 2004; Larkin et al., 2007).

Second, the use of qualitative techniques limited the number of participants which could be interviewed in the 6.5 week timeline of the field research. Therefore, there was a possibility that some ideas, attitudes and behaviours would not be encountered during data collection, which may affect the transferability of the results. This issue was overcome in two ways. First, a maximum variation strategy was utilized during participant selection. This strategy allowed for varied groupings of individuals to be interviewed, while providing access to the majority of views held by community members (Patton, 2002). Secondly, a community barazas, open to all community members, was held at the conclusion of the study. This allowed for any community members who were not interviewed to voice their concerns about the community. No new themes were uncovered during this meeting.

5.5 Future Directions of KAPE

As a result of this study, the next step in the larger UNU-INWEH KAPE project is to address the issues facing Usoma residents. Before the implementation of water and sanitation facilities, the research team aims to build trust with and unity within the community. This is important for two reasons. First, by increasing unity, the research team will begin to bring people together so that visioning exercises can be undertaken. This will allow the solutions for the water and sanitation facilities to be created by the community itself, along with help from the research team, instead of solely by an outside party. Community participation helps to ensure the solutions implemented are accepted by the community as they will play an integral role in deciding which strategy is implemented, while fostering leadership and sustainability of the project (O'Fallon and Dearry, 2002).

Second, increasing the social capital in the community will help to ensure sustainable use and maintenance of facilities. The main goal of this project is to empower the community and build capacity, so that the researchers are made redundant to the community. Much of the empowerment and capacity building will be implemented with the help of local NGOs and organizations which specialize in these areas.

Once this step has been completed, a water and sanitation facility intervention will be implemented. This intervention will then be evaluated, and the knowledge learned from this pilot community will be translated to other communities facing similar issues around water and sanitation within the Lake Victoria Basin. In addition, further analysis of the data collected from this pilot community, including the community maps and photovoice photography, will occur to allow for triangulation of the data.

5.6 Conclusion

Overall, this study provides insight into how knowledge, attitudes and practices act as facilitators and barriers to safe water and sanitation facilities. While community knowledge of water-health links are important to initiate facility demand; contextual, compositional and collective factors also interact to influence the ability to create change. For sustainable solutions to be implemented, community members must be united in deciding on common goals and the steps needed to obtain these changes. This will not only increase individual access to safe water and sanitation, but enhance the health and wellbeing of the community as a whole.

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Appendix A

Defining Aspects of Embodied Humans (Krieger and Smith, 2004)

Body aspect	Features
Aspects of an embodied human as a biologic organism and member of a biologic species	<i>Reproduce</i> : capacity to give rise to the next generation, whether asexually (typically the case for bacteria, the most common form of life on Earth) or sexually (involving contribution of genetic information from both biologic parents), even if not every organism itself reproduces.
	<i>Develop</i> : life history change within an organism, involving generation of cellular diversity, differentiation, and morphogenesis.
	<i>Grow</i> : increase in physical size; in multicellular organisms, by processes involving regulation of cell division, addition of new cells (by mitosis), and deletion of extant cells (by apoptosis).
	<i>Interact</i> : with other members of the species (in deme), with other organisms in the same ecosystem, and with the physical environment(s) in which the ecosystem is located, so as to meet basic needs for food, safety, pleasure, procreation, and rest, including avoiding noxious stimuli, seeking life-sustaining environs, and reproducing.
	<i>Exist in time and space</i> : from birth to death, bodies exist (and, if motile, move around) in spatially and temporally delimited ecosystems with geographically contingent patterns of temperature, climate (if on land), altitude, and diurnal change (periods of light and dark).
	<i>Evolve</i> : given key criteria of reproduction, inheritance, and genetic variation, evolution involves emergence of new traits and new species, reflecting possibilities enabled and constrained through historically contingent biologic processes that are “selected” or “filtered” in a context of altered environments.
Aspects of an embodied human as a social being and member of society	Societal context: live life in the society (or societies) of which one is a member, vis-à-vis one’s historical period, economy, political and legal system, technology, and social, cultural, civil, economic, and political rights, resources, relationships, and institutions, plus one’s location in the global economy and global institutions of governance.
	Social position: be born into and/or raised in, and later form, a specific type of family and/or household, vis-à-vis social relations of class, gender, sexuality, race/ethnicity, and other salient social divisions premised on power, property, and social inequality.
	Social production: engage in socially delimited processes, relationships, and institutions, contingent on one’s social position, involving production, exchange, distribution, and consumption of goods and services, as well as ideas and information, with differential distribution and intergenerational transfer of assets, typically enforced by law.
	Social consumption: engage in socially delimited processes, relationships, and institutions, contingent on one’s social position, involving acquisition and consumption of goods, services, and ideas and information required to meet basic needs (for physical survival) and social needs (for a socially meaningful life).
	Social reproduction: engage in socially delimited processes that sustain, modify, or replace societal structures, relationships, and institutions.

Appendix B – Participant Characteristics: Focus Groups

Category	Quadrant	Age (years)	Marital Status	Children (Y/N)	Grandchildren (Y/N)	Level of Education	Source of Income	Community Role
Younger Women	1	29	Married	Y	N	Grade 8	Fish Handler	None
	1	30	Widow	Y	N	Grade 6	Small Business	None
	2	23	Not Married	Y	N	Grade 12	N/A	None
	3	24	Married	Y	N	Grade 11	None	Group Facilitator
	3	28	Married	Y	N	Grade 8	None	None
	3	21	Not Married	Y	N	Grade 8	Small Business	None
	4	21	Not Married	N	N	Grade 7	Small Business	None
Younger Men	1	28	Married	Y	N	Grade 10	Fisherman	Community Group Secretary
	2	28	Not Married	N	N	Grade 6	Small Business	Youth Group Treasurer
	3	26	Married	Y	N	Trained Teacher	Self Employed	Sand Harvester Secretary
	3	19	Married	Y	N	Grade 10	Fisherman	None
Older Women	1	55	Widowed	Y	Y	None	Housewife	None
	2	Unknown	Married	Y	Y	Unknown	Unknown	Health Worker
	2	61	Widow	Y	Y	Grade 8	Small Business	Unknown
	2	70	Widow	Y	Y	None	None	None
	3	58	Widow	Y	Y	None	Small Business	Church Chair

	3	67	Widow	Y	Y	None	Sells Firewood	None
	3	48	Widow	Y	Y	None	None	None
	4	Unknown	Widow	Y	Y	None	Farmer	Church Treasurer
	4	73	Widow	Y	Y	Grade 8	Pension	Undugu Treasurer
	4	Unknown	Widow	Y	Y	None	Farmer	Fishing Society Member
Older Men	1	78	Married	Y	Y	Grade 10	Pension	Fishing CO- Op Chair
	1	62	Married	Y	Y	Grade 12	Farmer	School Chair
	1	73	Two Wives	Y	Y	Grade 6	Farmer	Evangelist
	2	Unknown	Widower	Y	Y	Grade 8	Pension	Unknown
	2	70	Married	Y	Y	None	Small Business	Advisory Board
	3	59	Married	Unknown	Unknown	Grade 12	Pension	Chairmen, multiple groups
	3	60	Married	Y	Unknown	Grade 5	Unknown	Undugu Treasurer
	3	50	Married	Y	N	Grade 10	Farmer	Church Catechist
	4	44	Married	Y	N	Grade 10	Casual Worker	Church Secretary
	4	35	Married	Y	N	Grade 8	Boda Boda	Church Member

Appendix C – Focus Group Checklist

- Introduction of the project to members of the focus group.
- Explanation of the informed consent forms. Signatures obtained.
- Members of the focus group will introduce themselves to the facilitators, stating their name, their age, their family status, and their favourite leisure time activity.
- Tell me about your community....
- What are the major challenges facing your community right now?
- Are they different than the challenges you've faced in the past? How are they different?
- How does the community cope with these challenges? What do you do about them?
- How is health in this community? Your health? Your family's health? The community's health?
- What's the major health concern in this community right now? For adults? For children?
- Is this different than it's been in the past? How? In what way?
- What happens when someone gets sick....what about you? Husband? Mother? Kids?
- In what ways has this community addressed these health issues?
- Who teaches you how to stay healthy? (mum/parents; school; community health workers; community elder/leader; other).
- Do you teach your children how to stay healthy? What do you tell them...
- Where do you get your water from? Why? How? How often? Do you use different sources of water at different times? Tell me about that...
- Is this different from where you've taken water from in the past? Why? How?
- Are some water sources better than others? Cleaner? Safer? Better for you? Better for the children?
- How do you know when the water is clean and/or safe? (If not clean/safe) what things have you done to try to fix this? If nothing, why not? (what are the barriers to action)
- Are there things this community could do to improve local water supplies? <refer back to barriers, if appropriate>
- Do you have latrines in this community? (why not if they say no) Where are they? Are they used? By adults? By the children? (if not used, ask why not)

Appendix D – Participant Characteristics: In-depth Interview

Category	Quadrant	Age	Marital Status	Children (Y/N)	Grandchildren (Y/N)	Level of Education	Source of Income	Community Role
Young Women	1	26	Married	Y	N	Grade 8	Small Business	None
	1	25	Widow	Y	N	Grade 8	Fish Handler	Undugu Secretary
	1	26	Married	Y	N	Grade 9	Fishing	Undugu Secretary
	2	37	Widow	Y	N	Grade 8	Small Business	Church, Women's Group
	2	23	Not Married	Y	N	Grade 8	Small Business	Unknown
	2	27	Married	Y	N	Grade 7	Unknown	Unknown
	3	28	Married	Y	N	Grade 7	Fish Handler	None
	4	28	Married	Y	N	Grade 8	Tailor	Church Treasurer
	4	24	Married	Y	N	Grade 10	Housewife	Church Elder
Younger Men	4	16	Married	Y	N	Grade 8	Housewife	None
	1	30	Married	Y	N	Grade 8	Small Business	Church Chairman
	2	33	Married	Y	N	Grade 8	Self Employed	None
	3	23	Married	Y	N	Grade 7	Fisherman	None
	4	20	Married	Y	N	Grade 8	Sand Harvester	Group Chairman

Category	Quadrant	Age	Marital Status	Children (Y/N)	Grandchildren (Y/N)	Level of Education	Source of Income	Community Role
Older Women	1	51	Married	Y	Y	Grade 10	Community Health Worker	Church Chairlady
	1	42	Married	Y	Y	Grade 7	Tailor	Red Cross, World Vision
	2	60	Widow	Y	Y	Grade 5	Small Business	Organizing Secretary
	2	46	Widow	Y	Y	Grade 10	Unknown	Women's Group
	3	67	Widow	Y	Y	None	Splits Firewood	None
	3	48	Widow	Y	Y	None	None	None
	4	50	Married	Y	Y	Unknown	Small Business	Church Chairlady
Older Men	1	Unknown	Married	Y	Y	Unknown	Unknown	Village Elder
	2	75	Married	Y	Y	Unknown	Sells Rocks	Advisor to Chief
	3	62	Married	Y	Y	Primary (level unknown)	Fisherman	Advisory Board
	4	50	Widower	Y	Y	Grade 4	Fishing and Sand Harvesting	Advisory Board and Church

Appendix E – In-depth Interview Schedule

Water, Sanitation and Health: Knowledge, attitudes, practices, empowerment in rural communities		
<p>Purpose of Checklist:</p> <p>This checklist will guide in the collection of perceptions related to water, sanitation and health, and the current attitudes and practices the in community.</p>		
Construct	Question	Probes
<p>Perception of the Community Space</p>	<p>To start out with, I am going to ask you to draw for me a map of your community. Please highlight areas in your community such as latrines, water collection areas, and anything else that you think is important.</p>	<p>-please feel free to add anything within your community that you feel is important</p> <p>- Which of the places found on your map is the most important to you? Why?</p>
<p>Socio-Economic Status</p> <p>- Current economic standing</p> <p>- facilities within their home and community</p>	<p>Ok, now I am going to ask a few questions about your home and daily life.</p> <p>Do you have electricity?</p> <p>Does your family have a radio?</p> <p>What is your house made of? Is this typically what houses are made of in your community? How</p>	<p>If yes, do you use it for cooking? If no, what do you use for cooking your food?</p>

	<p>many rooms to you have?</p> <p>How many children do you have? Do they all attend school?</p> <p>What are your goals for your children? What do you want them to be when they grow up?</p>	<p>If some children do not attend school, why not? Is it age, gender, money?</p>
<p>Water and Sanitation</p> <ul style="list-style-type: none"> - availability of water -perception of “safeness” of water within the community -Availability of sanitation facilities and how they use them 	<p>Thank you very much! Now I am going to change topics, and ask you some questions about the water and sanitation facilities in your community.</p> <p>Do you have running water in your house? Near your house? Within your community? How far is it?</p> <p>Do you get your water from the same sources every day? If not, why?</p> <p>Is your water clean? How do you know it’s clean?</p>	<p>If not, where do you get your water from? How do you collect it? How much time does this take?</p> <p>Do you boil, use</p>

	<p>Do you treat your water? What method do you used to treat it?</p> <p>How do you store your water? How do you transport the water?</p> <p>Can you show me how you get your water out of the container?</p> <p>How do you use your water? How much do you use on a daily basis?</p> <p>Great, now I'm going to ask you about your sanitation facilities. Do you have a latrine?</p> <p>How long have you had the latrine? What made you put a latrine in? How did you pay for the latrine?</p> <p>Do you use it? Does everyone in the household use it?</p>	<p>chlorine, filters? Why/why not?</p> <p>Why do you do it this way?</p> <p>Why do you do it this way?</p> <p>Is the main use cooking? Do you use less if you have to walk further to collect it?</p> <p>If you do, where is it? Can you show it to me?</p> <p>Why/Why not?</p>
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	<p>Do your neighbours have a latrine? Do they use it? Do your neighbours use your latrine?</p> <p>Who is responsible for maintaining the latrine? Who would take responsibility if you shared latrine usage?</p> <p>What about babies and small children? Where do they defecate?</p> <p>What happens to the waste from the latrines? Would you be willing to compost the waste and use it as fertilizer on your crops?</p>	<p>Why/Why not? What would they use if they do not have a latrine? Would community members share latrines?</p> <p>Can you explain how it is kept clean and safe?</p> <p>Can you show me?</p> <p>What would stop you from using it as fertilizer? Why?</p>
<p>Health of Family and Community</p> <p>- current level of illness perceived within the community</p> <p>-how they deal with sickness</p> <p>-facilities/infrastructure available for the</p>	<p>Thank you! I now would like to discuss the health of the community, and any health issues that you or your family have.</p> <p>Firstly, do you have access to a health clinic? Where is it? Is it free?</p>	

community	<p>Do you use the clinic when you or your family gets sick?</p> <p>Where do you get medicine from? Do you have to pay for it?</p> <p>What are the main health issues for you? Your family? Your community? Does this change during different times of the year?</p> <p>How often are your children sick? What are their symptoms?</p> <p>What makes them sick? What do you do with them when they are sick?</p> <p>How does your daily routine change when you have a sick family member?</p>	<p>If no, why not? Economics, distance, time? What stops you?</p> <p>If yes, why do you think that these issues would change?</p> <p>-water? Food? Bugs? How do you know what makes them sick?</p> <p>-less time to do normal daily activities? Do you try to be more careful about sanitation when you/family are sick?</p>
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	<p>How often is your child sick from diarrhoea? Does it cause them to miss school? How often? Do you see this as a problem?</p> <p>How do you respond when your child is sick?</p> <p>How often in a month does your child have loose stools more than three times a day?</p> <p>How do you try and prevent diarrhoea? Other diseases?</p> <p>Do these preventions help?</p>	<p>-why is this a problem?</p> <p>-do you change what they eat/drink? Use medication? Do you go to a doctor?</p> <p>-boil water? Food? Medications? Bed nets for other?</p> <p>If yes, how? If no, why do you think they do not help?</p>
<p>Education and Solutions</p> <p>- amount of health education programs</p> <p>- solutions that the community would like to</p>	<p>Thank you. There is just one more area that I would like to discuss with you today. First I will ask about how you keep yourself and your family healthy, and then I will discuss what you would</p>	

<p>see happen</p>	<p>do about the problems in your community.</p> <p>Who taught you how to be healthy?</p> <p>Who taught your children how to stay healthy? Did your children teach you anything about health that you didn't already know?</p> <p>What other things would you like to see in your community to help make you healthy? Do you think that community members can teach each other about health and health problems?</p> <p>If you were in charge of the community, how would you make sure the children/community stay healthy?</p> <p>What would you like to see done with the resources that your community currently has?</p>	<p>-Was it your parents, KEMRI, media, elders, women's group, church?</p> <p>-You, school programs</p> <p>Why/why not? What stops community members from teaching each other?</p> <p>If they don't mention water, ask "what about the water, what would you do about it?"</p>
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	How do you think the community can make this happen? Where would you go for additional resources?	
Conclusion	Thank you very much for your time. Is there anything else you would like to tell me about your water and health in your community? Would you like to add or expand on anything that you put into your map?	

Appendix F - Focus Group Coding Manual

(1) Community

a. Community Description

- i. Community Description/Likes
- ii. Community Description/Dislikes
- iii. Community Description/Benefits
- iv. Community Description/Benefits/proximity to lake
- v. Community Description/benefits/low crime levels
- vi. Community Description/benefits/resource base
- vii. Community Description/Meaning
- viii. Community Description/Meaning of lake
- ix. Community Description/Meaning of other resources
- x. Community Description/Meaning of education
- xi. Community Description/Meaning of sanitation

b. Community Challenges

- i. Community Challenges/Urbanization
- ii. Community Challenges/Urbanization/Urban encroachment
 1. Land use (pipeline company, airport)
 2. Industrial pollution of water
- iii. Community Challenges/Water
- iv. Community Challenges/Water/lack of tap water
- v. Community Challenges/Water/water contamination
- vi. Community Challenges/Water/distance to sources
- vii. Community Challenges/Sanitation
- viii. Community Challenges/Sanitation/access to latrines
- ix. Community Challenges/Sanitation/latrine building and stability
- x. Community Challenges/Income
- xi. Community Challenges/Income/lack of jobs
- xii. Community Challenges/Health
- xiii. Community Challenges/Health/Alcoholism
- xiv. Community Challenges/Health/waterborne disease
- xv. Community Challenges/Health/HIV AIDS
- xvi. Community Challenges/Resources
- xvii. Community Challenges/Resources/resource use and sharing
- xviii. Community Challenges/Resources/resource contamination
- xix. Community Challenges/Resources/lack of food

- xx. Community Challenges/Unity
 - xxi. Community Challenges/Unity/Lack of unity between community members
 - xxii. Community Challenges/Unity/Lack of leadership
 - xxiii. Community Challenges/Unity/Attitude towards problems
 - xxiv. Community Challenges/Unity/lack of action
- c. Coping with Challenges
- i. Coping with Challenges/community scale
 - ii. Coping with Challenges/Community Scale/self help groups
 - iii. Coping with Challenges/Community Scale/approaching governments and NGOs
 - iv. Coping with Challenges/Community Scale/lack of leadership and governance
 - v. Coping with Challenges/Community Scale/lack of empowerment
 - vi. Coping with Challenges/Individual scale
 - vii. Coping with Challenges/Individual Scale/water treatment
 - viii. Coping Challenges/Individual Scale/hygiene and sanitary practices

(2) Health

- a. Community Health
- i. Community Health/Infectious disease
 - ii. Community Health/Infectious disease/waterborne disease
 - iii. Community Health/Infectious disease/ malaria
 - iv. Community Health/Infectious disease/smallpox
 - v. Community Health/chronic disease
 - vi. Community Health/Chronic Disease/Alcoholism
 - vii. Community Health/Chronic disease/Diabetes
 - viii. Community Health/sexually transmitted infections
 - ix. Community Health/Disease affecting children
 - x. Community Health/Disease affecting adults
 - xi. Community Health/Blame
 - xii. Community Health/Blame/Due to government
 - xiii. Community Health/Blame/Due to the young
 - xiv. Community Health/Blame/Truck route

- xv. Community Health/Blame/Alcohol

- b. Health Changes
 - i. Health Changes/infectious disease
 - ii. Health Changes/infectious disease/increase in prevalence
 - iii. Health Changes/infectious disease/decrease in prevalence
 - iv. Health Changes/Chronic disease
 - v. Health Changes/Chronic disease/increase in prevalence
 - vi. Health Changes/Chronic disease/decrease in prevalence
 - vii. Health Changes/Health in community
 - viii. Health Changes/ Health in community/improving
 - ix. Health Changes/Health in community/worsening

- c. Health Treatment
 - i. Health Treatment/Access to treatment
 - ii. Health treatment/Access to treatment/adults
 - iii. Health Treatment/Access to treatment/children
 - iv. Health Treatment/Access to treatment/hospitals
 - v. Health Treatment/Access to treatment/dispensaries
 - vi. Health Treatment/Access to treatment/community health workers
 - vii. Health Treatment/inhibitors of treatment
 - viii. Health Treatment/inhibitors of treatment/lack of funds
 - ix. Health Treatment/inhibitors of treatment/transportation
 - x. Health treatment/inhibitors of treatment/time
 - xi. Health treatment/inhibitors of treatment/access to clinics
 - xii. Health Treatment/home remedies
 - xiii. Health Treatment/home remedies/herbal medicine
 - xiv. Health Treatment/home remedies/pain killers

- d. Coping Strategies
 - i. Coping Strategies/infectious disease
 - ii. Coping Strategies/Infectious disease/waterborne diseases
 - iii. Coping Strategies/Infectious disease/malaria prevention
 - iv. Coping Strategies/Sanitation
 - v. Coping Strategies/Sanitation/latrine installation
 - vi. Coping Strategies/Sanitation/washing
 - vii. Coping Strategies/barriers to coping

- viii. Coping Strategies/barriers to coping /lack of knowledge of disease
- ix. Coping Strategies/barriers to coping/public attitude
- x. Coping Strategies/barriers to coping/lack of governance
- xi. Coping strategies/barriers to coping/lack of funds

e. Health Education

- i. Health Education/Learning Forum
- ii. Health Education/Learning Forum/School
- iii. Health Education/Learning Forum/parents
- iv. Health Education/Learning Forum/children
- v. Health Education/Learning Forum/Church
- vi. Health Education/Learning Forum/Community Groups
- vii. Health Education/Learning Forum/NGOs
- viii. Health Education/learning Forum/observation
- ix. Health Education/Learning Forum/Media

(3) Water

- a. Water/water sources
- b. Water/water sources/lake
- c. Water/water sources/bandani
- d. Water/water sources/boreholes
- e. Water/water sources/coca-cola
- f. Water/water sources/forest
- g. Water/water sources/other
- h. Water/water sources/dry season
- i. Water/water sources/rainy season
- j. Water/water safety
- k. Water/water safety/barriers to clean water
 - i. Pollution – lack of community control
- l. Water/water safety/water improvement strategies
 - i. Individual level
 - 1. Boiling water
 - 2. Water guard
 - 3. Sieving
 - ii. Community Level
 - 1. Drilling bore holes
 - 2. Tapped water
- m. Water/water safety/knowledge of safety and water cleanliness
 - i. Word of mouth

- ii. Source (flowing or stagnant)
- iii. Water quality testing
- iv. Water colour
- v. Water smell
- vi. Dirt accumulation

(4) Sanitation

- a. Sanitation/Latrines
- b. Sanitation/Latrines/present
- c. Sanitation/Latrines/barriers to installation
 - i. Cost
 - ii. Soil type
- d. Sanitation/Latrines/usage
 - i. Adults
 - ii. Children
- e. Sanitation/Latrines/barriers to use
 - i. Fear
 - ii. Unusable latrine structure
- f. Sanitation/Latrines/sharing by community members
- g. Sanitation/Stigma
- h. Sanitation/Stigma/embarrassment to visitors
- i. Sanitation/Stigma/embarrassment for usage (neighbours know what you do)
- j. Sanitation/Stigma/latrines unnecessary

(5) Change over time

- a. Change over time/water challenges
- b. Change over time/water challenges/use of different sources
- c. Change over time/water challenges/reasons for change
 - i. Environmental encroachment (water hyacinth in lake)
 - ii. Industrial Interference
- d. Change over time/health challenges
- e. Change over time/health challenges/waterborne disease
 - i. Cholera
 - ii. Diarrhoea
 - iii. Other
- f. Change over time/health challenges/poverty and income sources

- g. Change over time/health challenges/food resources
- h. Change over time/health challenges/alcoholism

(6) Empowerment and Governance

- a. Empowerment
 - i. Empowerment/community
 - ii. Empowerment/community/self help groups
 - iii. Empowerment/community/church
 - iv. Empowerment/community/lack of empowerment
 - 1. Lack of responsibility
 - 2. Attitude-action
 - v. Empowerment/individual
- b. Governance
 - i. Governance/community
 - ii. Governance/community/elected officials
 - iii. Governance/community/community elders
 - iv. Governance/community/lack of control
 - v. Governance/community/community groups
 - 1. Fishing groups etc

Appendix G – In-Depth Interview Coding Manual

- (1) Socio-Economic Status (Current Economic Standing and facilities within the home)
 - i. SES/electricity
 - ii. SES/radio
 - iii. SES/building materials of home
 - iv. SES/number of rooms
 - v. SES/number of children
 - vi. SES/schooling of children
 - vii. SES/goals for children

- (2) Water and Sanitation (Availability of water, perception of safeness within community, availability of sanitation facilities and their use)
 - a. Water
 - i. Water/running water
 - ii. Water/running water/in community
 - iii. Water/running water/near home
 - iv. Water/running water/in home
 - v. Water/water sources
 - vi. Water/water sources/lake
 - vii. Water/water sources/bore holes
 - viii. Water/water sources/bandani tap
 - ix. Water/water sources/forest
 - x. Water/water sources/coca-cola tap
 - xi. Water/water sources/other
 - xii. Water/water sources/consistent use
 - xiii. Water/water sources/distance from home
 - xiv. Water/ time to collect
 - xv. Water/water cleanliness
 - xvi. Water/water cleanliness/murky
 - xvii. Water/water cleanliness/insects
 - xviii. Water/water cleanliness/dirt
 - xix. Water/water cleanliness/water hyacinths
 - xx. Water/Perception of Cleanliness
 - xxi. Water/Perception of Cleanliness/clear water is clean
 - xxii. Water/Perception of Cleanliness/Lake water is clean
 - xxiii. Water/Perception of Cleanliness/Lake water is dirty
 - xxiv. Water/Perception of Cleanliness/Running water is clean

- xxv. Water/ water treatment
- xxvi. Water/water treatment/chlorine tablets
- xxvii. Water/water treatment/boiling
- xxviii. Water/water treatment/filtering
- xxix. Water/water treatment/no treatment
- xxx. Water/water treatment/other
- xxxi. Water/water storage
- xxxii. Water/water storage/jerry cans
- xxxiii. Water/water storage/clay pots
- xxxiv. Water/water storage/buckets
- xxxv. Water/water transport
- xxxvi. Water/water transport/head
- xxxvii. Water/water transport/personal bicycle
- xxxviii. Water/water transport/boarder boarder
- xxxix. Water/water transfer
 - xl. Water/water transfer/cup
 - xli. Water/water transfer/jug
 - xl.ii. Water/water transfer/bacterial contamination
 - xl.iii. Water/water transfer/traditional method
- xliv. Water/water use
 - xl. v. Water/water use/washing
 - xl. vi. Water/water use/drinking
 - xl. vii. Water/water use/cooking
 - xl. viii. Water/water use/animals
 - xl. ix. Water/water use/reduction with distance

b. Sanitation

- i. Sanitation/latrine
- ii. Sanitation/latrine/personal latrine
- iii. Sanitation/latrine/compound latrine
- iv. Sanitation/latrine/residential home latrine
- v. Sanitation/latrine/neighbours latrine
- vi. Sanitation/latrine/facilitator for installation
- vii. Sanitation/latrine/payment methods
- viii. Sanitation/shared latrine
- ix. Sanitation/shared latrine/possibility
- x. Sanitation/shared latrine/not feasible
 - 1. People like their own private latrine
 - 2. It would fill up too fast
- xi. Sanitation/latrine usage

- xii. Sanitation/latrine usage/adults
- xiii. Sanitation/latrine usage/children
- xiv. Sanitation/latrine usage/sharing with neighbours
- xv. Sanitation/latrine maintenance
- xvi. Sanitation/latrine maintenance/individual responsible
- xvii. Sanitation/latrine maintenance/cleaning methods
- xviii. Sanitation/latrine maintenance/cleaning time
- xix. Sanitation/latrine maintenance/cleaning regularity
- xx. Sanitation/children
- xxi. Sanitation/children/defecation sites
- xxii. Sanitation/children/nappies
- xxiii. Sanitation/children/potty use
- xxiv. Sanitation/waste disposal
- xxv. Sanitation/ waste disposal/transfer hole dug
- xxvi. Sanitation/waste disposal/old hole filled in
- xxvii. Sanitation/waste disposal/sewage sucker truck
- xxviii. Sanitation/waste disposal/crop fertilizer
- xxix. Sanitation/Stigma
- xxx. Sanitation/Stigma/embarrassment for visitors
- xxxi. Sanitation/Stigma/not necessary
- xxxii. Sanitation/Stigma/embarrassment for user (neighbours know what you are doing)

(3) Health (current level of illness perceived in community, dealing with sickness, available facilities)

- a. Health Clinics
 - i. Clinics/access
 - ii. Clinics/access/open times
 - iii. Clinics/access/distance
 - iv. Clinics/access/available personnel
 - v. Clinics/barriers to use
 - vi. Clinics/barriers to use/time
 - vii. Clinics/barriers to use/money
 - viii. Clinics/barriers to use/distance

- b. Health Issues
 - i. Health Issues/Main Issues
 - ii. Health Issues/Main Issues/personal
 - iii. Health Issues/Main Issues/Children

- iv. Health Issues/Main Issues/family
- v. Health Issues/Main Issues/community
- vi. Health Issues/Main Issues/dry season
- vii. Health Issues/Main Issues/rainy season
- viii. Health Issues/Main Issues/why they change

c. Child Health

- i. Child Health/Illness
- ii. Child health/Illness/frequency of sickness
- iii. Child health/Illness/duration of sickness
- iv. Child Health/Symptoms
- v. Child Health/symptoms/fever
- vi. Child health/symptoms/diarrhoea
- vii. Child health/symptoms/loss of appetite
- viii. Child health/causes
- ix. Child health/causes/insects
- x. Child health/causes/cold weather
- xi. Child health/causes/dirt
- xii. Child health/causes/bacteria
- xiii. Child health/causes/lack of hygiene
- xiv. Child health/causes/water
- xv. Child health/treatment
- xvi. Child health/treatment/changes in food
- xvii. Child health/treatment/non-prescription drugs
- xviii. Child health/treatment/medical treatment at dispensary
- xix. Child health/treatment/medical treatment at hospital
- xx. Child health/treatment/prescription drugs
- xxi. Child health/treatment/no action taken
- xxii. Child health/Diarrhoea
- xxiii. Child health/Diarrhoea/frequency
- xxiv. Child health/Diarrhoea/length
- xxv. Child health/Diarrhoea/treatment
- xxvi. Child health/Diarrhoea/absence from school
- xxvii. Child health/Diarrhoea/cause for concern
- xxviii. Child health/Diarrhoea/methods of prevention
- xxix. Child health/diarrhoea/methods of prevention/boiling water
- xxx. Child health/diarrhoea/methods of prevention/washing bed sheets
- xxxi. Child health/loose stool
- xxxii. Child health/loose stool/frequency

xxxiii. Child health/loose stool/length of occurrence

d. Health and Home

- i. Health and Home maintenance/routine changes due to illness
- ii. Health and Home maintenance/routine changes/get up earlier
- iii. Health and Home maintenance/routine changes/put chores off
- iv. Health and Home maintenance/routine changes/get help from others
- v. Health and Home/disease prevention
- vi. Health and Home/disease prevention/water purification
- vii. Health and home/disease prevention/bed nets
- viii. Health and home/disease prevention/short hair
- ix. Health and home/disease prevention/short fingernails
- x. Health and home/disease prevention/medication
- xi. Health and home/disease prevention/positive prevention assessment
- xii. Health and home/disease prevention/negative prevention assessment

e. Attitudes and Perceptions

- i. Attitudes and Perceptions/Waterborne Disease
- ii. Attitudes and Perceptions/Waterborne Disease/Prevalent
- iii. Attitudes and Perceptions/Waterborne Disease/Not Prevalent
- iv. Attitudes and Perceptions/Waterborne Disease/major health issue
- v. Attitudes and Perceptions/Waterborne Disease/Diarrhoea a non-issue
- vi. Attitudes and Perceptions/Waterborne Disease/prevention possible
- vii. Attitudes and Perceptions/Waterborne Disease/no preventions available
- viii. Attitudes and Perceptions/Waterborne Disease/loose stool a problem
- ix. Attitudes and Perceptions/water-health links
- x. Attitudes and Perceptions/water-health links/diarrhoea linked to water

- xi. Attitudes and Perceptions/water-health links/illness related to water
- xii. Attitudes and Perceptions/water-health links/illness related to other source
- xiii. Attitudes and Perceptions/water-health links/water safety not a problem
- xiv. Attitudes and Perceptions/community acceptance
- xv. Attitudes and Perceptions/community acceptance/unity possible
- xvi. Attitudes and Perceptions/community acceptance/unity impossible

(4) Education and Solutions (amount of health education, solutions for the community)

a. Health Education

- i. Health education/adults
- ii. Health Education/adults/schools
- iii. Health education/adults/self help groups
- iv. Health education/adults/KEMRI
- v. Health education/adults/Non-Governmental Organizations
 - 1. Family matters
 - 2. Red cross
- vi. Health education/adults/their parents
- vii. Health education/adults/their children
- viii. Health education/adults/women's groups
- ix. Health education/adults/church groups
- x. Health education/children
- xi. Health education/children/their parents
- xii. Health education/children/school
- xiii. Health education/community interaction
- xiv. Health education/community interaction/positive response
- xv. Health education/community interaction/negative response
 - 1. Lack of unity
 - 2. Animosity towards neighbours who teach
 - 3. Lack of time
- xvi. Health Education/community interaction/need for outside teacher

- b. Community Solutions
 - i. Community solutions/health improvements
 - ii. Community solutions/health improvements/increased latrines
 - iii. Community solutions/health improvements/piped water
 - iv. Community solutions/health improvements/treated water
 - v. Community solutions/health improvements/health education
 - 1. Given by community members
 - 2. Given by outside health worker
 - vi. Community solutions/health improvements/resource management
 - vii. Community solutions/groups
 - viii. Community solutions/groups/micro financing options
 - ix. Community Solutions/groups/advisory boards
 - x. Community Solutions/groups/regulatory councils

Appendix H – Community Report Back Script

1. Thanks for coming today.
2. I am so pleased to have this opportunity to visit with you again today.
3. The reason I'm here is because when I was here before, you took the time to talk with me about your community and about things that were important to you. This included things like water, sanitation and health.
4. Today, I'd like to share with you some of the things you told me. That's what I'm going to do for the next few minutes and my good friend Bernard is again going to translate for me because I didn't learn enough Luo the last time I was here
5. And what I'm going to tell you is about five things that you and I talked about;
 - a. Water
 - b. Sanitation
 - c. Health
 - d. Education
 - e. Solutions
6. When we talked about water, you told me:
 - a. About the sources of water that you used. For example, most of you said that for washing and for cooking, you got water from the Lake and the boreholes.
 - b. But when you needed drinking water, most of you used the forest water or the bandani tap.
 - c. So, you used different sources for different things. You told me this was because the lake water is really close by, always available no matter what the season and easy to get, but not clean for dinking.
 - d. You also told me that when you thought the lake was murky or when the water hyacinths made it hard to get to the lake water, you used the boreholes instead.
 - e. You also liked getting water from the forest because it was always available but you said that for some of you it was expensive because you couldn't get there yourself to get it so you had to pay a boda boda to get it for you.
 - f. You also told me that the bandani water tasted much better than the water from the coca cola tap because it didn't seem to have so much chlorine in it.
 - g. During the dry seasons, most people told me they got their water from either the forest if it was for drinking or the lake if it was for washing or cooking.
 - h. You remember when I was here before? I took samples of all the water sources you told me about and we had them tested at the Ministry of Health. What we found out was that water from the forest, the bandani tap and the coca cola tap were safe for drinking. The other sources were contaminated (with fecal coliforms).

- i. When we talked about how you treated the water that was not safe to drink, most of you preferred to use Water Guard because it was cheaper than boiling and also it took less time.
7. And when we talked about sanitation,
 - a. half of you told me you had access to a latrine.
 - b. For those of you who do NOT have a latrine, you told me the primary reason you didn't was because you didn't have the money.
 - c. You also told me you really were not comfortable thinking about sharing a latrine with other families because latrine use is a very private thing. You also thought they would fill up too fast.
 - d. Also, you told me that there were some structural problems with the soil type so that if you did build a latrine then it might collapse because of the sandy soil because you couldn't afford to put a cement base.
8. When we talked about health:
 - a. You told me that malaria is the main illness which is affecting children within the community
 - b. But stomach problems were a main issues for many of the adults within the community
 - c. Many of you said that actions you do can help prevent disease in the community - and this was especially true when using nets to stop the spread of malaria by mosquitoes
 - d. Most of you told me that waterborne diseases can be reduced through actions like treating your water with water guard or boiling it. BUT many of you said that you cannot completely prevent this disease, as it occurs even after you treat your water.
9. When we talked about education:
 - a. Most of you said that education is really important to making sure people understand health issues, and to make the community a healthier place.
 - b. Most of you said you would like to have someone to teach the community about health, water, and hygiene
 - c. BUT Most of you said that you wanted someone from outside of the community to come and teach you, that it can be difficult for community members to teach each other
10. Finally we talked about solutions to make your community a healthier place
 - a. The biggest thing that you said would make you healthier was to have more education, and make sure everyone understood health and what practices can make them healthy
 - b. You also wanted to increase the water treatment by community members at their homes, and the water sources at the site, to help increase health.
 - c. Finally you said that you wanted to have more latrines in the community for people to use, to make sure waste is disposed of properly.

- d. You told me that the main reason that these solutions haven't happened yet is because there is a need for you to come and work together to put the solutions in place, which is not happening within the community right now.
11. From all of this, I can say:
- a. You feel that the water is causing a health issues for community members, both adults and children
 - b. You know there are things that you can do to reduce sickness, but you feel they don't always work
 - c. You need someone to come from outside of the community to help you come together to learn about health and come up with solutions, before community members can teach each other and work together.
12. Thank you again, so much again for taking the time to teach me about your community, and for coming to listen to me today. Are there any questions about what you told me?

Appendix I – Water Quality Results

Water Site	Sample Date	Protected (Y/N)	Protection Method	Pump (Y/N)	Pollution Source	Chlorine (Y/N)	Total Coliform	Faecal Coliform	Potability
Mosque H/D Well	14/12/2009	Y	Sides Only	N	Surface Run-Off	N	TNTC*/100m 1	TNTC*/100m 1	No/ Grossly Polluted Water
Naomi H/D Well	12/12/2009	Y	Completely Covered	Y	Surface run-off / latrine approx 10M away	N	TNTC*/100m 1	5 c.f.u/100ml	Not Potable
Dispensary H/D Well	13/12/2009	Y	Completely Covered	Y	surface run-off from roof catchment	N	TNTC*/100m 1	Nil c.f.u/100ml	No/ Grossly Polluted Water
Beach B3	12/12/2009	N	N/A	N	surface run-off	N	98 c.f.u/100ml	1 c.f.u/100ml	No / Polluted water
Komollo Pond	12/12/2009	N	N/A	N	surface run-off	N	TNTC*/100m 1	2 c.f.u/100ml	Not Potable
Koyange Open well	12/12/2009	N	N/A	N	surface run-off	N	TNTC*/100m 1	16 c.f.u/100ml	No/ Grossly Polluted Water
Koyange H/D Well2	13/12/2009	N	N/A	N	surface run-off	N	TNTC*/100m 1	TNTC*/100m 1	No/ Grossly Polluted Water
Mama	13/12/2009	N	N/A	N	Surface	N	TNTC*/100m	TNTC*/100m	No/

Vera H/D Well	9				run-off		1	1	Grossly Polluted Water
Mosque Roof Catchment	13/12/2009	Y	Covered metal Tank	N	Drawing Utensils / Clogged Gutters	N	TNTC*/100m 1	1 c.f.u/100ml	No/ Grossly Polluted Water
Beach A1	13/12/2009	N	N/A	N	Surface run-off	N	TNTC*/100m 1	6 c.f.u /100ml	No/ Grossly Polluted Water
Beach A2	13/12/2009	N	N/A	N	Surface run-off	N	TNTC*/100m 1	2 c.f.u/100ml	No/ Grossly Polluted Water
Beach A3	13/12/2009	N	N/A	N	Surface run-off	N	TNTC*/100m 1	8 c.f.u / 100ml	No/ Grossly Polluted Water
Beach A4	13/12/2009	N	N/A	N	Surface run-off	N	TNTC*/100m 1	3 c.f.u /100ml	No/ Grossly Polluted Water
Beach A5	13/12/2009	N	N/A	N	Surface run-off	N	TNTC*/100m 1	16 c.f.u/100ml	No/ Grossly Polluted Water
Beach B1	12/12/2009	N	N/A	N	Surface run-off	N	82 c.f.u / 100ml	3 c.f.u /100ml	No/ Grossly Polluted Water
Beach B2	12/12/2009	N	N/A	N	Surface run-off	N	70 c.f.u / 100ml	1 c.f.u/100ml	No / Polluted water

Rarombe Earth Pan	12/12/2009	N	N/A	N	Surface run-off	N	20 c.f.u / 100ml	Nil c.f.u/100ml	Not Potable
John Osir H/D Well	12/12/2009	Y	Sides Only	N	Surface run-off	N	TNTC*/100m 1	2 c.f.u/100ml	Not Potable / requires Disinfection
Samuel Agayi H/D Well	12/12/2009	N	N/A	N	Latrine Nearby	N	TNTC*/100m 1	TNTC*/100m 1	No/ Grossly Polluted Water
Kobware H/D Well	13/12/2009	N	N/A	N	Surface run-off	N	TNTC*/100m 1	TNTC*/100m 1	No/ Grossly Polluted Water
pond Water	12/12/2009	N	N/A	N	Surface run-off	N	TNTC*/100m 1	20 c.f.u / 100ml	No/ Grossly Polluted Water
Bandani Municipal Stand tap	13/12/2009	Y	Piped	N	None	Y	Nil c.f.u/100ml	Nil c.f.u/100ml	Potable
Forest Spring	13/12/2009	N	N/A	N	Surface run-off	N	2 c.f.u/100ml	Nil c.f.u/100ml	Potable
Muchilwa H/D Well	12/12/2009	N	N/A	N	Surface run-off	N	TNTC*/100m 1	TNTC*/100m 1	No/ Grossly Polluted Water
Coca Cola Stand Tap	10/28/2009	Y	Piped	N	None	Y	Nil c.f.u/100ml	Nil c.f.u/100ml	Potable