

**Social capital, collective action and the water-health nexus in  
rural Kenya**

by

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## **AUTHOR'S DECLARATION**

This thesis consists of material all of which I authored or co-authored: see Statement of Contributions included in the thesis. This is a true copy of the thesis, including any required final revisions as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

## Statement of Contributions

Exceptions to sole authorship:

Chapter 3:

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I hereby declare that as lead author on all three manuscripts, I was responsible for the research conceptualisation, data collection and analysis. I was also responsible for drafting and submitting all the articles for publication in the respective peer-reviewed journals. I also addressed all the comments from peer-reviewers. The other co-authors adopted a supervisory role, providing directions in data collection and feedback on draft manuscripts. Dr. Susan Elliott, as the primary supervisor provided significant direction and editorial assistance.

## **Abstract**

Access to safe water and adequate sanitation is widely recognised as an important means of protecting public health and human dignity. For example, the introduction of clean water and sewerage disposal (the Sanitary Movement) around the late 19<sup>th</sup> century in England had significant impacts on disease reduction, especially diarrhoeal diseases and other infectious diseases among marginalised populations. However, similar advancement in water and sanitation coverage has been difficult to achieve in many low and middle-income countries (LMICs) even more than a century and a half later. In recent years, there has been growing emphasis on citizen participation and collective action for initiating and managing community-based water and sanitation related interventions in low resource settings. However, there is limited understanding of the structural and social factors that influence participation in collective action or hinder the success of community based water initiatives.

This thesis explores the influence of social capital on water-health linkages, with emphasis on collective action in Usoma, a rural lakeshore community in Western Kenya. The research focused on three broad objectives: first, to develop a framework for understanding the role of social capital in addressing challenges around water-health linkages in LMICs; second, to determine how social capital mediates the relationships between access to water and participation in collective action; and finally, to explore factors that influence individual and community water related practices and collective action. A mixed-method approach – involving a conceptual review, household survey and photovoice – was used in the research.

The conceptual review suggests that there are two major pathways linking social capital and health within the context of water. First, social capital enhances the success of water-related behavioural interventions that can improve knowledge, behaviours and practices (KAPS). Second, social capital facilitates collective action towards addressing issues related to access to facilities and/or sustainable management of facilities and water

resources. Results from the household survey (n=485) reveal that indicators of social capital such as trust and group membership are primary determinants of collective action.

Perceptions of differences in landholding and social status were also negatively associated with collective action. Further, findings from the photovoice interviews (n=8) reveal that access to water, perceptions and practices are shaped by broader structural factors such as power relationships, marginalisation and unemployment. Collective actions to improve access were also constrained by institutional and economic structures, thus (re)enforcing inequalities.

This research makes important contributions to knowledge, policy and practice. Theoretically, the research links social capital with ecosocial theory to demonstrate how researchers can connect interactions between environmental risks and (re)actions with broader socio-economic factors to understand environment and health inequalities. The research also developed a framework for understanding how populations literally embody lack of access to safe water and adequate sanitation. This framework can be applied to the embodiment of other environmental risks (e.g., water/air pollution) within similar (or different) context. Methodologically, the research contributes to the conceptualisation and measurement of social capital in a cross-cultural context. The research also provides an effective example of embedded mixed-method design that highlights the strength of mixing quantitative methods with participatory methods such as photovoice. In terms of policy, the research highlights the need for community based water–health interventions to recognise broader policy issues that determine who gets access to water and at what price; as well as micro and macro-level factors that facilitate or constrain social capital, community mobilisation and collective actions.

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## **Dedication**

This work is dedicated to Mary Magdalen Bamiebo Bisung

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# CHAPTER ONE

## Introduction

### 1.1 Research problem

In 2007, readers of the *British Medical Journal* chose the introduction of clean water and sewage disposal (the Sanitary Movement) as the single most important medical advancement since 1840 because it resulted in significant reductions in rates of cholera and other infectious diseases (Ferriman, 2007). This advancement also facilitated social and economic activities in otherwise marginalised communities in 19th century England (Ferriman, 2007). For example, sewage and public health infrastructure improvements that were undertaken to prevent ill-health among factory workers led to reduced mortality, morbidity, and increased standards of living (Morley, 2007). However, similar advancements in water and sanitation coverage have been difficult to achieve in many low- and middle-income countries (LMICs) even more than a century and a half later. The water-health nexus, defined as the interface at which issues of water, sanitation, and human health interact, is a major global health concern due to the large number of people without access to safe water and adequate sanitation and the concomitant health impacts that arise (Elliott, 2011).

Though some successes have been achieved with regards to the Millennium Development Goal (MDG) targets on water and sanitation, a significant proportion of the world's population (almost 700 million people) remain without access to safe water and more than 2.5 billion people do not use an improved sanitation facility (WHO/UNICEF, 2014). In addition, open defecation is widespread in developing regions with approximately 1 billion people undertaking this practice (WHO/UNICEF, 2014). Nearly half of those without access to improved sources of water live in sub-Saharan Africa and Southern Asia (WHO/UNICEF, 2014).

As the global community continues to grapple with how to improve access for these large populations, inequalities in these regions have added another layer of complexity to the problem. For example, in Sub-Saharan Africa, inequalities in access to water and sanitation are manifest among disadvantaged geographical areas and groups such as minority groups, women, people living in rural areas and urban slums (WHO/UNICEF, 2014).

As the world prepares to adopt and implement the sustainable development goals (SDGs), it is widely recognised that addressing these gaps and achieving universal access to water and sanitation will require considerable acceleration of the pace of improvement witnessed during the era of the MDGs and significant efforts to improved access for hard to reach populations in resource-poor settings (WHO/UNICEF, 2014). This will involve finding appropriate “hardware” (technology) solutions and breaking “software” (socio-cultural) barriers that continue to hinder water and sanitation provision in resource-poor settings.

In response, some researchers and practitioners have pointed to citizen participation and collective action as important strategies for initiating water-related interventions and incrementally achieve universal access within the context of low resource settings (Manguenze et al, 2014; Schuster-Wallace et al, 2015). Further, social capital – defined as features of social structures and relations such as interpersonal trust, norms of reciprocity and mutual aid that facilitate collective action (Coleman, 1988; Putnam, 1993) – is regarded as an important ingredient for collective action to address water-related challenges. For example, interventions such as community led total sanitation that relies on community appraisal and analysis of open defecation to facilitate behaviour changes (Kar, 2005); community water and sanitation micro-financing models (Manguenze et al., 2014); community-based ecosystem technologies for water conservation in dryland areas (Zafar et al., 2008); and common watershed development and

management for smallholder farming (Krishna and Uphoff, 2002) are largely dependent on elements of community participation that are driven by social capital.

However, the theoretical utility and influence of social capital on water-health linkages in otherwise marginalised communities has received limited attention over the years. This may in part be due to difficulties in conceptualisation, measurement, and determining the contribution of social capital to water-related outcomes such as knowledge diffusion and collective action in different cultural and resource settings (Krishna and Uphoff, 2002; Wakefield et al, 2007). To address this knowledge gap, this dissertation integrates social capital with ecosocial theory to explore the water-health nexus in Usoma, a lakeshore community in Western Kenya. The **objectives** of this research were:

- a) to develop a conceptual framework for understanding the role of social capital in addressing challenges around the water-health nexus in LMICs;
- b) to determine how social capital mediates the relationship between access to water and sanitation and participation in collective action; and
- c) to explore factors that influence individual and community water and sanitation related practices and collective action.

These objectives emanate from a broader Knowledge, Attitudes, Practices and Empowerment (KAPE) project spearheaded by the United Nations University Institute of Water, Environment and Health (UNU-INWEH) in Hamilton, Canada. The KAPE project is implemented in the Lake Victoria Basin of East Africa, with the collaboration of the Kenya Medical Research Institute (KEMRI). The project seeks to understand and address local water-health challenges through the following strategies:

- a. investigate knowledge, attitudes and practices related to water and sanitation in rural and otherwise marginalised communities on the shores of Lake Victoria in East Africa;
- b. undertake, alongside local communities, interventions to raise awareness of the links between water and health; and
- c. evaluate the impacts of intervention on the knowledge, attitudes and practices of local communities and transfer learnings to other similar communities.

By using strategies that foster community mobilisation and participation, the initiative intends to create a sense of community ownership as well as improved understanding of water-health linkages and the resources necessary to secure safe water provisioning in otherwise marginalised communities.

## **1.2 The water-health nexus**

Historically, the links between water and the health of populations has played an important role in the evolution of medicine as well as epidemiologic research. Hippocrates, a Greek philosopher generally regarded as the “father” of modern medicine, suggested as early as the fifth century BC that human disease might be related to the environment within which people live, work and play; this of course includes water (Hennekens and Buring, 1987; Gatrell and Elliott, 2014). Much of Hippocrates’ thesis titled *On Airs, Waters, and Places* was concerned with the safety of the environment – and to a large extent water – and how this could cause diseases:

Whoever wishes to investigate medicine should properly proceed thus: in the first place to consider the seasons of the year, and what effect each of them produces.... *and concerning the waters* which the inhabitants use, whether they be marshy and soft, or hard, and running from elevated and rocky situations, and then if saltish and unfit for



cooking; and the ground, whether it be naked and deficient in water, or wooded and well watered, and whether it lies in a hollow, confined situation, or is elevated and cold... (Hippocrates, 1923 *emphasis added*)

2000 years after Hippocrates' writings, John Snow's 1854 ground-breaking investigation of a cholera epidemic in London firmly established the links between water, disease patterns, and human health (Gatrell and Elliott, 2014). Snow published a map that showed that most cholera cases in the city were clustered in a small area of Soho, and amongst people who had taken contaminated water from a pump in Broad Street (cited in Gatrell and Elliott, 2014). This work continues to influence public health interventions and epidemiologic investigations around the water-health nexus, especially in areas such as transmission pathways, disease burden and patterns of health and wellbeing (Gatrell and Elliott, 2014; Elliott, 2011; Confalonieri and Schuster-Wallace, 2011).

Over the years, many studies have explored the water-health nexus to highlight its implications for disease transmission and general wellbeing of populations (Mehta and Knapp, 2004). With regards to disease transmission, researchers have identified multiple risk factors and pathways associated with unsafe water and sanitation. These include ingestion of unsafe water; inadequate hygiene resulting from lack of water; poor personal and domestic hygiene; contact with unsafe water; and inadequate management of water resources (White, Bradley, and White 1972, Cairncross and Feachem 1993; Pruss Ustun et al., 2008). There are far-reaching effects and health implications of many of the diseases transmitted through these pathways. These include associated detrimental effects of diarrhoea and malnutrition on child stunting and cognitive impairment (Checkley et al., 2008; Berkman et al, 2003) and effects of schistosomiasis and soil-transmitted helminthiases like hookworm, tricuriasis, ascariasis on child development and performance in schools (Schuster-Wallace et al, 2015). In addition, other notable health impacts

related to pregnancy and childbirth include infections in health facilities and at homes especially during pregnancy and after delivery and adverse health impacts and complications resulting from water carrying by pregnant women in LMICs (Cheng et al, 2012; Rhee et al, 2008; Zaid, 2005; Won et al., 2004)

Aside from direct health impacts, the water-health nexus has implications for poverty reduction and wellbeing of individuals and communities (Schuster-Wallace et al, 2008). Firstly, water-related diseases have major impacts for household productivity and national economies (Howard and Bartram, 2003). The loss of productivity due to poor health from diseases and direct cost of treating diseases resulting from lack of safe water affect household incomes, savings and economic growth (Hutton, 2012). Secondly, rural agricultural livelihoods such as household gardening, livestock keeping and other productive activities require adequate water supplies within a reasonable distance (Howard and Bertram, 2003). Thus, without access to water and sanitation, poverty becomes a cycle; households without safe water and sanitation are more prone to disease, unable to work due to disease, engage less in productive activities that require water, and use their savings to seek treatment for water-related diseases where available (Schuster-Wallace et al, 2015). Thirdly, adverse impacts on cognitive development and school attendance among children affect performance and result in low economic potentials in later years (Elliott, 2011). Finally, beyond the economic and social impacts on the general population, women disproportionately bear a greater burden when water and sanitation is lacking within the household or community (Schuster-Wallace et al, 2015; Sorenso et al., 2011). For example, in the absence of adequate sanitation facilities in schools, many girls may drop-out of school or record low attendance once they reach puberty or during menstruation (Elliott, 2011). In addition, women and girls are also vulnerable to sexual abuse when walking long distances in

search of water and when searching for privacy in bushes or dark places to practice open defecation (Elliott; 2011; Sorenso et al., 2011).

### **1.3 The geographies of water and health**

Health geography is a broad field that reflects geographers' empirical foci and philosophical perspectives on health and medicine (Kearns and Collins, 2010). Health geographers' substantive focus on *place* and engagements with *critical geographies of health* are at the core of debates that ensued regarding "shifts" in the sub-discipline from medical geography to geographies of health in the early 90's (Kearns and Moon, 2002). This shift was viewed as a move "from concerns with disease and the interests of the medical world in favour of an increased interest in wellbeing and broader social models of health and health care" (Kearns and Moon, 2002; 606).

Empirically, studies around the water-health nexus form an important part of health geographers' interest in *places* where risks to health occur and the health experiences of populations in such *places*. Typical examples include investigations of exposure to risk from polluted and contaminated water in different parts of the world (Ali, 2004; Paul, 2004; Patrick, 2012; Sultana, 2006). In addition, health geographers have also considered the cultural significance of water within the context of therapeutic landscapes literature (Gesler, 1992). Health geographers interested in the therapeutic and healing dimensions of water across various cultures have used water-based ecosystems such as wells, canals, and rivers to make important contributions to the therapeutic landscapes literature (Foley, 2011, 2010; Yamashita, 2002). The expanding literature on therapeutic landscapes has developed beyond healing and spiritual sites to include studies in urban bluescapes (Volker and Kistemann, 2013). Such studies consider

water as an important element of urban landscape for enhancing human health and wellbeing (Houghton and Houghton, 2015; Völker and Kistemann, 2013, 2011). The benefits of bluescapes for health and wellbeing range from direct therapeutic benefits to recreational and emotional benefits (Völker and Kistemann, 2011).

Further, geographers have borrowed insights from conflict theory – a critique of the economic, social and power arrangements in society – to address issues related to systematic disparities in determinants of health and the forces that shape and reinforces these disparities (Cutchin, 2007). This lens has been extended to the water-health nexus to explore many complex issues including the political ecology of chronic arsenic poisoning and embodied health and wellbeing (Sultana, 2012), water politics and women’s marginalisation and wellbeing (Sultana, 2007), and the commodification of water and how this affects access and perpetuates inequalities (Stoler et al, 2012). Other critical perspectives include an examination of the relationships between socio-political structures and the hydrological cycle at different levels (Swyngedouw 2004, 2009; Wilson, 2014) and the privatisation and commercialisation of water resources, management and governance in the global south (Bakker, 2014; Harris et al, 2013). Enriching engagements with the broader political economy and environmental factors at different scales that influence health and wellbeing have largely informed these critical perspectives on the water-health nexus (Mayer, 1996, 2000; Mansfield 2008, 2011; King, 2010).

#### **1.4 Research context**

Kenya is located in East Africa and covers an area of 583,000km<sup>2</sup> with a population of 38, 610, 097 according to the 2009 national population and housing census (RoK, 2010). Water demand in the country exceeds renewable freshwater sources and it is among the most water-

stressed countries in Africa. Renewable freshwater supply per capita is estimated at 647m<sup>3</sup> per year, far below the recommended 1000 m<sup>3</sup> per capita per year and expected to drop to 250 m<sup>3</sup> per capita by 2025 (FAO, 2005; Agwata, 2005). The lack of freshwater creates serious environmental and health challenges to arid and semi-arid regions of the country (Agwata, 2005). Further, water resource-based sectors such as agriculture, forestry and a growing industrial sector depend heavily on water thus exacerbating the water situation (Agwata, 2005). In addition, high population growth rates and urbanisation have resulted in increased demand for domestic water supplies (Orindi and Huggins, 2005).

An important water resource in the East Africa region is Lake Victoria. The lake plays a major role in meeting the domestic water needs of many households as well as other national economic needs such as irrigation, hydropower generation, transport, fishing and wildlife (Orindi and Huggins, 2005). The lake has a total catchment area of 184 200 sq km shared among Kenya, Uganda and Tanzania and supports about 28 million of the poor rural inhabitants (Swallow et al, 2003). Further, concentration of commercial plantation agriculture and fishing around the lake, which rely on mobile workers and trade networks along the basin, has over the years contributed to the spread of HIV/AIDS in the region (Drimie et al, 2009). Thus, the Lake Victoria region has the highest HIV prevalence in the East African Community (EAC), which comprises of Kenya, Uganda, Tanzania, Rwanda and Burundi.

#### ***1.4.1 Historical background to water management and access to water in Kenya***

During the pre-colonial era, control and management of water resources in Kenya and many parts of Africa were largely governed by indigenous institutions, customs and laws (Sambu and Tarlule, 2013). In Kenya and Tanzania for example, water management was a key part of the

overall customary laws and norms of each tribal society and ethnic group (Sutton, 2004; Huggin, 2000). Most of these norms still persist were important for water resource management in some rural areas, ensured collective participation, benefits and safety-nets for people without secured access (Carlsson 2003; Orindi and Huggins 2005). For example, customary water management along the Lake Victoria Basin was based on the principle that water for certain limited domestic uses was free and open-access while access for other uses (e.g. livestock production) was regulated and controlled by specific household heads and clan leaders (Huggins, 2000). This ensured access by all members of the community subject to reciprocal arrangements and commitments such as labour or capital into the development of the resource (Huggins, 2000; Meizen- Dick and Nkonya, 2007). In addition, arrangements among pastoral societies stretched wide-ranging kinship networks that allowed negotiated access to water resources and grazing rights among clans and tribes to address challenges of droughts (Huggins, 2000).

Beginning in the early 20<sup>th</sup> century, the Ugandan Railway Company spearheaded the development of domestic water supply to serve urban areas (Nilson and Nyanchaga, 2008). The expansion of the railway system and increased European population in later years necessitated the introduction of the bucket latrine system to meet sanitation demand (Juuti et al., 2007; Nilson and Nyanchaga, 2008). Water legislation and reforms during this period focused on government control over water resources and supplies in order to satisfy agricultural expansion and meet the needs of urban areas (Sambu and Tarhule, 2013). Until Kenya's independence in 1963, major developments in the water sector that would ensure expansion of water supply to all citizens across the country largely benefited only urban populations (Nyanchaga, 2007; Nilson and Nyanchaga, 2008)

After 1963, the need to correct rural-urban inequalities influenced a series of reforms in the water sector to accelerate provision in rural areas, where close to 80% of the country's population lived (Sambu and Tarhule, 2013; Nilson and Nyanchaga, 2008). Water projects in rural areas were virtually state led and provided free with the promotion of community self-help projects and contributions in the form of labour (Sambu and Tarhule, 2013). These interventions led to increased access to improved sources of water from 29% in 1960 to 44% by 1970 (Sambu and Tarhule, 2013). The expansion in water infrastructure and gains in access however began to diminish in the early 1980's following reduction in government spending and removal of subsidies on social infrastructure due to implementation of the World Banks' Structural Adjustment Program as well as reduced government revenue due to severe droughts and reduced coffee and tea exports (Sambu and Tarhule, 2013). Population growth, especially urban growth and development of informal settlements, further compounded the impacts of these socio-economic challenges on water access (Orindi and Huggins, 2005). While commitments to global initiatives – such as the International Drinking Water Supply and Sanitation decade (1981-1990) – provided motivation to increase coverage, only 43% of the country had access to water and 25% had access to improved sanitation by 1990 (Sambu and Tarhule, 2013; UNICEF/WHO, 2014). With a series of reforms and commitment toward meeting the MDG targets over the past decade, access to water and sanitation were 62% and 30% respectively in 2012, with wide disparities between urban and rural areas (WHO/UNICEF, 2014). Particularly for water, coverage as at 2012 were 82% and 55% for urban and rural areas respectively, with visible intra urban differences between low- income and high-income areas (WHO/UNICEF, 2014).

### ***1.4.2 Usoma***

This research was undertaken in Usoma, a lakeshore community of about 3000 people located about fifteen kilometers from Kisumu –the third largest city in Kenya (Figure 1). The village shares borders with Kisumu International Airport as well as a Coca Cola bottling company (Equator Bottles), a molasses plant and Kenya pipeline company. The pipeline depot has a total storage capacity of 45,288 and is one of the most important suppliers of petroleum products to other countries in the East Africa region including Uganda and Tanzania. Thus, there is always the presence of petrol trucks and truck drivers from around the Lake Victoria Region in the village. More recently, land speculators in Kisumu have started to buy large parcels of land in Usoma following expansion of the nearby airport to accommodate international flights.

Most residents in the village are members of the Luo ethnic group and use DhoLuo as the major language for communication. KiSwahili is also widely spoken in the community. There is a strong presence of religion in the village, with Islam and Christianity as the major religions co-existing in all four quadrants of the village.

Though surrounded by many industries, there is high unemployment in the community, with very few people finding jobs in the nearby companies. Further, the lake is an important resource for most economic activities in the community as the majority of the population is involved in fishing activities and sand harvesting (abstraction of sand from the lakeshore for sale to local building constrictors) (Levison et al., 2011). These activities, which require frequent contact with the lake and stagnant pools of water, result in high prevalence of water-related diseases. For example, studies reveal high rates of schistosomiasis in the community, with over 90% infection rate among school children (Shane et al., 2011). There is also high prevalence of HIV/AIDS in Usoma and Kisumu (Nyanza region) in general, with 2012 estimate around 15.1%



by the Kenya Aids Indicator Survey (KAIS, 2014). Further, studies in Kisumu have reported high prevalence of HIV/AIDS among fishermen and long distance truck drivers largely due to the wide sexual networks of men in these occupations (Ondondo et al., 2014)

In terms of access to health care, a dispensary provides for the primary health care needs of residents in the community. However, inadequate resources and medical supplies usually hinder diagnosis and treatment of common illnesses. The highest educational level in the village is a primary school though there are secondary schools in nearby communities. The village also records high school drop-out rates due in part to the attractiveness of fishing and sand harvesting. This has been a major concern for the community elders and teachers who have undertaken several initiatives including a permanent ban on children going to the lake during school sessions.

Overall, about 65% of residents in Kisumu have access to improved sources of water and 35% use water from unimproved sources such as open wells, streams, the lake and water vendors (Maoulidi, 2010). However, access to water and sanitation in informal settlements and peri-urban areas such as Usoma is quite different. From a household survey conducted as part of this research, the majority of the population use water from Lake Victoria for cooking (38%) and other domestic needs (86%). With regards to sanitation, access to adequate sanitation is significantly lower than Kisumu, with 42% of the population practicing open defecation as compared to 5 % in Kisumu (Maoulidi, 2010).

From an earlier qualitative study conducted as part of the KAPE project, most community members understood the direct links between environmental conditions in the village and their health. However, lack of trust among community members and low financial resources were identified major barriers to collective action and community mobilisation to address these water

related challenges (Levison et al., 2011). These “software” barriers at the community level, together with the complex interactions between the population and the lake, continue to drive water related diseases in the community (Levison et al., 2011).

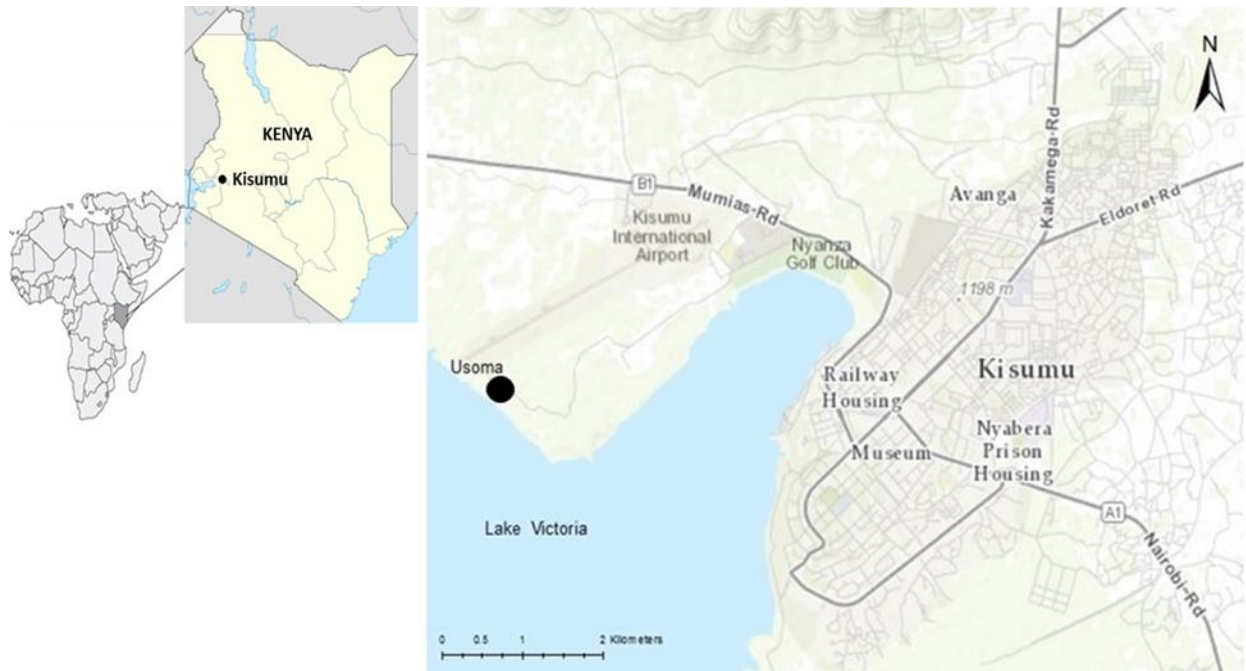


Figure 1.1 Location of Usoma

## 1.5 Outline of dissertation

This dissertation is organised as a collection of published manuscripts. Though all the manuscripts together form a conceptual whole, the objectives and methods employed for each paper are unique. Chapter 2 of the thesis provides detailed description of research design and methods. Chapter 3 addresses the first research objective, and provides an important conceptual background to understanding the links between social capital and the water-health nexus. The chapter proposes a conceptual framework for understanding how social capital influences health and wellbeing through the water-health nexus in LMICs. Chapter 4 addresses the second

research objective and explores how social capital mediates the relationship between access to water and participation in water-related collective action. Chapter 5 explores local perceptions and practices around water-health linkages and how the ecological and socio-political environments shape these perceptions and practices. Together, Chapters 3, 4 and 5 consist of three manuscripts published in peer-reviewed journals and form the *substantive* chapters of the thesis. Chapter 6 summarises the main findings across the three manuscripts and provides a discussion of the broader implications of social capital on health within the context of water. The chapter also highlights contributions of the research and concludes with directions for future research.

## **CHAPTER TWO**

### **Research Methods**

#### **2.1 Introduction**

This thesis undertook to explore the influence of social capital on the water-health nexus using ecosocial and social capital theories. The thesis employed an embedded mixed method research design using a cross-sectional survey and photovoice. Since the thesis is a conceptual whole, this chapter outlines the details and justification for the research design, methods, and techniques. The chapter also gives detailed account of the data collection process. Though some of these details are included in the main manuscripts, this chapter provides an integrated and consolidated methodology for the entire research as journal word limitations prevented the adequate elaboration on the methods in the published manuscripts.

#### **2.2 Approaches to research in health geography**

Over the past two decades, the role of theory in research has become increasingly important in health research (Kearns, 1993; Litva and Eyles, 1995; Krieger, 2011; Aboud, 2012). Aboud (2012) and Krieger (2011) emphasised the practical importance of making explicit philosophical approaches that influence inquiry in health research for two main reasons. First, without explicit engagement with theory, health researchers are likely to pose poorly conceived questions and potentially generate wrong answers (Krieger, 2011). Second and perhaps most importantly, observation and by extension the whole enterprise of research is shaped by theory (Litva and Eyles, 1995; Krieger, 2011).

Within health geography, diverse philosophical approaches such as positivist, social constructionist, structuralist and structurationist inform the broader questions of how to

identify, classify and reduce risks that result from environmental and social inequalities and behavioural determinants of health (Luginaah, 2009). Though these philosophical perspectives differ in their assumptions, beliefs and values regarding reality (Doucet et al., 2010), they all guide researchers in fundamental ways by shaping both the questions asked – about the health and wellbeing of individuals and populations and – the methods used to generate answers (Guba and Lincoln, 1994). For example, understanding factors that shape perceptions and practices around water can be understood through a social constructionist approach by giving priority to “lay perceptions,” or through structuralist interpretations that give weight to the impacts of broad socio-economic systems on local practices.

### **2.3 Research design**

This research was framed within the broader framework of social constructionist and ecosocial interpretations to capture both lay interactions and to explore the web of causal factors at multiple levels that drive collective actions around the water-health nexus in Usoma. The research used an embedded mixed-method design where the collection and analysis of both quantitative and qualitative data were combined within a traditional quantitative study (Greene, 2007). In an embedded research design, the secondary and primary data are collected simultaneously though analysis of the former is done during or after the primary data is analysed (Creswell and Clark, 2011). Thus, the second data set usually provide a supportive role or explores findings from the primary data set.

In this research, the primary data was the quantitative survey while the qualitative (photovoice) data provided a supportive role to explore some of the issues and findings from the quantitative study. Though the second data set (photovoice) was collected during the household

survey, the photovoice analysis occurred after the quantitative analysis in order to provide supporting evidence and explanations (Cresswell and Clark, 2011). The premise of this design is that different questions about the case need different types of data sets in order to provide sufficient knowledge (Creswell et al, 2007). This design was appropriate since the broad research objectives required the application of both qualitative and quantitative techniques but time constraints did not allow an “extensive exploratory design” (where the collection, analysis and results from the quantitative survey would inform the qualitative research design). In addition, because each method addressed a separate research objective within a broad research goal, an embedded approach enabled the exploration of different components of the social capital framework (Figure 3.1) outlined before the data collection. Figure 2.1 below provides a general framework and flow of activities for the data collection and analysis. The rest of this section details the data collection and analysis procedures employed.

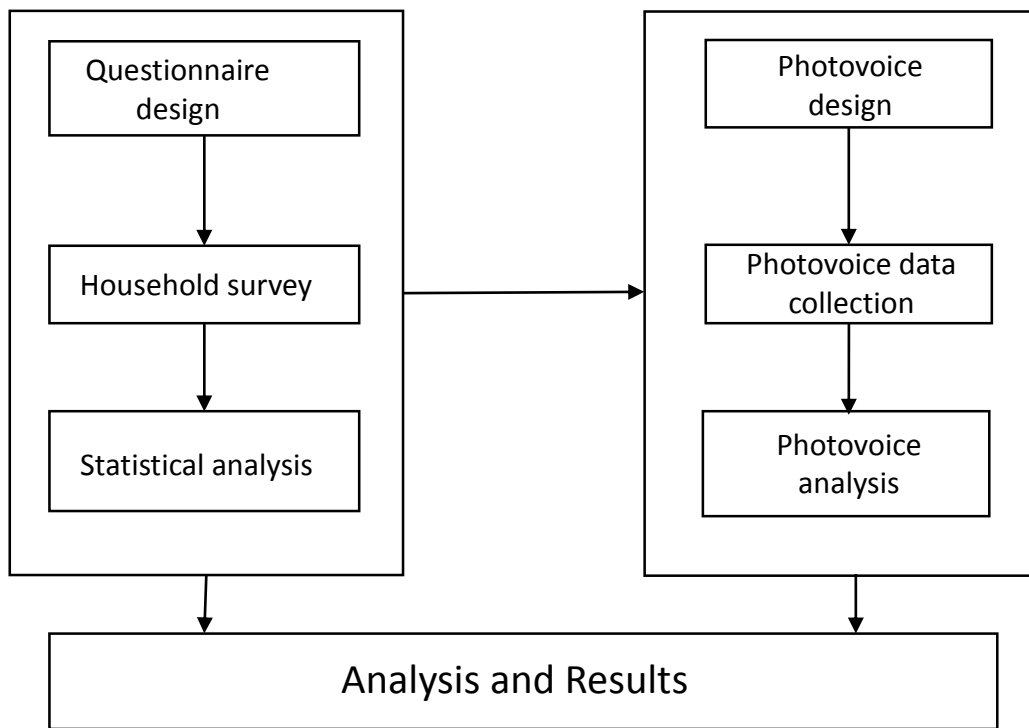


Fig. 2.1 Framework and flow of activities for the data collection and analysis

### **2.3.1 Case studies and mixed methods designs**

In this research, using a mixed-method case study was most appropriate as it provided an opportunity to employ both extensive (breadth) and intensive (depth) research approach. Case studies have often been described as “empirical enquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially where the boundaries between phenomenon and context are not evident” (Yin, 2009:18). Though case studies have largely been identified with intensive research, the use of broad range of techniques (both quantitative and qualitative) has often been suggested in order to present strong evidence for any case (Yin, 2009). Mixed methods research designs in case studies focus on the complementary roles the different methods can play rather than their limitations and differences (Sayer, 1992). Thus, instead of emphasising difference between “quantitative and qualitative,” “objectivity and subjectivity, “truth and perspective,” “generalisations and extrapolations” (Patton, 1999), mixed methods emphasise the complementarity and reveal the benefits of using different aspects of empirical reality. When using mixed-methods in case study research, the qualitative aspects are concerned with how processes and experiences occur within the case to transfer learnings to similar contextual settings (Warshawsky, 2014). On the other hand, the quantitative techniques seek to determine some general pattern, possible association and common properties among the general population – in order to make generalisations based on observable data (Sayer, 1992; Gatrell and Elliott, 2009). For example, to find association between social capital and collective actions in this research, household surveys were conducted and analysed through bivariate analysis, principal component analysis and regression models. Though this provided very useful information on general patterns and predictors of collective action in the general population, it failed to capture residents’ everyday practices, interactions and lived experiences around

collective activities. Qualitative methods were thus used to explore practices and lived experiences that remained unknown in the quantitative analysis.

### **2.3.2 Research techniques**

The research employed a cross-sectional survey and photovoice as the two main data collection techniques. In health research, cross-sectional surveys are carried out at a point in time to take a snap-shot of exposure and outcome in a population. They are usually conducted to estimate the prevalence of the outcome of interest or to determine association between the exposure and certain outcomes of interest in a population (Levin, 2006). Thus, data on the exposure and outcomes are collected concurrently over a relatively short period. In this research, association between the exposure (access to water and sanitation) and outcome of interest (participation in collective action related to water and satiation) were determined with a focus on social capital as a major pathway between the two. Cross-sectional studies are limited by the fact that it is often difficult to infer causality or temporality since they are usually conducted at a point in time. For example, in this research, it was not possible to determine whether the outcome (collective action) occurred after or before the exposure (access to water and sanitation). However, employing a cross-sectional survey was very important for determining possible pathways linking access to water and collective action as well as generating questions and hypothesis for future research. Further, it was possible to include many exposure variables and confounding variables in the survey instrument, which created an opportunity to assess multiple pathways. In addition, the survey required less time and resources to implement.

The second method employed was photovoice. Photovoice is a relatively new technique that promotes social action by equipping communities to participate in the identification and



analysis of local problems. Through photography, participants are able to identify and discuss their everyday environment and health problems (Castleden et al, 2008). The use of photovoice in health and environment research is greatly influenced by the works of Wang and her colleagues who initially used the principles and techniques to enable Chinese village women to photograph challenges to their everyday health and wellbeing (Wang, 1999; Wang and Burris, 1994). Wang and her colleagues identified three main theoretical foundations of photovoice: Freirean-based education techniques (Friere, 1970), feminist theory and practice (Wang et al, 1996), and documentary photography (Rose, 1997). Recognising that the lack of safe water and adequate sanitation places a disproportionate health and social burden on women and children, photovoice was used among women for exploring a wide range of challenges around the water-health nexus in Usoma.

## **2.4 Field data collection**

Field data were collected from 9th June 2013 to 20th August 2013. Prior to starting fieldwork, reconnaissance trips were undertaken two occasions (1 week and 1 month in Winter and Fall 2012 respectively) in order to enhance understanding of the study context, establish key contacts and build trust with the people of Usoma. Prior to data collection, a meeting with the village elders was organised to introduce the research and formally ask for their permission to conduct the study. After this initial meeting, the elders scheduled a community baraza (*community durbar or forum where people come to share ideas, thoughts and opinions around issues of importance to the community that require action*) where the general research purpose and objectives were discussed with all community members. Community members demonstrated interest in the study during this meeting and some immediately gave an indication of their

weekly work schedule to enable adequate scheduling of the household surveys. It was agreed that the survey be administered 7 days a week from early morning to late afternoon in order to accommodate the work schedules of village members. This information proved essential in scheduling most of the data collection activities and contributed to the high response rate (91%). Surveys were conducted with the head of household, a role determined by the household itself. As shown in table 4.1, 52% of household heads were male and 48% were female. Though the percentage of female-headed households was relatively high considering the cultural context, the literature suggests that female-headed households are on the rise in Western Kenya partly due to HIV/AIDS prevalence and male labour migration (Mikalitsa, 2015; Drimie, 2002; Drimie et al., 2009)

#### ***2.4.1 Household data collection***

An adapted version of the Social Capital Assessment Tool (SOCAT) (see Appendix C) was used for the household survey. The SOCAT is a social capital measuring tool developed by the World Bank's social capital thematic group (Grootaert and Bastelaer, 2001). To meet the research objectives, a number of modifications (discussed in Chapter 4) were made to the SOCAT to ensure that it reflected the local context, captured important community resources, and reduced the time required to administer the questionnaire. To ensure context appropriateness, a professional translator from KEMRI and three other KEMRI researchers translated the questionnaire into DhoLuo and back to English. Two other research assistants (RAs) were recruited to administer the actual survey. These RAs were both third year undergraduate students fluent in DhoLuo and understood the local context. The RAs also received rigorous training that focused on the research objectives and purpose, what each question in the questionnaire sought

to elicit and general ethics considerations in the data collection process. Before the actual survey, the research team received a roster of all houses and households in the village that was compiled under a different project by KEMRI. To facilitate recruitment, an elder from the community led the RAs to the various households listed on the roster daily. The questionnaire was pre-tested on the first day (16th June 2013) on nine respondents. The outcome was satisfactory as all the pre-tested questionnaires were correctly administered without errors. On subsequent days, the RAs administered the questionnaires independently with a debriefing exercise every evening to take stock of progress and to check for any gaps on completed surveys. Follow-ups were made the following day to correct any gaps that existed. Overall, the survey covered all houses on the roster including others that did not exist on the roster. The survey had a 91% response rate that represented 485 households and captured 2131 individuals. All the questionnaires were carried back to Canada for analysis using SPSS version 21. Chapter 4 presents a detailed account of the quantitative data analysis and results.

#### ***2.4.2 Photovoice data collection***

Though Chapter 5 provides a detailed account of the photovoice process, it is important to summarise the details here in order to present a logical flow of the methodology used for the thesis. Eight (8) women participated in the study from June to August, 2013. Women were recruited for this study because they typically bear the greatest burden for providing water for households in most parts of Kenya, do not hold decision-making authority and are equally at risk from both health and social challenges associated with water collection from the lake and other open water sources. Using convenience (snowball) sampling (Creswell, 1998), participants were recruited by first identifying two key participants based on past community connections. These

two women then recommended other women they felt would have interest in the project. It is important to mention that two (2) of the photovoice participants were household heads and thus participated in both the household survey and the photovoice.

After recruitment, participants were given detailed information on the research as well as training in basic photography skills and ethics associated with taking photographs. The training was conducted in DhoLuo and all training manuals and consent forms were translated into DhoLuo. After the training exercise, disposable cameras (with 28 exposures each) were given to participants to take photographs of what they felt best represented *attitudes and practices around water and sanitation that influence health in the community*. Participants were allowed to take any number of photographs they felt adequately represented their views. All the cameras were retrieved after eight days and the photographs developed in a local photo laboratory. Overall, participants took between 16–26 photographs each. One set of photos was given to each participant as a token of appreciation. Each participant then chose four photographs that best represented her views. A summary of study participants and details of photovoice interviews and analysis are provided in Chapter 5.

This research received initial ethical clearance from the University of Waterloo Ethics Review Board and further approval from the Ethics Review Committee of KEMRI-SSC Protocol # 2468.

## **2.5 Positionality**

I situate my methodological approach to research within the realm of what Donna Haraway refers to as “partial and situated knowledges” (Haraway, 1988). Haraway’s notion of partiality and situated knowledges has had a major influence on critical human geography

research, and to a larger extent, qualitative debates in human geography (Nightingale, 2003). Whiles issues of power and positionality in Haraway's thesis remain important, the epistemological and methodological implications of "partial and situated knowledges" to mixed research design cannot be overstated. The use of mixed-methods implies that different vantage points and techniques "produce different views of particular processes and events" (Nightingale, 2003:80). The ability to use these different techniques to address a research question makes mixed methods very useful in human geography. Thus, the focus of my research design was to address my research questions using different methods to complement each other. I allowed the questions to determine the methods as suggested by Elliott (1999).

While undertaking my doctoral research work, I have been conscious of the fact that the practical focus and substance of my work reflect some of my individual interests and experiences growing up. In particular, access to water and sanitation remain a challenge in many rural communities in my home country, Ghana. I have had personal experiences of challenges involved in community initiatives and mobilisation to address these issues. Researching how a community is addressing similar challenges in the face of more complex environmental and health challenges, I could not escape the tendency to use the "lens" from my Ghanaian experiences to ask questions, probe further and analyse situations during my field work. Thus, I did not approach the research or go to the field with a "God's eye view" (Haraway, 1989) or "the view from nowhere" (Nagel, 1989), but rather had a *perspective* which could influence what I saw and how I interpreted it.

The social landscape I inhabited (Ghanaian studying in Canada) offered further complexities to the research. My subject position virtually occupied a space of "betweenness", that is, doing fieldwork "from a position that is neither inside nor outside" (Katz, 1994; Marcia-

Lees, et al, 1989:33). I was sometimes called a *son* (because I am black and young) by many elderly people in the community and sometimes a *visitor* by others, because as they explained, I was coming from a “far distance”. Being a son and a visitor at the same time proved useful for the research. From this standpoint, it was possible to ask questions that were of practical necessity to the needs of the community and substantively relevant to the research questions.

## CHAPTER THREE

### **Manuscript #1: Toward a social capital based framework for understanding the water-health nexus**

Bisung, E., and Elliott, S. J. (2014). Toward a social capital based framework for understanding the water-health nexus, *Social Science and Medicine*, 108: 194 – 200.

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**Abstract:** In recent years, there has been considerable interest in social capital theory in both research and policy arenas. Social capital has been associated with many aspects of improvements in health, environment and development. This paper assesses the theoretical support for a social capital based analysis of environment and health issues with a focus on the water-health nexus in low-and middle-income countries. We review the conceptualisation of social capital by Pierre Bourdieu in relation to his concepts of “fields” and “habitus” as well as other conceptualisations of social capital by James Coleman and Robert Putnam. We integrate these authors' ideas with ecosocial analysis of social and geographical patterns of access to safe water, adequate sanitation and hygiene and the resulting health impacts. Further, we develop a conceptual framework for linking social capital and health through the water-health nexus. The framework focuses on the role of social capital in improving water-related knowledge, attitudes and practices as well as facilitating collective action towards improving access to water and sanitation. The proposed framework will facilitate critical engagement with the pathways through which social processes and interactions influence health within the context of access to water, sanitation and hygiene in low and middle-income countries.

### **3.1 Introduction**

Access to safe water, considered a basic need and human right by many, is far from reality for many people. Though the millennium development goal on water has been achieved ahead of schedule, an estimated 768 million people still remain without access to improved drinking water within a reasonable distance from home and 2.5 billion lack improved sanitation facilities globally (WHO/UNICEF, 2013). The majority of the global population without access to safe water live in developing regions, specifically in sub-Saharan Africa, Oceania, Southern Asia and South Eastern Asia (WHO/UNICEF, 2013). Aside from huge disparities in access that exist at the global level, similar disparities are found within countries; that is, between the rich and poor and between people living in rural areas and those in urban areas.

A major challenge that remains in many rural areas of LMICs is how to provide cost effective solutions that are sustainable and adequately address adverse health impacts related to lack of safe water and adequate sanitation. Researchers have long identified that barriers to improving access to water and sanitation are not mainly technological but rather social and institutional. For example, with regards to uptake of sanitation and hygiene interventions, common challenges in research are inadequate attention to theories that address strategies of health behaviour change at the individual and community levels (Aboud and Singla, 2012). These barriers are partly reinforced by inadequate understanding of the range of social and institutional barriers that affect success in water interventions from the local to national levels.

In recent years, researchers have associated social capital with many aspects of sustainable development (Krishna and Uphoff, 2002) and improved health (Kawachi et al., 1999; Brown et al., 2006; Araya et al., 2006; Miller et al., 2006; Wood et al., 2012). Evidence has shown that societies with large stocks of social capital are able to better manage resources, have



better institutional capacity to promote development and easily adapt health behaviour interventions. However, like any other social theory, social capital has been faced with debates about its substance and utility in health research. Over the past decade, some researchers have raised theoretical and methodological shortcomings about the concept and have contested its utility in (health) research (Navaro, 2002, Navaro, 2004; Lynch et al., 2000). This article examines the theoretical usefulness of social capital by examining its role as a key construct in ecosocial theory. Our review explores current application of social capital to the water-health nexus and highlights possible pathways through which social capital can influence health within the context of access to water, sanitation and hygiene. The water-health nexus represents the intersection at which issues of water, sanitation, hygiene and human well-being meet (Elliott, 2011). The linkages between water and health are potentially influenced by a web of biological, social, economic and political factors. Thus, integrating social capital with ecosocial frameworks holds the potential to increase our understanding of the complex challenges affecting the water-health nexus.

### **3.2 Water-health linkages**

Globally, almost 10% of the burden of disease is attributed to unsafe water, inadequate sanitation and poor hygiene; for example, 1.4 million child deaths each year are caused by diarrhoeal diseases and 88% are attributable to unsafe water, inadequate sanitation and insufficient hygiene (Prüss-Üstün et al., 2008). In addition, one in five children born in LMICs die from child malnutrition associated with repeated diarrhoea or intestinal nematode infections induced by unsafe water, inadequate sanitation and poor hygiene before they reach age five (Prüss-Üstün et al., 2008). Detrimental effects of diarrhoea and malnutrition, especially on

children are noticed in their growth and cognitive development (Berkman et al., 2002). Aside from diarrhoeal diseases, improved access to water, sanitation and adequate hygiene contribute substantially to reduction in the prevalence of many neglected tropical diseases, such as trachoma, soil-transmitted helminthiases, schistosomiasis, lymphatic filariasis and dengue fever (Prüss-Üstün et al., 2004).

Further, there are numerous adverse effects of lack of water, sanitation and poor hygiene on maternal and newborn health. Specifically, there are adverse impacts resulting from water carrying by pregnant women and hygiene-related infections during and after delivery (Cheng et al., 2012; Watt and Chamberlain, 2011). Additionally, health-care facilities including hospitals, health centres and residential care settings require access to safe water and adequate sanitation to provide clean tools and ensure adequate hygiene practices among care givers to reduce the risk of hospital based infections.

The disease burden and economic impacts resulting from lack of access to water, inadequate sanitation and poor hygiene are central to poverty reduction efforts and development concerns in many LMI countries. For example, the cost of treating waterborne and water related diseases, low productivity resulting from sickness due to unsafe water, productive cost of time spent collecting water, and lack of water for household livelihood activities such as gardening and animal rearing have significant impacts on poverty reduction and community development (Schuster-Wallace et al., 2008). The water-health nexus thus provides fertile ground for synthesis of health and development issues with a focus on reducing inequalities and promoting human health and well-being.

### 3.3 Perspectives and definitions of social capital

Over the past two decades, social capital research related to health coalesces around three major perspectives. These perspectives are based on the ideas of Pierre Bourdieu (1977, 1986), James Coleman (1988), and Robert Putnam (1993, 1995). The first major analysis of social capital emerged from Bourdieu's analysis of *forms of capital*. He defined social capital as "the aggregate of actual or potential resources which are linked to possession of a durable network of more or less institutionalised relationships of mutual acquaintance and recognition" ( Bourdieu, 1986: 248). Bourdieu's concept of social capital – and by extension of social capital as a resource – can be understood and successfully employed, by integrating it with his concepts of "fields" and "habitus" ( Bourdieu, 1977; Bourdieu and Wacquant, 1996). Fields, in simple terms, may be regarded as structured spaces organised around specific forms of capital or combinations of capitals. As fields, all structured spaces within society are contested; and actors' positions within them have to be fought for continually using various forms of resources at their disposal. Thus, capital (including social capital) mediates processes in fields and is a means by which individuals achieve their social or economic goals (Grenfell, 2009). Further, the concept of habitus is necessary for understanding collective action and practices. Habitus is understood as a "system of lasting, transposable dispositions which, integrating past experience, functions at every moment as a matrix of perceptions, appreciations, and actions and makes possible the achievement of infinitely diversified tasks" (Bourdieu, 1977: 82). Habitus is developed through the process of socialisation, and determines a range of dispositions that influence human behaviour (Navarro, 2006). Such dispositions may influence an individual's behaviour towards collective activities and associational culture.

Further comprehensive analysis and review of other (eg. Putnam's and Coleman's) conceptualisations of social capital already exist in the health literature (Carpriano, 2006; Wakefield and Poland, 2005; Veenstra, 2000; Mohan and Mohan, 2002). Despite the differences in ideas, Bourdieu, Putnam and Coleman seem to agree in one respect: that is, social capital is a resource that actors stand to benefit from by virtue of membership in social networks or structures. For the purpose of this review, our analysis of social capital is focused on resources embedded in social networks, structures and relations potentially available to individuals within the networks or the larger community. These resources include composition and practices of local level institutions, both formal and informal, that serve as instruments of community development as well as shared norms, values, attitudes and beliefs that predispose people towards collective action (Krishna and Shrader, 2000). It is important to recognise that macro-level institutions and relationships (eg. political regime, rule of law, property rights, court systems, and political and social liberties) have strong impacts on the development of social capital and generating its beneficial outcomes by creating the enabling environment for local institutions and associations to develop ( Grootaert and Bastelaer, 2002).

### **3.4 Ecosocial theory, social capital and the water-health nexus**

Although social capital offers potential insights regarding how social and economic factors influence health, particularly at the neighbourhood or community level (Carpriano, 2006), many researchers have been critical about the theoretical and methodological strengths of the concept (Macinko and Starfield, 2001; Pearce and Davey-Smith, 2003). While some studies have associated social capital with some aspects of improved health (Kawachi et al., 1999; Brown et al., 2006; Araya et al., 2006), others have also found little or no benefits of social capital to

health (Veenstra et al., 2005; Mohan et al., 2005) and thus remain sceptical about both investing in social capital and “the explanatory power of social capital (vis-a-vis material circumstances)” (Mohan et al., 2005: 1282). With regards to explaining water-health linkages, integrating social capital with ecosocial theory offers a useful framework for generating a holistic social and biologic understanding of health, diseases and well-being (Krieger, 1994; Krieger, 2004, 2011).

Ecosocial theory seeks to explain: “who and what is responsible for population patterns of health, disease, and wellbeing, as manifested in present, past, and changing social inequalities in health?” (Krieger, 2011:213). With this explanation, an ecosocial framework presents opportunities to investigate patterns of disease distribution and health by examining the combination of social processes, structures, cultural norms and ecologic settings in any given populations (Krieger, 1994). For example, when applied to water borne diseases, an ecosocial approach may ask whether the factors or processes related to exposure to water-borne diseases are physical, social or biological in nature; or a combination of some/all these factors. Investigations, for example, may extend to ask why and how exposure varies between neighbourhoods, age groups, and ethnic groups. Thus, an ecosocial approach will emphasise how the processes of exposure to water borne diseases, or water interventions to prevent such diseases, cannot be separated from the social conditions in which people are born, live, play, grow and work.

Beyond improving living conditions and reducing income inequalities, public health and policy interventions that foster strong social networks and institutions are relevant for improving health. It is argued that while variables – such as trust and reliance – may not in and of themselves cause mortality or inequalities in health, societies with low stocks of social capital or those that disinvest in social capital may be those that fail to provide social institutions directly

or indirectly responsible for the health of their populations (Kawachi et al., 2008). Such institutions may include those responsible for water and sanitation. For example, a study by Levison et al. (2011) in the village of Usoma, Kenya revealed that lack of trust among residents in the community was a major barrier to community initiatives and mobilisation towards addressing water and sanitation problems.

Social capital can also offer some theoretical strength to ecosocial approaches vis-à-vis processes through which social norms and values shape patterns of health. Strong community networks and observance of norms are usually deployed to exert social control and preserve community values. These shared norms may be important forms of – and relevant for building – social capital and are relevant in ecosocial frameworks that seek to understand gender patterns of health in many local communities especially within the context of water provision. For example, in many sub-Saharan African countries, women and girls carry the burden of water collection within households (WHO/UNICEF, 2012). Though this phenomenon (shared norm) creates opportunities for women's mobilisation and participation in water issues, it has implications for their health that cannot be ignored in attempting to understand gender patterns of health in many rural communities. Aside from calories expended, women are also exposed to diseases such as typhoid fever, malaria, dengue fever, yellow fever and schistosomiasis during water collection (Watt and Chamberlain, 2011). Further, women and children are sometimes victims of assault and sexual abuse while undertaking water fetching roles. These risks disproportionately affect women's health and may shape gender patterns of disease distribution.

Further, ecosocial theory fundamentally seeks to examine health inequalities from within a web of social and biological factors. While inequalities in access to water and sanitation could explain patterns of water-related diseases, social capital may offer explanations to why such

inequalities in access exist within cities or local regions in the first place. For example, in a study to assess exclusion from access to water in two Nairobi slums, Mudege and Zulu (2011) observed that community mobilisation and collective action to address water issues was generally lacking due to water conflicts between different socio-economic groups within slums. They observed that socio-economic inequalities even within slums cause struggles for control over the few water facilities available. These struggles inhibit efforts to address more important issues. Thus, interventions to address inequalities in access to water in such communities need to take intra-group conflicts, and factors that hinder community mobilisation, into consideration. Such an example highlights the potential theoretical explanatory power of social capital for understanding what drives success in addressing local water and sanitation issues which have significant implications for patterns of water-related disease distribution and health.

### ***3.4.1 Embodiment, social capital and the water-health nexus***

Embodiment is a core construct within ecosocial theory that seeks to explain the interplay between bodies and the social world. Embodiment, with other ecosocial constructs (pathways to embodiment, cumulative interplay between exposure, susceptibility and resistance, and accountability and agency) can be employed in epidemiological studies to reveal population patterns of health, disease and well-being as biological expressions of social relations and structure (Krieger, 2011). At a general level, embodied epidemiology expresses how living organisms – including human beings – biologically incorporate the material and social circumstances in which they live. Krieger (2005) advanced three critical claims central to the notion of embodiment. First, “bodies tell stories about – and cannot be studied divorced from – the conditions of our existence” (Krieger, 2005: 350). The second claim is that “bodies tell

stories that often – but not always – match peoples stated accounts” (Krieger, 2005: 350). Finally, she advances the argument that “bodies tell stories that people cannot or will not tell either because they are unable, they are forbidden, or they choose not to” (Krieger, 2005: 350). Thus, embodiment involves the temporal transformation of bodily characteristics as a consequence of people's engagements with their worlds. For example, deprivation from some of the social determinants of health such as the lack of food, inadequate access to water and sanitation, economic and social deprivation, and inadequate health care temporally transform bodies or leave marks on the body. With respect to water and sanitation, diseases such as schistosomiasis, guinea worm, filariasis, yellow fever, river blindness, trachoma and yaws all leave marks on the body of infected persons, which tell stories about their living conditions or state of access to safe water and sanitation. Recognising the importance of socio-political and economic processes in determining epidemiological patterns, embodied epidemiology challenges researchers to understand the different social processes and circumstances that become “embodied” to generate diseases profiles, health and wellbeing.

How do bodies embody social capital within the context of access to water and sanitation? Bourdieu’s conceptualisation of social capital in relation to other forms of capital and habitus illuminates how embodied difference in social capital can operate in many aspects of social life. Social norms, values and expectations are reproduced in everyday social relations and subconsciously frame individual identities (Holt, 2008). These individual identities – such as woman/man, disable/able – possess embodied social capital which can (re)produce privileges and exclusion in a variety of ways. Such embodied social capital can generate broader patterns of social and economic (dis)advantages which influences health. For example, many individuals defined as disabled experience marginalisation and exclusion in many aspects of social and



economic arenas (Imrie and Edwards, 2007). People with physical disabilities are often excluded from using water points and toilet blocks because they cannot easily access them. They also rarely participate in water and sanitation activities in many local communities.

Further, ideas of embodiment include the notion that observed differences in health status between groups may result from group relations. For example, socio-economic relations between the poor and the rich may determine how they differentially accumulate privileges or access water resources, which may influence differences in water-related health outcomes. Social capital could further reinforce or reduce such privileges associated with socio-economic divisions. Strong “bonds” among “well-off” actors (e.g. wealthy community members with resources, rich individuals, land owners, etc.) may help reinforce inequalities in water-related health outcomes through restrictions and exclusion of people of lower socio-economic status from accessing such facilities and/or resources owned by “well-off” groups.

On the other hand, “bridging social capital” between economically/resource endowed and less endowed groups may be useful for reducing water inequalities. Bridging social capital is explained as diffuse and extensive networks and connections deployed by groups to “get ahead” (Harpham et al., 2002). These connections could be cooperation and connections between the rich and poor, bridging between low-income groups in a community, or bridging between poor and more affluent communities (Warren et al., 2005; Woolcock and Naraya, 2000). Consequently, to the extent that the poor lack broader connections (bridging social capital), they may remain isolated and less capable of improving their water and sanitation conditions and vice versa. Thus, social capital may serve to “bridge” embodied differences in group relations which may help reduce inter group differences in access to water resources and facilities.

### **3.5 A social capital based framework for understanding the water-health nexus**

Empirical evidence from the literature suggests that social capital can be applied to various aspects of the water-health nexus to achieve improved health and well-being. That is, social capital plays a significant role in various aspects of water and sanitation delivery systems.

#### ***3.5.1 Sustainability of community based facilities***

The success of community-based approaches (involvement of community members in the design, construction and management of water and sanitation facilities) in water and sanitation delivery is influenced by availability of social capital. Application of operational rules and sanctions, participation in community groups, shared norms and interactions among users have been found to be ingredients for collective action that facilitate proper implementation and management of water and sanitation systems (Isham and Kähkönen, 2003). Prevalence of social networks and interactions among community members may also influence their ability to collectively craft and enforce rules for management of water and sanitation facilities. Where water committees and boards are formed to oversee water and sanitation projects, evidence suggests the inability of communities to form effective committees and/or cooperate with them affects the implementation, management and performance of rural water systems (Isham and Kähkönen, 2003).

#### ***3.5.2. Management of common resources***

Similarly, communities with high levels of trust, shared beliefs and expectations for collective action are more able to mount collective responses to local problems such as watershed management issues. Krishna and Uphoff (2002) gives a classical example of the

success of soil and water conservation projects on Common Lands in 864 villages of Rajasthan, India. Committees were formed in villages to oversee the management of Common Land Development Projects, which involved planting trees and grasses, enforcing rules for watershed projects, and fencing common lands against stray cattle and human encroachment. The villages also had to contribute 10% of the cost in the form of labour. Though almost all the villages emphasised the need for the project, programme results varied from village to village. Social capital was associated with better development outcomes, both in watershed conservation management and in cooperative development activities more generally.

### ***3.5.3. Water related behaviour change***

Further, social capital offers theoretical support for research that seeks to explain and understand community water related behaviours and practices. The social environment influences individual water-related behaviour and activities through a number of causal mechanisms by shaping norms, enforcing social control, (not) enabling people to participate in particular behaviours, and constraining individual choices (Institute of Medicine, 2003). Social support and social networks, for example, may enable or constrain the adoption of health-promoting behaviours while social capital may influence the ability to enforce and/or reinforce group or social norms for positive health behaviours and provide tangible support (McNeill et al., 2006).

Social capital is thus considered an important element in water-related behavioural change interventions. Such water-related behaviours may be in relation to water treatment practices, improved hygiene behaviours, and improved sanitation practices. Evidence suggests that networks of social relations, social norms and group participation can influence individual

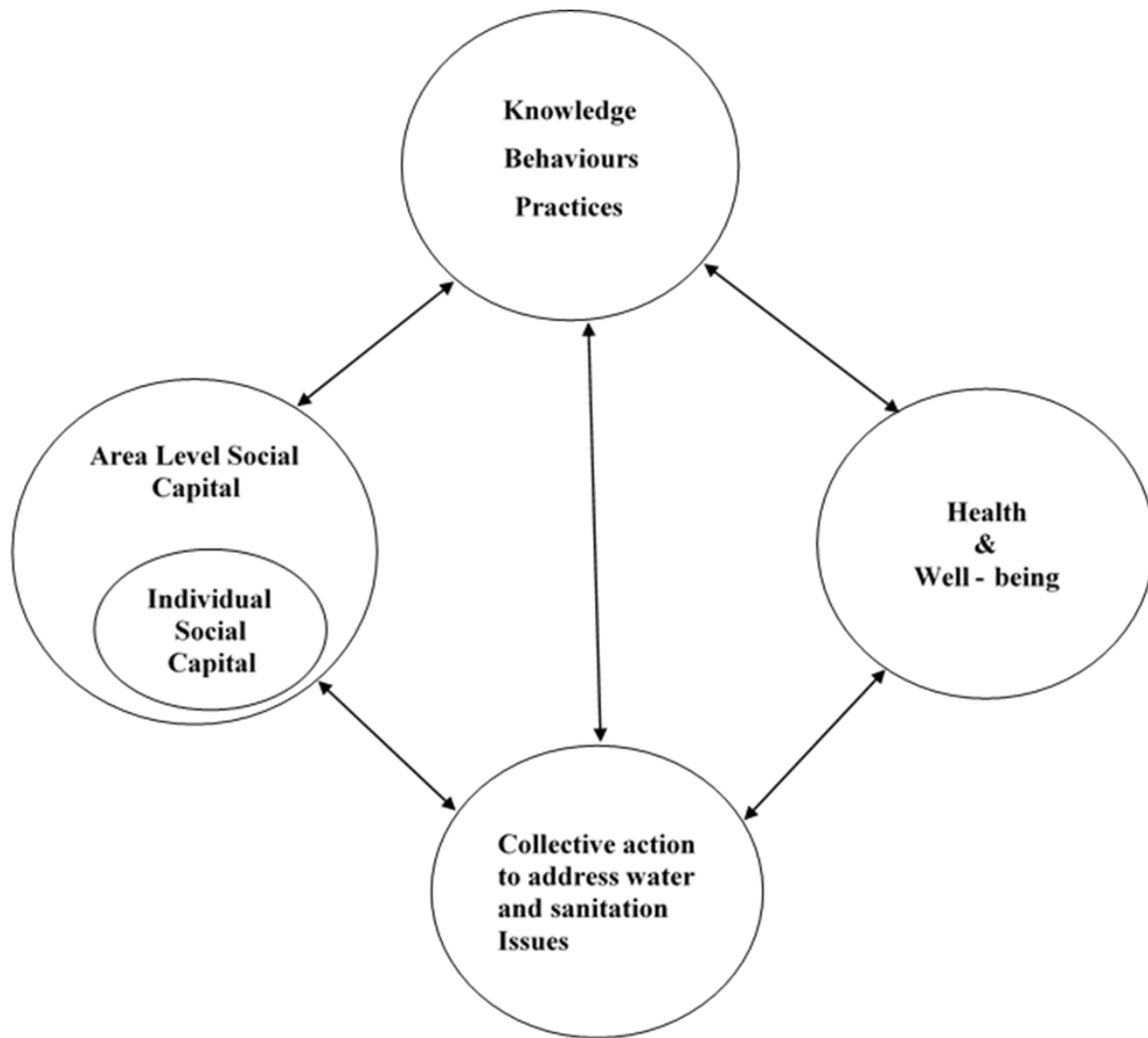
behaviours and practices around water-health as well as promote adoption of water-related behavioural interventions (Wood et al., 2012; Briscoe and Aboud, 2012). For example, in a study to explore women's motivation to adopt, sustain, or discontinue the use of chlorine water products in Malawi, Wood et al. (2012) found family support and encouragement to be a major factor for the continued use of chlorine treatment methods. Also, financial support and encouragement from husbands, neighbours and extended relations was a major factor among women who continued to treat their water after government stopped free distribution of the treatment products.

#### ***3.5.4. Group struggles and differences***

Further, social capital, when successfully employed with Bourdieu's concept of field, could serve as a useful framework for understanding facilitators or barriers to collective action for solving water problems at the community level. As fields are dominated with struggles for power and resources, policies aimed at building social capital to address water and sanitation issues within a particular field can be problematic if actors within compete or struggle amongst themselves for resources or power. The study by Mudege and Zulu (2011) in Nairobi slums found that intra-community struggles between households of different socio-economic status negatively affect community mobilisation and collective action to address water issues. Thus, power relations and economic differences within various communities are major factors that can influence interventions that seek to build social capital for collective action towards addressing water-related challenges.

The benefits of social capital on individual and population health flow through a number of pathways (Scheffler and Brown, 2008). From the above discussions, there are two major

pathways that link social capital and health within the context of the water-health nexus in LMI countries. These pathways are shown in Fig. 3.1. First, social capital can enhance the implementation and diffusion of water-related behavioural interventions (Briscoe and Aboud, 2012; Wood et al., 2012). These interventions can improve knowledge, behaviours and practices (KAPs) around water-health and lead to improved health and well-being. Second, social capital may tend to facilitate collective action towards addressing water and sanitation issues (Krishna and Uphoff, 2002; Isham and Kähkönen, 2003). These could be in areas related to improved access to facilities and/or sustainable management of facilities and water resources etc. Further, the framework has a feedback mechanism whereby health and well-being influences social capital through the same pathways; that is, collective action and KAPs. Individuals or populations with good health or better living conditions are more likely to adapt water-related behaviour interventions or undertake collective actions to improve their access to safe water and adequate sanitation. The two pathways discussed above are not mutually exclusive but continuously interact. Improved KAPs may motivate collective action to solve water and sanitation issues. At the same time, collective action in water-related activities may influence changes in KAPs.



*Figure 3. 1. A Suggested Conceptual Framework for Understanding the Pathways between Social Capital and Health within the context of the water-health nexus.*

### **3.6 The macro context**

Though our concern is with social capital as a resource for understanding water-health linkages at the community level, investment in social capital may be ineffective if we do not pay particular attention to macro level social, political and economic processes (Pearce and Davey-Smith, 2003). Water resources ownership, management and water-related pollution are

sometimes products of economic and political processes beyond the control of local communities. Social capital under such circumstances may be a useful construct when employed together with theories such as political ecology of health in order to connect large-scale political, economic and social processes to local health and wellbeing with the context of water (Mayer, 1996). Further, decisions related to how water resources are used or managed are influenced by decision-makers and actors with unequal power relationships, authority, and different economic interests. These decisions have consequences for access to safe water for communities in many instances. Thus, engaging with broader issues of power, scale, globalisation are equally important in understanding access to water and sanitation. Though engaging with the macro-level presents an opportunity to understand local environmental and health issues within the framework of external political and social forces, extending the lens to examine how communities manage, cope, or respond to these issues may require some theoretical explanations from social capital.

Further, inequalities in access to safe water and sanitation in many LMI countries are sometimes a reflection of broader inequalities in society (eg. inequalities in incomes and living conditions). As mentioned earlier, there are wide inequalities in access to water both between urban and rural areas and between rich urban areas and urban slums. Understanding these inequalities requires engagements with institutional, political and economic processes that are key determinants in deciding who gets access to water and at what price. Aside from these disproportionate inequalities in access that affects poor areas, some visible minorities and vulnerable populations are excluded from access to safe water and sanitation due to socio-political factors. Thus, the framework proposed above cannot be applied out of context but in

relations to macro-level factors which determine access to water and influences (dis)investments in social capital.

### **3.7 Some methodological issues in operationalisation of social capital**

Though social capital provides a theoretical lens for understanding how social processes and interactions affect the success of water and sanitation interventions, there are numerous acknowledged methodological ambiguities in its measurement and operationalisation (Lynch and Davey Smith 2000; Navaro, 2004). Resolving these methodological challenges may strengthen the application of a social capital based theory in analysis of health and environment/development issues. A fundamental point of contention in the public health literature is whether social capital ought to be considered an individual or group phenomenon. The idea that people can invest in relationships and get beneficial returns in future makes consideration of social capital at the individual level close to its original analogy with more “traditional” notions of capital (economic, cultural, and symbolic capital). Most health studies, however, adopt a communitarian view of social capital in line with the ideas of Putnam (1993). Such studies regard social capital as a neighbourhood, community or regional resource (Subramanian et al., 2003; Veenstra et al., 2005; Wakefield et al., 2007). However, there seems to be general agreement that social capital can be measured at either the individual or area unit depending on one’s conceptualisation and research questions (Kawachi et al., 2008; Harpham, 2008).

Further, translating social capital into valid and reliable measures has proven to be a difficult task over the years. In health literature, indicators such as trust, reciprocity, formal and informal networks, perceptions of social control, and civic participation, have all been used as



measures of social capital (Harpham, 2008; Cattell, 200; Campbell and McLean, 2002). Though trust has been a dominant indicator of social capital in many studies, some researchers have argued that an individual's perception of trust can either be a precursor of social capital or a consequence (outcome) of it, but not actually a part of social capital itself (Lin, 2001). While it is difficult to dismiss such an argument, trust in itself can facilitate collective action or inure to the benefit of those who possess it and therefore could be a valid measure of social capital.

In ecological studies, various community-level indicators have been proposed as indicators of social capital. These indicators include paid newspaper circulation, congregation size and participation in other church related organisations, trade union membership, number of and participation in voluntary organisations, number of blood donations, voter turnout, donations to charities, participation in sporting clubs, savings clubs, parent–teacher associations (De Silva et al., 2006; Putnam, 1995). The extent to which such indicators adequately measure social capital remain contested (Mohan and Mohan, 2002) especially as they may be culturally specific and thus limit comparability. Issues of intra-group power struggles have also been large largely ignored when using such indicators.

While the methodological issues discussed above may affect the measurement of social capital, it is feasible to achieve some form of balance between theoretical relevance and construct validity and reliability in health related studies. A wide range of lessons are offered in the literature (Harpham, 2008; Harpham et al., 2002, 2005; Whitley, 2008; Krishna and Uphoff, 2002; Kawachi et al., 2008). One proposal is for researchers to adopt a mixed-methods (quantitative–qualitative) approach incorporating a broad range of tools to both explain the mediating role of social capital as well as generate in-depth understanding of contextual measures of social capital.

### **3.8 Conclusion**

This paper emphasises that despite the criticisms of social capital, it is a concept that has potential theoretical value to enhance understanding of inequalities in health outcomes and highlight the pathways through which poverty and environmental issues affect health. Importantly, social capital can illuminate differences inherent in collective efforts towards improving the physical environment. Further, the paper emphasises the role of social capital as a key construct in ecosocial theory. Within the context of the water-health nexus, such a conceptualisation serves to reconnect the lack of access to water and sanitation and the resulting health impacts with factors that hinder or facilitate community efforts in addressing such challenges. Thus, a social capital based theoretical analysis of issues related to improving access to water and sanitation and promoting KAPs around water and sanitation within the context of LMI countries is important for both research and policy. Generally, it is also important to (re)emphasise engagement with social theory in environmental health research in order to improve understanding of how social processes affect human health as well as inform the design of theoretically informed health behavioural interventions.

A critical assessment of the different definitions of social capital and methodological application of the concept suggest that policy application of social capital cannot be done in isolation from its theoretical background. There is some danger that current policy discussions, which focus on the beneficial aspects of social capital among groups or community members without addressing differences in status, interests and resources (struggles within fields) may yield minimal results. Further, attempts to build social capital may require an approach that fosters the development of macro level structural institutions that facilitate and encourage civic engagements as well as associational culture. This is more likely to achieve collective action in

LMI countries. Further, key areas of future research include creating understanding of social and environmental factors that drives long-term use and sustainability of water and sanitation interventions. Also, there is a fertile ground for researchers and development practitioners to engage in theoretically informed community hygiene behaviour change interventions that are embedded within existing social structures (Aboud and Singla, 2012).

## CHAPTER FOUR

### Manuscript #2: Social capital, collective action and access to water in rural Kenya

Bisung, E., Elliott, S. J., Schuster-Wallace C. J., Karanja, D. M. and Abudho, B. (2014) Social capital, collective action and access to water in rural Kenya. *Social Science and Medicine*, 119: 147–154

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**Abstract:** Globally, an estimated 748 million people remain without access to improved sources of drinking water and close to 1 billion people practice open defecation (WHO/UNICEF, 2014). The lack of access to safe water and adequate sanitation presents significant health and development challenges to individuals and communities, especially in low and middle income countries. Recent research indicates that aside from financial challenges, the lack of social capital is a barrier to collective action for community based water and sanitation initiatives (Levison et al., 2011; Bisung and Elliott, 2014). This paper reports results of a case study on the relationships between elements of social capital and participation in collective action in the context of addressing water and sanitation issues in the lakeshore village of Usoma, Western Kenya. The paper uses household data (N = 485, 91% response rate) collected using a modified version of the social capital assessment tool (Krishna and Shrader, 2000). Findings suggest that investment in building social capital may have some contextual benefits for collective action to address common environmental challenges. These findings can inform policy interventions and practice in water and sanitation delivery in low and middle income countries, environmental health promotion and community development.

## 4.1 Introduction

With the 2015 target date for the Millennium Development Goals (MDG's) fast approaching, progress in water and sanitation in sub-Saharan Africa presents mixed results. Whereas encouraging progress has been made in access to water, many countries (69) are off track in meeting the sanitation target. Approximately 644 million people do not have access to improved sanitation and 1 billion practice open defecation (WHO/UNICEF, 2014). The lack of access to safe water and adequate sanitation places significant health and socio-economic burden on households and governments (Cheng et al., 2012; Bisung and Elliott, 2014). Further, the health and social burdens resulting from lack of access to safe water and adequate sanitation are spatially and socially differentiated at the global, regional, national and local levels. The impacts are particularly felt by rural populations, urban slum dwellers, women and children (WHO/UNICEF, 2014). In order to achieve progress in meeting the water and sanitation needs of rural dwellers, investments and infrastructural development need to be accompanied by individual and community willingness to introduce self-supply as an interim strategy to scale up service and incrementally achieve the right to water and sanitation within context of low resource settings. Additionally, difficulty of changing water related practices requires an in-depth understanding of social and cultural resources necessary for community mobilisation and diffusion of behavioural interventions (Aboud and Singla, 2012). Although there are other barriers – aside from financial barriers – to improving access to and sustainability of water and sanitation interventions, studies have shown that the inability of communities to collectively initiate interventions and/or manage water and sanitation facilities could be a major factor that inhibits efforts towards addressing rural water and sanitation challenges (Isham and Kähkönen, 2002; Levison et al., 2011). Increasingly, the success of community based water interventions depends on the social and cultural acceptability of technological options, capacity of local

communities to operate and manage water systems, and the broader formal and informal institutional arrangements for water and sanitation delivery at both the central and local levels of government.

Generally, communities have an enormous role to play to ensure the effectiveness of both the implementation and management of water and sanitation facilities. In many rural areas, community members are increasingly expected to collectively choose the type and level of services they can manage, contribute cash or labour during construction, and participate actively in on-going operation and maintenance of systems. However, a major challenge for many communities is how to overcome barriers to achieving mutually beneficial cooperative ways of meeting these expectations – i.e. collective action. As noted by Ostrom and Ahn (2007:6), achieving collective action is not usually an easy task because people who decide not to cooperate with others are “always better off in the short-run”. While “first generation” collective action theories argue that in the absence of regulation by an external authority and privatisation, individuals cannot achieve mutually beneficial collective outcomes independently ( Hardin, 1968), there has been compelling evidence that decisions on whether or not to cooperate with others to achieve a collective goal are not made independently but within the context of pre-existing social relations, networks and institutions ( Robbins et al., 2010; Ostrom and Ahn, 2007). These decisions are embedded in formal and informal institutions as well as rules and social norms that guide people's expectation of one another's behaviour, leading to orderly use of common resources or collective actions to address environmental problems (Robbins et al., 2010; Ostrom and Ahn, 2008). Thus, there have been attempts to link social capital – defined as features of social structures and relations such as interpersonal trust, norms of reciprocity and

mutual aid that facilitate collective action (Coleman, 1988; Putnam, 1993) – with environmental collective action for protecting health and well-being.

Within the context of water and sanitation, Bisung and Elliott (2014) suggest that social capital could enhance the diffusion and adaptation of water-related behavioural interventions and facilitate collective action in areas related to management of water resources and facilities, thus influencing/improving health and wellbeing. Further, continuous adaptation and success of some traditional water conservation and management systems in dryland areas such as Qanat in Syria, Zarh-Karez in Pakistan and Khattara in Morocco lie in strong social bonds, social cohesion, mutual trust and homogeneity of communities (Khan, 2008; Oshima, 2008; Wessels, 2008). While early empirical investigations of determinants of environmental collective action focused on environmental concerns and socio-demographic characteristics (Finger, 1994; Lober, 1995), recent work has shown that social capital could potentially play a mediating role between these factors and environmental collective action (Wakefield et al., 2001; Wakefield et al., 2007). In particular, Wakefield et al. (2007) investigated the relationships between social capital and collective action around outdoor pollution in Hamilton, Ontario and suggest that social capital is a primary determinant of collective action, potentially even more important than environmental concerns and socio-demographic characteristics of residents. Similarly, Krishna and Uphoff (2002) associated social capital with better development outcomes resulting from collective management of social conservation projects and water resources in Rajasthan, India. Further, in the area of biodiversity conservation, features of social capital such as trust, common rules, norms, sanctions, and connectedness in groups are seen as necessary resources for facilitating positive individual and collective actions (Pretty and Smith, 2004).

While the literature exploring the relationships between social capital and environmental collective action is expanding, there are opportunities for further work especially in relation to social capital and collective action within the context of access to water and sanitation in marginalised communities for a number of reasons. Firstly, the social context within which collective action takes place is generally not adequately explored in current literature. For example, relations of power, gender differences, inequalities, community conflicts and social status are social issues that may influence participation in collective action among individuals/households with high levels of social capital. Secondly, while investigations have associated social capital with collective action, the determinants of collective action in relation to risks from environmental concerns such as unsafe water and inadequate sanitation have largely been unexplored, more particularly in a low resource context.

This article aims to explore the role of social capital in collective action for addressing local water and sanitation challenges. The study is part of an on-going Knowledge, Attitudes, Practices, Empowerment, (KAPE) project headed by the United Nations University Institute for Water, Environment and Health (UNU-IWEH) in the Lake Victoria Basin, Kenya, that among other objectives, aims to develop community-based decision-support tools for understanding the physical and socio-economic contexts within which local communities work towards addressing their water and sanitation challenges. Thus, this article aims to establish a knowledge base for community mobilisation and collective action related to social capital as a pre-condition for environmental collective action. More specifically, the study aims to answer the following questions: (a) what are the socio-demographic and environmental determinants of collective action? (b) what role do socio-economic differences play as potential determinants of collective action? and (c) what role does social capital play in mediating between these relationships?



## 4.2 Research context

Based on on-going research work and collaborations with the Kenya Medical Research Institute (KEMRI), Usoma, a community located on the shore of Lake Victoria in North Western Kenya was taken as a case study (See Fig. 1.1). Lake Victoria is the second largest freshwater lake in the world after Lake Superior of the Laurentian Great Lakes of North America. The Lake Victoria basin is shared by five countries that include Kenya, Tanzania, Uganda, Rwanda and Burundi. Regionally, the lake is an important resource for domestic water provision as well as agricultural, transportation, industrial and tourism development. However, changing conditions in the lake such as pollution and invasion of water hyacinth have affected its traditional uses (Mailu, 2001). Usoma is located about fifteen kilometres from Kisumu – the third largest city in Kenya – and is under the Municipal Council of Kisumu. Overall, about 65% of residents in Kisumu have access to improved sources of water and 35% use water from unimproved sources including open wells, streams, ponds and water vendors (Maoulidi, 2010). However, access to water and sanitation in informal settlements and peri-urban areas is quite different. With regards to Usoma, the majority of the population use water from Lake Victoria for their cooking and other domestic needs and open defecation is widespread due to the lack of sanitation facilities. Most economic activities in the village are also centred on the lake. Specifically, the majority of the population is involved in fishing and sand harvesting. These activities result in high prevalence of water-related diseases such as schistosomiasis. In terms of health care, the community is served by a dispensary that provides their primary health care needs. From earlier qualitative studies, most community members understood the direct links between environmental conditions in the village and their health; however, lack of trust among community members was identified as the major barrier to collective action and community mobilisation to address these

water related challenges (Levison et al., 2011). As a follow-up to these findings and interventions by the UNU-INWEH, a social capital based study was designed to explore the relationship between access to water, individual and household characteristics, social capital and collective action.

## **4.3 Methods**

### ***4.3.1 Data collection***

The primary survey instrument used for this study was a locally modified version of the Social Capital Assessment Tool (SOCAT) household questionnaire. The SOCAT is an instrument developed by the World Bank for measuring levels of social capital over time in relation to other development indicators at the community level (Krishna and Shrader, 2000). The SOCAT has been used to study social capital and water resources management in Rajasthan, India. An adapted version – Adapted Social Capital Assessment Tool (A-SOCAT) – has also been used to study mental health in Columbia (Harpham et al., 2004) and women's health in sub-Saharan Africa (Thomas, 2003). To make the SOCAT contextually relevant for our study, the following modifications were made to the instrument: firstly, water and sanitation categories were modified to reflect locally available sources of water and sanitation facilities; secondly, due to time constraint, we eliminated extensive community mapping and genogram for each household; thirdly, we eliminated questions about political and religious participations as we felt they were sensitive to investigate in the community; finally, because the village was relatively small and most residents were of the Luo ethnic group, questions of ethnicity and neighbourhood were removed. The survey was administered to every household head in the community between June and August, 2013 with a response rate of 91%. This represented 452 households, a total of

2131 individuals. The survey was administered in a language chosen by respondents (either English, Luo or Swahili). The questionnaires were administered by two trained undergraduate students who were fluent in all three languages. The instrument was translated into Luo and Swahili by three researchers from KEMRI and was pre-tested for face validity on nine respondents on the first day of data collection. Each survey took an average of 46 min to complete. All questions were focused on socio-demographic characteristics of the household head, access to water and sanitation and individual social capital. Ethics review and approval was obtained from University of Waterloo Ethics Review Board and the Ethics Review Committee of KEMRI (SSC Protocol No. 2468).

#### ***4.3.2 Data analysis***

The outcome measure – participation in collective action – was assessed using the following question: “how often in the past year have you joined together with others to address a common issue related to water and sanitation in the community.” These common issues included contributing labour for construction of a village water and sanitation facility, attending village water committee meetings and contributing cash to a village water and sanitation committee. In our analysis, we first performed bivariate analysis to identify water access and socio-demographic variables significantly related to participation in collective action. The results are shown in Table 4.1. Second, we utilized Principal Component Analysis (PCA) with varimax rotation to drive independent dimensions of social capital from all social capital variables. We chose this rotation because its solution to data reduction discriminates between theoretical constructs and gives higher loads to fewer indicators (De Silva et al., 2006; Hurtado et al., 2011). After interpretation of components based on indicators with high loads on a common factor, we

created three additive indices of social capital: informal support networks index, formal support networks index and trust index. The component interpretations were based on expositions by Krishna and Shrader (2000) and De Silva et al. (2006). From Table 4.3, items T1–T3, N1–N3, N4–N6 were used to construct trust index, formal support network index and informal support network index respectively. Following evidence from measurement of social capital in Nicaragua by Mitchell and Bossert (2007), degree of involvement in groups was excluded from PCA as respondents that did not belong to any group could not respond to their degree of involvement. However, we created a group membership index based on breadth and depth of group involvement (Veenstra et al., 2005); that is, using number of group memberships for each household head and the corresponding degree of participation. A score of 0, 1 and 2 were assigned to no membership, membership in one group and membership in two groups respectively. Respondents were also assigned 1 and 0 respectively for being a leader/active in a group and being somewhat/not active in a group. These scores were combined to form an index of group membership for each household head. We further created an additive index of exclusion for socio-economic differences that tend to divide people in the community. This index was constructed using responses to the question; “to what extent do differences such as the following [wealth/material possession, landholding, social status and gender] tend to divide people in the community”. Only one component was extracted with Eigen value greater than 1. (See Appendix A.1 for PCA results used to construct the exclusion index.)

Table 4.1 Environmental and socio-demographic characteristics of respondents by participation in collective action

Variable		No. (%)	No Collective Action 197 (44%)	Collective Action (one – three times) 255 (56%)
<i>Water and sanitation</i>				
Water for cooking	Lake**	172 (38)	63 (37)	109 (63)
	Other sources	280 (62)	134 (48)	146 (52)
Water for other domestic uses	Lake*	389 (86)	161 (41)	228 (59)
	Other sources	63 (16)	36 (57)	27 (43)
Sanitation facility	Open defecation	189 (42)	92 (49)	97 (51)
	Use of facility*	263 (58)	105 (40)	158 (60)
<i>Socio-demographic</i>				
House Ownership	Rented/Squatter/others	147 (33)	72 (49)	75 (51)
	Family owned*	305 (68)	125 (41)	180 (59)
Children in household	No child	81 (18)	37 (46)	44 (54)
	One or more children*	371 (82)	160 (43)	211 (57)
Gender	Male	241 (53)	102 (42)	139 (58)
	Female*	211 (48)	85 (40)	126 (60)
Years lived in Usoma (Mean = 13 yrs)	Up to 13yrs	195 (43)	76 (39)	119 (61)
	More than 13yrs*	257 (57)	121 (47)	136 (53)
Age	15yrs- 34yrs	237 (53)	113 (48)	124 (52)
	35yrs-54yrs*	159 (35)	64 (40)	95 (60)
	55yrs+	56 (12)	19 (34)	37 (66)
Marital status	Single/divorced/widowed	135 (30)	58 (43)	77 (57)
	Married	317 (70)	139 (44)	178 (56)
Education	Up to primary	316 (70)	138 (44)	178 (56)
	Above primary	136 (30)	58 (43)	78 (57)

\*p < 0.05; \*\*p < 0.01; \*\*\*p < 0.001

Finally, we used binary logistic regression models to determine the predictors of non-participation/participation in collective action related to water. Four models were constructed as shown in Table 4.4 and Table 4.5; in Model 1, access to water and sanitation and socio-demographic variables significantly associated with collective action were entered simultaneously. Model 2 included indices of social capital and exclusion index simultaneously. Model 3 and 4 further explored determinants of collective action among males and females separately. This was particularly important as lack of access to water and sanitation has different impacts for males and females and these impacts could influence participation in water related collective action differently (Bisung and Elliott, 2014).

#### **4.4 Results**

Table 4.1 presents respondent characteristics used in the study. Sources of water were dichotomized into lake water versus other sources. Thus, if a household did not use lake water, they were not as sensitised to/impacted by the health challenges associated with the use of lake water. The other sources included tap water located approximately 3 km away from the community, pond and wells. The majority of households (86%) used lake water for domestic uses and 42% practiced open defecation. In terms of age, most respondents (63%) were between 15 and 34 yrs and most were married (70%). Table 4.2 presents social capital indicators used in our analysis. Detailed descriptions of these social capital indicators are provided by Krishna and Shrader, (2000); Krishna and Uphoff, (2002) and De Silva et al. (2006).

Table 4.2 Social capital characteristics of respondents by participation in collective action

Social capital		No. (%)	No Collective Action 197 (44%)	Collective Action (one – three times) 255 (56%)
Group membership	No group membership	279 (62)	137 (49)	142 (51)
	Membership in 1 group	16 (4)	7 (46)	9 (54)
	Membership in 2 groups**	153 (35)	44 (30)	109 (70)
Degree of participation <sup>a</sup>	Not/somewhat active	65 (38)	23 (35)	42 (65)
	Active/leader**	104 (62)	34 (33)	70 (67)
Trust	Trust in finding lost property <sup>*</sup>	263 (58)	118 (45)	145 (55)
	People are basically honest <sup>*</sup>	384 (85)	160 (42)	224 (58)
	More trustworthy <sup>*</sup>	287 (64)	126 (44)	161 (56)
Who will get together to find a solution if the primary school went without a teacher for about six month?	Entire village**	196 (43)	68 (35)	128 (65)
	Village association**	131 (29)	36 (27)	95 (73)
	Local government	39 (9)	10 (26)	29 (74)
Who will get together to find a solution if a problem (eg. animal disease outbreak) occurred in the community?	Each household will act individually** <sup>b</sup>	303 (67)	110 (36)	193 (64)
	Community leaders <sup>**</sup>	270 (60)	99 (37)	171 (63)
	Government/political leaders <sup>*</sup>	25 (10)	10 (26)	25 (74)
<i>Exclusion and cohesion</i>				
To what extent do differences in the following tend to divide people in the community?	Wealth (very much/somewhat)	188(41)	76(40)	112 (60)
	Landholding (very much/somewhat)	198(43)	87(44)	109 (56)
	Social status (very much/somewhat)	189(42)	82 (43)	107 (57)
	Gender (very much/somewhat)	353 (78)	162 (46)	191 (54)
Is the community generally peaceful?	Yes**	250 (55)	98 (39)	152 (61)

\* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$

<sup>b</sup> Variable reverse coded so that high score will indicate more social capital.

<sup>a</sup> Applicable to a subset of respondents (only those with group membership)

Bivariate analysis showed that, with the exception of education and marital status, all socio-demographic variables were significantly associated with collective action. Females, respondents who had lived longer than the average length of stay (13 yrs) and households with children were associated with participation in collective action. In terms of water and sanitation access, respondents who used lake water for cooking as well as those who used lake water for other domestic purposes were associated with collective action. Further, all social capital indicators exhibited positive significant relations with collective action (meaning that respondents with those social capital attributes were significantly likely to participate in collective action). With respect to social exclusion, none of the differences showed significant association with collective action. However, perception of a peaceful community was significantly associated with collective action.

#### ***4.4.1 Social capital indices***

Results from the PCA are presented in Table 4.3. Though many researchers conceptualise group membership, formal and informal support networks as structural dimensions of social capital, our results reveal that these dimensions may have distinct underlying factors. With the exception of support from the village association, all other indicators of structural social capital loaded distinctively on a single construct. Perceptions of support from the village association however appeared to be positively related to two underlying factors; group membership and formal networks. This is not surprising as respondents with membership in the village association may tend to have perceptions of support from that association. All the indices had an acceptable reliability: Cronbach's alpha for trust index, informal support networks index and



formal support networks were 0.80, 0.70 and 0.60 respectively. The exclusion index had a Cronbach's alpha of 0.60.

Table 4.3. Principal component analysis and rotated component matrix

	Item	Component 1 structural- informal	Component 3 cognitive- trust	Component 2 structural- formal	Component 4 structural- group membership
M1	Membership in one group	0.067	-0.030	0.004	0.98
M2	Membership in two groups	0.068	-0.32	0.01	0.878
N1	Perceived support from political leaders	1.115	-0.137	0.742	-0.133
N2	Perceived support from local government	-0.090	0.049	0.674	-0.041
N3	Perceived support from village association	0.023	0.005	0.61	0.336
N4	Each household acts individually	0.924	-0.087	0.099	0.078
N5	Perceived support from community leaders	0.886	-0.048	-0.224	0.158
N6	Entire village acts together	0.544	0.167	0.086	-0.48
T1	Trust in finding lost property	-0.011	0.838	-0.036	-0.058
T2	Believe that others are honest	-0.035	0.915	0.006	-0.013
T3	Believe that village members are trustworthy	0.108	0.703	-0.035	0.007
	Percentage of variance explained	17.9	19.1	13.1	18.9

#### ***4.4.2 Access to water, socio-demographic characteristics and collective action***

The final logistic regression models capturing relationships between various independent variables and collective action are shown in Table 4.4 and Table 4.5. We present the Odd Ratios (exponent beta) of the models, which may be interpreted as the estimated likelihood/odds of change in collective action as a result of a unit change in the independent variable. From Model 1, respondents who used other sources of water for cooking and for domestic uses were less likely to participate in collective action than those who used lake water. The interaction term “water for cooking–sanitation facility” was also associated with collective action. That is respondents who used other sources of water for cooking (i.e. not lake water) and used a sanitation facility were more likely to participate in collective action. With regards to socio-demographic characteristics, respondents who lived in the community beyond 13 yrs and females living in their own homes were less likely to participate in collective action. Further, the following interaction terms: females between 15 and 34 yrs, and home owners who had lived in the community beyond 13 yrs were more likely to participate in collective action. Marital status and education were not included here, as they were not statistically significant in the bivariate analysis. Upon inclusion of social capital variables in Model 2, only “other sources” of water for cooking was significantly associated with collective action. All other socio-demographic variables that were significantly associated with collective action in Model 1 became non-significant, with the exception of the interaction term female–Age (35–54) which was marginally 3.291 (95% CI 0.0889–12.191,  $p = 0.075$ ) significant.

Table 4.4 Determinants of collective action in binary logistic regression.

	<b>Model 1</b>	<b>Model 2</b>
	Adjusted OR (CI)	Adjusted OR (CI)
<b>Water and sanitation</b>		
Water for cooking (lake)	0.380 (0.200–0.721)**	0.255 (0.103–0.629)**
Water for domestic uses (lake)	0.515 (0.281–0.944)*	1.170 (0.480–2.848)
Sanitation facility	0.790 (0.408–1.528)	0.758 (0.297–1.934)
Water for cooking (lake)*sanitation facility	3.601 (1.548–8.373)**	2.164 (0.664–7.055)
<b>Socio-demographic characteristics</b>		
Age 15–34 yrs (ref)	–	–
35–54 yrs	0.663 (0.336–1.307)	0.834 (0.320–2.171)
55 yrs+	0.678 (0.265–1.734)	1.027 (0.256–4.130)
Lived 13 yrs+ in village	0.372 (0.165–0.839)*	0.522 (0.182–1.498)
Gender (male)	1.491 (0.693–3.208)	1.888 (0.665–5.363)
Own home	1.486 (0.501–4.407)	1.219 (0.288–5.170)
Household with children	1.075 (0.625–1.849)	1.241 (0.570–2.701)
Own home*female	0.347 (0.129–0.934)*	0.331 (0.081–1.355)
Own home*lived 13 yrs+ in villages	2.671 (1.009–7.066)*	2.615 (0.692–9.882)
Female*age (15–34 yrs)	3.973 (1.557–10.138)**	3.291 (0.889–12.191)
Female*age (35–54 yrs)	3.009 (0.797–11.359)	1.929 (0.245–15.193)
<b>Social capital</b>		
Group membership & support index	–	1.362 (1.095–1.695)**
Informal networks & support index	–	0.622 (0.346–1.116)
Formal networks & support index	–	1.176 (0.547–2.529)
Trust index	–	2.141 (1.224–3.743)**
<b>Social cohesion</b>		
Index of exclusion	–	0.902 (0.649–1.254)
Perception of peaceful community	–	1.383 (1.189–2.778)**
Constant	1.783	0.868
Sensitivity %	80	81
Specificity %	51	62
Correctly classified %	68	73

Table 4.5 Determinants of collective action for males and females in binary logistic regression.

	<b>Model 3- males</b>	<b>Model 4- females</b>
	OR (CI)	OR (CI)
<b>Water and sanitation</b>		
Water for cooking (lake)	0.711 (0.259–1.949)	0.314 (0.114–0.866)*
Water for domestic uses (lake)	0.611 (0.262–1.427)	0.213 (0.057–0.800)*
Sanitation facility	1.532 (0.554–4.238)	0.486 (0.173–1.366)
Water for cooking (lake)*sanitation facility	1.862 (0.517–6.703)	3.602 (0.916–14.161)*
<b>Socio-demographic characteristics</b>		
Age 15–34 yrs (Ref)	–	–
35–54 yrs	3.221 (1.525–6.801)**	0.441 (0.192–1.014)*
55 yrs+	1.950 (0.700–5.433)	1.019 (0.276–3.771)
Lived 13 yrs+ in village	0.874 (0.425–1.795)	0.605 (0.272–7.762)
Own home	1.219 (0.582–2.549)	2.798 (1.009–7.762)*
Household with children	0.936 (0.427–2.051)	1.629 (0.500–5.307)
Education (less than primary)	0.785 (0.208–2.965)	3.482 (1.539–7.881)**
Married (single)	0.276 (0.034–2.249)	4.923 (0.998–24.298)*
Married*more than primary education	1.638 (0.403–6.647)	1.211 (0.067–1.664)**
<b>Social capital</b>		
Group membership & support index	1.117 (0.882–1.414)	1.512 (1.177–1.941)***
Informal networks & support index	1.337 (1.054–1.695)*	1.132 (0.866–1.479)
Formal networks & support index	0.802 (0.579–1.112)	0.817 (0.386–1.438)
Trust Index	3.029 (1.349–6.804)**	1.004 (0.701–1.438)
<b>Social cohesion</b>		
Index of exclusion	0.828 (0.580–1.183)	0.817 (0.524–1.275)
Perception of peaceful community	1.409 (0.193–1.865)*	0.566 (0.227–1.410)
Constant	1.447	0.261
Sensitivity %	81	77
Specificity %	56	61
Correctly classified %	69	70

#### ***4.4.3 Social capital, social cohesion and collective action***

With regards to social capital indices, Model 2 suggests that a high group membership index and trust index were significantly associated with the odds of participating in collective action. However, neither informal nor formal support network indices were significantly associated with collective action. With regards to association between community social cohesion and collective action, respondents who held perceptions of a peaceful community were more likely to partake in collective action than those who perceived the community to be conflictive. Though the difference index was not associated with collective action, further investigation introducing every difference variable independently revealed that respondents with perceptions of differences in landholding 0.513 (95% CI 0.288–0.914,  $p = 0.023$ ) and social status 0.611 (95% CI 0.314–1.189,  $p = 0.045$ ) were less likely to participate in collective action.

#### ***4.4.4 Gender dimensions***

Models 3 and 4 included education and marital status for two reasons. Firstly, marital status was significantly associated with collective action among females in the bivariate analysis. Secondly, education has been found to be a predictor of environmental collective action in other studies (Wakefield et al., 2007). Collective action was more likely to be found among females with home ownership, educated above primary school and those who were married. However, with the exception of age (35–54 yrs), none of the socio-demographic characteristics nor water access variables were significantly associated with collective action among males. Further, collective action was more likely to be found among males with high informal networks support index, high trust index and perceptions of a peaceful community whilst high group membership index was a predictor for collective action among females. Finally, though the exclusion index

was not associated with collective action in either gender category, further exploration revealed that perceptions of differences in landholding 0.369 (95% CI 0.173–0.790,  $P = 0.010$ ) and social status 0.477 (95% CI 0.219–0.914,  $p = 0.023$ ) were significantly associated with collective action among females and males respectively. Respondents who held these perceptions were less likely to engage in collective action.

#### **4.5 Discussion**

In the management of common property resources such as grazing lands, water resources and irrigation systems, collective action has become an important alternative to privatization or state regulation, especially in rural settings (Ostrom and Ahn, 2007). In Kenya there has been a long tradition of mutual help and collective action which still manifests in local events called Harambee (people working together in social groups to achieve a common goal). These mutual support groups and cooperatives continue to play an important role in providing safety nets for households and are important avenues for community mobilisation. Our study emphasises the important role of social capital features in community mobilisation and collective action. For example, availability of transparent and active groups could provide an avenue for people to come together to address common environmental issues. With regards to cognitive social capital, trust in other community members is most likely to predispose people to join in communal activities thereby increasing the possibility of engaging in environmental collective action.

Through this study, it became clear that social capital may be necessary but not sufficient for improving access to water and sanitation in marginalised communities. Our findings support earlier suggestions that environmental challenges in marginalised communities are outcomes of structural inequalities in distribution of resources but not necessarily the absence of social capital

(Wakefield et al., 2007). Within the context of water and sanitation, there are many power and social structures that determine how water resources are managed or who gets access to water and at what price (Swyngedouw, 2009). These structures could work against the interests of marginalised communities. Thus, policy assumptions that social capital may provide a less costly way for marginalised communities to improve their wellbeing need to recognise that material deprivation and inequalities in resource distribution are equally significant policy considerations for improving health and wellbeing in such communities.

Though early empirical investigations showed little association between environmental concerns and collective action (Finger, 1994; Lober, 1995), our findings suggest that environment concerns could be major reasons for people's engagement in environmental collective action. Firstly, in Model 1, respondents with access to “relatively improved” sources of water for cooking and other domestic purposes were less likely to participate in collective action than those who used lake water. Secondly, comparing our models for males and females, it was not surprising that these environmental concerns (using water from the lake) were significantly associated with collective action among females but not males. This is because women typically bear the greatest burden for providing water for households (Watt and Chamberlain, 2011) and are equally at risk from both health and social challenges associated with water collection from the lake. Aside from environmental concerns, our gender exploration also revealed interesting socio-demographic determinants of collective action among males and females. Particularly, education and marital status were associated with collective action among females but not among males. Perhaps, these differences could be potentially due to the social construction of gender and the roles, opportunities and expectations associated with being a female. Thus, individual characteristics within males or females can (re)produce privileges and

exclusion in a variety of ways that may affect participation in environmental collective action (Bisung and Elliott, 2014).

Our study also presented interesting associations between support networks and collective action that calls for a rethinking of the inclusion of social support networks as a feature of social capital that can facilitate collective action at the individual level. From Model 2 neither informal nor formal support networks were associated with collective action. In the public health literature, a vast amount of literature has empirically linked social capital to various health outcomes via variations in social support networks (Szreter and Woolcock, 2004). However, an important contribution of social capital as noted by Kawachi et al. (2004) lies in its potential to account for the influences of the collective on the individual. Our findings suggest that social support networks could be lacking this collective ingredient of social capital necessary to facilitate collective action. However, with regards to water related interventions, social support networks may still be important for uptake and diffusion of water-related behavioural interventions in developing countries (Wood et al., 2012; Briscoe and Aboud, 2012).

There are important inherent strengths and key limitations of our study worth mentioning. First, by using multiple indices of social capital, we were able to perform a detailed assessment of how various dimensions of social capital are related to environmental collective action at the individual level. Second, by including these various indices in one model, we reduced threats to validity through the omission of potential confounding social capital indices – a recognised limitation of many social capital studies (Kim and Kawachi, 2006). Finally, by grouping the various social capital indicators into indices, we reduced potential threats to validity through multicollinearity of the social capital indicators. In terms of limitations, firstly, as with many social capital studies, causality could not be established in this study. It is possible that there



could be some feedback mechanisms or reverse causality between collective action and social capital. For example, a respondent could have high trust because he/she participates in collective action. Secondly, the study measured social capital and collective action of the household head and not all members of the household. We recognise that collective action by the household head could be influenced by other household member's social capital. Finally, the sources of water and household sanitation facility could not be verified to ascertain how safe or adequate these were for protecting human health. For example, with regards to sanitation, we dichotomized responses into open defecation/use of facility. However, the facilities category included some pit latrines which may not be adequate for protecting human health.

#### **4.6 Conclusion**

The findings established in this study contribute to the current literature on the mediating role of social capital in achieving environmental collective action. Firstly, our inclusion of various exclusion variables offers new evidence with regards to the role of community structural differences in collective action. In this regard, engagement with Bourdieu's (1986) conceptualisation of social capital in relations to how other forms of capital (cultural, economic and symbolic) are utilised to achieve individual and/or environmental goals may be very promising for future research. In terms of policy, interventions that aims to build social capital and/or achieve collective action requires due attention to differences or inequalities that makes others feel excluded from the community. From our study, landholding, social status and perceptions of a peaceful community emerged as very important factors. These are community structural differences and factors that may affect efforts in achieving community driven initiatives. Further, our study underscores the importance of arguments that differences in health

outcomes are fundamentally rooted in inequalities in access to material and social resources (including water and sanitation facilities). Thus, we (re)emphasise concerns that focussing policy attention on building social capital without due consideration to political and ideological process that produces inequalities in access to social services may not yield desired health outcomes.

With regards to methodological contributions, though a number of tools (e.g. Adapted – Social Capital Assessment Tool and Social Capital Assessment Tool) have been developed to guide empirical measurement of social capital in different cultures, their application in developing countries and more especially to environmental health issues remain limited. Our study contributes to current literature on the application of the SOCAT and in particular, its application to collective action in water related collective action. More interestingly, we were able to use the instrument together with other research techniques within an existing research project. As suggested by De Silva et al. (2006) validation of social capital tools such as SOCAT and SASCAT is a progressive process that requires varying approaches in different studies and cultural context. We hope other researchers will continue to apply these tools for further methodological development and measurement of social capital in varying cultural contexts.

Finally, we conclude by (re)emphasising the relevance of social capital in environmental collective action especially in marginalised communities. While cognitive social capital could predispose people towards cooperative behaviours thus enforcing collective efficacy and collective action (Hurtado et al., 2011), structural social capital could facilitate collective management of common environmental resources, grassroots' accountability, capacity building and mobilisation. In terms of policy development and environmental health promotion, binding environmental policies and interventions to social capital could facilitate collective agreements, consensus building and community ownership of interventions.

## CHAPTER FIVE

### **Manuscript #3: Dreaming of toilets: Using photovoice to explore knowledge, attitudes and practices around water–health linkages in rural Kenya**

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Dreaming of toilets: Using photovoice to explore knowledge, attitudes and practices around water-health linkages in rural Kenya. *Health and Place*, 31, 208 – 215

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**Abstract:** As part of a knowledge, attitudes, practices and empowerment (KAPE) project implemented by the United Nations University Institute for Water, Environment and Health (UNU-INWEH) in the Lake Victoria Basin, this paper reports findings from a photovoice study with women in Usoma, a lakeshore community in Western Kenya. Drawing on ecosocial and political ecology theory, findings reveal that access to water, perceptions and practices were shaped by ecological and broader structural factors. Further, collective actions to improve access were constrained by institutional and economic structures, thus (re)enforcing inequalities.

## 5.1 Introduction

For over half a century now, there have been significant global initiatives and a developing political consensus to improve access to safe water and basic sanitation. Beginning in 2000, the Millennium Development Goals (MDGs), particularly those related to water, became the major global agenda with targets and benchmarks for improving access to water and sanitation (UNDP, 2003). Due to the interconnected and mutually reinforcing nature of the MDGs, it is widely agreed that achieving the water and sanitation MDG targets is key to achieving the other MDGs (Mehta and Knapp, 2004). For example, achieving water related MDGs is regarded as key to reducing child and infant mortality (MDG 4), pre and postnatal risks (MDG 5) as quantified by Cheng et al., (2012) and prevention of vector borne diseases such as malaria (MDG 6C). Further, with the sunset of the MDGs in 2015 and the continued need to improve access to drinking water for 700 million and sanitation for 2.5 billion people, the world is currently discussing post-2015 within the context of sustainable development goals (SDGs). Desired outcomes from the proposed water goal – i.e. universal access to water, sanitation and hygiene by 2030 – under the proposed SDGs include improved maternal and child health, improved nutrition and better educational outcomes for girls (UN Water, 2014).

In attempts to understand the complex linkages between water and health, an important strand of research in health geography has been studies that examine the environmental, social and political processes that simultaneously shape disease patterns within the context of water. These studies have explicitly invoked the political ecology of health framework (Mayer, 1996) as well as ecosocial theory (Krieger, 2011) as integrative approaches to elaborate conceptual connections between broader environmental and socio-political processes – at various levels – and water-related disease distribution. For example, through an examination of a cholera outbreak in the Marshall Islands between 2000 and 2001, Yamada and Palmer (2006) concluded

that the outbreak could be considered a biological embodiment of political, social and economic conditions as well as ecological imbalances. Though lack of water was a major cause of the outbreak, other socio-political conditions such as; overcrowding due to displacement of populations for US nuclear activities, poor living conditions, and social differences between land owners and the landless, were seen as major precursors. Similarly, Hunter (2003) demonstrates links between construction of agricultural dams and schistosomiasis in the Upper East Region of Ghana. A combination of ecological, political, economic and social factors were regarded as main catalysts for the construction of the dams and the subsequent unpredictable disease outbreaks (Hunter, 2003). Echoing similar conclusions through his work on cholera and bacillary dysentery in Mozambique, Collins (2002) suggested that changes in patterns and processes of change in diarrhoeal incidence were shaped by changing environmental and societal factors that affected the ecology of the disease as well as overall development trajectory and livelihood security. More recently, Mulligan et al. (2012) drew attention to connections between economic transformation, urbanisation, urban planning and dengue fever in Putrajaya, Malaysia.

Adding to this nascent literature, this paper examines health and well-being in a rural lakeshore community in western Kenya within the context of lack of safe water and adequate sanitation. Specifically, the objectives of this paper are to (a) explore local perceptions and practices around water–health linkages; and (b) to explore how the ecological and socio-political environments shape these perceptions and practices. In doing so, we unpack some of the structural forces that not only drive water challenges in the community but also serve as barriers to community action. This research forms part of the Knowledge, Attitudes, Practices and Empowerment (KAPE) project headed by the United Nations University Institute for Water, Environment and Health (UNU-INWEH) and implemented in collaboration with Kenyan

Medical Research Institute (KEMRI) and local communities in East Africa. The overall goal of the KAPE project is to educate and build capacity of local communities around water and health and empowering evidence informed decision making.

## **5.2 An ecosocial approach to understanding water–health linkages**

This research draws on Krieger's (2011) ecosocial theory to investigate ecological and structural factors that determine water-related health outcomes. Ecosocial theory explicitly incorporates constructs pertaining to political ecology, ecosystems, spatiotemporal scales and embodiment (Krieger, 1994; 2011). In integrating these constructs, we examine how socio-political processes, economic structures and ecologic settings together shape practices around water, access to water and economic activities in the Lake Victoria Basin. We give particular attention to two core constructs (embodiment and accountability and agency) of ecosocial theory. Embodiment literally refers to how humans incorporate, biologically, their lived experiences, in societal and ecological contexts (Krieger, 1994). Embodiment requires understanding of the different social processes and circumstances that become “embodied” to generate disease profiles, health and well-being. With regards to water, engagement with these social process and structures is important as inequality in access is increasingly an outcome of mutually constituted interplay between geographical conditions, technology and socio-political arrangements in society (Bisung and Elliott, 2014; Swyngedouw, 2009).

Accountability and agency directs attention to factors that (re)enforce inequalities in water access and the ways these inequalities are addressed. This construct also directs attention to institutional and individual capacity to take action (agency) to improve access and the need to take responsibility (accountability) for any (in)actions. The many instances of individuals and

community groups undertaking water and sanitation interventions or countering injustices in water delivery systems underscores the importance of accountability and agency. For example, the successes of community led total sanitation projects in Africa, Asia and the Middle East (Kar and Pasteur, 2005) and the well-known water protest, *la Guerra del Agua* in Cochabamba, that led Bolivia's third-largest city to cancel its private water concession contract in 2000 (Murthy, 2013) points to the centrality of human agency and collective actions in improving access. While ecosocial theory considers the role of agency in improving conditions and health, it also recognises that macro-level structural phenomena may sometimes drive or constrain the capacity of individuals or communities to act (Krieger, 2011).

### **5.3 Research context**

This research was undertaken in Usoma, a lakeshore community located about 15 km from Kisumu – the third largest city in Kenya (Fig. 1.1). Based on a household survey implemented as part of the larger research project, the community has approximately 3000 residents. Though located by the second largest freshwater lake in the world, the community had no access to safe water at the time of this study. The nearest safe water source was a tap located about 3 kms away on the premises of a Coca-Cola bottling plant. With regards to sanitation, access to adequate sanitation is significantly lower than Kisumu, with 42% of the population practicing open defecation (Bisung et al., 2014) as compared to 5% in Kisumu (Maoulidi, 2010). Continuous contact with the lake through economic activities such as fishing and domestic water collection has resulted in high incidence of water-borne and other water related diseases. For example, studies reveal high rates of schistosomiasis in the community, with over 90% infection rate among school children (Shane et al., 2011).

There is a strong presence of community groups that have been actively involved in attempting to solve many of the environmental and development challenges in this community. Examples of such groups include the Usoma Beach Management Unity, Usoma Community Health Volunteers, Usoma Water Sanitation and Hygiene Organisation (UWASH), a women's group and youth groups. UWASH was specifically formed to mobilise the community for undertaking water and sanitation interventions. Their efforts have since resulted in the extension of piped water to a vending tap in the community by the Kisumu Water and Sewerage Company Limited (KIWASCO) and the construction of a sanitation facility through financial support from UNU-INWEH, Rotary Club of Hamilton, Canada, and private contributions.

#### **5.4 Methods**

We used photovoice as a participatory action research method to address the research objectives. Photovoice is a relatively new technique built on the principles of social constructivism, community empowerment, education, and documentary photography (Grieb et al., 2013). The concept of photovoice was developed from three main foundations (Wang and Burris, 1994 and Wang and Burris, 1997). First, it assumes that education should start with issues people see as central to their lives and facilitated through active participation and sharing of mutual experience. Second, by drawing on feminist theory and practice, photovoice is meant to empower and ensure adequate participation of vulnerable groups such as women, children and minority groups in community development as well as value the lived experiences of these groups in the production of knowledge. Third, building on the ideas of documentary photography, photovoice is premised on instigating social change through photography by



ensuring that people are not treated as passive participants and images but as active participants in the taking of photographs and discussing the images (Wang and Burris, 1997; Rose, 1997).

#### ***5.4.1 Data collection***

The study was undertaken between June and August, 2013. Eight women participated in the study over the entire period. The sample size was adequate to generate rich information (photographs and narratives) on the phenomenon studied (Miles and Huberman, 1994; Curtis et al., 2000). The number of photographs generated was also manageable for participant's face-to-face interviews and discussions thus providing an opportunity for conceptually relevant thick descriptions (Dennis et al., 2009; Curtis et al., 2000). Women were recruited for this study because they typically bear the greatest burden for providing water for households in most parts of Kenya, do not hold decision-making authority and are equally at risk from both health and social challenges associated with water collection from the lake and other open water sources (Bisung et al., 2014). Using convenience (snowball) sampling (Creswell, 1998), participants were recruited by first identifying two key participants based on past community collaborations. These initial contacts were then asked to suggest other women they felt would have interest in the project. Though participant recruitment was not designed to be representative, it is worth noting that good maximum variation in terms of age, length of stay in the community and occupation evolved (Table 5.1).

Table 5.1 Summary description of participants

<b>Participant's pseudonym</b>	<b>Age (years)</b>	<b>Education</b>	<b>Occupation</b>	<b>Length of stay in the community(years)</b>
Zaaria	28	High school	Unemployed	5
Anita	33	Standard eight	Fish seller	12
Shemima	22	Standard eight	House wife	7
Mary	49	Standard seven	Seamstress	23
Betty	54	High school	Fish seller and a community health volunteer	30
Dorcas	34	Standard eight	Unemployed	6
Wintima	43	Standard eight	Businesswoman	12
Diana	39	None	Housewife	24

#### **5.4.2 Data collection procedure**

Participants were first provided detailed information on the research as well as training in basic photography skills and ethics associated with taking photographs. The training was conducted in DhoLuo (the language widely spoken in the community) and all training manuals and consent forms were also translated into DhoLuo. A Ph.D. researcher from KEMRI was recruited as a research assistant and acted as a translator for the study. After the training exercise, disposable cameras (with 28 exposures each) were given to participants to take photographs of what they felt best represented *attitudes and practices around water and sanitation that influence health in the community*. Participants were allowed to take any number of photographs they felt adequately represented their views. All cameras were retrieved after eight days and the photographs were printed. Overall, participants took between 16–26 photographs. It is however important to note that some of the photographs were not related to the project but rather photographs of participants' household members. One set of pictures was given to each participant as a token of appreciation.

Each participant then chose four photographs that best represented her views. These were used as a basis for discussion in follow-up individual interviews. Thus, thirty-two (n=32) interviews were conducted ranging between 60 and 90 min per photo. During interviews, each participant was generally asked to explain the following regarding the photo: (1) what the photo was and where it was taken; (2) why the photo was important to understanding water–health linkages; (3) how the photo related to health and wellbeing in the community; and (4) what could be done about the issues or challenges highlighted in the photo. After the one-on-one interview sessions, participants were invited to a group discussion. The purpose was to give all participants the opportunity to comment or share their views on the collection of photos in a group setting (Haines-Saah et al., 2013) and also share their experiences with the project. All the interviews and discussions were conducted in DhoLuo.

#### ***5.4.3 Challenges of using photovoice as a methodology***

Photovoice presents a number of ethical challenges because it involves unique relationships between the researcher, the research participants (photographers) and those photographed. Though a number of studies have offered some guidelines and examples on how ethical considerations can be dealt with in photovoice (Wang and Redwood-Jones, 2001; Castleden et al., 2008; Grieb et al., 2013), every photovoice project presents additional ethical challenges because of cultural and contextual differences (Prins, 2010). Following recommendations and examples from Wang and Redwood-Jones (2001) and Castleden et al., (2008), consent and confidentiality, particularly of those photographed was dealt with in the following ways: (1) training was conducted with all research participants to explain the research objectives and the ethical considerations that the researcher and participants needed to ensure;

(2) a community *baraza* (A community durbar or forum where people come to share ideas, thoughts and opinions around issues of importance to the community that require action.) was held to explain the project objectives to the whole community; (3) research participants signed consent forms indicating their responsibilities and agreed to have their photographs used in teaching, scientific presentations and/or publications; (4) signed informed consents were required from people who appeared in the photographs; (5) a set of photographs was given to people who appeared in the photographs and requested a copy. This was to ensure that they were satisfied with the photos used for the project. Ethical clearance for this study was received from University of Waterloo Ethics Review Board and the Ethics Review Committee of KEMRI (SSC Protocol # 2468).

#### ***5.4.4 Data analysis***

Interviews were audio recorded with permission from participants and transcribed verbatim. The photographs and transcripts were then imported into NVivo 10, a qualitative software package, for analysis. Photographs were first coded according to the themes identified by participants; more themes were then added from the interview transcripts as the coding progressed. Some photographs captured more than one theme and were thus coded in more than one category. Themes, sub-themes and the photographs were reviewed more than three times to ensure concepts and photographs that related to the same phenomenon were coded under the same category. Data was coded by the lead author with assistance from the second author. Preliminary findings were presented to the community in May, 2014 to discuss themes that emerged and to solicit feedback and enhance rigour. Codes were organised around four major themes: environmental concerns and practices; social and health impacts; structural factors; and

water related collective action. Quantitative counts of the number of photographs under each theme are presented in Table 5.2.

## 5.5 Results

To facilitate reporting, Table 5.2, Table 5.3, Table 5.4, Table 5.5 and Table 5.6 report the number of pictures in which particular themes and sub-themes were captured. Pseudonyms are used in reporting to ensure anonymity.

Table 5.2. *Thematic summary of photos*

<b><i>Emerging theme</i></b>	<b><i># of photographs Representing theme</i></b>
Environmental concerns and practices	41
Health and social impacts	44
Structural factors	18
Collective action	15

Table 5.3. *Environmental concerns and practices captured*

<b><i>Types of environmental concerns and practices</i></b>	<b><i># of photographs in which captured (n= 41)</i></b>
Open defecation	9
Lake pollution/contamination	8
Poorly constructed pit latrine	6
Unsafe water	6
Unhealthy practices of fishermen	4
Sand harvesting/abstraction from lakeshore	4
Washing of clothes and utensils inside lake	4

Table 5.4. *Health and social impacts*

<i>Types of health and social impacts</i>	<i># of photographs in which captured (n= 44)</i>
Exposure to water related diseases	14
Water collection burden on women and children	12
Disease burden on women and children	6
Impacts on savings	6
Impacts on education	3
Opportunity cost of time used in collecting water	3

Table 5.5. *Collective actions to address water challenges*

<i>Emerging themes related to collective action</i>	<i># of photographs in which captured (n= 15)</i>
Community mobilisation (coming together)	7
Importance of “baraza”	4
Role of Village elder/leaders	4

Table 5.6. *Reported structural factors*

<i>Types of structural factors</i>	<i># of photographs in which captured (n= 18)</i>
Power relations	5
Unemployment and low incomes	4
Unequal distribution of resources/marginalisation	3

### ***5.5.1. Environmental concerns and practices***

Participants had concerns with open defecation, as illustrated in their photographs. The inextricable links between open defecation and water were demonstrated by many participants during interviews:

*You can see bush, these bushes are places for open defecation, so people walking to go fetch water are exposed to all sorts of infections because the water becomes polluted after heavy rainfalls (Zaria; photo of a man and a child walking through a bushy path towards a lake water collection point).*

Participants also talked at length about the inadequacy of some sanitation facilities, such as pit latrines, to protect human health. Such pit latrines were regarded as inadequate, inappropriate and unacceptable in terms of protecting the health of those who use them and their neighbours:

*This toilet is not well made, the owner thinks he is better off than somebody going into the bush to defecate, but this condition is not good for protecting his health either (Betty).*

*You could even see house flies all over, they fly in and out. Even the doors are not there, so there is very little difference between defecating in the bush and this toilet (Wintima).*

Participants were also concerned with the effects of sand harvesting/abstraction; a common practice whereby young men shovel sand off the bottom of the lake or from the lakeshore for sale to local construction firms. Once sand is harvested from the lakeshore, the top soil is usually degraded and large parcels of land are turned into open pits and ponds after heavy rains. These ponds become breeding grounds for mosquitoes. This was illustrated in a number of photographs and interviews:

*Mosquitoes breed here and most people living close by these sand harvesting places are always suffering from malaria as a result of stagnant water providing breeding sites for mosquitoes (Dorcas).*

Pollution of the lake was another concern captured. Though the lake was identified as an important source of water for domestic uses, most participants expressed concern about how it has been polluted by industrial activities:

*It is not the villagers who pollute the lake. Trucks from construction firms around are washed inside the lake. There is also a Molasses company at the other side that discharge waste into the lake (Zaaria).*

Related to these environmental concerns were other water-related practices that participants felt had influence on their health. From the interviews, these practices were largely shaped by the environmental context (presences of lake), economic activities and the general lack of water. Commonly captured practices were children swimming in the lake, fishing and washing in the lake. Participants were able to adequately link these practices to their health and wellbeing and explained the reason for engaging in these practices. An example is illustrated below:

*Because lake water is the only source and it is free and convenient, children prefer to do all their daily activities there at once. They will usually carry clothes and go wash there, then bathe, and then carry some water home. What is more convenient than this? But it is not safe at all since these children are exposed to bilharzia and other diseases (Diana).*

Most participants were also critical about the practices of some fishermen. Though participants understood and explained the health risks associated with fishing activities, they attributed some practices of the fishermen to inadequate knowledge and ignorance:

*When these people [fishermen] are washing their nets, they stand in the water and unnecessarily expose themselves to bilharzia infection. Sometimes too when they are fishing and right in the middle of the lake they get thirsty, they just drink the contaminated water. It is sometimes ignorance if not they can easily carry water with them into the lake (Anita).*

### **5.5.2. Health and social impacts**

Participants also highlighted the health and social impacts of lack of access to safe water and adequate sanitation. Aside from direct exposure to water related diseases, the impacts on the



health and well-being of children and women were emphasised. It is not surprising that gender related impacts were a dominant theme as lack of safe water and adequate sanitation are disproportionately felt by women and children (Cheng et al., 2012). The impacts on maternal health, educational opportunities for children and loss of calories expended by children in fetching water were exemplified. The impact on maternal health and child health was particularly expressed in a photo that showed a pregnant woman carrying water and her son pushing barrels of water in a wheelbarrow:

*This [water carrying] affects the lives of our people, sometimes children need a lot of energy to push these wheelbarrows and carts, and as you can see the boy is barefooted and is exposed to all kinds of injuries. Even the woman is pregnant and carrying this 20 liters on the head and still holding 10 litres (Zaaria).*

Participants were also particularly aware of how the lack of water affected their children's education:

*Fetching water always affects the time children go to school, sometimes you go to the well and you find children and ask them why they are fetching water when it is school time? They tell you the water in the well can get finished by the time they return from school (Shemima).*

Participants further captured economic impacts to households and the community. Not only did they talk about productive time wasted walking long distances to get potable water, they also explained the direct cost involved if a household decides to buy from a vendor:

*I took this picture because I wanted to show where we get clean water [tap location]. It is far and if you want to walk you must forgo all other productive activities. If you want to buy from a vendor too, each of these jerry cans [20 litres jerry cans] goes for 20 shillings [about 0.25 USD] and because you cannot use only one jerry can for your household needs, we virtually finish all our savings buying water (Mary).*

According to the WHO, between 20 and 100 litres of water per person per day is needed to ensure basic needs are met and health concerns are controlled (Howard and Bartram, 2003). In

Usoma, this translates into spending between 0.25 and 1.25 USD per person per day if a household decides to buy from vendors. Considering the level of unemployment and incomes in the community, it is very unlikely households can afford to buy the required quantities from vendors.

### **5.5.3. Collective action**

Participants reported taking a number of actions to cope with or find solutions to the water-related challenges in the community. For this research, collective action was defined broadly to include a variety of mutually beneficial actions undertaken by a group or the whole community (Bisung et al., 2014). These actions included water and hygiene education, contributions towards common activities, attending community meetings and participation in community based groups focused on water, sanitation or hygiene. An example of an educational intervention is illustrated in this quotation:

*Through our own initiatives, people are taught basic hygiene. Even children know how to sieve water, though they may not do it very well but at least they know the water is not safe for drinking if not treated. The community health volunteers do very well by going round from house to house to educate people on healthy practices and lifestyles (Wintima).*

Important avenues for community mobilisation for such actions are community based groups. The presence of community groups including women's groups, youth groups and cooperatives are features of social capital that facilitate water-related collective action (Bisung et al., 2014):

*Sometimes when we go for women group meetings we discuss things such as water treatment, storage and even how we can get help to construct boreholes. The groups are really helping to bring all the women together (Anita).*

Leaders within the community, especially the village elder, play a very important role in facilitating collective action. Particularly during *barazas*, they facilitate discussions and try to educate people on the need to take some form of action. For example:

*The village elder and chief have talked about it [sand harvesting] several times during barazas. The whole village agreed to stop some few years back and even some families have stopped giving out their land for sand harvesting (Diana).*

Though the above quotation illustrates the importance of community leaders, most people reported general lack of trust in community leaders during our community feedback. The inability of leaders to build trust was seen to be partly responsible for the continued water and sanitation challenges. The community attributed lack of trust to a number of factors; monopolisation of leadership positions; elected leaders wanting to stay in office forever; and disrespect towards leaders who were considered young.

#### ***5.5.4 Structural factors***

Participants generally perceived environmental concerns and practices to be influenced by two primary determinants; lack of economic opportunities (unemployment) and unequal distribution of resources (marginalisation). Participants indicated that the youth continued to engage in sand harvesting because of the lack of economic opportunities and the high rates of youth unemployment:

*We try our best to avoid sand harvesting but because of the lack of employment some families will go hungry if the young men do not go to harvest sand (Shemima).*

They further explained that the lack of safe water in the community is partially due to unequal distribution of resources and lack of commitment from local government authorities to solve the problem:

*If the administration was fair to provide us with water most of our problems will be solved. Sometime we need to talk about the way we have been cheated and neglected over the years (Betty).*

Further, some structural factors were identified as barriers to collective actions. These factors were closely tied to power relations, inequalities and the lack of economic activities. Particularly with respect to strategies to stop industries from dumping waste into the lake, they felt some form of help from government was needed since those industries had more power than the community:

*Hmmm... these construction firms are big and have money, it is very difficult to stop them easily unless some big people or government officials also help. The other day we held a meeting and chose some people to go and talk to them but because we are powerless nothing will happen (Mary).*

Finally, while participants felt they had a better chance of constructing sanitation facilities or boreholes if they came together, low incomes and unemployment were again seen as a barrier to achieving such “dreams”:

*We have a water and sanitation committee that is trying to mobilise people to solve these problems, but the problem is how to raise capital to either build public toilets or help people construct their own toilets. Sometimes I tell people we are dreaming. How can we contribute money when we don't have jobs? We just need help from government! (Dorcas).*

## **5.6 Discussion and conclusion**

Though the application of ecosocial frameworks in health geography has been limited, it provides researchers with a deeper understanding of factors that drive population patterns of disease. It directs attention to the interplay of ecology and social processes, and makes use of spatiotemporal events and processes in determining disease patterns. This research has identified

a number of structural factors – unemployment, unequal distribution of resources (marginalisation) and lack of trust in leadership – that become embodied through lack of access to water and sanitation in Usoma. Historical and current industrial activities around the community have also led to two major adverse impacts; disruption of pipelines that used to supply the community with water and pollution of the lake. Though contamination of the lake cannot be solely attributed to industries around the community, seeing heavy trucks being washed in the lake and waste being discharged in the lake created discomfort and anxiety in the community. The effects of unemployment and lack of economic opportunities were manifest in a number of ways. First, respondents indicated that unemployment was a major factor that drove young men to engage in sand harvesting which destroyed the environment and created breeding grounds for mosquitoes. Secondly, unemployment affected their incomes and savings which made financial contributions towards communal projects (such as construction of sanitation facility) very difficult. Thirdly, low incomes also meant little money available to buy water treatment products and soap for hand washing. Lastly, during our community feedback exercise, many members of the community indicated unemployment resulted in less time for participation in community *barazas* as few local economic opportunities resulted in most community members leaving very early in the morning to go search for casual work in the city.

Unequal distribution of resources and marginalisation was also tied to the lack of water in the community. Some participants regarded the provision of water to be the responsibility of government and therefore attributed their challenges to government neglect. Water services in Kisumu are provided under the mandates of the Lake Victoria South Water Services Board (LVSWSB) which contracts service provision to Kisumu Water and Sewerage Company (KIWASCO), a subsidiary company of the Municipal Council of Kisumu. Though KIWASCO

has a “pro-poor” water delivery model expected to serve the needs of poor communities such as Usoma, its implementation has been difficult due to the large number of poor and informal communities in the region, and financial requirements (Maoulidi, 2010). Thus communities such as Usoma feel marginalised by the current distribution system in the city and see themselves as victims of government policies.

This research provides further important information for understanding barriers and facilitators to water-related collective action. Collective action was common in the community with varying degrees of success. For example, while actions/interventions by the community health volunteers group and UWASH were seen to be successful, other actions to stop sand harvesting were considered unsuccessful. Identified key facilitators of collective action were availability of community groups, attendance at *baraza* and commitment of the village chief and elder. On the other hand, structural barriers to collective action included unemployment (affecting contributions) and perceived lack of power. Particularly, low community efficacy and perceived lack of power affected the initiation and likely success of interventions that involved negotiating with other institutions or industries. As reported in similar studies, community members are sometimes unwilling to fully participate in actions if they feel the effectiveness of the actions will be limited due to their powerlessness (Wakefield et al., 2001).

Findings suggest that access to water and sanitation, and water related behaviours and practices are played out as part of everyday lived experiences embedded in social processes, economic opportunities and the ecological context. We draw on these findings to develop a framework (See Fig. 5.1) for understanding embodied health and well-being within the context of water in Usoma. The framework has four micro-level determinants: water related practices; sand harvesting (including other economic activities around the lake that expose people to water

related diseases); lake contamination; and access to water and sanitation. At the macro-level, we identify lack of economic opportunities (unemployment), power relations and unequal distribution of resources as structural factors that influence health and well-being. These wider structural factors also drive the micro-level factors. For example, unequal distribution of resources manifest in disparities in access to water and sanitations and unemployment drives people to engage in sand harvesting. We observe the centrality of human agency and collective actions in addressing both micro-level and macro-level factors. For example, at the micro-level, there were collective efforts to stop sand harvesting and lake pollution and to build sanitation facilities. Also, findings demonstrated that individuals took actions such as water sieving, proper water storage, contribution of resources and volunteering in water related activities to improve their access to safe water. Further, there is a constant dialogue between collective actions and the structural forces. For example, while the community continued to petition relevant local government and water sector agencies to address their concerns, the lack of employment meant that some people skipped community meetings and deliberations for fear of not being able to make financial contributions.

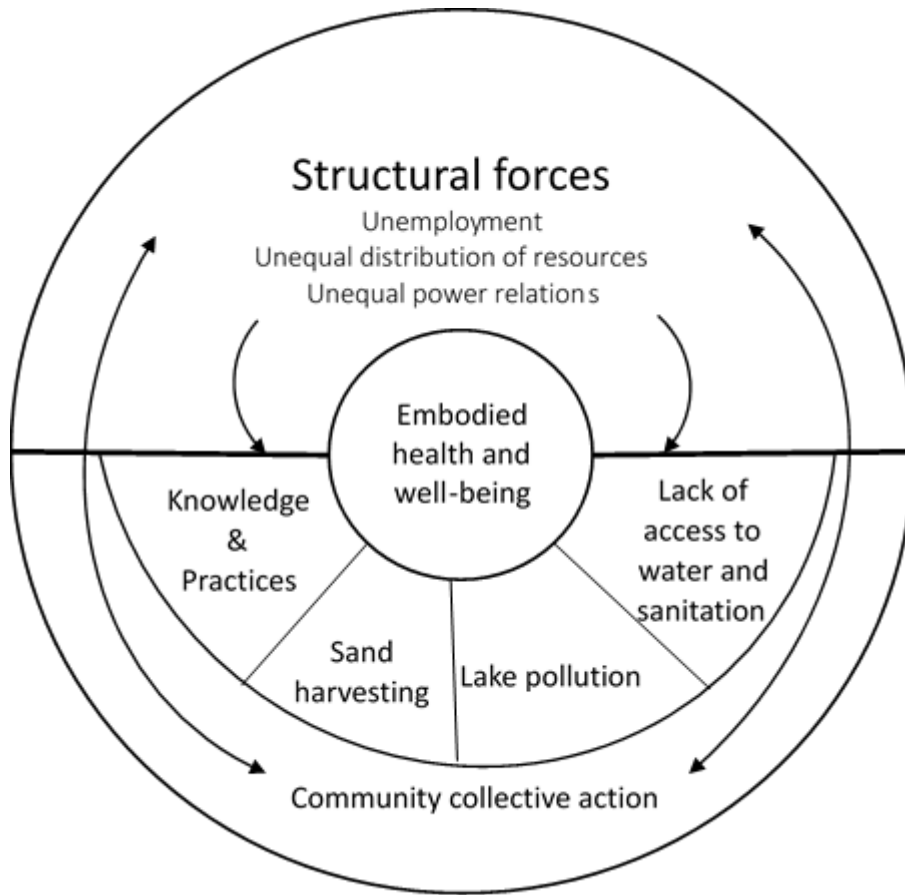


Fig. 5.1 Embodying access to water and sanitation in Usoma

In conclusion, these findings suggest that understanding water–health linkages in marginalised communities require adequate examination of the environmental, social, economic and political context that determines access to water. Thus, community based water–health interventions must take a holistic approach that considers: broader policy issues that determine who gets access to water and at what price; the ecological setting within which people live and work; and micro and macro-level factors that facilitate or constrain community mobilisation and collective actions. In Usoma and perhaps in many other rural lake shore communities in sub-Saharan Africa, efforts to improve health through community based initiatives will have to confront these structural forces and complex human-environment interactions. In terms of policy directions, local government policies and institutional frameworks need to recognise poverty



indicators such as low income and unemployment both as determinants and outcomes of sustainable improvements to water and sanitation. Thus greater policy emphasis on community capacity building and its retention for sustainable access to water supply and sanitation needs to incorporate direct economic and social programs that enable people to achieve their full potential. This can make meaningful contributions (financial, time and resource) towards community based water and sanitation projects.

Further, future research that highlights the breadth and association between socio-political, economic and ecological indicators and sustainable access to water and sanitation will help in the application of these findings. Finally, as suggested by Dennis et al., (2009), photovoice and other participatory photography methods should move beyond engaging only policy makers and government officials towards strategies that involve direct interventions. Though this project has a component that directly supports the community to construct a water and sanitation facility, future research must also include strategies for evaluating interventions in order to contribute to our current stock of knowledge.

## CHAPTER SIX

### Discussions and Conclusions

#### 6.1 Introduction

The goal of this thesis was to gain a better understanding of how social capital shapes the water-health nexus. In order to achieve this goal, the research used a mixed method approach to address the following research **objectives**:

- d) to develop a conceptual framework for understanding the role of social capital in addressing challenges around the water-health nexus in LMICs;
- e) to determine how social capital mediates the relationships between access to water and participation in collective action; and
- f) to explore socio-political factors that influence individual and community water related practices and collective actions.

This chapter presents a summary of key findings, contextualised within the context of current literature on social capital and health. The chapter further identifies the main contributions of the research as well as limitations. This chapter concludes with a discussion of implications of these findings for policy as well as directions of future research.

#### 6.2 Summary of key findings

The thesis consists of three substantive papers (Chapters 3, 4 and 5). **Chapter 3** reviewed existing literature to explore how social capital shapes the links between water and health in LMICs. The review suggests that within the context of water, social capital shapes health through two key pathways. First, networks of social relations, social norms and group participation shape individual behaviours and practices around water-health as well as promote adoption of water-related behavioural interventions (Wood et al., 2012; Waterkeryn and

Caircross, 2010). Further, resources embedded in social relations can serve as constraining factors to enforce or reinforce group or social norms against negative behaviours. For example, evidence from a sanitation intervention in Zimbabwe suggests that changes in hygiene practices were linked to decisions and effectiveness of clubs rather than individual expectations (Waterkeryn and Caircross, 2010)

Second, social capital facilitates collective action towards addressing issues related to improving access and sustainable management of water facilities and resources. Examples include the role of social capital on collective action related to irrigation resource and watershed management (Krishna and Uphoff, 2002), and management of water and sanitation systems (Isham and Kähkönen, 2003). The suggested framework linking social capital with health and wellbeing has a feedback mechanism whereby health and wellbeing can influence social capital through the same pathways; that is, healthier communities, as defined by better health outcomes, are more likely to adopt positive behaviours and practices and are more socially cohesive, thus facilitating collective actions. The two pathways discussed above are not mutually exclusive but interact continuously as shown in Figure 3.1.

Further, the review suggests that social capital may have little influence on health and wellbeing if macro-level socio-political and economic processes that have a strong bearing on who gets access to water and at what price are ignored (Pearce and Davey-Smith, 2003). Structural inequalities that affect access to water and health such as class, gender, social status as well as other broad institutional and political systems are important for understanding social determinants of health (Lynch et al., 2000; Muntaner et al., 2001). Szreter and Woolcock (2004) further demonstrate that these macro-level systems and institutions are important for developing, sustaining and providing resources to social networks that influence health outcomes.

**Chapter 4** uses logistic regression modelling to identify determinants of water-related collective action among household heads. Results from the models indicate that social capital mediates relationships between individual socio-demographic characteristics and participation in collective action. Specifically, household heads with a high group membership index and trust index were significantly more likely to participate in collective action. These findings appear to confirm the second pathway – that is, social capital influencing health and wellbeing by facilitating cooperative activities and collective actions – shown in Figure 3.1. These findings are also consistent with findings by Krishna and Uphoff (2002) from a study of development oriented collective action in Rajasthan, India. Social capital was found to be significantly related to collective action in common land development.

Further, respondents with perceptions of differences in landholding and social status were less likely to participate in collective action. In addition, determinants of collective action varied between males and females. While married females, females with home ownership and education above primary school were more likely to participate in collective action, none of the socio-demographic characteristics and water access variables was significantly associated with collective action among males except age (those between 35-54 years being more likely to participate in collective action as against 15–34 years). With regards to social capital, males with high informal support networks, high trust index and perceptions of a peaceful community were more likely to take part in collective action. On the other hand, high group membership index was a predictor of collective action among females. The research hypothesised that these gender differences in predictors of collective action were potentially due to the social construction of gender and the responsibilities (especially water fetching), opportunities and expectations associated with being female in Usoma. That is, as females take on a greater burden for fetching

water in many households (Sorenson et al., 2011), access to water will tend to motivate their participation in collective action more so than their male counterparts.

Measures of fit were not reported for the models in chapter 4 for two reasons. First, no consensus has yet emerged on the best goodness of fit measure for logistic regression (see Pampel, (2000) for further discussion of measures of fit in logistic regression). Second, measures of fit are more useful when logistic regression modelling is used for prediction, as oppose to explanation as in the current instance. In the interest of full disclosure, Cox and Snell  $R^2$  and Nagelkerke  $R^2$  were 0.099 and 0.132 respectively for Model 1; 0.212 and 0.286 respectively for Model 2; 0.158 and 0.213 for Model 3; and 0.251 and 0.336 for Model 4.

In **Chapter 5**, water related behaviours, practices, and the socio-political factors that influence them were explored using photovoice. The results indicate that social processes, economic opportunities and ecological context have a direct influence on community behaviours and practices. Important factors that influenced access to water, water-related behaviours and general wellbeing included unequal distribution of resources (marginalisation), lack of power, and lack of trust in leadership. Facilitators of collective action included availability of community groups, attendance at *baraza* and commitment of the village chief and elders. Based on these findings, a framework (Figure 5.1) for understanding “embodied health and wellbeing” within the context of water in Usoma was presented. At the community level, four determinants of health and wellbeing were identified: water related practices; sand harvesting; lake contamination; and access to water and sanitation. Macro-level structural determinants included economic opportunities (unemployment), power relations and unequal distribution of resources. The findings suggested that these wider structural factors influenced community level determinants as well as constrained collective action to solve water challenges.

## Discussion

### *6.3.1 Revisiting social capital, collective action and health in Usoma*

Despite increased research interest in social capital and health over the past two decades, the theoretical relevance and empirical evidence linking the concept of social capital to health remain contested. A number of researchers have been critical of the utility of social capital for a number of reasons. These include indiscriminate usage and vague definitions of social capital in the literature (Mohan and Stoke, 2000); lack of attention to macro-level socio-economic processes that influence health and wellbeing across the life-course (Pearce and Davey-Smith, 2003); and inadequate attention to structural inequalities (Lynch et al., 2000; Navarro, 2002). Other researchers remain skeptical about the lack of mechanisms for building and/or maintaining social capital (Mohan and Mohan, 2002; Eriksson, 2011) and the tendency of measuring “all that is good in a community” in the name of social capital and relating that to health (Hawe and Shiell, 2000). The inconsistent representation of social capital in the health literature and inability to link social capital to the day-to-day work of health and development practitioners further complicates these criticisms and contentions (Wakefield and Poland, 2005). In the health literature, social capital has been presented both as an individual asset (network approach) and a collective resource (communitarian approach) informed by different theoretical perspectives (Wakefield and Poland, 2005). These two (communitarian and network) approaches have different implications for health within the context of water in resource poor and otherwise marginalised communities.

Within *communitarian* approaches, social capital is regarded as a collective resource characterising whole neighbourhoods, villages, towns, cities, regions. This perspective draws theoretical insights from Putnam (1993, 2000). Putnam suggests that the amount of social capital

in a society, generated through social trust and prosocial norms and interpersonal relationships has multiple beneficial outcomes in terms of positive economic, political and social development for most communities. These beneficial outcomes are important returns for investing in social capital (DeFilipis, 2001).

From a communitarian view, it is evident that Usoma has a substantial stock of dense and strong associations that are important for generating social capital. The availability of community based groups and committees (see Appendix A.2) as well as the strong association between group membership and participation in collective action in the logistic regression models demonstrates the benefits of these groups as a collective resource. Further, communitarians argue that communities with high volumes of social capital have high interpersonal and generalised trust that encourages people to cooperate based on mutually beneficial outcomes and reciprocity (Eriksson, 2011). Findings in Chapter 4 clearly confirm this argument: the additive trust index from the three trust variables was positively associated with participation in collective action. However, the community also reported low trust (25%) in government officials and elected leaders to solve community problems. This implies that though there was a high volume of general and interpersonal trust within the community, trust in local and political leaders to solve important social and development problems was lacking.

Further, it is hypothesised that social capital is linked to a community's ability to secure important social services and amenities since socially cohesive communities may be more successful in cooperating and uniting to ensure that important services delivered by state and municipal agencies are available (Eriksson, 2011). This hypothesis however appears not to be the case in Usoma as access to water and sanitation and other essential services like health care were still lacking or inadequate even with the presence of high volumes of interpersonal trust. Some of

the structural issues discussed in Chapter 5 provide important explanations to this apparent disconnect between social capital and accesses to social services. For example, lack of employment, low incomes and unequal distribution of resources and powerlessness were important contributory factors to the inability to secure many important social services. These structural factors are important social determinants of health that are mostly ignored in communitarian discussions of social capital (Navarro, 2002; Lynch et al, 2000).

*Critical network* approaches to social capital have their theoretical background in sociology, more specifically in the work of Pierre Bourdieu (Bourdieu, 1977, 1986; Bourdieu and Wacquant, 1992) and James Coleman (Coleman, 1988). From a network perspective, social capital is regarded as a resource that actors benefit from by “virtue of membership in social networks and other social structures” (Portes, 1998: 4). Thus, the resources available in the network do not reside within the individuals but in the networks and structures (Eriksson, 2011). Accordingly, the amount of social capital that accrues to an individual depends on the size of his/her network and the volume of capital possessed by members of the network (Bourdieu, 1986). Within the context of water, resources embedded in networks are important for social influence and conformity towards good (or bad) practices and confers a sense of belonging to the community, which can facilitate collective action.

However, the regression models in Chapter 4 did not show any association between high networks and participation in collective action. This is perhaps due to inadequate social resources or lack of “collective ingredients” within the networks to generate collective action. Another key characteristic of Bourdieu’s work that became manifested in Usoma is the role of power and inequality on social capital. More dominant groups or individuals are able to preserve structures and decide the kind of networks and outcomes in which to include or exclude people. In Usoma,



people who held perceived differences in landholding and social status were less likely to participate in collective actions. Perhaps, such people anticipated exclusion or fewer benefits from the outcomes of collective efforts and thus chose not to participate. Thus, engagement with critical network analysis of social capital highlighted the impacts of these perceived local structural inequalities and power differences on collective action in Usoma.

#### **6.4 Contributions**

Many social and ecological factors influence health within the context of water. Ecosocial theory offers a useful framework for understanding how access to water and other environmental injustices are embodied to produce patterns of disease, health and wellbeing. As demonstrated in this research, though social capital facilitates collective action to improve access to water or cope with the risks of lack of access, these actions are constrained by broader socio-economic processes and structures. The interactions between community level actions and broader social-economic processes further underscores the complexities involved in addressing access inequalities witnessed between poor and rich or rural and urban areas in LMICs. By incorporating social capital with ecosocial theory, this research contributes to how researchers can connect interactions between environmental risks and (re)actions with broader socio-economic factors to understand patterns of environment and health inequalities (Wakefield et al., 2001).

Further, a major limitation of the role of social capital discussed in the public health literature is the inability to simultaneously engage with social inequalities at the individual and macro-levels (Pearce and Davey-Smith, 2003). This research integrates social capital theory with ecosocial theory to address this limitation and offers some lessons for researchers. For

example, structural inequalities relating to wealth, gender, land holding and social status as well as macro-level issues of power, economic inequalities, and unemployment were integrated with key constructs of social capital to understand how they interact to affect collective action, health and wellbeing. Thus, rather than employ social capital as an “alternative to materialist structural inequalities” (Muntaner et al., 2001), the research demonstrated that there are theoretical opportunities to blend social capital with other eco-theories. This integration helps our understanding of the implications of horizontal relationships among socio-economically differentiated actors within the community as well as vertical relationships between communities and state/private agencies for health promotion.

Further, the framework (Figure 5.1) for understanding how health and wellbeing is embodied within the context of water is important for identifying and understanding how multi-level factors interact to shape patterns of health. While this framework can contribute to understanding how populations literally embody other environmental risks in developing countries (e.g., water and pollution in mining areas, deforestation etc), it also adds to the literature on health and wellbeing vis-à-vis environmental risks in health geography (Walker et al, 2014; Wakefield et al, 2007; Sultana, 2008, 2012). Such empirical evidence is important for understanding how macro-level factors interact with local environmental risks to generate patterns of health and wellbeing. The findings from this thesis further provide fertile ground to incorporate social capital theory with environmental health research to inform the design of theoretically informed interventions for health promotion.

In addition, findings from this thesis can be transferred to similar contexts in other LMICs. The social and economic conditions in most lakeshore communities in the Lake Victoria region are similar and the learnings from this study will be applicable to most communities

facing similar challenges in access to water and sanitation. Though place-specific circumstances may limit transferability beyond developing regions, lessons from this research can be applied to vulnerable contexts in developed countries (e.g. small communities in the Arctic regions of Canada) where communities are faced with water challenges (Castleden et al, 2015; Daley et al, 2014)

This research make four contributions to the methodological literature. First, it contributes to the conceptualisation and measurement of social capital in a cross-cultural context. Though a number of researchers have measured social capital in developing countries, the use of comprehensive indicators of social capital to capture social networks, psychosocial perceptions of trust and social cohesion in communities remains limited. For example, aside from the World Bank Commissioned studies that initially used the SOCAT, there is very little evidence of its application and adaptation to other countries (see appendix E for examples of World Bank studies). Thus, this research contributes to this knowledge and methodological gap by providing evidence of adaptation and application of a validated social capital measurement tool in a developing country context.

Second, this research demonstrates how to explicitly use theory to inform research design, data collection and analysis. The conceptual framework developed at the beginning of the research (described in Chapter 3) drew on literature from epidemiology, sociology, political science and public health to illustrate pathways through which social capital can influence health within the context of water and sanitation. These pathways were subsequently used to design and structure the social capital data collection and subsequent analysis. The use of theory to inform data collection and analysis is particularly important given recent calls and emphasis to move away from “blind observation” to theoretically informed research (Aboud, 2011; Krieger,

2011). Third, the research contributes to the application of “decolonizing and participatory methodologies” in response to some of the criticisms regarding power relationships in research involving marginalised communities (Castleden, 2008). The use of photovoice created an environment for adequate participation and discussion of community challenges and an opportunity to value local knowledge and expertise in the identification of water challenges. This research provides evidence that participatory methodologies that require active involvement of marginalised groups are possible in diverse resource settings and can provide an effective means to explore many issues that affect health and wellbeing.

Finally, the research provides an effective example of embedded mixed-method design. Though a number of guidelines on how to conduct mixed-methods exist in the literature, they hardly address issues of mixing quantitative methods with participatory methods such as photovoice. For example, using photovoice concurrently with the survey was able to elicit the full participation of women, who were less represented in the household surveys because majority of household heads were men. Further, mixed-methods literature contains limited discussion of the unique ethical and methodological challenges that techniques such as photovoice present. This thesis brought some of these issues to the fore with examples of how to address them. Further, photovoice created critical consciousness about some of the practices within the community, which is an important step for finding sustainable solutions.

## **6.5 Implications for policy and practice**

Over the past decade, health researchers and practitioners have recognised that community actions and empowerment play a vital role in protecting and promoting population health (Aboud, 2012; Merzel, and D’Afflitti, 2003). The landmark international conference on

health promotion held in Ottawa, Canada in 1986 emphasised this view by defining health as a resource for everyday living that allows individuals or populations to realise their aspirations or cope with their environment (Epp, 1986). This definition demonstrates that health has a unique aim of reducing inequalities and ensuring equal opportunities for people to achieve their full potential through multi-sectoral interventions. The Ottawa Charter recommended community action in priority setting and community empowerment as key pillars of health promotion (WHO, 1986). Following this recommendation, Campbell (2000) suggested that health practitioners should invest in developing programs that mobilise social capital for health especially in otherwise marginalised communities. However, mechanisms for building adequate social capital for health promotion have received little attention in the literature (Hooghe and Stolle, 2003; Eriksson, 2011). Within the context of water-health linkages and the findings from this thesis, possible pathways for building social networks (network approach) and mobilising collective social capital (communitarian approach) for health vis-à-vis collective actions are discussed below.

### ***6.5.1 Strengthening networks for water-related collective action***

From the regression models in Chapter 4, there is evidence that participation in group activities influenced participation in collective actions. More broadly, the framework in Chapter 3 hypothesised that social capital could influence health through participation in water related activities and adoption of health behaviours. Thus, the maintenance of social networks built on trust and reciprocity is crucial for strengthening networks that result in increased participation and contributions towards water related activities. Within the health promotion literature, there is considerable evidence that intervening in social networks can change numerous health

behaviours including contraceptive use, physical activity and substance abuse (Gesell et al., 2013). Given that collective action is more likely to be found among household heads with group membership, the following social network interventions may prove beneficial for health in Usoma.

1) Intentionally building new social networks (new groups): Building new groups with the sole objective of facilitating diffusion of positive water-related practices could be a useful option as these types of interventions have been successfully employed in other areas. For example, Waterkeryn and Cairncross (2010) reported findings from a sanitation intervention in Zimbabwe where Community Health Clubs were created as units for health education and knowledge application. Aside from remarkable changes in hygiene practices, sanitation coverage increased by 43% – as compared to 2% in controlled areas – within 18 months (Waterkeryn and Cairncross, 2010). In this example, Community Health Clubs served as platforms to influence members’ hygiene and sanitation activities such that “group decisions” rather than “individual expectations” became a major reason for members to change their hygiene practices and also build new latrines. With regards to Usoma, starting water and sanitation clubs in the primary schools, among fishermen and among various faith-based organisations would be a useful step for diffusion of behavioural change messages and mobilisation for collective action.

2) Strengthening existing networks or groups: This could take a variety of forms including providing leadership training to existing group members or tailored workshops on how to maintain effective groups and networks. Building the capacity of the current Water and Sanitation Committee (UWASCO) in Usoma will be useful considering their successes in partly facilitating the construction of a sanitation block and the extension of piped water by KIWASCO to a vending site in the community. Further, given the impacts and burdens that accrue to women

in the absence of safe and adequate sanitation, empowering women's groups and civil society organisations can create the commitment and avenues needed to mobilise local communities and scale- up successful community interventions (Schuster-Wallace et al., 2015).

3) Enhancing network linkages (networking of networks): This refers to networks that link various groups within the community. These links enable groups to combine knowledge and resources to achieve a common purpose (Potanga, 2002). Considering that household heads belong to groups in 8 different sectors (Appendix A.2), an important starting point is to identify groups that overlap in their missions and activities in order to encourage cross linkages and collaboration to achieve a common purpose. For example, aside from UWASCO, Usoma Community Health Workers (UCHEW) also engages in routine house-to-house water treatment and hygiene education. Facilitating effective linkages between these two groups may be important for broadening the reach of their interventions and making maximum use of the few resources available to them.

Whether public health practitioners are using any of the three approaches above to build networks, Ostrom and Ahn (2007) suggest that it is important to assess the types of formal and informal rules that govern networks and how they retard or create cooperative activities. Another important consideration for intervening in networks is to examine the extent to which *all* actors benefit from the resources generated by the network. In the absence of clear and mutually beneficial outcomes to all members of the network, actors will be less motivated to conform to norms and avail their personal resources (e.g., time) to the network. Other important considerations for intervening in networks include the extra burden or cost (e.g., time spent attending meetings) of being networked on the poor and resources required to maintain networks.

### ***6.5.2 Mobilising collective social capital for health promotion***

Social capital, conceptualised as a collective community resource, is characterised by the existence of strong and dense associations and active citizen participation in cooperative activities (Putnam, 2000). To differentiate between these collective features and the resources they generate, Grootaert et al. (2004) conceptualised collective action (particularly where an external force does not induce the actions) as an important output indicator of social capital for health and development. However, empirical examples of how to mobilise these “collective social resources” in a community are limited. The few examples that exist though provide some useful information on the key ingredients and processes that are likely to form the foundation of mobilising collective social capital. For example, in a study that focused on collective social capital mobilisation to prevent closure of a health facility in rural Sweden, Eriksson et al. (2013) found the availability and interactions between *collective actors* as the most important factor in the mobilisation process. Collective actors at the community level included *enthusiasts* (traditional leaders who reacted with shock and fear towards the closure), *patriarchs* (men who usually made sure things get done in otherwise marginalised communities), and *local entrepreneurs* (local entrepreneurs within and outside the community who have an interest in the community) (Eriksson et al., 2013). These actors were able to offer *fighting spirit, know-how, connections and power* to the mobilisation process (Eriksson et al., 2013).

From the discussions of structural barriers to community initiatives in Usoma, a key factor missing in the mobilisation process is perhaps the limited involvement of such collective actors to make things happen with their “power and connections.” However, with the influx of many land speculators and new residents who are attracted to Usoma because of the expansion of the nearby Kisumu international airport, it is possible to identify *local entrepreneurs* to lead the



mobilisation process. Within Usoma, collective actors could also include the women's group leader and UWASH leader (*enthusiasts*) and assistant chief and village elders (*patriarchs*). Utilising the time and resources of these actors require a delicate balance between the relative power they have and the ability to maintain democratic practices and a cohesive society (Erikson et al, 2013). Otherwise, the forces of power held by these actors could be used to suppress other legitimate actors in the mobilisation process which can retard social capital in the long run.

### **6.5.3 “Linking social capital”: the missing link in Usoma**

A multiple dimensional approach to social capital introduced by Woolcock and Narayan (2000) argues that different combinations of social capital are responsible for the types of outcomes social capital generates. Beyond bonding and bridging discussed in Chapter 3, *linking social capital* was introduced to explicitly distinguish between networks and relationships among dissimilar actors across horizontal power lines and those that connect actors across vertical power lines (Woolcock and Narayan, 2000; Szreter and Woolcock, 2004). They defined linking social capital as “norms of respect and networks of trusting relationships between people who are interacting across explicit, formal or institutionalised power or authority gradients in society” (Szreter and Woolcock, 2004:655). Linking social capital is important for poor communities as some evidence has shown that bonding and bridging within such communities is not sufficient to access formal institutions and services such as credit agencies, municipal services and government services that have a strong bearing on health and wellbeing. For example, an ethnographic study by Bebbington and Perreault (1999) in Ecuador showed that external interventions by NGOs to establish relationships between communities and external actors enabled indigenous people to access various resources including land, credit and

technology to improve their livelihood activities. Similar studies conducted in Peru and Bolivia showed that linking federations (networks of community based groups) with regional and national agencies generated inclusive local governance and access to credits, inputs and markets for peasant farmers (Babbington and Carroll, 2000). The authors identified donor support in the form of finance; technological and credit support from external organisations; lobbying support to legitimise the concerns of local communities and provide access to decision makers as important sources of linking social capital for poor communities.

The evidence from Usoma suggests that the lack of trust in local political leaders, feelings of marginalisation and lack of power may have contributed to weak *links* between the community and relevant institutions in charge of water and sanitation provision. Thus, strategies to build linking social capital with local institutions responsible for the delivery of key services will be important to complement the efforts of community members. The examples from Latin America described above suggest that strategies for strengthening linking social capital in Usoma could include identifying and mediating conflicts and disagreements between community groups and local government agencies as well as promoting local government policies that support broad based decision making and planning processes. Local NGOs and local research institutions such as KEMRI that have extensive knowledge of challenges in Usoma can facilitate this process.

## **6.6 Limitations**

The quantitative component of this research was based on a cross-sectional design, which did not allow for potential changes in access to water and sanitation over time to be taken into consideration. Further, causality between social capital and collective action could not be

established. Second, the access to water and sanitation data used was based on self-reported information by household heads. The sources of water and household sanitation facility use could not be verified to ascertain how safe or adequate these were for protecting human health. Third, self-reported information was used to ascertain both social capital (trust, networks, group membership) and participation in collective action, which could increase the potential of “same-source bias” (Diez-Roux, 2007). That is, the possibility that the use of self-reported data for both collective action and social capital generates a spurious association between the two because reporting collective action may affect perceptions of social capital (eg. trust). Fourth, though types of collective action varied in scope, they were all weighted equally. For example, type of collective action reported included contributing labour or money towards a common water and sanitation project or leading a community baraza on water and sanitation. Though the efforts and commitment required for each of these contributions may be different, they were all weighted equally in the analysis. In addition, generalisability – and in some instances explanation – of the findings was limited by the use of a single case study. Future comparative research in a similar or contrasting context will help ground the current findings and offer further explanations.

Further, I am aware that my inability to speak Kiswahili and Dholuo, the two dominant languages in Kisumu, restricted my ability to speak directly with most research participants. The research relied on expert translation of all interview guides, information letters, consent forms, training manuals and questionnaires. Precautions were taken to ensure rigour in this process and ensure that language limitations did not restrict the amount or quality of data or rigour in the research process. Firstly, I developed rapport with many respondents and community members and engaged in conversations in order to adequately understand the community context. Secondly, a community feedback exercise in May 2014 gave an opportunity for community

members to “member check” the adequacy of the key findings in order to enhance credibility of the findings. This meeting was also attended by local government officials, health officials, representative from the county health ministry and other researchers from KEMRI. Thirdly, all interviews and discussions were recorded verbatim and transcribed. In addition, all the audio tapes were cross-checked with the transcripts before analysis to correct any errors and fill any gaps that may exist. Further, adequate field notes were kept and accounts of behaviours and activities during interviews to aid in the analysis. Finally, all the research instruments were translated before data collection so that the RA (a local PhD student who has been working in the community for about five years) and other KEMRI researchers could have adequate time to cross-check context appropriateness and consistency in the local framing of constructs and sentences.

## **6.7 Directions for future research**

The substantive chapters (Chapters 3, 4 and 5) of this thesis gave some specific future research directions. These directions, which focused on future studies to explore the measurement, formation and influence of social capital on environment and health outcomes, need further expansion to guide future research design and empirical analysis.

As mentioned earlier, though researchers have analysed the relationships between social capital and health through a number of pathways, little research explains how to improve or build social capital in resource poor settings. To fill this theoretical and empirical gap, future research to explore mechanisms for building social capital in different cultural contexts is necessary. In this regard, both longitudinal qualitative and quantitative data may be very important in order to

explore how the building process evolves at different spatiotemporal scales and influences health.

In addition, social capital research has often been criticised for downplaying the effects of material conditions on health in favour of psychosocial justifications. Szreter and Woolcock (2004) introduced linking social capital to make a connection between the two (materialism and psychosocial explanations) through “state-society” relationships. However, little empirical research has analysed how such “state-society” relationships influence the formation of adequate networks for health in otherwise marginalised communities. Understanding such mechanisms is vital for health promotion in developing regions such as Sub-Saharan Africa considering the many governance and social challenges populations there are confronted with.

Further, understanding the scale (individual, household, community) at which people react to water issues and participate in collective actions is important for developing interventions. Since the scale of analysis influences association between access and reactions to address lack of access, using household analysis in the case of this research may not provide a holistic explanation of the relationships between access, social capital and collective action. Conducting multi-level analysis (household, community, district and provincial levels) and comparative analysis between villages or regions will add another layer to our understanding.

In addition, future research that explores the utility of photovoice as a community-based participatory method for effecting change may be useful for scaling-out behavioural interventions. Though in this research photovoice proved to be a useful method for creating awareness and instigating change in the community, future research – in different cultural, ecological and resources settings – to expand the literature and test the usefulness and effectiveness of photovoice in effecting behavioural change is important. Additionally, it is

important for researchers to continue to apply the various social capital tools (SOCAT, A-SCAT) in varying resource and cultural context for methodological development and validity.

Finally, this research developed a framework for understanding the links between social capital and the water-health nexus. Applying the framework on other areas beyond the focus of this thesis (e.g., in the context of other environmental issues such as air pollution, afforestation projects, wind turbine development etc.) will make significant contributions to the subdisciplinary field of health geography. Particularly, continued use and improvement of the social capital framework is central to advancing the conceptualisation of pathways between social capital and health within the context of environmental risks. Increasing our understanding in this area is important, as material conditions and the quality and quantity of social relationships both contribute to the achievement of population and public health goals (Szreter and Woolcock, 2004).

## Appendix A

### 1. Principal Component Analysis (Eigen Value > 1) for constructing exclusion index

	<b>Component 1- Exclusion</b>
Differences in wealth/material possession	0.744
Differences in landholding	0.683
Differences in social status	0.754
Gender differences	0.596
<i>Percentage of variance explained</i>	48.5

Note: The exclusion index had a Cronbach's alpha of 0.642.

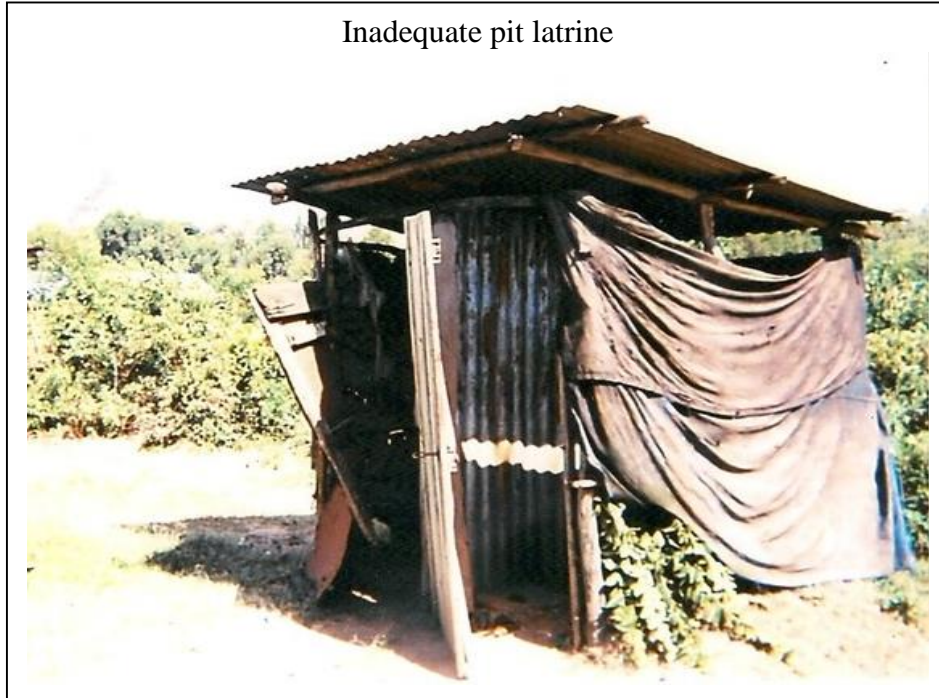
### 2. Household heads group membership distribution.

<b>Groups</b>	<b># (%)</b>	<b>Degree of Participation</b>	
		Not/ somewhat active	Leader/active
Fishermen group	7 (4)	3	7
Cooperatives and business association	12 (7)	9	3
Health/Water Committee	8 (5)	3	5
Village Association	23 (14)	9	14
Religious/Cultural Groups	7 (4)	3	4
Men's Group	5 (3)	3	2
Youth Group	23 (14)	0	23
Women's group	84 (49)	41	43
Total	169		

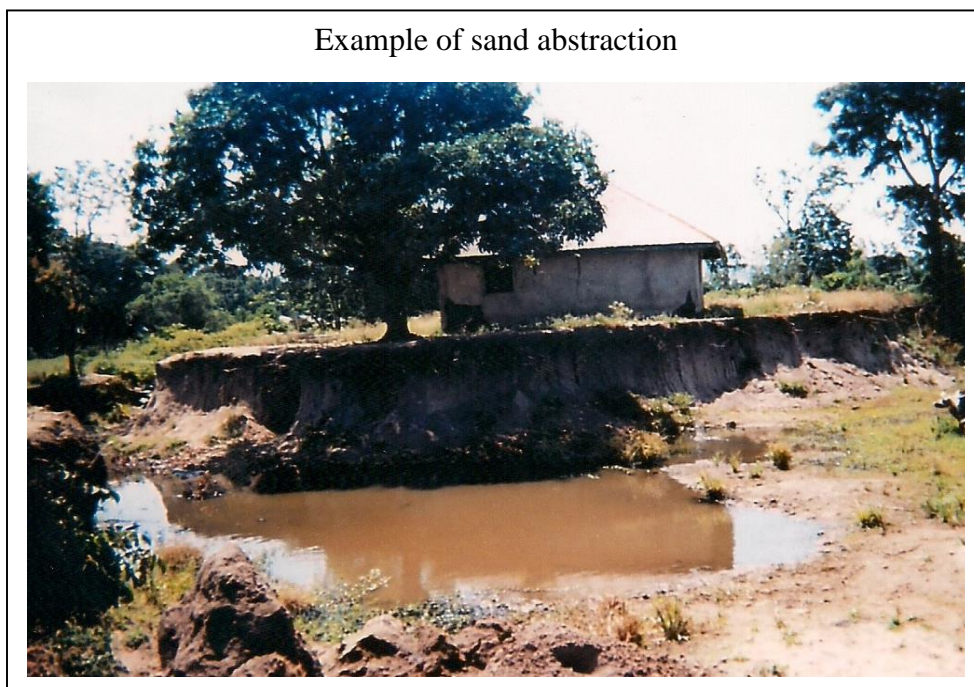
## Appendix B

Examples of pictures selected by participants for the photovoice interviews.

1.



2.





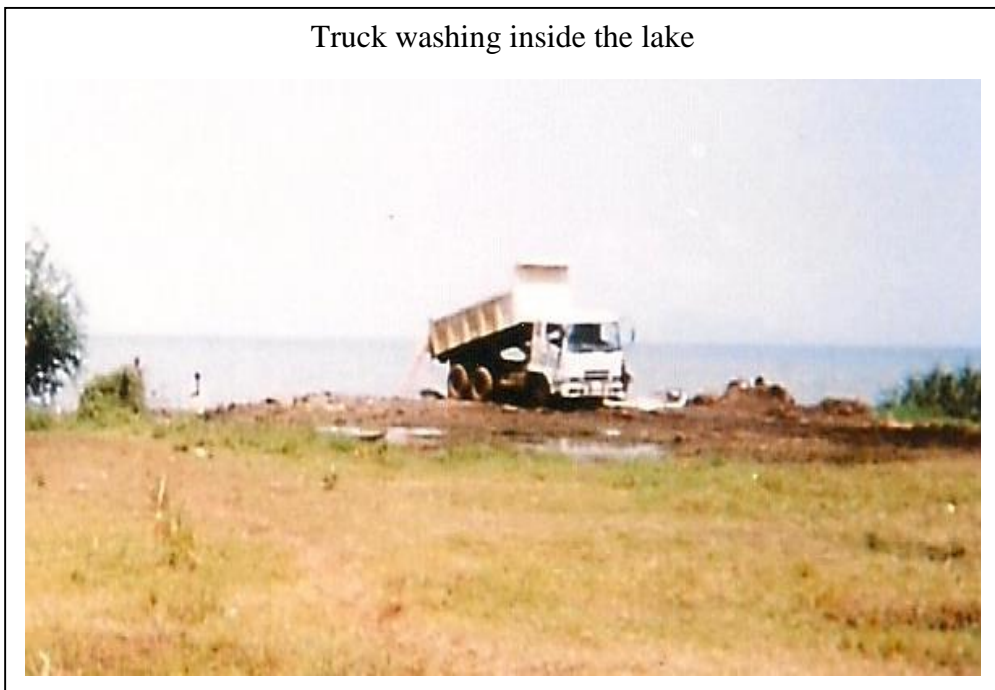
3.

Tap water located about 3Km away on the premises of a Coca-Cola bottling plant



4.

Truck washing inside the lake



5.

Fishing activity



6.

Water collection burden on women and children



7.

A child sieving water



8.

Lake water collection point



## Appendix C

### HOUSEHOLD SURVEYS

(ADAPTED FROM THE SOCIAL CAPITAL ASSESSMENT TOOL)

(Source: <http://go.worldbank.org/QQ348DZRE0>)

Date:                      Time initiated:                      Time terminated:                      Length of interview:

#### IDENTIFICATION OF SELECTED HOUSEHOLD:

**Province/Region:** Nyanza

**County:** Kisumu

**District:** Kisumu North

**Division:** Nyaera

**Location:** East Kisumu

**Sub-Location:** Kogony

**Village:** USOMA

#### Address of household:

Compound Head:

Compound number

Number of Households:

Household Head:

Interviewer: .....

Signature.....

SECTION 2: HOUSING CHARACTERISTICS AND HOUSEHOLD ROSTER

2.1 Type of house (observation only)

Individual house [    ]

Pen roof and patio [    ]

Apartment [    ]

Room within a larger house [    ]

Other (specify).....

2.2 What construction material is used for the majority of the exterior walls of the house or building?

Cinderblock/brick/stone/concrete/cement [    ]

Wood [    ]

Adobe/wattle and daub [    ]

Cane/straw/sticks [    ]

No walls [    ]

Other (specify).....

2.3 What is the construction material of most of the roof of this house?

Concrete/cement [    ]

Tiles [    ]

Metal (zinc, aluminum, etc.) [    ]

Wood [    ]

Straw or thatch [    ]

Other (specify) .....

2.4 What is the construction material of most of the floor of this house?

Concrete/cement [    ]

Tiles, brick, granite [    ]

Wood [    ]

Vinyl [    ]

Earth, sand [    ]

Cane [       ]

Other (specify) .....

2.5 How many rooms are used by this household for sleeping only?..... (Insert #)

2.6 What type of sanitary services does this household use?

Connected to sewage system [    ]

Connected to septic tank [    ]

Latrine [       ]

Open defecation [    ]

Don't know [       ]

Other (specify).....

2.7 Who owns the facility?

Self [    ]

Relative [    ]

Neighbour [    ]

Public [    ]

Don't know [    ]

Other (Specify).....

2.8 What is the primary source of water for this household for drinking?

Piped water system [       ]

Private well [       ]

Public well [       ]

Public tap [       ]

Lake [       ]

Don't know [       ]

Other (specify).....

2.9 What is the primary source of water for this household for cooking?

- Piped water system [      ]
- Private well [      ]
- Public well [      ]
- Public tap [      ]
- Lake [      ]
- Don't know [      ]
- Other (specify).....

2.10 What is the primary source of water for this household for other domestic uses?

- Piped water system [      ]
- Private well [      ]
- Public well [      ]
- Public tap [      ]
- Lake [      ]
- Don't know [      ]
- Other (specify).....

2.11 How does this household dispose of most of its garbage?

- Public garbage service [      ]
- Private garbage service [      ]
- Throw in vacant lots [      ]
- Throw in lake [      ]
- Burn and/or bury [      ]
- Don't know [      ]
- Other (specify).....

2.12 What type of lighting does this household use?

- Electricity (public source) [      ]
- Electricity (private source) [      ]
- Electricity (combination public and private) [      ]

Only kerosene, gas, candles [       ]  
 Don't know [       ]  
 Other (specify) .....

2.13 This home is?

Owned and completely paid for [       ]  
 Family owned [       ]  
 Rented [       ]  
 Given in exchange for services [       ]  
 Squatter [       ]  
 Don't know.....  
 Other (specify).....

2.14 List all the people in the household and then ask the questions that follow.

Codes for Relationships	Codes for Occupation	Codes for Education	Codes for Marital Status	Codes for sanitary services
Head.....1	Fisherman.....1	Primary..1	Single..1	Connected to sewage system..1 Connected to septic tank..2 Latrine..3 Open defecation..4 Don't know..5 Other (specify)..6
Wife/Husband..2	Farmer.....2	Secondary..2	Married..2	
Child.....3	Artisan.....3	Vocational.3	Divorced..3	
Father/Mother..4	Labourer.....4	College..4	Widowed4	
Grandchild.....5	Trader.....5	University..5	Separated..5	
Grandparents....6	Public servant.6			
Other Relative.7	Others.....7			



ID	2.14.1 Names of household members	2.14.2 How long has....lived in Usoma	2.14.3 Age	2.14.4 R/ship to head of household	2.14.5 Sex
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
ID	2.14.1 Names of household members	2.14.6 Marital Status	2.14.7 Occupation	2.14.8 Education Level	2.14.9 Type of sanitary service used by.....
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					



3A.3 Which of these groups is the most important to your household? (List up to three by name and code type of organization.)

Group 1: [ ]

Group 2: [ ]

Group 3: [ ]

Group	1	2	3
3A.4 Are group members mostly of the same extended family?			
3A.5 Are members mostly of the same religion?			
3A.6 Are members mostly of the same gender?			
3A.7 Do members mostly have the same occupation?			
3A.8 Are members mostly from the same age group?			
4A.9 Do members mostly have the same level of education?			

**3B Networks and Mutual Support Organizations**

*Now I am going to ask you some questions about how the community functions and deals with problems.*

3B.1 If the primary school of this village went without a teacher for a long time, say six months or more, which people in this village do you think would get together to take some action about it?

	YES	NO
No one in the village would get together (if yes, go to question 3B.3)		
Local government		
Village association		
The entire village		
Don't know		
Others, Specify.....		

3B.2 Who would take the initiative (act as leader)?.....

3B.3 If a problem affected the entire village (eg. animal disease ), who do you think would work together to deal with the situation?

	YES	NO
Each person/household would deal with the problem individually (If yes, go to 3C)		
Political leaders		
All community leaders acting together		
Others, specify.....		

**3C. Exclusion**

3C.1 Differences often exist between people living in the same village. To what extent do differences such as the following tend to divide people in Usoma?

	Not at all	Somewhat	Very much
Differences in wealth/ material possessions			
Differences in landholdings			
Differences in social status			
Differences between men and women			

***Skip to Section 3D***

3C.2 Are there any services that you or members of your household are occasionally denied service or have only limited opportunity to use?

- |                                       | Yes    | No     |
|---------------------------------------|--------|--------|
| a. Education/schools [    ]           | [    ] | [    ] |
| b. Health services/clinics [    ]     | [    ] | [    ] |
| c. Housing assistance [    ]          | [    ] | [    ] |
| d. Job training/employment [    ]     | [    ] | [    ] |
| e. Credit/finance [    ]              | [    ] | [    ] |
| f. Transportation [    ]              | [    ] | [    ] |
| g. Water distribution [    ]          | [    ] | [    ] |
| h. Sanitation services [    ]         | [    ] | [    ] |
| i. Agricultural extension [    ]      | [    ] | [    ] |
| j. Justice/conflict resolution [    ] | [    ] | [    ] |
| k. Security/police services [    ]    | [    ] | [    ] |
| l. Others Specify.....                |        |        |
| I Don't know.....                     |        |        |

3C.3 Do you think that there are other households in this community that have such access problems? Yes [    ]1 No [    ]2 Don't know [    ]

3C.5 What are the reasons or criteria why some people are excluded from these services?

	Yes		No	
a. Income level	[ ]	1	[ ]	
b. Occupation	[ ]	1	[ ]	
c. Social status (class, caste)	[ ]		[ ]	
d. Age	[ ]	1	[ ]	
e. Gender	[ ]	1	[ ]	
f. Race/ethnicity	[ ]		1	[ ]
g. Language	[ ]	1	[ ]	
h. Lack of education	[ ]		1	[ ]
I Others (Specify).....				

### 3D. Previous Collective Action

3D.1 In the past three years, how often have members of this village gotten together and jointly petitioned government officials or political leaders with village development as their goal?

Never [ ] (go to question 3D.3)

Once [ ]

A couple of times [ ]

Frequently [ ]

3D.1.1 What kind of problem?

Education [ ]

Health [ ]

Water/Sanitation [ ]

Others .....

3D.2 Was this action/were any of these actions successful?

Yes, all were successful [ ]

Some were successful and

others not [ ]

No, none were successful [       ]

3D.3 How often in the past year have you joined together with others in the village to address a common issue related to water and sanitation (attending and actively and participating in a water and sanitation baraza, contributing money, providing labour to a common water and sanitation project etc.)?

Never [       ]

Once [       ]

A couple of times (2 to 4) [       ]

Frequently (above 4) [       ]

3D.4 If some decision related to a water and sanitation project needed to be made in this village, do you think the entire village would be called upon to decide or would the community leaders make the decision themselves?

The community leaders would decide [       ]

The whole village would be called [       ]

3D.5 Overall, how would you rate the spirit of participation in this village?

Very low [       ]

Low [       ]

Average [       ]

High [       ]

Very high [       ]

3D.6 How much influence do you think people like you have in making this village a better place to live?

A lot [       ]

Some [       ]

Not very much [       ]

None [       ]

4A COGNITIVE SOCIAL CAPITAL

**4A. Solidarity**

4A.1 Suppose someone in the village/neighborhood had something unfortunate happen to them, such as a father's sudden death. Who do you think they could turn to for help in this situation? (*Record first three mentioned.*)

--	--	--

No one would help

Family

Neighbours

Friends

Religious leader or group

Community leader

Business leader

Police

Family court judge

Patron/employer/benefactor

Political leader

Mutual support group to which s/he belongs

Assistance organization to which s/he does not belong

Other (specify) .....

4A.2 Suppose your neighbor suffered an economic loss, say (RURAL: "animal disease"; URBAN "job loss"). In that situation, who do you think would assist him/her financially? (*Record first three mentioned.*)

--	--	--

No one would help

Family

Neighbors



- Friends
- Religious leader or group
- Community leader
- Business leader
- Police
- Family court judge
- Patron/employer/benefactor
- Political leader
- Mutual support group to which s/he belongs
- Assistance organization to which s/he does not belong
- Other.....

**4B Specific Trust and Cooperation**

4B.1 Do you think that in this village people generally trust one another in matters of lending and borrowing?

- Do trust [       ]
- Do not trust [       ]

4B.2 Do you think over the last few years this level of trust has gotten better, gotten worse, or stayed about the same?

- Better [       ] 1
- The same [       ] 2
- Worse [       ] 3

4B.3 Compared with other villages, how much do people of this village trust each other in matters of lending and borrowing?

- Less than other villages [   ]
- The same as other villages [   ]
- More than other villages [   ]

4B.4 Suppose someone from the village had to go away for a while, along with their family. In whose charge could they leave (RURAL: “animal disease”; URBAN: “their house”)? (*Record first three mentioned.*)

--	--	--

Other family member

Neighbor

Anyone from the village/neighborhood for this purpose

Other (specify)

No one<sup>5</sup>

4B.5 Suppose a friend of yours in this village/neighborhood faced the following alternatives, which one would s/he prefer most?

Own 10 cows entirely by themselves

Own 25 cows jointly with one other person

4B.6 If you suddenly had to go away for a day or two, whom could you count on to take care of your children? (Record first three mentioned.)

--	--	--

Other family member

Neighbor

Anyone from the village/neighborhood for this purpose

Other (specify)

Don't have children

#### 4C.1 General Trust, Solidarity and Belonging

Please tell me whether in general you agree or disagree with the following statements:

	Strongly agree 1	Agree 2	Disagree 3	Strongly Disagree 4
Most people in this village are basically honest				
Members of this village are more trustworthy than others				

If you lose a goat, someone in the village would help look for it or would return it to you.				
In this village one has to be alert or someone is likely to take advantage of you.				
If I have a problem, there is always someone to help me				
I do not pay attention to the opinions of others in the village				
Most people in this village are willing to help if you need it				
I feel accepted as a member of this village				

**4.D Conflict Resolution & Development Contribution**

4C.1 In your opinion, is this village generally peaceful or conflictive?

Peaceful [     ]

Conflictive [     ]

4C.2 Compared with other villages is there more or less conflict in this village?

More [     ]

The same [     ]

Less [     ]

4C.3 Do people in this village contribute time and money toward common development goals?

They contribute some or a lot. [      ]

They contribute very little or nothing. [   ]

4C.4 Compared with other village, to what extent do people of this village contribute time and money toward common development goals?

They contribute less than other villages [   ]

They contribute about the same as other villages [   ]

They contribute more than other villages [   ]

4C.5 Are the relationships among people in this village generally harmonious or disagreeable?

Harmonious [      ]

Disagreeable [      ]

4C.6 Compared with other villages, are the relationships among people in this village more harmonious, the same, or less harmonious than other villages?

More harmonious [      ]

The same [      ]

Less harmonious [      ]

4C.7 Suppose two people in this village had a fairly serious dispute with each other. Who do you think would primarily help resolve the dispute?

No one; people work it out between themselves [      ]

Family/household members [      ]

Neighbours [      ]

Community leaders [      ]

Religious leaders [      ]

Courts [      ]

Other (specify).....

## Appendix D.1

### CHECKLIST FOR PHOTOVOICE TRAINING.

Topics	Probes	Probes
<b>Personal Safety</b>	<p>Don't take any risks.</p> <p>Don't go anywhere you wouldn't usually go (e.g. the Lake), or do anything you wouldn't usually do</p>	
<b>Confidentiality</b>	<p>Always ask first!</p> <p>Don't invade people's privacy.</p> <p>Get consent before taking pictures</p>	<p>Ask yourself, "Would I mind if someone took a picture of me in this situation?"</p>
<b>Pictures of a large number of people or properties</b>	<p>It is still a good idea to ask permission before taking a picture of private property (someone's well or latrine for example) or a large number of people</p>	
<b>Pictures of Minors</b>	<p>Talk to their parents first for consent</p>	
<b>How to use a disposable camera</b>		

**Appendix D.2**

**CHECKLIST FOR PHOTOVOICE DISCUSSIONS**

Introduction of the research		
Explanation of informed consent and obtaining informed consent.		
Introduction of group members (name, age, occupation, level of education, family status)		
Note: Each participant should be given a copy of each picture.		
	<b>Questions</b>	<b>Probe</b>
1	What do you see in the picture? .....	Describe what the eyes can see
2	What is really happening in the picture? .....	The story behind the picture
3	How does the situation in the picture relate to your health and wellbeing? .....	
4	Why is the situation in the picture happening in the community? ..... .....	Why does this concern/problem/Strength exist in the community?
5	How could this picture educate people? .....	

6	What can be done? ..... .....	To solve the problem in the picture or To promote the strengths in the picture
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Thank you for participating in this discussion. Is there any other information you will like to share with me regarding water, sanitation and health in any of the pictures?

## Appendix E:

### STUDIES FROM THE WORLD BANK SOCIAL CAPITAL INITIATIVE

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