The role of social capital in HIV prevention
Experiences from the Kagera region of Tanzania

Gasto Frumence
2011
To my family – my wife Diana
and our children Lorraine, Laura and Larry
Abstract

Background
The role of social capital for promoting health has been extensively studied in recent years but there are few attempts to investigate the possible influence of social capital on HIV prevention, particularly in developing countries. The overall aims of this thesis are to investigate the links between social capital and HIV infection and to contribute to the theoretical framework of the role of social capital for HIV prevention.

Methods
Key informant interviews with leaders of organizations, networks, social groups and communities and focus group discussions with members and non-members of the social groups and networks were conducted to map out and characterize various forms of social capital that may influence HIV prevention. A quantitative community survey was carried out in three case communities to estimate the influence of social capital on HIV risk behaviors. A cross-sectional survey was conducted to estimate the HIV prevalence in the urban district representing a high HIV prevalence zone to determine the association between structural capital and HIV infection.

Main findings
In early 1990’s many of the social groups in Kagera region were formed because of poverty and many AIDS related deaths. This formation of groups enhanced people’s social and economic support to group members during bereavement and celebrations as well as provided loans that empowered members economically. The social groups also put in place strict rules of conduct, which helped to create new norms, values and trust, which influenced sexual health and thereby enhanced HIV prevention. Formal organizations worked together with social groups and facilitated networking and provided avenues for exchange of information including health education on HIV/AIDS. Individuals who had access to high levels of structural and cognitive social capital were more likely to use condoms with their casual sex partners compared to individuals with access to low levels. Women with access to high levels of structural social capital were more likely to use condoms with casual sex partners compared to those with access to high levels. However, there was no association between access to cognitive social capital and being tested for HIV. Individuals who had access to low levels of both structural and cognitive social capital were more likely to be HIV positive compared to individuals who had access to high levels with a similar pattern among men and women.
Conclusion
This thesis indicates that social capital in its structural and cognitive forms is protective to HIV infection and has played an important role in the observed decline in HIV trends in the Kagera region. Structural and cognitive social capital has enabled community members to decrease number of sexual partners, delay sexual debut for the young generation, reduce opportunities for casual sex and empower community members to demand or use condoms. It is recommended that policy makers and programme managers consider involving grassroots’ social groups and networks in the design and delivery of interventions strategies to reduce HIV transmission.
Original papers

This thesis is based on the following papers:


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## Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>AIDS</td>
<td>Acquired Immunodeficiency Syndrome</td>
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<tr>
<td>CI</td>
<td>Confidence interval</td>
</tr>
<tr>
<td>CSC</td>
<td>Cognitive social capital</td>
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<tr>
<td>ELISA</td>
<td>Enzyme-Linked Immunoabsorbent Assay</td>
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<tr>
<td>FBO</td>
<td>Faith-based organizations</td>
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<td>FGD</td>
<td>Focus groups discussion</td>
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<tr>
<td>HIV</td>
<td>Human Immunodeficiency Virus</td>
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<tr>
<td>IDU</td>
<td>Intravenous drug users</td>
</tr>
<tr>
<td>KARP</td>
<td>Kagera AIDS research project</td>
</tr>
<tr>
<td>MoHSW</td>
<td>Ministry of Health and Social Welfare</td>
</tr>
<tr>
<td>MUHAS</td>
<td>Muhimbili University of Health and Allied Sciences</td>
</tr>
<tr>
<td>NBS</td>
<td>National Bureau of Statistics</td>
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<tr>
<td>NGO</td>
<td>Non-governmental organizations</td>
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<tr>
<td>OR</td>
<td>Odds ratio</td>
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<tr>
<td>PCA</td>
<td>Principal component analysis</td>
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<tr>
<td>Sida</td>
<td>Swedish International Development Agency</td>
</tr>
<tr>
<td>SSC</td>
<td>Structural social capital</td>
</tr>
<tr>
<td>STI</td>
<td>Sexually transmitted infections</td>
</tr>
<tr>
<td>TACAIDS</td>
<td>Tanzania Commission for AIDS</td>
</tr>
<tr>
<td>TDHS</td>
<td>Tanzania Demographic Health Survey</td>
</tr>
<tr>
<td>URT</td>
<td>United Republic of Tanzania</td>
</tr>
<tr>
<td>VCT</td>
<td>Voluntary, counseling and treatment services</td>
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<tr>
<td>Administrative definitions</td>
<td>Administrative definitions</td>
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<td>----------------------------</td>
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<tr>
<td>Region</td>
<td>Region</td>
</tr>
<tr>
<td>One of the 26 largest geographical and administrative divisions of Tanzania governed by a regional commissioner as a political leader and regional administrative secretary as the chief executive officer.</td>
<td>One of the 26 largest geographical and administrative divisions of Tanzania governed by a regional commissioner as a political leader and regional administrative secretary as the chief executive officer.</td>
</tr>
<tr>
<td>District</td>
<td>District</td>
</tr>
<tr>
<td>The largest sub-division of a region governed by a district commissioner as a political leader and district administrative secretary as the chief executive officer.</td>
<td>The largest sub-division of a region governed by a district commissioner as a political leader and district administrative secretary as the chief executive officer.</td>
</tr>
<tr>
<td>Division</td>
<td>Division</td>
</tr>
<tr>
<td>The largest sub-division of a district governed by a divisional secretary.</td>
<td>The largest sub-division of a district governed by a divisional secretary.</td>
</tr>
<tr>
<td>Ward</td>
<td>Ward</td>
</tr>
<tr>
<td>The largest sub-division of a division governed by a ward executive officer.</td>
<td>The largest sub-division of a division governed by a ward executive officer.</td>
</tr>
<tr>
<td>Village</td>
<td>Village</td>
</tr>
<tr>
<td>The largest sub-division of a ward in the rural setting and administered by a village executive officer.</td>
<td>The largest sub-division of a ward in the rural setting and administered by a village executive officer.</td>
</tr>
<tr>
<td>Ten-cell unit</td>
<td>Ten-cell unit</td>
</tr>
<tr>
<td>The smallest administrative unit consisting of a group of 10 households and administered by a ten-cell leader who is answerable to the ruling party. The ten-cell unit applies to both urban and rural areas and was extensively used before the introduction of a multiparty democratic system in 1995.</td>
<td>The smallest administrative unit consisting of a group of 10 households and administered by a ten-cell leader who is answerable to the ruling party. The ten-cell unit applies to both urban and rural areas and was extensively used before the introduction of a multiparty democratic system in 1995.</td>
</tr>
<tr>
<td>Kitongoji/hamlet</td>
<td>Kitongoji/hamlet</td>
</tr>
<tr>
<td>The smallest rural based administrative unit consisting of 50-200 households and governed by a chairperson. It replaced the ten-cell leadership unit that was used before the introduction of a multiparty system. The chairperson is answerable to the local government.</td>
<td>The smallest rural based administrative unit consisting of 50-200 households and governed by a chairperson. It replaced the ten-cell leadership unit that was used before the introduction of a multiparty system. The chairperson is answerable to the local government.</td>
</tr>
<tr>
<td>Street</td>
<td>Street</td>
</tr>
<tr>
<td>The smallest urban administrative unit consisting of 25-150 households governed by a street secretary as executive officer. This administrative unit was introduced after the introduction of multiparty system and its leaders are answerable to the local government.</td>
<td>The smallest urban administrative unit consisting of 25-150 households governed by a street secretary as executive officer. This administrative unit was introduced after the introduction of multiparty system and its leaders are answerable to the local government.</td>
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Introduction

In spite of its long history, the concept of social capital became more popular in the political and socio-economic research areas following the 1993 Putnam’s work on “Making Democracy Work: Civic Traditions in Modern Italy”. Here the concept was used to explain issues of local governance in Italy. Putnam defines social capital as people’s engagement in local associations, informal social networks and norms based on trust and reciprocity between community members. These features of social organization (trust, norms, and networks) can help to improve the efficiency of society by facilitating coordinated actions. He has explained several benefits to be accrued from social capital, ranging from governance, health, education and neighborhood safety (Putnam, 2000). Putnam’s work on social capital and governance with benefits both to individuals and the community became the beginning of a new paradigm shift that related social capital to have positive impact particularly in the social and economic areas.

Studies on social capital and health outcomes are recent phenomena in public health research. Before 1990s the dominant paradigm focused on the association between behavioral and biomedical factors in treatment and prevention of diseases both at individual and community level (Campbell, 2011). The concept of social capital became more prominent starting from mid 1990s when the public health arena witnessed a paradigm shift from the traditional biomedical approach to more social and community oriented ways of determining illness behavior and related interventions. This paradigm shift is seen in the advocacy by public health researchers to use social networks as important channels for conveying health related information instead of relying on traditional information sources such as posters, radio, television and newspapers (Campbell, 2000).

This paradigm shift went hand in hand with the new research interest focusing on HIV/AIDS and social capital. At the beginning, researchers paid more attention to the impact of HIV/AIDS on social networks and social cohesion. Pronyk (2002) conducted a study on “social capital and the HIV/AIDS epidemic in rural South Africa” and reported that the HIV/AIDS epidemic had created a heavy burden on the social fabric. Traditional networks, including social groups, served as safety net enabling communities to cope with the social and economic problems facing them. These networks supported communities by for example contributing money to funerals, donating food and lending money. Several other studies have shown that the HIV/AIDS burden disintegrated and disempowered existing social networks to cope with the economic burden created by the same epidemic. The networks could no longer manage the increasing number of deaths, orphans...
INTRODUCTION

and the growing number of families headed by children (Foster, 2006; Nombo, 2007).

Researchers in public health have developed an interest in exploring how social capital in terms of informal and formal networks (structural) and norms and trust (cognitive) are associated with the risk of HIV infection. However, there is continuing debate among researchers regarding the role of social capital in influencing the HIV epidemic. In some contexts social capital, characterized by high level of community cohesion, has been reported to have a protective and facilitating role for community responses to the HIV epidemic. In other settings, membership in social groups, such as sexual networking groups, may increase the risk of being HIV infected. Similarly those who have been excluded from membership may have an elevated risk for HIV infection due to lack of collective norms and values (Baum, 1999; Gregson et al, 2004; Pronyk et al, 2008).

Whether social capital is protective for HIV infection needs to be further explored and elaborated. There is need to understand more about people’s experiences of being involved in organizations and social groups (structural social capital) and the trust and reciprocity embedded in their interactions (cognitive social capital). There is limited knowledge about the mechanisms through which social capital in its structural and cognitive forms influence HIV risk behaviors. This thesis is an attempt to provide information to fill this knowledge gap. Results from a qualitative case study of three communities with varying HIV prevalence is used to characterize social capital in terms of its structural and cognitive components and to construct a theoretical model to illustrate the mechanisms through which social capital may influence HIV risk behaviors and therefore enhance prevention. Data from a survey of social capital and HIV risk behaviors in the same three communities are used to analyze the links between different forms and levels of individual social capital and HIV risk behaviors both for men and women. Data from a cross-sectional study are used to estimate the association between social capital, socio-demographic characteristics and HIV infection.
Aims

The overall aims of this thesis are to investigate the links between social capital and HIV infection and to contribute to the theoretical framework of the role of social capital in HIV prevention.

The specific aims are:

• To explore and describe the mechanisms of how structural and cognitive social capital may influence the transmission of HIV/AIDS (Paper I and II)

• To determine the association between structural and cognitive social capital, HIV/AIDS risk related behaviors and HIV infection (Paper III and IV)
Study context

The United Republic of Tanzania

The United Republic of Tanzania was formed out of the union of two sovereign states of Tanganyika and Zanzibar. The country is bordered by Kenya and Uganda to the north, Rwanda, Burundi and the Democratic Republic of the Congo to the west, and Zambia, Malawi and Mozambique to the south. The country’s eastern borders lie on the Indian Ocean (Figure 1). Tanzania mainland, where Kagera region is situated, has 21 regions and is further sub-divided into 113 districts. It has a total area of 945,087 km$^2$ of which 886,037 is land and the remaining part is covered by water. Based on the projections from 2010 Tanzania national bureau of statistics, the total population of the country is about 43 million (Table 1).

Figure 1. Map of the United Republic of Tanzania showing Kagera region (see arrow). Source: URT-TDHS (2011).
**Socio-political and economic situation**

Tanzania gained its independence from the British colony in 1961 and in 1967 the country adopted the socialist ideology, locally known as “Ujamaa”. The basic traits under Ujamaa emphasized cooperation, extended family-hood, and welfare to all members of the society (Nyerere, 1968). The implementation of Ujamaa ideology was largely characterized by communalsm based on the principle of collective production, nationalization of all major means of production by practicing state economy and an equalitarian resource distribution (Nyerere, 1967; Rodney, 1972). During this period Tanzania experienced equity in access to social services by providing free health and education services to all.

In the early 1980s, Tanzania’s economy experienced a heavy deterioration caused by poor implementation of Ujamaa policies, the war with Uganda in the late 1970s, the hiking of oil prices, droughts, low prices of exports, and increasing debt (Maliyamkono & Bagachwa, 1990; Bagachwa, 1992). In the mid 1980s the government of Tanzania adopted the World Bank and International Monetary Fund’s liberal policies aiming at recovering the economy through structural adjustment programmes. The liberal policies led to the demise of the Ujamaa ideology when adopting the new policies of free market economy.

The introduction of free market economy forced the government of Tanzania to abolish free access to social services by introducing a cost sharing policy. The government introduced user fees and social insurance schemes in the health sector and tuition fee in the education sector. The cost sharing policy has experienced several challenges. A study based on literature review and semi-structured interviews (Schwerzel et al, 2004) showed that the government has not achieved the intended goals of equity. The free market policies have increased marginalization of the vulnerable poor and excluded them from accessing health services. The most affected vulnerable groups include: under-five children, pregnant women, widows, elders aged 60 years old and beyond, people living with AIDS, and orphans. When one family member gets sick, close relatives are forced to sell their disposable properties, borrow money from other capable relatives and friends or get money from social groups (for those who are members) in order to pay for user fees. This situation has increased impoverishment and created difficulties for poor people to survive. Sometimes children have to drop out of schools due to lack of money to buy uniforms and stationeries (Save the Children, 2005).

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STUDY CONTEXT

Table 1. Selected demographic indicators for Tanzania and Kagera region.

<table>
<thead>
<tr>
<th>Basic characteristic</th>
<th>Tanzania</th>
<th>Kagera region</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population size</td>
<td>43,000,000</td>
<td>2,600,000</td>
</tr>
<tr>
<td>Population growth rate</td>
<td>2.9%</td>
<td>3.1%</td>
</tr>
<tr>
<td>Fertility rate</td>
<td>5.4%</td>
<td>7.4%</td>
</tr>
<tr>
<td>Maternal mortality ratio</td>
<td>454/100,000</td>
<td>31.5/1000</td>
</tr>
<tr>
<td>Stillbirth rate</td>
<td>26/1000</td>
<td>32/1000</td>
</tr>
<tr>
<td>Neonatal mortality rate</td>
<td>36/1000</td>
<td>32/1000</td>
</tr>
<tr>
<td>Perinatal mortality rate</td>
<td>25/1000</td>
<td>32/1000</td>
</tr>
<tr>
<td>Postneonatal mortality rate</td>
<td>69%</td>
<td>69%</td>
</tr>
<tr>
<td>Life expectancy (years)</td>
<td>51</td>
<td>53</td>
</tr>
</tbody>
</table>


*2010 projected population by Tanzania Bureau of Statistics

Despite the collapse of Ujamaa and the adoption of liberal economy, this ideology left behind important legacy to Tanzanians including the values of solidarity, trust, cooperation, collectiveness and social networks which laid down a foundation of social capital in the country.

The HIV epidemic

Tanzania is one of the Sub-Saharan African countries greatly affected by the HIV epidemic. The first three HIV cases in the country were discovered in 1983 in the Kagera region. Ten years later, HIV had reached all regions of Tanzania (Kwesigabo, 2001) including the rural areas thereby increasing the previously low rural prevalence to more than 10% (TACAIDS, 2006). Data from the Tanzania Health Indicators Survey indicates that there has been a slight decrease in the overall prevalence for both men and women from 6.3% (2003-04) to 4.6% (2007-08) for men and from 7.7% (2003-04) to 6.6% (2007-08) for women (TACAIDS, 2008).

Several structural factors relating to the social, cultural and economic arenas have been reported as responsible for spreading HIV infection in Tanzania. These factors include: poverty, multiple partnering, family separation and gender-based violence (URT, 2009). Areas with high social and economic interactions along main roads, i.e. with trading centres, a large number of bars, hotels, shops and schools have also been identified as risk environments for HIV transmission (Bloom et al, 2002). Cultural norms, beliefs and practices such as polygamy, wife...
inheritance and female circumcision are also believed to have contributed to HIV transmission in Tanzania (Lugalla et al, 2004; TACAIDS, 2008).

Like in many Sub-Saharan African countries, women in Tanzania bear the biggest burden of HIV. Although biological factors contribute to their increased risk there is a growing recognition that structural factors including gender inequalities play a role for HIV transmission. Women’s low social and economic condition makes them dependent and powerless decreasing their possibilities to negotiate sexual relations. Taboos and rigid gender roles keep women at home to carry out domestic activities. These practices make women unexposed to HIV education and increase their likelihood of contracting HIV/AIDS (UNICEF, 2002).

**HIV prevention and control**

Tanzania’s HIV preventive programs utilize two main approaches based on biomedical and behavioral interventions. Such programs target both the general population and specific vulnerable groups. The behavioral interventions include information, education and communications programs integrated into work places, faith-based organizations (FBOs), community groups and schools. These interventions focus on reducing risky behaviors such as number of casual sex partners, condom use, intergenerational sex, commercial sex and early sexual debut, all of which are advocated by massive media campaigns. The biomedical interventions include prevention of mother to child transmission, male circumcision, HIV counseling and testing and screening and treatment of sexually transmitted infections (STI) (Kwesigabo, 2001; Lugalla et al, 2004; URT, 2009).

The new development in the public health discourse has raised concerns about the ineffectiveness of the biomedical and behavioral approaches in the fight against HIV (Campbell, 2003). Furthermore, researchers and implementers of HIV prevention programs have put limited attention to the underlying social and structural contextual factors influencing the HIV epidemic (UNAIDS, 2000; Pronyk, 2006). HIV intervention programs have also been criticized for adopting a top down approach in both design and implementation. The emerging paradigm shift from a biomedical and behavioral approach to a more social and structural approach support the argument that community participation in the design and delivery of any intervention will lead to more effective HIV prevention programs. This means that community mobilization, participation and empowerment are emerging in the public health discourse as the guiding principles for programs seeking to address the underlying broader social and structural factors affecting the vulnerable groups (Pronyk, 2006). However, there are a limited number of studies in the African setting that have studied the importance of community
mobilization and participation in HIV interventions. A review of epidemiological data has highlighted that social mobilization through local networks has been an effective approach to reduce the HIV prevalence in Uganda (Low-Beer & Sem-pala, 2010). Social capital has emerged as an important concept of the new paradigm that acknowledges the social and structural context of HIV interventions.

The Kagera AIDS Research Project (KARP)

The research questions raised in this thesis originate from the project “Epidemiology towards evaluation of interventions and monitoring of HIV infection in the Kagera region of Tanzania”. The project, popularly known as Kagera AIDS Research Project (KARP) was initiated in 1986 as a long-term research and intervention programme in which a series of population-based epidemiological and socio-anthropological studies have been performed. The first reported cases of AIDS in Tanzania were identified at the Kagera Regional Hospital in 1983. Following an observation that the epidemic was already in Tanzania an agreement between the MoHSW, Muhimbili University of Health and Allied Science (MUHAS), and Swedish International Development Agency (Sida) was reached to initiate population-based studies in the Kagera region. The overall aim of the project was to determine the magnitude and spread of HIV infection in the region as well as to study the socio-anthropological aspects of its spread. The basic trait of KARP was the inclusion of inter-disciplinary collaboration between the social and biomedical sciences. This strategy involved a joint venture between the disciplines of epidemiology, social science, linguistic and microbiology/immunology in both Tanzania and Sweden (Kwesigabo, 2001). Since its inception, KARP has conducted several cross-sectional studies in order to monitor HIV infection trends in the region. The baseline survey in 1987 revealed an overall prevalence of HIV-infection varying from 24.2% in the urban area to 0.6% in the most remote rural area (Killewo et al, 1990). Subsequent studies conducted in 1996, 1999 and 2004 showed declining trends of HIV infection in the region, particularly among the women (Kwesigabo, 2001; Frumence et al, 2011).

KARP and other studies have found several factors to be responsible for the observed downward trends. These factors included promotion of condom use, health education, voluntary HIV counseling and testing (VCT), an increased awareness and knowledge about HIV/AIDS causes and prevention. An increased openness that may have decreased the stigma previously associated with the disease was also identified to have played a role in the declining trends (Kwesigabo, 2001; Lugalla et al, 2004; URT, 2009). Although many factors had been proposed to explain the declining trends, it was still unclear how community
participation or involvement in social groups or associations may have influenced people's sexual health behavior, thus contributing to the observed HIV decline in Kagera region. This knowledge gap prompted the research interest to use the theoretical concept of social capital to investigate how social groups and networks may positively shape people's sexual health behaviors and ultimately contribute to reduction of HIV transmission.

The following section gives an overview of the theory of social capital by examining the origins of the concept itself and describes the theoretical explanations for how social capital is seen as influencing health in general and HIV in particular.
Theoretical framework

The concept of social capital

The concept of social capital can be traced back to classical thinkers of the 19th century. According to Portes (1998) social capital originates from the works of Karl Marx and Émile Durkheim who discussed social capital in terms of community involvement and participation. In 1948 Marx wrote about class-consciousness, pointing out that social capital is an important tool towards bringing about social change in the capitalist state. He argued that trust among workers could help in building class identity and identify common interests to fight for (Giddens, 1973). Durkheim (1951) provided another useful feature of social capital by pointing out that group life was the basis for social cohesion. He differentiated between two types of social networks based on mechanical or organic solidarity. A typical pre-industrial society was characterized by social networks formed by members who shared the same values, beliefs and norms, i.e., mechanical solidarity. Organic solidarity was found in the modern society where interests and roles differ but yet people create links and social networks based on their social class (Giddens, 1973; Haralambos & Holborn, 1990).

Other social scientists have attempted to apply the concept of social capital on human relationships and socio-economic achievements in the society. Pierre Bourdieu, James Coleman and Robert Putnam were the first scholars who revived and made the concept popular as briefly discussed in the following section.

Pierre Bourdieu

Bourdieu gave the first systematic definition of social capital in the early 1980s (1986: 248), when he stated that it is "the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance or recognition".

Bourdieu's concept of social capital put emphasis on the role of social relations, which is viewed through conflicts and power relations between individuals. For him, social relations empowered individuals and were seen as resources in the social struggle for better social conditions (Portes 1998; Siisiäinen, 2000). For Bourdieu, social capital is the existence of social networks consisting of group contact and membership, provision of support, access to resources and obligations. Networks provide shared identity, possession of sociability skills and ability to maintain the network. Bourdieu emphasized that social capital is created and reconstructed by the individual. Like any other investment, community members need to invest in social capital through adopting various strategies such as community involvement and participation.
as participation in groups or associations (Bourdieu, 1985, 1986). According to Bourdieu social capital has two basic elements. Firstly, resources in the social network are collectively owned by all members and not by the individual. Secondly, the type of benefits one may access through social capital differs according to the nature of the social network (Campbell et al, 2000; Macinko et al, 2001).

James Coleman
In the late 1980’s, Coleman defined social capital as: “a particular kind of resource available to an actor, comprising a variety of entities which contains two elements: they all consist of some aspect of social structures, and they facilitate certain actions of actors … within the structure” (Coleman, 1988; p 98).

According to Coleman (1990), social capital is both an individual and collective asset. He refers to social capital as resources that an individual can acquire out of his or her social ties with other members in the communities.

Coleman listed several mechanisms through which social capital can be generated including group enforcement, reciprocity and members’ expectation (Coleman, 1988). This implies that individuals participate in relationships with an expectation of getting back some rewards such as access to information or materials as a result of their participation or involvement (Coleman, 1990; Portes, 1998; Macinko et al, 2001). Contrary to other scholars Coleman cautioned that not all forms of social capital may result into positive results. Strong ties in a social group may for example benefit some members while prohibiting others from accessing the same benefits (Coleman, 1990).

Robert Putnam
The political scientist Robert Putnam has perhaps been the most influential in conceptualizing and theorizing social capital. He wrote about the political and economic situation in Italy and pointed out that the way society organized itself into different social structures contributed largely towards differing levels of achievements. He showed that regions with high civic participation had good performance in local government compared to regions with low level of civic participation (Hawe et al, 2000; Campbell et al, 2000). The presence of high level of trust and enforceable norms also increased the level of civic participation (Portes, 1998; Campbell et al, 2000).

Putnam’s conceptualization of social capital means that a community with high level of social capital has many social networks with high level of civic participation within these networks. Generalized norms of trust and reciprocal support among community members are also crucial (Campbell et al, 1999).
In summary, Bourdieu, Coleman and Putnam emphasize three important elements of social capital theory. Firstly, social capital consists of social networks, people’s participation in organizations, and trust and reciprocity. Secondly, it is a resource acquired by individuals as a result of relationships they build with others in the society. Thirdly, it consists of shared norms and values, which guide and facilitate the functioning of the social networks and organizations for successful realization of opportunities and advantages.

Critic against the concept of social capital

Many scholars have criticized that there is a lack of consensus on the basic definitions of social capital. They are concerned that the definitions cover many types of relationships at several levels making social capital vague, slippery and poorly specified (Portes, 1998; Baum, 1999). In addition, Wills (2000) pointed out that Putnam’s work lacks theoretical specificity by failing to show the link between associational life, high social trust and better government. Another criticism is based on Putnam’s assumption that social capital is a societal good that always yields positive results. Gilbert (2009) pointed out that even crime gangs may involve well-organized networks with shared norms but they do not yield positive results for society. Other identified negative results include restriction of individual freedom and exclusion of outsiders (Portes, 1998). Also, there is no consensus on how to operationalize and measure the concept of social capital. It is difficult to quantify non-observable variables such as norms and shared values, which are used as proxies for social capital.

Despite these criticisms, the interest in the concept of social capital is growing and many researchers have adopted it to explain and understand community development (Portes, 1998; Hawe et al, 2000; Macinko et al, 2001).

Three approaches of social capital

The definitions of social capital are based on three approaches. The first views social capital as an individual property, the second as a collective attribute and the third is an integration of both individual and collective approaches.

Individual social capital

Bourdieu (1986), Lin (2001) and Flap (2004) view social capital as an individual resource that enables individuals to access resources that they could otherwise not access. An individual acquires social capital through participating in social groups or networks and transforms the collective actions within the groups into socio-economic benefits. The extent to which an individual has access to these resources depends on the person’s connections, how much they interact through resources depends on the person’s connections, how much they interact through

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the networks, the strengths of these networks, as well as the resources available in their connections (Sobel, 2002).

**Collective social capital**

Putnam (1995, p.57) views social capital as a community level resource and defines it as “features of social organization such as networks, norms and social trust that facilitate coordination and cooperation for mutual benefit”. Coleman (1988) and Woolcock (1998) argued that social capital is a collective resource since it results from members’ participation in various formal and informal organizations. However, Hyypa and Maki (2003) claimed that even if social capital is regarded as a collective property, its impact can only be assessed at the individual level.

**Integrative approaches to social capital**

The integrative approach combines features of individual and collective social capital. It is characterized by individual social connectedness, which is seen as a foundation for collective social capital. Therefore social capital is viewed as a resource generated from social ties and used by individuals or groups of networks. This implies that social capital has both individual and collective benefits (Portes, 1998; Franke, 2005).

**Classifications of social capital**

Social capital is commonly classified into structural and cognitive. According to Harpham and co-workers (2002), structural social capital includes the number of organizations individuals belong to and the extent to which individuals or members actively participate in these organizations or other social activities. Hitt and colleagues (2002) viewed structural social capital as a basis for building relationships and cooperation as well as for facilitating mutual benefits through collective actions. Cognitive social capital includes the resources accrued from people’s participation in formal and informal associations including reciprocity, norms, and values. It also encompasses insights of trust, and support and facilitates mutual benefits through collective actions (Krishna & Uphoff, 2002).

Structural social capital can be further sub-classified into bonding, bridging and linking. Naraya and Pritchett (1997) defined bonding social capital as relations that include people from homogeneous formal and informal groups that are closely linked through networking. This is a type of social capital which people take part in daily life. It includes the family, churches, and other social groups in which people meet frequently (Campbell et al, 2000). Through these networks, trust among members is created and enhanced. Also norms and codes of conduct

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are established to facilitate communication and responsibility within the social network (Portes, 1998).

Bridging social capital is viewed as relations that are formed beyond the boundaries of various social networks. These relations extend to individuals, formal and informal organizations that cut across different communities and individuals (Naraya & Pritchett, 1997; Wallis et al, 1998; Putnam, 2000).

According to Woolcock (2001), linking social capital involves the relationships between non-homogenous individuals and those who are outside their communities. It enables members to access a wider range of resources than those available in the community. Baum and Ziersch (2003) referred linking social capital to networks that cut across different ties and it is a vertical connection that covers different powers. Thus, linking social capital may help to reduce inequities by encouraging people to feel responsible for people beyond their boundaries.

This thesis adopts the division of social capital into individual and collective social capital. Individual social capital is further divided into its structural and cognitive forms while collective social capital is divided into conventional and neighbourhood related social capital. This is in line with Rothstein and Stolle (2003) who define social capital both at individual and collective level. At individual level, they view social capital as the number of contacts a person has in the society and the extent to which these contacts are beneficial to individuals. At the collective level the emphasis is on aggregated measurements of individual level social contacts and networks. It also includes aggregated levels of trust and the resources that are accessible collectively to all individuals in the society. Kawachi et al (1997) underscored that collective social capital is equivalent to aggregated levels of individual social capital. Figure 2 depicts the different forms of social capital, and how they are conceptualized in this thesis.

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Social capital and health outcomes

Several studies have found a positive relationship between social capital and different dimensions of health. According to Veenstra (2000), community networks may provide an enabling environment in which health-related information could be diffused. Studies from the US (Kawachi et al., 1999; Subramanian et al., 2002), using ‘aggregated’ individual social capital, found that living in areas with high levels of social capital was strongly associated with individual well-being and health. In a cross-sectional study of 75 neighborhoods in Malmö, Sweden, Lindström et al. (2004) found that ‘aggregated’ high levels of social capital (social participation) was significantly associated with individual self-reported good health. Studies focusing on access to individual social capital in Västerbotten County in Northern Sweden have shown that access to individual social capital increases the likelihood of having good self-rated health for both men and women (Eriksson, 2010).

Even if social capital, both collective and individual, appears to influence health positively, the mechanisms of how social capital operates have been subjected to...
much debate. Berkam and Glass (2001) argued that existing ties within social networks may influence health through the social support that can be accessed by network members. These include emotional support whereby members may share care, love and sympathy; person-to-person contact, which may promote or restrict exposure to infectious agents. Instrumental support, that may provide material support and indirectly affecting the health of network members and information support where exchange of health information may facilitate healthy behaviors. Getting access to material resource through networks may provide opportunities for members to engage in economic activities that can directly or indirectly influence health. Furthermore, Erickson (1988) suggested social influence as a mechanism for social capital to influence health, where peers influence others through normative guidance.

Social capital may also have a negative effect on people’s health. Kawachi and Berkam (2001) pointed out that networks with strict norms may have destructive mental health effects on members who fail to adhere to them. According to Yamamura (2010), being excluded from networks may also have indirect negative effects on health. Lindstrom (2003) and Greiner et al (2004) reported that social participation in certain networks may encourage unhealthy behaviors, such as taking alcohol and smoking.

Social capital and HIV transmission

That social capital can be both health enhancing and health demaging is evident in studies on risk factors for HIV. Jesus et al (2002) indicated that social capital in its structural form may create norms and trust (cognitive social capital) which promote risk behaviors for HIV infection both in developed and developing countries. Examples of networks that may have a negative impact are those involving transactional sex and multiple partnering (Kiama, 1999; Pronyk, 2002; Epstein, 2007). Other studies have shown that social capital may positively influence and help contain the HIV epidemic by fostering positive norms of conduct (Pronyk, 2002; Campbell & MacPhail, 2002). In an exploratory study conducted in rural Zimbabwe, Gregson and co-researchers (2004) showed that participation in well functioning local community groups was positively associated with avoidance of risk behaviors for HIV infection. The mechanisms have been described to include high trust relationships, enhancing self-confidence and self-esteem. These are regarded as important tools for making decisions and negotiating about sexual relations. Social capital has also been shown to facilitate access to information and knowledge about HIV/AIDS and HIV testing, needed for shaping HIV protective behavior (Jamil & Muriisa, 2004; Pronyk et al, 2008). Campbell (2003) suggested that lack of social capital may intensify the HIV epidemic since
those outside networks may have norms resulting into less interconnectedness. Such norms may hinder the effect of HIV interventions by encouraging for example the use of illicit drugs and excessive alcohol drinking that are regarded as risk factors for HIV infection.

The possible negative effects of social capital are seen also in relation to sexual behaviors. Associations or networks with strict rules, unaffordable fees or contributions may exclude some community members to join. This may encourage excluded community members to form own groups with norms facilitating HIV transmission (Baum, 1999). Excluding community members from networks due to economic constraints may also enhance inequity and increase the risk for HIV in specifically vulnerable groups (Turmen, 2003). Women may more be affected than men since their power to negotiate safe sex with their sexual partners is weaker (Heise & Elias, 1995).
Materials and methods

A multi-methodological approach

The multi-dimensionality of the concept of social capital (social interactions in groups and networks, trust, norms and reciprocity) calls for employment of a combination of qualitative and quantitative methods. The methods are seen as complementary allowing, the researcher to uncover the mechanisms as well as the associations between different dimensions of social capital and health in various local contexts (Harpham et al, 2002; Dudwick et al, 2006). In this thesis qualitative methods were used to deepen the understanding of how people’s experiences and involvement in social networks (social capital) may influence their HIV risk behaviors and quantitative methods to illustrate how this involvement is distributed in the population and eventually influence health behaviors and the risk of being HIV infected. In addition, the qualitative sub-study included triangulation in data collection. Focus group discussions were performed to capture community norms related to social capital while key informant interviews and documentary reviews were used to describe in detail the existing social capital in the study area (Dahlgren et al, 2007). Table 2 gives an overview of the thesis structure indicating sub-studies, overall aims, study design, study sample, sources of data, analytical approaches, study period and corresponding papers.
<table>
<thead>
<tr>
<th>Sub-study</th>
<th>Aims</th>
<th>Study design</th>
<th>Study sample</th>
<th>Data sources</th>
<th>Analytical methods</th>
<th>Study period</th>
<th>Paper</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>To explore and describe the mechanisms of how structural and cognitive social capital may influence the transmission of HIV/AIDS</td>
<td>Qualitative</td>
<td>120 community members, 29 key informants (leaders of formal/informal organizations and local leaders)</td>
<td>Focus group discussions, key informant interviews</td>
<td>Case analysis, Grounded theory</td>
<td>Sept - Oct 2008</td>
<td>I</td>
</tr>
<tr>
<td>II &amp; III</td>
<td>To determine the association between structural and cognitive social capital, HIV/AIDS risk behaviors and HIV infection</td>
<td>Quantitative, cross-sectional (sub-study II)</td>
<td>1301 community members aged 15-64 years</td>
<td>Semi-structured questionnaire</td>
<td>Multivariable logistic regression</td>
<td>March - May 2010</td>
<td>II</td>
</tr>
<tr>
<td>III</td>
<td>Quantitative, cross-sectional (sub-study III)</td>
<td>3422 community members aged 15-54 years</td>
<td>Semi-structured questionnaire and serological test results for HIV infection</td>
<td>Multivariable logistic regression analysis</td>
<td>July - Oct 2010</td>
<td>IV</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Overview of the thesis: sub-study, aims, study design, study sample, data sources, analytical methods, study period and corresponding papers.
MATERIALS AND METHODS

Study area

The study was conducted in the Kagera region situated in the northwestern corner of Tanzania. The regional capital is Bukoba town. The region shares borders with Uganda to the North, Rwanda and Burundi to the West, the Kigoma and Mwanza regions to the South and Lake Victoria to the East. Kagera region comprises of seven administrative districts: Bukoba urban, Bukoba rural, Muleba, Karagwe, Biharamulo, Chato and Ngara. The 2002 National Census showed that Kagera region had a population of about 2 million people with an annual growth rate of 3.1% (NBS, 2003). The region has witnessed an overall decline in HIV prevalence from 6.6% in 1987 to 3.4% in 2008 (TACAIDS, 2008).

As described earlier the KARP project has closely followed the HIV/AIDS epidemic in the area since the late 1980’ies. Repeated cross-sectional studies have created a base for dividing the region into three prevalence zones; high, medium and low. In the urban high prevalence zone the prevalence declined from 24% in 1987, to 18% in 1993, 13% in 1996 and 8.2 % in 2004. In the peri-urban medium prevalence zone it declined from 10% in 1987, to 6.8% in 1996 and 4.3% in 1999 and in the rural low prevalence zone the prevalence declined from 4.5% in 1987 to 2.6% in 1999. The decrease in HIV prevalence was supported by a decline in incidence rate; from 48/1000 in 1989 to 9.1/1000 persons at risk in 1996 and from 8.2/1000 in 1989 to 3.9/100 persons at risk in 1999/2000 in the high and medium HIV prevalence zones respectively (Killewo et al, 1990, 1993; Kwesigabo, 2001; TACAIDS, 2008).

For the qualitative sub-study three case communities from the three districts of Bukoba rural, Bukoba urban and Chato (Figure 3) were selected to represent high, medium and low HIV prevalence zones. In each identified zone, one ward was randomly selected followed by purposive selection of one community. The selection of the case communities were done in collaboration with the ward leaders who were asked to identify all existing formal and informal organizations operating in their wards to facilitate the selection of a community where all types of organizations were represented. The selected communities were then regarded as “typical” communities by having an average number of both formal and informal organizations.

The Bukoba urban district, that represented the high HIV prevalence zone, was also selected for the cross-sectional survey to determine the association between social capital and HIV infection.
MATERIALS AND METHODS

Study populations and sample size
For the qualitative studies (sub-study I) 29 key informants were purposively selected to represent community leadership, existing organizations and networks. In total five community leaders, six leaders of faith based organisations and 18 leaders of informal organizations were interviewed.

Fifteen focus group discussions (FGDs) were conducted involving 120 members and non-members of informal organizations. The FGD participants were selected to capture the wide range of experiences among community members of existing forms of organizations and the possible influence on their health particularly sexually related health behaviors. In the urban and rural communities we had four FGDs in each community: one male youth group, one female youth group aged 24-34, one male adult group and one female adults group aged 35-64 years. In the peri-urban community, seven FGDs were conducted comprising of one female youth group, two male youth groups, two male adults groups and two female adults groups.

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The community survey (sub-study II) focused on determining the association between social capital and HIV risk behaviors. The survey was conducted in the same three communities where the qualitative studies (sub-study I) had been performed. A total of 1339 15-64 year old adults in these communities were visited for an interview. Of these, 1301 (97%) agreed to be interviewed. Sex representation in the study sample differed between the communities. There were more women (63%) in the urban community compared to the peri-urban (57%) and the rural (42%) communities. This is because there were more households with women only family members (19%) compared to households with men only (13%) in the urban community.

The cross-sectional study (sub-study III) was conducted in the urban district. A total of 3586 adults aged between 15 and 54 were interviewed. Of these, 3422 (95%) agreed to participate in the study (58% women and 42% men).

**Sampling procedures**

Following written permission from both the regional and district levels the research team visited the study area and held meetings with community leaders to explain the nature of the study, its objectives as well the importance of having informed consent from each participant. These leaders were also asked to assist in purposively selecting eligible participants for the FGDs as well as in identifying and visiting formal organizations working on HIV related activities in the study area. One leader from each organization was selected, and asked to be interviewed as a key informant.

For the cross-sectional studies the researchers sought permission from the regional, district, and community authorities. They were informed about the purpose of the study and asked for cooperation and continuing support. Community guides were appointed by the leaders to guide the research team in visiting households. The research team made a list of eligible study participants and one individual was randomly selected to participate in the study. For both sub-studies selected individuals were asked to give informed consent to participate in the studies.
MATERIALS AND METHODS

Training of field assistants.

Focus group discussion with young men.

Interviewing in privacy.
Measure instruments

**Forms and characteristics of social capital and the mechanisms through which social capital may influence HIV transmission (Paper I and II)**

An interview guide for both focus group discussion (FGD) and key informant interviews formed the basis for collecting information on structural and cognitive forms of social capital. The interview guide included questions based on Putnam’s framework of understanding social capital. This implied discussing people’s engagement in civic organizations and voluntary activities, their views on institutional and organizational trust and reciprocity and strategies used to build trust and reputation. The guide also included questions about HIV and AIDS preventive activities and care seeking behavior (Table 3).

Most interviews and discussions were conducted in local government offices and lasted between 1 and 2 hours. The FGDs consisted of 6–8 participants and they were homogeneous in terms of sex and age to enhance openness during the discussion. An emergent design was adopted whereby the results from the first group determined what to focus specifically on in the forthcoming ones. All discussions and interviews were tape recorded, transcribed verbatim and translated into English, to facilitate joint analysis by the research team.

**Social capital and HIV risk behaviors (paper III)**

The questionnaire used in the first survey within the KARP project in 1987 was modified and updated for use in sub-study II. This community survey aimed at determining the association between social capital and HIV risk behaviors. The questions were constructed to measure individual and collective social capital and were based on indicators such as trust and reciprocity (cognitive social capital) and membership in social networks and organizations and voluntary participation in public activities (structural social capital). The questionnaire also included questions on HIV risk behavior: “condom use with casual sex partner” and “testing for HIV infection”. Questions on socio-demographic and socio-economic factors such as sex, age, level of education, marital status, religion, accessibility to water source, type of building materials used in dwellings and type of assets possessed were also included in the questionnaire.

**Social capital and HIV infection (paper IV)**

For the prevalence study (sub-study III) a questionnaire was designed to determine the association between social capital and HIV infection in the urban district with an observed steep decline in HIV prevalence. Like in sub-study II, the questions included in the questionnaire contained several sections: socio-demographic and
economic characteristics and measurement of social capital. A blood sample was collected from each consenting individual and tested for HIV-1 antibodies.

Table 3. Key issues guiding key informant interviews and focus group discussions (FGD).

<table>
<thead>
<tr>
<th>Key issue</th>
<th>Interviews</th>
<th>FGDs</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIV and AIDS related activities focusing on: health education, treatment of STIs, procurement of condoms, promotion and distribution of condoms, VCT, reduction of multiple sex partners, material support to vulnerable population, and duration and intensity of the HIV and AIDS activities</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Strategies used to build trust and reputation</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Number of organizations and social groups in the community and their activities related to care of the sick, protection of vulnerable populations, support to bereavement and economic livelihood</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Institutional and organizational trust and reputation</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>General activities of organizations, social groups and networks and specific activities targeting HIV prevention</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Ranking HIV related activities according to their importance in changing sexual behavior paying particular attention to care of the sick, protection of vulnerable populations, support to bereavement and economic livelihood</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

Measurement of social capital

We reviewed the literature to identify indicators of social capital that could be applicable in our local social and cultural context (Grootaert & Bastelaer, 2001; Narayan & Cassidy, 2001; Stones & Hughes, 2002; Harper, 2002; Grootaert et al, 2004; O’Brien et al, 2004; Dudwick et al, 2006). Based on this review and our experiences from the qualitative study we decided which proxy indicators of social capital to include in sub-study II and III. We adopted a tool consisting of six dimensions for measuring both collective and individual social capital as well as its structural and cognitive forms namely membership in groups and organizations, neighborhood characteristics, social networks and support, trust and solidarity, collective action and cooperation, and social cohesion and inclusion. The details of the questions used are given in papers III and IV.

The study team

The study team consisted of researchers and trained research assistants. The research assistants were nurses, well experienced in the field of HIV/AIDS counseling and treatment of patients and they knew the local language and culture. The Regional Medical Office appointed one medical doctor to coordinate and oversee the project field work activities, two laboratory technicians, ten nurses and one driver while the Bukoba urban medical office provided one nurse for the project. Despite
their medical background and counseling experiences the research assistants were given additional one week training with lectures, discussions and demonstrations on pre- and post counseling. They were also trained on social capital concepts, interview techniques, and how to draw, store and transport blood samples.

**Laboratory procedures (for sub-study III)**

Blood samples were collected aseptically in 5 ml red top vacutainers (BD, NJ, USA) and left to clot. Sera specimens were separated after centrifugation, aliquoted into 2 ml cryotubes tubes (Nalge Nunc International, Ill, and USA) and stored at -20°C until the time for assay.

HIV status was determined by ELISA tests. Abbott Murex Wellcozyme anti-HIV-1 recombinant was used as first ELISA. Specimens with negative results underwent no further testing and were considered negative. Reactive samples were retested by second ELISA test (Dade Behring Enzygnost anti-HIV-1/2). This assay detects both HIV-1/2 infections. All samples that were reactive on first and second ELISA were regarded as positive for IgG anti HIV antibodies. Inno-Lia HIV I/II immunoblot assay (Immunogenetics) was used as a reference method. Discrepant results between the two ELISAs were confirmed by western blot using Inno-Lia HIV I/II assay.

**Ethical considerations**

The KARP has ethical clearance from the research and ethical clearance committee of the MoHSW in Tanzania to implement the project “Epidemiology towards evaluation of interventions and monitoring of HIV infection in the Kagera region of Tanzania”. As a requirement the project submits regular progress reports to the MoHSW and provides feedback to the Kagera regional and district authorities about the research results.

At the community level, ward and village/street leaders were informed about the study aims, the data collection procedures and their permission was sought and given. Informed consent was also sought from the study participants after explaining to them the purpose, the methods and the data collection procedures. The field assistants conducted pre- and post test counseling in connection with collecting blood samples and returning the HIV test results respectively.

**Data analysis**

We performed a case study analysis (Creswell, 1998) based on various sources of information to describe and characterize the social capital in the study area (Paper I). A list of activities for each formal and informal organization was cre-
A grounded theory approach (Strauss & Corbin, 1990) was used to analyze the mechanisms of how social capital may have influenced the HIV transmission in the study area (Paper II). Grounded theory is “a qualitative strategy of inquiry in which the researcher derives a general, abstract theory of process, action, or interaction grounded in the views of participants in a study” (Creswell, 2009, p. 13 & 229). The process involves a series of actions including emerging data collection for refining interrelationships of categories and sub-categories of information about certain phenomenon (Strauss & Corbin, 1990; Charmaz, 2006). Table 4 shows how codes and concepts were identified and assigned line by line to segments of the text. The software Open Code facilitated the coding process and helped in comparing codes to sort out similarities and differences as well as to find general patterns. Then axial coding was conducted to identify categories and sub-categories and to relate them to each other through an inductive thinking. For each form of social capital (structural and cognitive) we developed three main categories and three sub-categories to illustrate theoretically the general role and mechanisms through which they may influence sexual behavior.
In the second sub-study, we selected eight and nine variables that could be linked to theoretical ideas on collective social capital (based on conventional and neighborhood related variables) and individual social capital (based on structural and cognitive forms). A principal component analysis (PCA) was performed on these variables separately, one for measuring collective social capital and the other for individual social capital. The aim of the factor analysis was to reduce the number of variables that were collected in our study and to detect or classify variables into one index or locating clusters of variables that are related to each other and used them to measure social capital in our local context (Howitt & Cramer, 2003). Using SPSS, factors were extracted for eigenvalues > 1 implying that the factor is accounting for a greater proportion of the variance than the original variable leading to better interpretation. Furthermore, the factors were rotated to present patterns of loadings which are easier to interpret. Only variables with factor loadings greater than 0.3 were extracted in the factor analysis. From the patterns of loadings it was clear that variables related to conventional and neighborhood collective social capital were clumped together while those related to individual structural and cognitive social capital were also clumped together at a different level (Table 5).

Using PCA, we constructed factor scores to each subject to indicate where that subject stands on the retained variables in each component. The PCA assigned a
value of 1 and 2 to indicate strong positive loadings, a value of -1 to strongly negative loadings and a value of 0 to immediate loadings (DeCoster, 1998). The generated scores were labeled according to how they were theoretically clustered or structured together in each component: conventional and neighborhood scores for collective social capital and structural and cognitive scores for individual social capital. The structural and cognitive social capital scores were later divided into three equal groups to create different levels of social capital (Paper III and IV).

In determining on an aggregated level, if a community had a low, medium or high collective social capital, we used the generated scores for conventional and neighborhood related variables for each individual and calculated average scores for each case community (paper III).

In sub-studies II and III, cross-tabulations were done to describe the association of HIV risk behaviors and HIV prevalence by socio-demographic and socio-economic characteristics. The impact of socio-demographic and socio-economic factors and social capital on HIV risk behavior as measured by condom use with casual partner and testing for HIV and on HIV status was analyzed using multivariable logistic regression analysis. Independent variables with a 95% confidence interval (CI) for the odds ratio (OR) not including 1 in the bivariate analysis were included in the multivariable analysis. Like in sub-study II, we also used a principal components factor analysis in sub-study III to measure individual social capital in its structural and cognitive forms.

Table 5. Variables used to measure collective and individual social capital.

<table>
<thead>
<tr>
<th>Collective social capital:</th>
<th>Individual social capital:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional measure</td>
<td>Structural social capital</td>
</tr>
<tr>
<td>Membership in organizations</td>
<td>Membership in organizations</td>
</tr>
<tr>
<td>General trust</td>
<td>General trust</td>
</tr>
<tr>
<td>Trust in strangers</td>
<td>Individual influence on decisions</td>
</tr>
<tr>
<td>Participation in voluntary activities</td>
<td>Receiving financial support</td>
</tr>
<tr>
<td></td>
<td>Interaction with neighbors</td>
</tr>
<tr>
<td>Neighborhood related measure</td>
<td>Cognitive social capital</td>
</tr>
<tr>
<td>Kind of neighborhood</td>
<td></td>
</tr>
<tr>
<td>Interaction with neighborhood</td>
<td></td>
</tr>
<tr>
<td>Cooperation to influence on decisions</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In sub-studies II and III, cross-tabulations were done to describe the association of HIV risk behaviors and HIV prevalence by socio-demographic and socio-economic characteristics. The impact of socio-demographic and socio-economic factors and social capital on HIV risk behavior as measured by condom use with casual partner and testing for HIV and on HIV status was analyzed using multivariable logistic regression analysis. Independent variables with a 95% confidence interval (CI) for the odds ratio (OR) not including 1 in the bivariate analysis were included in the multivariable analysis. Like in sub-study II, we also used a principal components factor analysis in sub-study III to measure individual social capital in its structural and cognitive forms.
Results

How can the social capital in the study area be characterized?

We observed extensive numbers of both formal and informal organizations and networks in the study area. Formal organizations consisted of governmental, non-governmental, community-based and faith based organisations. Informal groups comprised social groups and networks, which were not officially registered but village or street leaders were aware of their operations. Our findings indicated that the peri-urban community with medium HIV prevalence had more formal and informal organizations than the high HIV prevalence urban community and the low HIV prevalence rural community (Table 6).

<table>
<thead>
<tr>
<th>Type of organization</th>
<th>Community</th>
<th>*Urban</th>
<th>**Peri-urban</th>
<th>***Rural</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Informal organizations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adult women</td>
<td></td>
<td>12</td>
<td>18</td>
<td>3</td>
<td>33</td>
</tr>
<tr>
<td>Adult men and women</td>
<td></td>
<td>5</td>
<td>11</td>
<td>12</td>
<td>28</td>
</tr>
<tr>
<td>Adult men</td>
<td></td>
<td>1</td>
<td>2</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>Youth men and women</td>
<td></td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Youth men</td>
<td></td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Workers men and women</td>
<td></td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Sub-total</td>
<td></td>
<td>20</td>
<td>33</td>
<td>17</td>
<td>70</td>
</tr>
<tr>
<td>Formal organizations</td>
<td></td>
<td>3</td>
<td>6</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Community</td>
<td></td>
<td>2</td>
<td>2</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Government</td>
<td></td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>NGOs</td>
<td></td>
<td>1</td>
<td>1</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Sub-total</td>
<td></td>
<td>7</td>
<td>11</td>
<td>3</td>
<td>21</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>27</td>
<td>44</td>
<td>20</td>
<td>91</td>
</tr>
</tbody>
</table>

Furthermore, the urban community had higher scores indicating higher level of social interactions than the peri-urban and rural communities (Figure 1, Paper I). We found that all three case communities had high levels of bonding social capital while linking social capital was less pronounced, especially in the rural community. The urban and peri-urban communities had more pronounced cognitive social capital than the rural community (Figure 4).
The existence of informal organizations also depended on support from the local government leadership. Sometimes problems occurred within some of these organizations, which could not be resolved by group leaders and had to be reported to local authorities. The most common problem reported by these social groups was bad debtors. The local government leaders assisted to resolve the problem by ensuring that the debts were repaid as per group’s rules and regulations.

**What are the mechanisms through which social capital may influence HIV risk behaviors?**

The grounded theory analysis resulted into six categories, which describe the general role of structural and cognitive social capital and six sub-categories that capture the mechanisms through which structural and cognitive forms of social capital may have influenced HIV risk behaviors (Table 7).

**Table 7.** Categories and sub-categories describing the general role and mechanisms through which social capital may have influenced HIV risk behaviors.

<table>
<thead>
<tr>
<th>Categories</th>
<th>Sub-categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural:</td>
<td></td>
</tr>
<tr>
<td>Serves the needs of vulnerable groups</td>
<td>Enables socio-economic empowerment</td>
</tr>
<tr>
<td>Create new opportunities for participation</td>
<td>Increases information, knowledge and skills exchange</td>
</tr>
<tr>
<td>Increases women’s enrolment</td>
<td>Strengthens women’s rights</td>
</tr>
<tr>
<td>Cognitive:</td>
<td></td>
</tr>
<tr>
<td>Formalizes membership rules</td>
<td>Increases openness</td>
</tr>
<tr>
<td>Fosters strict behavioral conduct</td>
<td>Creates social pressures to take responsibility</td>
</tr>
<tr>
<td>Fuels religious norms and values</td>
<td>Enhances togetherness</td>
</tr>
</tbody>
</table>

**Figure 4.** Levels of bonding, bridging, linking and cognitive forms of social capital in high (urban), medium (peri-urban) and low (rural) HIV prevalence zone.

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<td></td>
</tr>
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</tr>
</tbody>
</table>
Three categories describing the general role of structural social capital as well as the three sub-categories describing the mechanisms through which social capital may create protective environment for HIV infection support Putnam’s view of the benefits that individuals’ participation in civic organizations and networks may have on socio-economic development (Putnam, 1995).

**Serving the needs of vulnerable groups**

A majority of the community members from vulnerable groups, such as the poor and women participated in organizations and networks to access support from other members. These organizations and networks provided loans, which were used to initiate small scale business enterprises as well as addressing basic needs of members whenever in need. They also supported members by giving them food aid and money to be able to go to the hospital for treatment if needed.

**Creating new opportunities for participation**

Both new and old organizations and networks created opportunities for vulnerable groups to participate in socio-economic activities that had a direct impact on their daily lives.

**Increasing enrolment by women**

There were more women social groups and networks (47%) when compared to mixed groups (43%), men’s groups (6%) or youth groups (4%). The increasing number of women groups may be a result of traditional gender roles in caring for sick relatives and being responsible for funerals. Women may also regard participation in social groups and networks as an important strategy towards social and economic emancipation. Participation in social groups and networks enabled women to provide basic needs for their families.

The mechanisms for how structural social capital influenced people’s lives are illustrated below.

**Enabling economic empowerment**

Participation in social groups and networks facilitated members to access financial support. Rotating give-and-take scheme, whereby members contribute money to a collective fund every month, allow one or more members to borrow a large sum of money depending on the amount available to invest in economic activities. In addition to monthly contributions, the collective fund gets additional resources from other income generating activities undertaken within the groups. Such income generating activities include buying commodities such as sugar, salt, cooking oil, and soaps at a wholesale price and selling them at retail.
prices and keeping goats, cows, pigs and poultry for sale. Members could also apply for a loan and pay back with a small interest within a period ranging from three to six months. Some social groups had established a “village bank”, which was a small wooden box with three padlocks where they deposited their monthly contributions, interest generated from loans and money generated from group projects. The money deposited in the “village bank” was given to members or non-members as loans or given to members as financial support. These different types of financial support empowered members economically by enabling them to start up small business ventures or by injecting additional capital to those who already had ongoing income generating activities.

**Strengthening women’s rights**

Women’s participation in social groups and networks strengthened their rights to earn their own income. Traditionally, most women used to stay at home and carry out domestic activities such as fetching water, collecting firewood, washing clothes and cooking for the children and husband. By participating in social groups and networks, women became empowered and able to start their own small scale business ventures. This ultimately enabled them to be independent and contribute to the basic household needs and enhance their respect both at household and community levels.

**Increasing information, knowledge and skills**

Participation in both formal and informal organizational activities provided members’ access to various sources of information, knowledge and skills. By coming together in their weekly or monthly meetings they were informed about issues related to health including HIV/AIDS transmission and prevention methods. In addition, formal organizations, particularly FBOs provided HIV/AIDS education to members of social groups using group representatives or mobile workshops. Members of social groups and networks also got entrepreneurial knowledge and skills to start up and maintain small scale business projects. Successful members of social groups were seen as exemplary and their groups were regarded as role models in the community.

Three categories developed to describe the general role of cognitive social capital and the three sub-categories formed to describe the mechanisms through which social capital influenced people’s behaviors can also be related to Putnam’s notion of social capital as creating norms of trust and reciprocity.

**Formalizing membership rules**

All social groups and networks in the case communities had stipulated strict rules and regulations for their members to adhere to. These rules and regulations dif-
fered from one group or network to another. However, the most common and formalized rules included: respect fellow members, behave in a respectful manner, keep organization’s secrets and be trustworthy.

**Fostering good behavior through strict conduct**
Before joining any social groups or networks, applicants were supposed to read the constitutions and agree to stipulated rules and regulations. These rules and regulations formed the norms and values that governed the operation of these organizations. Those who violated the stipulated norms and values were obliged to pay fines or penalties or loose their membership. Such strict rules and regulations contributed to maintenance of good behavior among group members.

**Fuelling religious norms and values**
Faith based organizations (FBOs) encouraged members from the same neighborhoods to form social groups comprising five to seven neighbors and then used these groups as avenues for conveying educative information. FBOs also supported social groups by giving them small capital or animals to start up small-scale business ventures. Such group activities did not only brought members together and enhanced their interaction and support to each other but also provided an important avenue for religious leaders to inculcate religious norms and values.

The mechanisms of how cognitive social capital influence people’s behavior are briefly discussed below.

**Increasing openness**
The requirement that all members should adhere to stipulated rules and regulations created an environment through which members were confident and open to discuss misconduct that may violate these norms and values. Such practices were translated at the family level whereby parents became open to discuss health issues including sexual related risk behaviors with their children, especially teenagers.

**Increasing social pressure to take responsibility**
Many social groups had made taking loans from the group funds a compulsory practice as a way of generating additional income to the group funds. This system put pressure on members to take social responsibilities. Borrowing money from the group empowered members to initiate small scale business projects making them feel responsible to provide basic needs such as school and medical fees to their families.
**Increasing togetherness**

The social groups and networks were seen as important for bringing community members together and the established rules and regulations enhanced collective-ness within the community regardless of age, sex and socio-economic status.

Our analysis identified four major behavioral changes resulting from people’s involvement in social groups and networks and the norms and values that arise from these interactions. The changes included decreased number of sexual partners, encouraging abstinence until marriage, decreasing opportunities for casual sex and empowering community members to demand or use condoms.

**Is access to structural and cognitive social capital associated with HIV risk behaviors?**

**Association between structural social capital and condom use with casual sex partner**

Adjusted odds ratio (controlled for sex, age, marital status, wealth index, place of residence and level of education) show that individuals who had access to medium and high levels of structural social capital were more likely to use condoms with casual sex partners compared to those without such access: OR=1.6, 95% CI: 1.03-2.4 and OR=1.7, 95% CI: 1.1-2.7 (Figure 5). When stratified by sex and controlling for sex, age, marital status, wealth index, place of residence and level of education, women’s access to medium and high level of structural social capital was significantly associated with condom use with casual sex partners compared to women with low access (OR=2.4, 95% CI: 1.2-4.8; and OR=2.3, 95% CI: 1.1-4.4). However, the multivariable analysis did not show association between access to structural social capital and use of condom with casual sex partners among men (Table 8).

**Association between cognitive social capital and condom use with casual sex partner**

The adjusted odds ratio (controlled for education, sex, place of residence, age, and marital status) show that individuals who have access to high levels of cognitive social capital were more likely to use condoms with casual sex partners than those with low access (OR = 1.7, 95% CI: 1.05-2.4). When stratified the analysis by sex, there was no association observed between access to cognitive social capital and condom use with casual sex partners both for women and men (Table 8).
Figure 5. Adjusted odds ratio (OR) for condom use with casual sex partners by access to structural social capital (SSC) and cognitive social capital (CSC).

Table 8. Bivariate and multivariable logistic regression analysis calculating odds ratio (OR) and 95% confidence intervals (CI) for likelihood to use condom with casual sex partner by sex and structural and cognitive social capital (SC). Analysis limited to persons who reported to have had sex.

<table>
<thead>
<tr>
<th>Sex and type of social capital</th>
<th>Level</th>
<th>Used condom with casual sex partner</th>
<th>Bivariate analysis OR 95% CI</th>
<th>Multivariable logistic regression OR 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Females: Structural SC</td>
<td>Low</td>
<td>29/233 1</td>
<td>1.80/1.03-3.1</td>
<td>2.40/1.2-4.8</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>30/134 1.4</td>
<td>0.82/0.92-2.9</td>
<td>1.20/1.06-2.3</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>33/132 1.4</td>
<td>0.82/0.92-2.9</td>
<td>1.20/1.06-2.3</td>
</tr>
<tr>
<td>Cognitive SC</td>
<td>Low</td>
<td>42/308 1</td>
<td>1.40/0.82-2.2</td>
<td>1.20/1.06-2.3</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>30/162 1.4</td>
<td>0.82/0.92-2.9</td>
<td>1.20/1.06-2.3</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>20/89 1.6</td>
<td>0.92/0.71-1.3</td>
<td>1.50/0.71-3.1</td>
</tr>
<tr>
<td>Males:</td>
<td>Low</td>
<td>47/113 1</td>
<td>1.40/0.82-2.2</td>
<td>1.20/1.06-2.3</td>
</tr>
<tr>
<td>Structural SC</td>
<td>Medium</td>
<td>30/162 1.4</td>
<td>0.82/0.92-2.9</td>
<td>1.20/1.06-2.3</td>
</tr>
<tr>
<td>Cognitive SC</td>
<td>Low</td>
<td>21/67 1</td>
<td>1.40/0.82-2.2</td>
<td>1.20/1.06-2.3</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>15/48 1.4</td>
<td>0.92/0.71-1.3</td>
<td>1.50/0.71-3.1</td>
</tr>
</tbody>
</table>
Association between structural social capital and self-reported HIV testing

The adjusted odds ratio (controlled for age, sex, level of education, place of residence, and marital status), show that individuals who had access to low and medium levels of structural social capital were more likely not to have tested for HIV infection than those with access to high levels: OR=1.7 (95% CI: 1.2-2.5) and OR=1.7 (95% CI: 1.2-2.4), respectively (Figure 6). Stratified analysis by sex and controlled for age, marital status, place of residence and level of education, indicates that women with access to medium and men with access to low levels of structural social capital were more likely not to have tested for HIV than those with access to the high levels: OR=2.3, 95% CI: 1.2-4.3 and OR=2.2, 95% CI: 1.3-3.7, respectively (Table 9).

Association between cognitive social capital and self-reported HIV testing

Adjusted odds ratio show that there is no association between access to cognitive social capital and not tested for HIV infection at any level of cognitive social capital. When stratified analysis by sex, similar pattern was observed both for women and men (Table 9).

Figure 6. Adjusted odds ratios (OR) for not testing for HIV infection by individual access to structural social capital (SSC) and cognitive social capital (CSC).
RESULTS

Table 9. Bivariate and multivariable logistic regression analysis calculating odds ratio (OR) and 95% confidence intervals for the likelihood of not testing for HIV by sex and structural and cognitive social capital (SC).

<table>
<thead>
<tr>
<th>Level</th>
<th>Tested for HIV</th>
<th>Bivariate analysis</th>
<th>Multivariable logistic regression</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>Yes</td>
<td>OR</td>
</tr>
<tr>
<td>Females: Structural SC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>37</td>
<td>195</td>
<td>1</td>
</tr>
<tr>
<td>Medium</td>
<td>42</td>
<td>138</td>
<td>16</td>
</tr>
<tr>
<td>Low</td>
<td>65</td>
<td>222</td>
<td>15</td>
</tr>
<tr>
<td>Cognitive SC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>24</td>
<td>101</td>
<td>1</td>
</tr>
<tr>
<td>Medium</td>
<td>36</td>
<td>165</td>
<td>0.92</td>
</tr>
<tr>
<td>Low</td>
<td>84</td>
<td>289</td>
<td>1.2</td>
</tr>
<tr>
<td>Males: Structural SC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>52</td>
<td>153</td>
<td>1</td>
</tr>
<tr>
<td>Medium</td>
<td>72</td>
<td>129</td>
<td>16</td>
</tr>
<tr>
<td>Low</td>
<td>108</td>
<td>88</td>
<td>3.6</td>
</tr>
<tr>
<td>Cognitive SC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>48</td>
<td>59</td>
<td>1</td>
</tr>
<tr>
<td>Medium</td>
<td>86</td>
<td>140</td>
<td>11</td>
</tr>
<tr>
<td>High</td>
<td>98</td>
<td>171</td>
<td>1.4</td>
</tr>
</tbody>
</table>

Is access to structural and cognitive social capital associated with risk of HIV infection?

Association between structural social capital and risk of HIV infection

The findings show that the overall HIV prevalence in Bukoba urban was 9.8% (95% CI: 8.8-10.8) with women having a higher prevalence of HIV infection (11.6%; 95% CI: 10.2-13.0) than men (7.4%; 95% CI: 6.0-8.8). After controlling for age, sex, marital status, level of education, occupation and wealth index, the adjusted odds ratio show that individuals with access to low and medium levels of structural social capital were almost eight and three times more likely to be HIV infected than those with access to high levels: OR=7.2, 95% CI: 4.4-12 and OR=2.8, 95% CI: 1.8-4.5, respectively (Figure 7). Similar pattern was observed when stratified the analysis by sex and controlled for age, marital status, level of education, occupation and wealth index. However, among men, those with low levels of structural social capital had high risk of being HIV infected than those with high levels, OR=10, 95% CI: 4.4-23 while among women, those with low access to structural social capital had slightly less risk of being HIV infected than those with high access, OR=7.2, 95% CI: 4.4-12 (Table 5, Paper IV).
RESULTS

Association between cognitive social capital and risk of HIV infection

The adjusted odds ratio (controlled for age, sex, marital status, level of education, occupation and wealth index) show that individuals whose accessibility to cognitive social capital is low were 2.4 times more likely to be infected with HIV than those in the high level OR=2.4; 95% CI: 1.6-3.5 (Figure 7). However, the association between access to cognitive social capital and HIV infection was not as linear as in the structural social capital, since there was no association observed between those who had access to medium level of cognitive social capital and HIV infection. The multivariable regression analysis shows that women and men with access to low levels of cognitive social capital were respectively 2.3 and 2.7 times more likely to be HIV positive compared to those who have access to high level (Figure 8).

These results demonstrate that individuals, who have low participation in formal and informal organizations, have little interactions with neighbors, have insufficient ability to influence decisions that affect their lives and have low engagement in reciprocal relations (Structural social capital) and those who have low general trust and low trust in strangers (Cognitive social capital) have increased risk of HIV infection.

Figure 7. Adjusted odds ratio for the risk of being HIV infected by individual access to structural social capital (SSC) and cognitive social capital (CSC).

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Figure 8. Adjusted odds ratio for the risk of HIV infected by access to structural social capital (SSC) and cognitive social capital (CSC) and sex.
Methodological considerations

Strengths
The main strength of this study is the combination of qualitative and quantitative methods for data collection and analysis. In the qualitative approach, we adopted triangulation of different data sources using key informant interviews, FGDs and review of documents, to enhance credibility and validity of the study (Creswell, 2008). To capture variation, data was collected from members as well as non-members of formal and informal organizations, leaders of social groups and organizations as well as village and ward leaders. Field notes were taken and all recorded information was later transcribed verbatim. Our long-term engagement in the project enhanced our understanding of how social capital may exert influence on behavior change among community members and thereby increased the trustworthiness of the study.

Hypotheses generated in the qualitative sub-study were tested in the quantitative study, which increased the validity of the study. The questionnaires were developed following a thorough review of the literature on the measurement of social capital and adjusted to fit the local context.

The questionnaire was administered using face to face interviews. This was considered an appropriate to reach also illiterate respondents and to ask about sensitive issues such as HIV risk behaviors. This tool has been criticized for not being able to provide sufficient anonymity and privacy in reporting sensitive issues compared to other tools like self-administered questionnaires (Gregson et al, 2002). However, a recent systematic review has shown that there is no significant difference between types of interview tool in reporting about non-condom use, number of sexual partner and ever had sex (Phillips et al, 2010).

Our field assistants were qualified professional nurses and experienced in counseling and they were trained before undertaking the field work. In addition, a majority of them had been working within the project for more than ten years, which increased their ability to interview about sensitive issues.

The research team in this study represented multidisciplinary fields of social science, epidemiology and biostatistics as well as microbiology and immunology. All contributed with their specific competence in the planning of the three studies, interpretation of the findings and reviewing drafts of different papers, which increased the credibility of this work.
LIMITATIONS

The selection of informants in sub-study I was based on identification of study participants by community leaders, which may have contributed to some participants having overly positive notions of social capital. The information on how long the formal and informal organizations had been in place was incomplete, since our informants had difficulties recalling when these organizations had started their operations. This limited our possibility to describe historically the influence of social capital on HIV risk behaviors in Kagera region.

A cross-sectional design provides accurate point estimates of HIV infection. However this design is limited by its inability to allow any conclusions of causal relationships between social capital and the risk of HIV infection.

In Tanzania, like other African countries, speaking openly about sexual matters particularly in the presence of children is a taboo (Killewo, 1994). In sub-study I we therefore organized homogenous focus groups in terms of age and sex to respect the local traditions governing sexual matters. This increased the chance that participants would openly discuss sex related issues.

For Paper III, we used aggregated individual data instead of ecological data to measure collective social capital. Ecological data is preferred for measuring collective social capital but is rarely used (Eriksson, 2010). We are of the view that by utilizing both conventional and neighborhood related aggregated individual indicators; this study has sufficient strengths to measure collective social capital.

There is no consensus on how to operationalize and measure the concept of social capital. Portes (1998) underscored that it is particularly difficult to quantify some of the indicators of social capital like norms and shared values. However, Stone (2001, P 34) suggests that all dimensions of social capital can be measured. She underscores that “empirical operationalization of social capital must reflect theoretical understandings of the concept”. In this study, only indicators that reflect our conceptual framework were included, which we believe ensured conceptual validity and reduced ambiguity in our measurements of social capital.
Discussion

This thesis supports the argument that social capital can be protective to HIV infection. Access to structural and cognitive forms of social capital is an important strategy for community members to adopt safer sexually related behaviors. Therefore including social capital in the design and delivery of HIV and AIDS interventions strategies will enhance effectiveness in the fight against HIV epidemic. The distribution of collective social capital differed between our three case communities, which represented varying HIV prevalence. The urban community, initially characterized by high HIV prevalence and later on declining HIV trends, had the highest collective social capital. This implies that the collective social capital that initially was regarded as fueling the epidemic could be mobilized and become an important avenue for creating conducive environments for adopting safer health behaviors. However, social capital can also expose community members to increased risk of HIV infection by excluding individuals from existing networks or by being part of networks with high-risk interactions. Thus programme managers and policy makers need to consider these negative aspects when deciding how to include social capital into new strategies for HIV prevention.

Social capital and HIV infection

The studies illustrate that access to high levels of structural and cognitive forms of social capital can be protective to HIV infection. Access to structural social capital increases the likelihood for reducing HIV related risk behaviors. Participation in formal and informal organizations, individual ability to influence decisions, interactions with neighbors and relatives play a positive role for reducing HIV infection among community members. This effect of structural social capital was observed among both men and women although the influence of structural social capital was greater for men than women. Our findings conforms with Putnam’s conceptualization of social capital referring to high level of community participation in civic organizations that results in positive aspects of community life, which in this case include avoidance of HIV infection (Putnam, 1995).

Our findings also show that access to high levels of cognitive social capital is associated with less risk of HIV infection. This is also in line with Putnam’s definition of social capital, suggesting trust as one of the main features of social capital that facilitates the coordination and the attainment of various community and individual benefits Bandura (1996). Israel et al (1994) has further described that trust within social groupings leads to generalized levels of perceived self-efficacy or ‘empowerment’ that may influence individuals to engage in health-protective behaviors.

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DISCUSSION

Social capital and HIV prevention

Structural (bonding, bridging, linking) and cognitive social capital was most pronounced in the communities situated in the urban and peri-urban areas with observed declining HIV trends, compared to the community with low HIV prevalence situated in the rural area. People’s participation in formal and informal organizations and the norms of trust and reciprocity embedded in their interactions seem to have played a positive role in changing community members’ behaviors. The organizations have been used as meeting points for community members to engage in activities that empower them, and where norms, values, trust and reciprocal relations also helped to shape sexual behaviors. Active participation in formal and informal organizations enabled members to access loans/money, through weekly or monthly contributions from other members and to initiate their own income generating projects. These economic activities were particularly important for women allowing them to engage in small projects, decreasing the need for transactional sex relationships. Economic empowerment also enhanced women’s confidence to negotiate use of condoms with their sexual partners. The values and norms developed within the networks played an important role by for example demanding members to avoid engaging in multiple sexual relations and encouraging young generation to abstain from sexual relations until marriage. Other studies have also suggested that social capital may empower vulnerable community members to develop a consciousness that may enhance their capacity to take control over important aspects of their lives including those related to health (Wallerstein, 1992; Campbell, 2003).

Formal organizations, particularly faith-based organizations, were found to play a vital role in nurturing social capital in the study setting. They supported the community to fight against further spread of HIV infection by forming social groups that also became entry points for HIV/AIDS related health education focusing on encouraging abstinence and faithfulness. Putnam also pointed out the indirect role of religious organizations when describing how they served American civic life by providing social support to community members and at the same time inculcated moral values encouraging unselfishness (Putnam, 2000). In South Africa, religious leaders themselves have emphasised their role in educating the young generation about sexuality. However, the taboo of speaking about sexuality in public, in the African context, makes it difficult for some religious leaders to organize life skills programme for their followers (Eriksson et al, 2011).

This thesis indicates that access to structural and cognitive social capital increased the likelihood for both men and women to use condoms with casual sex partners. The structural social capital provided avenues for people to come together and...
DISCUSSION

openly discuss HIV related issues including use of condoms. Furthermore, participation in social groups empowered people economically and enhanced their confidence thereby enabling particularly women and the poor to negotiate about condom use with their sexual partners. Our analysis showed that women with access to high and medium levels of structural social capital had an increased likelihood of using condom with casual sex partners as compared with those with access to low levels. Gregson et al (2011) reported similar findings from Zimbabwe indicating that participation in community groups such as rotating credit societies and burial societies influenced women to adopt protective behaviors against HIV infection by enhancing self-efficacy. This is in line with a South African study by Campbell et al, (2002), that examined civic participation as a proxy for understanding community influences on HIV infection. They showed that women belonging to sports clubs had a higher likelihood to use condoms with casual partners than non-members.

The studies also showed the potential influence of cognitive social capital on sexual risk behaviors among network members. Discussions about HIV risks created norms that influenced others to take precaution and to use condoms with casual sex partners. A systematic review of social capital and health found a stronger influence of cognitive than of structural forms of social capital on health (Harpham et al, 2004; Phongsavan et al, 2006). A study among male partners of female sex workers in the Dominican Republic reported that pro-condom norms within male’s social networks explained the high level of condom use, thereby providing an entry point for HIV prevention efforts (Barrington, 2009). However, other studies have reported contradictory results showing that non-use of condom especially among permanent sex partners is a sign of trust. Men in particular connote use of condom as lack of trust and intimacy (Boulton, 1995; Middelthon, 2001).

In this thesis people with access to low and medium levels of structural social capital had a higher likelihood of not being tested for HIV than those with access to high levels. This indicates that participation in formal and informal organizations may lead to increased knowledge about the importance of testing for own benefit but also for protecting others. Such participation may result in enhanced self-efficacy, reduce the HIV/AIDS related stigma and influence both women and men to test for their HIV status. A study from India (Sudha et al, 2006) has discussed the role of HIV/AIDS related stigma in preventing community members to test for HIV. In this study people who had high levels of structural social capital (members of associations) and high levels of cognitive social capital (high norms of reciprocity between neighbors and high trust to health care providers) had less stigmatising attitudes and were more likely to test for HIV.

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Social capital and increased HIV risk

This thesis also highlights that social capital can become a risk factor for HIV infection. The adherence to strict behavioral membership rules may deny some community members to participate in informal organizations. Many of these informal organizations also demand regular contributions of money which put strong economic pressure on poor people. These requirements may lead to the formation of new groups characterized by less strict rules, which may become potential risk groups for HIV infection. It may also increase the gap between rich and poor, as the poor will automatically exclude themselves because of inability to pay. Bourdieu’s (1986) argued that social capital can be used by the well-to-do people for transmitting resources among themselves and in doing so; they may exclude members with lower resources from joining such resourceful networks. Campbell (2000) emphasized that “social capital is not a homogenous resource that is equally created, sustained, and accessed by all members of a particular community”. Despite the fact that access to different forms of social capital may be unequally distributed based on gender, age and socio-economic status, we still argue that access to social capital has been mainly beneficial for the most vulnerable groups in the study area.

Networks for social gatherings among the youth were seen as potential risk environments in the study setting. Discos attracted many youths as part of recreation and enjoyment. Since condoms were scarce particularly in the rural areas and youth usually drink alcohol during these night gatherings, their risk of having unprotected sex was likely to increase. A study from Kenya (Njue et al, 2011) also reported that young men and women who were exposed to night clubs and pornography in video halls had an increased risk of being HIV infected since it encouraged liberal sexual attitudes and unprotected sex.

Implications for HIV prevention strategies

There is increasing evidence that the conventional approach to health education using posters, televisions, radios, school lessons, fliers, seminars and workshops has major limitations in reaching marginalized communities to reduce the spread of HIV infection. Campbell (2000) and Beeker et al (1998) advocate for a paradigm shift from these formal channels towards a more comprehensive approach involving local communities in promoting their own health. Social capital has been shown to be an important resource for creating health enabling environments through its positive influence on economic development, reducing crimes and mortality rate and enhancing democratic processes and health (Kawachi et al, 1997; Reid, 2000; Pronky et al, 2008). This thesis provides additional support for a paradigm shift by showing that strong social capital in its structural and
DISCUSSION
cognitive forms has been an important determinant of the community response to the HIV epidemic, particularly among the most vulnerable women and the poor in Kagera, Tanzania. This implies that policy makers and programme managers should start considering including social capital in HIV interventions and implementation strategies to remove the barriers observed by using the conventional approach. Policy makers and programme managers need to identify and recognize the existence of informal organizations such as social groups and networks and their functions at the local level. They should involve leaders of these organizations in the design and delivery of health promotive HIV intervention activities and in conveying health information to all group and network members.

HIV/AIDS messages should also be conveyed directly to members of social groups and networks through their monthly or weekly meetings. This may lead to dissemination of health information to other family members, neighbors and the community at large. I believe that when social groups or community members participate in the design and implementation of HIV interventions they are more likely to be successful since participation increases community members’ power and control over their daily lives. Furthermore when community members are responsible for developing own norms and values, they are more likely to adopt them and protect themselves from HIV infection (Levine et al, 1993; Reid, 2000).

The role of local governance in mobilizing social capital
To mobilise strong structural and cognitive social capital requires supportive local leadership. Social groups and networks face operational problems such as conflicts among members due to delays in paying back loans. Local leaders are expected to interfere and resolve such conflicts, and support these organizations to survive and function well. Tanzania has adopted a decentralization policy, which allows decision-making and planning on community development activities to start at the grassroots level. Local governance comprising of ward, village/street and hamlet leaders may utilize their autonomy to play a linking role and create an enabling administrative environment for collaboration between policy makers, programme managers, social groups and networks in their respective areas. Low-Beer and Sempala (2010) argue along the same line suggesting that governance can support the mobilization of resources for HIV prevention programs based on social networks.

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Concluding remarks

Firstly, the findings from this thesis add to Putnam’s definition of social capital showing that community cohesion, resulting from high levels of individual participation in civic organizations, leads to positive aspects of community life. Individual participation in bonding, bridging and linking organizations (structural social capital) was associated with the adoption of positive community norms, values, trust and reciprocal relations (cognitive social capital), which in turn led to behavioral change among community members.

Secondly, participation in civic organizations generated opportunities for vulnerable social groups, such as women and the poor, to access economic resources such as loans, which empowered them economically, giving them confidence, self-esteem and decision-making power to negotiate over daily life, including their sexual relations.

Lastly, behavioral change and empowerment enabled community members to adopt safer sexual behaviors, thus contributing to the observed declining trends in HIV infection.

There is no doubt that considering structural and cognitive social capital in the national and district HIV prevention programs and strategies will increase efficiency and effectiveness in the fight against new HIV infections especially in settings where resources to implement HIV interventions are limited.
The researcher

The first contractual employment with the MoHSW in 1997 changed my ambition to become an administrator. When I was working as a transport management consultant, I had an opportunity to travel all over the country and visited many hospitals, health centers and dispensaries. During these visits I observed the impact of the HIV epidemic. I observed the suffering from AIDS related diseases, met orphans and saw dilapidated houses left unattended because the owners had died from AIDS. I became concerned and asked myself why HIV is spreading more rapidly in some societies than in others.

In 2003 I was involved in a multi-country study on “The functioning of health systems in the era of HIV/AIDS in Tanzania, Zambia and South Africa”. However, this study did not answer my inquiry about the spread of HIV. In 2006 I was introduced to the Kagera AIDS research project (KARP) that assessed the magnitude, spread, risk factors as well as the community response and social impact of the HIV epidemic in the Kagera region of Tanzania. I felt that this was something for me and asked the KARP principal investigator if there was a possibility for me to pursue my PhD studies within the project. My request was accepted and in early 2007 I had the opportunity to meet the whole KARP research team to discuss my research interest. I was asked to consider formulating a PhD proposal focusing on the role of social capital in influencing the observed HIV declining trends in Kagera. This was actually the first time I heard about the concept of social capital. However, after reviewing the literature, I realized that social capital formed part of my original interest of exploring the spread of HIV in Tanzania.

As a PhD student at the division of Epidemiology and Global health in Umeå, I began my research journey focusing on the role of social capital for HIV prevention. I had to move from my early specialization in political science and public administration to the field of public health and attend courses in epidemiology, biostatistics and qualitative methods. The new knowledge upgraded my research capacity in general and gave me opportunities to explore further public health related problems and to find solutions to solve them. I agree with the greatest astrophysicist, Albert Einstein who said: “The significant problems we have cannot be solved at the same level of thinking we were at when they were created”.

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Acknowledgements

This work is a product of contributions from several people and organizations. It is a result of long term collaboration between the government of Sweden through its international development agency (sida) and the government of Tanzania. Different partners have been involved in the Kagera AIDS research project including the Department of Public Health and Clinical Medicine, Epidemiology and Global Health from Sweden, Department of Epidemiology and Biostatistics, Microbiology and Immunology and Department of Development Studies from Muhimbili University of Health and Allied Sciences. Other partners included the Kagera regional hospital and the Kagera regional medical office. The financial, material and technical support for this project were received from the Swedish government through sida, Umeå Centre for Global Health Research through the Swedish Council for Working Life and Social Research, the Swedish Research School for Global Health and the government of Tanzania.

I wish to express my very special thanks to everyone who in one way or another contributed towards the accomplishment of this work. Since it is not possible to express my gratitude to everyone in person and in public but I would like to take this opportunity to mention some of people who deserve special recognition:

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Dr Gideon Kuvesigabo, co-author, Dean of School of Public Health and Social Sciences. I would like to thank him very much for his encouragement, advice and fruitful discussions which we had during the whole period of undertaking my PhD studies. He spared time to work with me during data analysis and writing of the manuscripts despite his very busy schedule with school management tasks, teaching and travel workload. I enjoyed his constructive and valuable epidemiological and statistical comments, which improved my skills in writing the manuscripts. I highly appreciate his administrative and material support as it facilitated the accomplishment of this work.

Dr Sabrina Moyo, co-author, coordinator of laboratory work for the project. I am very thankful to her for ensuring that the adopted HIV testing strategies meet the required and acceptable standards. I am also indebted to her for providing the technical input into the writing process that pertains to the HIV testing strategies and for being in charge of supervising the laboratory technicians who were testing the samples. I have learned a lot from her how collection, transportation and testing of blood specimens finally translate to HIV status of individuals.

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