



Fishing in dangerous waters: Ecology, gender and economy in HIV risk

Sanyu A. Mojola*

Department of Sociology, University of Colorado-Boulder, 219 Ketchum Hall, 327 UCB, Boulder, CO 80309-0327, USA

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ABSTRACT

This paper focuses on a neglected factor in literature on the HIV epidemic in sub-Saharan Africa: the role of the eco-social environment in shaping HIV risk. I argue that the changing ecological environment of Lake Victoria, Africa's largest freshwater lake, mapping onto a gendered economy, shaped fisherfolk's sexual relationships and sexual mixing patterns in ways that were consequential for their HIV risk. Specifically, I show how disrupted lake and fish ecology had an impact on fishermen's sexual, domestic and economic partnerships, as well as how it contributed to the "sex for fish" economy in Nyanza Province, Kenya. I also show the consequences of fishermen's relative wealth on transactional relationships with school girls and women in lakeside communities. The paper is based on ethnographic fieldwork over a seven month period among the Luo ethnic group, which has the highest HIV rates in Kenya. The study included 74 individual and focus group interviews in communities around Lake Victoria, as well as 20 key informant interviews. Additionally, literature reviews on fishing and sexual economies as well as on ecological research in Lake Victoria are employed. Exploring linkages between these literatures and fieldwork findings forms the basis of this paper. I argue that solely focusing on individual level HIV prevention strategies is limited without taking into account the eco-social context of individual sexual decision making.

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Introduction

According to the latest UNAIDS (2009) global report, 67% (22.4 million) of people living with HIV/AIDS and 72% of AIDS deaths are in sub-Saharan Africa. Multiple causes have been given for why HIV rates are so high in Africa and identification of these causes has led to specific kinds of interventions. For example, individual level explanations such as concurrent partnerships (more than one sexual partner at a time), poor sexual health (i.e. high STI rates which increase the likelihood of acquiring HIV), and frequent unprotected sex (Cleland, Ali and Shah, 2006; Glick & Sahn, 2008; Glynn et al., 2001; Halperin and Epstein, 2004; Hitchcock & Fransen, 1999) have led to interventions aimed at changing individual behavior. The ABC (abstinence, being faithful, condom use) approach is a classic example of this. Similarly cultural explanations have led to interventions aimed at changing cultural beliefs and practices e.g. mass education campaigns and more recently mass circumcision campaigns. In this paper, I focus on a neglected factor in literature explaining the causes of the epidemic - the role of the eco-social environment. Using ethnographic interview based fieldwork among lakeside communities

in Nyanza Province, Kenya, I illustrate the effects the ecological environment of Lake Victoria, the second largest freshwater lake in the world and the largest in Africa, had on fisherfolk's HIV outcomes. I do this by showing how environmental changes in the lake conditioned their sexual relationships and sexual mixing patterns in ways that were consequential for their HIV risk. I also show how this was exacerbated by the gendered structure of the local economy.

The case takes on special significance because the disproportionate early burden of the HIV/AIDS epidemic in sub-Saharan Africa was in the region around Lake Victoria; in particular, the bordering fishing communities and regions in Uganda (Rakai district), Tanzania (Mwanza and Kagera provinces) and Kenya (Nyanza province) where the first cases of HIV/AIDS were recorded in the early 1980s (Barnett & Whiteside, 2002; Iliffe, 2006; Pickering, Okongo, Bwanika, Nnalusiba, & Whitworth, 1997). In the Kenya Demographic and Health Survey (KDHS, 2010), a nationally representative survey which included HIV testing, 16% of women and 11.4% of men in Nyanza province were HIV positive. Among the Luo, Nyanza's dominant ethnic group, 22.8% of women and 17.1% of men were infected. These represent the highest provincial and ethnic group HIV rates in Kenya, rates which have persisted for most of the past decade. The current national HIV prevalence is 6.3%. (In KDHS, 2004, corresponding HIV rates were 18.3% and 11.6% for Nyanza women and men respectively, and 25.8%

* Tel.: +1 303 492 7080.

E-mail address: sanyu.mojola@colorado.edu.

and 17.5% for Luo women and men respectively. While there were slight reductions for women, rates for men were virtually unchanged). The cumulative nature of epidemics suggests that early causes significant in this region might have played an important role in the rapid spread of the virus within the region, as well as to other parts of the continent. I will argue that if the role of the eco-social environment in shaping HIV risk had been taken into account, radically different interventions might have been undertaken – for example, cleaning up Lake Victoria.

Background

There is increasing global evidence that fisherfolk are particularly vulnerable to HIV. Studies in Thailand and Cambodia found elevated HIV prevalence rates of 15.5% and 16.1% respectively among fishermen (Entz, Ruffolo, Chinveschaikitvanich, Soskolne, & van Griensven, 2000; Samnang et al., 2004). This compared to a range of 2.6% (sentinel surveillance sites)–3.6% (military recruits) in Thailand and 3.2% in Cambodia (Surasiengsunk et al 1998, Samnang et al 2004). In a review and calculation of estimates of HIV prevalence among fisherfolk in low and middle income countries in Africa, Asia and Latin America, Kissling et al. (2005) found that HIV prevalence rates were 4–14 times higher than the national average for adults aged 15–49. A key reason for fishermen's vulnerability is their status as migrant workers, engaging in circular migration to search for fish. A number of other migrant professionals have also been identified in the literature as experiencing high risk of acquiring HIV including truck drivers, *boda boda* (bike-taxi) men, and miners. A combination of their being away from home for long periods of time, frequenting commercial sex workers and/or having transactional relationships with “second wives” at different stops or at work sites are all risk factors (Carswell, Lloyd, & Howells, 1989; Oruboloye, Caldwell, & Caldwell, 1993; Mbugua et al., 1995; Nyanzi, Nyanzi, Kalina, & Pool, 2004; Campbell, 1997, 2003; Lurie et al., 2003). Additionally, migrants are significant in the HIV epidemic because they connect local sexual networks with wider cross continental flows of disease. Their function as bridges in sexual networks, as described by Morris, Podhisita, Wawer, and Handcock (1996) in Thailand, would link and potentially transmit HIV between low and high risk communities across large geographic spaces.

Theoretical framework

Eco-social epidemiology

Social epidemiology takes as its starting point the idea that the distribution of disease in society is non-random and reflects intersecting systems of inequality such as income, ethnicity, and gender (Berkman & Kawachi, 2000; Freund & McGuire, 1999). This perspective suggests that particular forms of social structure situate people in positions of high risk of disease above and beyond their individual decisions and behaviors. An underemphasized aspect of this approach is attention to the *eco-social* – how the ecological environment shapes and is in turn shaped by social structural processes and people's lived experience of it in ways that mold health outcomes (Kearns, 1993; Macintyre & Ellaway, 2000). The role of the environment in the HIV epidemic remains underexplored (Hunter, De Souza, & Twine, 2008). The recent, limited, literature that exists examines the unintended consequences of the epidemic on the natural environment and people's livelihoods. For example, limited food security as a result of loss of a breadwinner and resultant food substitution, and land use changes in types of food grown for subsistence (De Souza et al., 2008; Hunter, Twine, & Patterson, 2007). However, there is little research on the reverse;

the impacts of the changing environment on HIV risk. Examining interactions between the ecological environment of Lake Victoria and its surroundings, the fishing economy and the sexual economy allows us to consider how eco-social processes might shape HIV outcomes.

Gendered economies and sexual economies

Economies structure occupations in gendered ways determining factors such as access to work (who can work and where), division of labor within work (occupational sex segregation) and compensation (pay) of particular kinds of work (Charles, 1992; Charles and Bradley 2009; Reskin, 1993). Many occupations dominated by men, such as mining, construction and quarrying pay more money than occupations such as road-side selling of vegetables, domestic housework and farming, dominated by women. Gendered economies with highly skewed compensation structures are a feature of several settings across Africa where HIV prevalence is high, e.g. mining and industrial towns in Southern Africa, and these economic realities structure intimate relationships and sexual economies. (Campbell, 1997, Hunter, 2002). Transactional sex relationships have been widely documented throughout sub-Saharan Africa (Hunter, 2002; Luke & Kurz, 2002; Luke, 2003, 2006; Cole, 2004; Chatterji, Murray, London & Anglewicz, 2004; Smith, 2006; Poulin, 2007). These refer to non-marital, non-commercial sexual relationships where money and gifts are exchanged, but in which issues of love and trust are sometimes also considered at stake. The predominantly one-way transfer of money and gifts – from men to women – reflects the fact that in most settings, men have greater access to money and resources due to the gendered structure of local economies. The key public health concerns with transactional relationships are: women's propensity for concurrent partnerships is greater if money and gifts are a primary motive, wealthy men's ability to maintain multiple partners, and dependent women's reduced leverage to negotiate safe sex (ibid). The highest risk relationships for HIV transmission and acquisition are concurrent partnerships (Halperin and Epstein, 2004; Kretschmar & Morris, 1995).

In the case study to follow, I illustrate this framework in motion – showing how the high HIV rates among the Luo in Nyanza province, Kenya reflect a sexual economy shaped by a gendered economy and a changing ecological environment.

Study sites, data, methods and setting

Study sites

Nyanza province exhibits many macro-economic elements common to other parts of Africa which are highly affected by HIV. It is a labor migrating province situated along major trading highways leading to West, North and Southern Africa. Kisumu, the provincial capital, on the banks of Lake Victoria, serves as a major port facilitating trade between Kenya, Uganda and Tanzania. However, despite large volumes of trade passing through Nyanza, many of its inhabitants remain poor. District Development Plans of districts in this study recorded absolute poverty rates (proportions of people living on less than \$1 a day) ranging from 53% to 69%. The lake has a shoreline length of 3440 km with 51% in Tanzania, 43% in Uganda and the remaining 6% in Kenya (Bairwa, 1998; Njiru, Kazungu, Ngugi, Gichuki, & Muhoozi, 2008). Fishing is a major component of the region's economy (Geheb & Binns, 1997; Njiru et al., 2008). Fieldwork was focused in four Nyanza province districts bordering Lake Victoria: Bondo (north), Kisumu (central, and includes the capital city), Nyando (central) and Homa Bay (south). They were selected because they represent geographic

Table 1
Classification and number of interviews by gender and age group.

	Women		Men	
	Focus group interviews	Individual interviews	Focus group interviews	Individual interviews
15–29 years – in school	10	8	4	3
15–29 years – out of school	2	9	2	3
35–55 years	4	8	2	5
56 years +	1	6	2	5
Total	17	31	10	16

diversity and are dominated by the Luo, a Nilotic ethnic group. As noted in the introduction, for most of the past decade, the Luo have had the highest HIV rates in Kenya.

Data collection and methodology

Data were collected between December 2005–March 2006, and June–August 2006 and included a combination of individual and focus group interviews, ethnographic observations and field notes. I conducted 47 individual interviews and 27 focus group interviews in English, Kiswahili and DhoLuo (the national and ethnic group languages) with translation assistance offered by two female Luo research assistants where needed. Table 1 shows the classification of interviews.

In addition, 20 key informant interviews including teachers, NGO workers, government officials and community members were conducted. The study protocol was approved by the University of Chicago's institutional review board, the Ministry of Education, Republic of Kenya, and the Nyanza district and school officials overseeing the sites of study.

15 secondary (high) and vocational schools from across the 4 districts were randomly selected from the Kenya Education Directory, an annually updated complete listing of all the schools in Kenya. Community interviews were conducted in homes immediately surrounding the randomly selected schools to capture young people who were not in school, and adults. Additionally, respondents were recruited from community settings such as market places, villages, hospitals, community centers, fish landing beaches, and during social events where locals were gathered. This approach allowed for data gathering from a combination of formal and non-institutionalized settings. School focus group interviews were typically composed of 6 young people selected by the principal or teacher in charge, while community focus groups ranged from 3 to 10 willing participants in the different settings. Most individual interviewees were drawn from volunteers who had participated in focus groups. Research material also included regularly written field notes to document aspects of the culture and people's everyday lives not captured by formal taped interviews.

Data analysis

Along with two female Luo research assistants, I transcribed taped interviews, and where needed, translated them into English. I then conducted all coding and analyses of interview transcripts and field notes recording ethnographic observations. Key resources used in conducting interviews, writing field notes, coding and analyzing data include Weiss (1994) and Emerson, Fretz, and Shaw (1995) who draw on an inductive grounded theory approach to the process (Strauss & Corbin, 1998). The study was designed to explore young people's transitions to adulthood in the context of an on-going HIV/AIDS epidemic, drawing on perspectives of young people, middle aged and elderly adults. However, recurring themes emerging during data analysis related to references by respondents of all ages to the Lake, fishermen, fish, and fishing when asked

about general issues facing the province (an ice breaker question initiating interviews), questions relating to young people's transitions to adulthood (relationship formation, education, employment and financial access), and questions about whether they felt HIV/AIDS was a problem in their community. Supplementing the findings from data analysis are literature reviews discussed below on ecological research on wetlands and Lake Victoria in particular, fishing and sexual economies. Exploring linkages between these literatures and fieldwork findings forms the basis of this paper.

Socio-ecological setting

The Luo are Kenya's third largest ethnic group and are scattered around Lake Victoria, the most dominant geographic feature of Nyanza province, and its' surrounding plains and highlands. Luo livelihoods in the districts of study were shaped by geographic features distinct to their settings. Residents living near fish landing beaches were often involved in the fishing industry in occupations such as fishing, selling or smoking fish, smoking rack making, and boat carpentry. Residents living on highland plateaus were involved in quarrying, brick and concrete making, while those living on the plains were often involved in rice farming. Many women also engaged in subsistence farming as well as small scale agriculture to sell vegetables to support their families.

The Luo often called themselves "Jonam" or people of the lake. Indeed, Lake Victoria, along with providing an important livelihood in fishing, also served as a key source of water for bathing, drinking, cooking, washing clothes, livestock, as well as agriculture. Part of the advantage of proximity to the lake, the source of the Nile, was the 100 year old treaty with Egypt (still in force at the time of fieldwork) which prohibited Nyanza, and other lake-side provinces (in Uganda and Tanzania) from using the lake as a major source of water – e.g. for large scale irrigation or as a piped water source for surrounding towns (Ong'or & Long-Cang, 2007). Consequently, those who lived furthest away from the lake were more subject to the vicissitudes of rainfall and found life hard. School girls discussed the many hours spent searching for water and residents' meager resources were sometimes spent buying water. For them, people closest to the lake epitomized abundant life, the Luo ideal. Lakeside villages and towns were dominated by hotels, bars and tailoring shops, fueled by money from daily sales of fish, and residents in these towns, seemed to encapsulate a phrase which occurred frequently in data analysis describing Luo's desire to enjoy their life; "gihero raha" meaning "they love pleasure."

Fishing became increasingly important to the Luo in the 1980s and 1990s because of the decline of formal sector economies including factory closures and mass layoffs. This contributed to increasing disillusionment about education as many began to doubt whether completing high school would necessarily lead to a formal sector job. For example female high school respondents noted in a focus group,

R1: Our young boys drop out of school thinking that fishing is the best option.

R2: Now you see that when you go to the lake once in a while, at times you get a lot of money. And once you have gotten used to money, at times you cannot do without it. So they boycott school and go to fish.

In a different setting, a female teacher discussing boys' dropping out of school to fish explained,

R: So when a child knows money, that child cannot go to school because they believe that when you go to school you are looking

for a future life where you'll be employed and you'll have money. So if at all I can get this money at this particular time, why should I go to school?

Teachers and students alike often noted that schools close to fish landing beaches had the highest male attrition rates. Loss of faith in the formal economic system was coupled with increasing faith in the fishing economy which was seen as offering a career trajectory and steady and/or supplemental income (see also Geheb & Binns, 1997).

Central findings

The significance of ecology

Lake ecology

Throughout fieldwork, when asking respondents about general issues in their area at the beginning of interviews, they often complained of the deteriorating quality of the lake. Older respondents in particular recalled a clear lake now turned green. For example two older female respondents said,

R1: The water we use is always lake water that is polluted and contains a lot of impurities if we use it without boiling or putting a water guard. So it affects us so much.

R2: The water has become green now, meaning it's highly polluted.

These local observations and experiences were also reflected in ecological research conducted in the lake. This literature has documented significant pollution of lake water because of eutrophication – the enrichment of lake waters with nutrients from a number of sources. One of these was sediment laden rivers flowing into the lake as a result of soil erosion from deforestation. Deforestation at the lake both served a fast growing population who needed charcoal or wood for their fires, as well as the fishing industry in which wood was required to build boats as well as to make racks on which to smoke fish. The almost 4% annual rate of population growth around the lake also led to the appropriation of wetlands surrounding the lake for farming (Geheb & Binns, 1997; Njiru et al., 2008; Odada, Ochola, & Olago, 2009). Additional sources of nutrients in the lake were untreated sewage from nearby towns and run-offs from surrounding farms of phosphorous used to enhance soil fertility (Okoko, 2000; Ong'or & Long-Cang, 2007; Sikoyo & Goldman, 2007; Njiru et al., 2008; MDG Center 2009). Eutrophication had the dual effect of decreasing water transparency which respondents had noted, as well as fueling a large scale infestation of water hyacinth weed beginning in 1989 – covering thousands of hectares of the lake in all three countries by the end of the 1990s (Katereggia & Sterner, 2009; Njiru et al., 2008; Sikoyo & Goldman, 2007).

Population ecology of fish

These ecological changes in and around the lake had consequences for the population ecology of fish. In addition to fish migrating away from toxic waters near beaches and inlets, appropriated wetlands as well as water hyacinth infestation contributed to destroyed fish breeding grounds including destruction and/or smothering of fish hatcheries, nurseries and feeding grounds of the most common fish (Tilapia and Nile Perch) while allowing for the flourishing of native species of fish that were not commercially sought (Njiru et al., 2008; Sikoyo & Goldman, 2007). Katereggia and Sterner (2009) studying trends in lake fish stocks between 1983 and 2000 also found that water hyacinth had the greatest impact on reduced catchability of fish in the Kenyan section of the lake relative to the Tanzanian and Ugandan sections. (Given Kenya's

6% share of Lake Victoria, and water hyacinth covering up to 6000 ha of the Kenyan portion (Sikoyo & Goldman, 2007), the effects of the weed were likely exacerbated in Kenya). A final consequence of these changes was a documented decline in fish catch sizes as well as declining maturity (and thus size/weight) of fish that were caught (Mugisha & Ddumba, 2006; Njiru et al., 2006). This also partly reflected, as noted earlier, increased dependence on the lake for income which had contributed to larger numbers of fishermen and boats (Geheb & Binns, 1997) with Kenyan fishermen chasing fewer available fish in limited waters.

When these ecological changes mapped onto the gendered structure of the fishing economy, they had, I will argue, significant effects on HIV risk. I briefly describe the structure of the fishing economy before illustrating this process.

Economy, gender and HIV risk

The fishing economy in Nyanza, as in many parts of the world, has a gendered structure; men fish and women sell the fish (Acheson, 1981; Béné & Merten, 2008; Carsten, 1989; Geheb & Binns, 1997; Merten & Haller, 2007; Steady, 1987; Stirrat, 1989; Thompson, 1985). However the way in which the exchange of fish between men and women happens varies considerably. In some settings such as Sri Lanka, fishing is a household affair where fishermen give fish to their wives who then sell it (Stirrat, 1989), while in others the relationship between husband and wife is businesslike such as in Sierra Leone where wives buy fish from their husbands and then sell it (Steady, 1987). In Nyanza, fishermen gave preferential access to fish – that is, first choice of fish, larger quantities of fish or simply a guaranteed supply of fish – to women with whom they were having sexual relationships. Sometimes these women were wives, and other times simply non-related fisherwomen whose livelihood depended on the sale of fish. As one fisherman described:

R: Just walk into that boat as it is landing. Ask for that fish; you will find that there is a lady who is responsible. There is somebody who is in charge, who must buy [fish] from that boat. She must buy it first from that particular boat [before everyone else]. And then from there you can get it from her. So she is related to [having a sexual relationship with] the boat owner or the crew members.

These so-called “sex for fish” relationships, called “jaboya” in Nyanza, are not unique to this setting, but have also been documented in other parts of the continent including other settings in Eastern Africa, as well as West and Southern Africa (Béné & Merten, 2008). Another important dimension of this economy in Nyanza was fishermen's limited access to refrigeration. As a result, exchange and sale of fish had to occur as soon as they returned from fishing to prevent fish from going bad. These two features were a critical backdrop to the consequences of changing lake ecology on fishermen's lives and the fishing economy.

Consequences for fishermen's lives

As noted above, a combination of circumstances affected the population ecology of fish: the deteriorating quality of the lake due to pollution, disruption by water hyacinth of fish breeding grounds, and increasing numbers of fishermen on the lake in search of fish. These circumstances meant that fishermen had to spend more time out in their boats, and away from home in search of fertile fishing grounds. Describing fishermen's migration, one fisherman noted,

R: The fish would like to stay in fresh waters...So you find fish moving from this side to that side, and people moving [from]

here to the other side, [and] people from the other side coming to this side.

The consequences of this kind of movement, of fish and people, on families was significant as fishermen could often be away from home for long stretches of time trying to track down the new location of the fish. An older female respondent talking about separated families she noticed in her community for example noted,

R: These men who have come to do fishing, they have left their wives in their homes faraway and they are staying here for a long, long time.

Once they found fish, longer migration and lack of refrigeration meant landing on the nearest beach – not necessarily their “home beach” – to sell the fish before it went bad. It also therefore meant the necessity of acquiring a woman other than their wife or primary sexual partner to sell the fish. So it made sense to establish a temporary home on the new beach. Interviews with key informants at the beginning of fieldwork, and community members throughout fieldwork often noted both high levels of migration among residents of lakeside communities as well as the fact that fishermen had homes on different beaches. Fishermen explained their many homes in terms of necessity, one noting,

R: Let's say like one who stays [here], suppose he moves from [here] to [another beach], he will be having a family here, and there also he has to have another family.

Combining ecological research findings with respondent accounts suggests that the ecological environment of the lake was having direct consequences on the work patterns of fishermen, and ultimately on their family lives. Lake ecology was affecting the movement of fish, and therefore the movement of fishermen. Prior circular migration patterns might have enabled fishermen to return more regularly to their home beaches and steady partners. However, ecologically driven changes in the lake, coupled with limited refrigeration extended migration and contributed to behavioral responses such as the establishment of new sexual partnerships. This not only expanded fishermen's sexual networks increasing their likelihood of encountering an HIV positive sexual partner, but also enhanced their role as bridges for disease transmission, linking fishing communities around the lake.

Consequences for the fishing economy

Lake ecology also impacted the fishing economy in ways that were exacerbated by the economy's gendered structure. As fishermen started to land on other beaches, and acquired new women to sell their fish, a competition among women for access to fish developed. As one fisherman noted,

R: You will find that in the fish marketing activity, especially when the catch has gone down, we have got quite a number of ladies who are also after the fish for their better market. That's where the story begins. So only those who could afford to be lured will be having opportunities for [adding] to their supplies. But those who cannot be influenced will have to stay aside. And that is where the major problem comes.

In this excerpt, he describes the increased leverage fishermen had when the quantity of available fish was low. With an increasingly limited supply of fish, fisherwomen faced raised stakes. Not having sex with a fisherman might mean not getting access to any fish. The critical omission in literature documenting this aspect of “sex for fish” relationships in this and other settings (Béné & Merten, 2008; Geheb & Binns, 1997) has been the underlying phenomenon that set the stage for competition: the environmental

conditions in the lake leading to catches of fewer, smaller fish, affecting the supply of fish to local markets.

Implications for the sexual economy and HIV risk

As I have shown, the changing ecology of the lake mapped onto the gendered structure of the fishing industry in ways that were consequential for the sexual economy and HIV risk. The sexual economy however extended beyond fisherfolk to those living in communities around the lake. Unlike many who lived on itinerant incomes, fishermen could depend on almost daily money. As noted earlier, lack of refrigeration meant that as soon as fishermen landed, their catch was sold immediately for cash. While local initiatives existed to encourage fishermen to save, officials interviewed suggested that this was an uphill struggle as fishermen did not bank their almost daily income, but instead spent it. Fishermen having plenty of a commodity (cash) so many lacked was no secret, least of all to women in the community. It was striking that reports from women and fishermen alike seemed dominated by accounts of female pursuit of fishermen. For example a fisherman noted,

R: The money comes from the fish on a daily basis. You find that the ladies from around here also come to the men and it is because [in] their own home area, they lack money. They are not well off. Sometimes I get between 300–500 [Kenyan shillings]. Then the lady comes, I don't even call her, but she comes with her budget [list of desired items], a very long list. At the same time, the 300–500 is what I want to take to [my] parents. I also want to save this money, and I am also looking for budgeting for this girl. So how much money do I remain with?... But she knows that so and so's boat has caught so many fish. And then the ladies will be running towards them. Now how can you prevent HIV/AIDS in that scenario?”

In this excerpt, the fisherman describes the dilemma of a crew who bring in a large catch on a particular day. Community knowledge that after sale of this catch, fishermen will have a lot of cash on hand, leads many women to target fishermen from that boat. For him, in particular, the challenge was in dividing his \$4–7 (in a setting where most people lived on less than a dollar a day) between his savings, the girl he wanted to support and his parents. High school girls in a focus group interview in a different lakeside community noted:

R1: So in this case you may find a girl only needs money or needs to buy clothes and things she was not having. And other things like the personal effects, like [sanitary] pads. You may see a girl suffering and not even having pads so she will go to the boy for money in order to meet all these needs.

I: So if a girl wanted to find a guy to help her get money, would that be easy in this community?

R1: Yes.

R2: Fishermen.

R3: Fishermen.

I: So is it them looking or the girls looking?

R1: The girls.

R2: All people are hunters.

Along with different groups of school girls highlighting fishermen as potential partners, widows and fishermen also noted that widows went to beaches to search for partners. (See also Swidler & Watkins, 2007 on the role of transactional sex in cementing ties of dependence with rich men).

Fishermen noted that it was hard to resist relationships with multiple partners. The following excerpt describes fishermen's views on HIV prevention strategies they had often been exposed to:

R1: People should not be told to abstain because it doesn't really work.

R2: How can you be told to abstain and you are seeing another beautiful lady the other side, it doesn't work. They should come up with [another] way, but not abstinence.

R3: And also another [point], my personal experience with human nature especially with fishermen [is], they eat well, they drink well, so what is the end of all this exercise, it is sexual.

Laughter

R4: You speak the truth

The widespread resistance to condom use documented in my interviews throughout the province was also evidenced in the discussion.

R1: Let me tell you the story [of what happens]. I have seen people buying it [a condom], they put them in their pocket. You are not with him when he is in the activity [sex], he may try to use it

Laughter

R2 *interrupts*: He puts it [the condom] on the shelf

R1: But he is not finding that pleasure, [so] he will remove it.

In this interview, fishermen were discussing their perceived ineffectiveness of the ABC campaign, discussing the limitations of abstinence and faithfulness in the face of available, plentiful and willing beautiful women, and condom use which they felt took away from the pleasure of sex.

Why "they know but they ignore"

A respondent's noting, "they know but they ignore", seemed to encapsulate the gap between behavior and knowledge. Many lakeside residents' weekends were spent attending or planning for funerals. Fishermen were themselves aware of high rates of mortality due to AIDS among their colleagues and HIV prevention knowledge was widespread. However, Nyanza fishermen, as in other parts of the world, experienced frequent, more immediate occupational risks of mortality due to drowning, and fatal encounters with hippos, crocodiles and pirates. Acheson (1981) reviewing anthropologies of fishermen noted that studies of fishermen in many societies find them to be "aggressive, courageous and independent" men who have been observed to have an "extreme masculine display" or "macho complex" (296–297). Seeley and Allison (2005) refer to this as the "occupational subculture of fishermen." They characterized this as a culture of risk taking, tolerance of danger, fatalism regarding death, and finally the heightened value of "proving their masculinity." While these studies concern fishermen, they clearly reflect attitudes present among men engaged in other risky professions such as mining (Campbell, 1997, 2003). This orientation, along with heightened uncertainty of life expectancy, and cultural norms supporting living life to the fullest might partly account for why unprotected sexual relationships persisted in the face of growing AIDS related mortality.

A further reason is implied by the findings. The multiple ABC style prevention efforts residents had been exposed to (Ogot, 2004) met with limited behavioral success given the high HIV rates noted earlier, because there were *eco-structural* limitations to practicing ABC. It would be hard for fisherfolk in this fishing economy to opt out of concurrent sex, and difficult for women searching for wealthy boyfriends in this sexual economy to find monogamous fishermen. The resistance to condom use encountered here (also widely documented in low and high HIV prevalence settings - Flood, 2003; Macphail & Campbell, 2001; Tavory &

Swidler, 2009) did not just underscore individual reluctance. It also marked disincentives for men in a risky (life-threatening) profession to use them, and difficulty for economically dependent women to demand safe sex.

Discussion

Accounts of migrant professionals as bridges of disease transmission in sexual networks and women's transactional relationships with rich men are not new and have been documented across sub-Saharan Africa. However what has been missing in these reports is a consideration of how the eco-social environment can shape people's HIV risk. Social structural processes shaped the ecological environment through rapid population growth and subsequent changing land use in wetland areas contributing to disrupted lake and fish ecology. The transformed ecological environment in turn shaped social structures, contributing to reorganized sexual, domestic and economic partnerships, and mapping on to a gendered fishing economy with problematic outcomes. The results of these interactive eco-social processes were high levels of sexual concurrency, increasing HIV risk.

Findings such as these suggest that interventions that focus solely on changing individual behavior without taking account of the eco-structural context of that behavior might have limited effectiveness. Indeed a consideration of the eco-social environment suggests different kinds of interventions to reduce concurrency. For example, educating a fisherwoman in this context to negotiate safe sex and insist on condom use makes little sense in practice when she is already at a disadvantage in terms of bargaining power and may lose business. However, *coupling* this intervention with ecological strategies to increase the supply of fish in the lake would reduce fishermen's leverage for demanding risky sex from fisherwomen. This would involve promoting farming further from the lake by investing in alternative water sources to reduce sources of lake pollution, as well as curtailing water hyacinth infestations. A more stable fish eco-system might also reduce fishermen's need for extended migration and allow for more regular returns to home beaches and partners (especially if unrelated fisherwomen were no longer necessarily available as partners).

While providing fridges might provide a good short-term solution, it could also result in longer fishing expeditions to harvest more fish, further diminishing fish supply and would have limited long-term environmental sustainability. Similarly, without more comprehensive alternative income generating solutions on land, seasonal fishing bans by the government to allow fish to restock might only exacerbate fish demand and competition during periods when fishing is allowed. A more effective solution might be directed at the gendered structure of the fishing economy. If women also fished, they could simply buy fish from other women thus removing fishermen's leverage of sex altogether. While these are clearly retrospective interventions, they suggest the kinds of eco-social structural changes that might meaningfully alter the context of fisherfolk's individual sexual decisions.

The magnitude of structural interventions such as cleaning up Lake Victoria, stimulating economic development, or reducing gendered work inequalities, and the difficulty of measuring their direct effect on HIV incidence might lead policy makers to leave these structural constraints untouched. It is easier to conduct discrete, measurable individual level interventions and count the number of people educated, or condoms distributed, than to measure behavior change resulting from operations to restore the lake eco-system. However, in settings such as Nyanza where individual level strategies implemented over several years have

had limited success, as evidenced by persistently high HIV rates, *integration* of these with creative, informed and specific eco-structural interventions could improve program effectiveness. More qualitative research highlighting specific connections between the eco-social environment and sexual behavior might contribute to fresh ways of thinking about HIV prevention in high prevalence settings. It might also allow for early intervention in settings where ecological factors might be fueling an epidemic.

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