Assessment of HIV Prevention Needs of West Kenyan Adolescents:

Implications for Intervention Adaptation

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Abstract

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Purpose: The purpose of this dissertation study was to examine early sexual partnerships of west Kenyan adolescents and their sociocultural context in order to shape an HIV prevention program to meet their needs. The impetus for this dissertation research came from a previous study conducted with Kenyan adults in North Nyamware, a village in Nyanza Province, which is an epicenter of the global HIV epidemic.

This dissertation describes three studies (Chapters 2 through 4), which were conducted to address the following goals:

1. Describe the characteristics of rural west Kenyan adolescents' sexual debut and the patterns of sexual partnerships in adolescence and young adulthood.
2. Examine the prevalence of concurrent, or temporally overlapping, sexual partnerships in west Kenyan adolescents.
3. Assess the feasibility and acceptability of the first component of the KYN concurrency reduction intervention for use with adolescents aged 13 to 17.

Methods: In the first study (Chapter 2) data from two household surveys of Kenyan adolescents and adults were acquired from the United States Centers for Disease Control and Prevention (CDC). The Asembo Baseline Cross-Sectional Study (Asembo BCS) and Gem Baseline Cross-Sectional Study (Gem BCS) were used to describe the features of sexual debut and to cluster respondents by features of their sexual debut. In the second study (Chapter 3) the Asembo BCS and Gem BCS data were examined to estimate the prevalence of concurrent, or temporally overlapping, sexual partnerships among rural Nyanza adolescents aged 13 to 19. In the third study, (Chapter 4) qualitative data were collected from adult and adolescent stakeholders to assess the feasibility and acceptability of a concurrency reduction intervention called *Know Your Network* (KYN). The data were analyzed using a thematic approach to content analysis, and the results used to inform the adaptation of KYN for use with adolescents aged 13 to 17.

Results: The results from study one indicate 20% of adolescents reached sexual debut before age 13, and the median debut age for males and females was relatively young (14 years, 15 years, respectively), underscoring the importance of targeting young adolescents for pre-risk HIV prevention efforts. Features of sexual debut can be used to cluster groups of respondents into distinct groups with different typologies of debut. Study two results estimate the point prevalence of concurrency on the date of interview was 2.2% among the entire sample of adolescents, and 4.4% for sexually experienced adolescents. Study three results reveal rural Nyanza adults and adolescents are concerned about HIV among youth and find current resources insufficient for addressing their concerns. KYN elements were difficult for 13 to 14 year olds to understand but were feasible and acceptable for use with 15 to 17 year olds.

Conclusions: This study has several important implications for HIV prevention. First, efforts to prevention HIV infection in rural Nyanza must target very young adolescents for effective primary prevention. Second, multiple features of sexual debut can be used to more fully describe a complex, multidimensional experience. Third, adults expressed interest in getting

HIV prevention messages to youth, and youth expressed interest in hearing such messages, but both agreed the current informational resources are inadequate. Finally, the KYN intervention offers information older youth find interesting and relevant to their lives and the lives of other youth. Taken together, the studies in this dissertation can be used to inform HIV prevention efforts for Nyanza youth, whose healthy transition to adulthood is critical to Kenya's success in the battle against HIV and AIDS.

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DEDICATION

Dedicated to the residents of North Nyamware, who persist in their efforts to find “the way forward” in a new era, under the weight of the HIV epidemic.

GLOSSARY OF TERMS AND ACRONYMS

Adolescent – a person in the second decade of life

AIDS – Acquired Immune Deficiency Syndrome

ART – Anti-Retroviral Therapy

Baraza – community meeting for social mobilization, information gathering/dissemination

BMU – Beach management unit

Concurrency – Having two sexual partnerships that overlap in time

FGD – Focus group discussion

HIV – Human Immunodeficiency Virus; the virus that causes AIDS

KNASP – Kenyan national AIDS strategic plan

KYN – the *Know Your Network* intervention

NACC – National AIDS Coordinating Council of Kenya

PI – Principal investigator

PrEP – Pre-exposure prophylaxis

STI – Sexually transmitted infection

TasP – Treatment as prevention

UNAIDS – The United Nations Joint Programme on HIV/AIDS

VMMC – Voluntary medical male circumcision

Youth – a person between ages 10 and 24

CHAPTER 1: STUDY PURPOSE

Dissertation Research Purpose

The purpose of this dissertation study was to examine early sexual partnerships of west Kenyan adolescents and their sociocultural context in order to shape an HIV prevention program to meet their needs. The impetus for this dissertation research came from a previous study conducted with Kenyan adults in North Nyamware, a village in Nyanza Province, which is an epicenter of the global HIV epidemic (Knopf, Agot, Sidle, Naanyu, and Morris, forthcoming). North Nyamware adults participated in a pilot study of a new, adult-focused, community-based HIV prevention intervention called *Know Your Network* (KYN) developed by Dr. Martina Morris. KYN takes a risk-reduction approach to HIV prevention and highlights the role of temporally overlapping, or concurrent, sexual partnerships in HIV transmission through a sexual network. During the study adults expressed surprise and concern that adolescents younger than 18 were not eligible to participate in the pilot project — they wanted these youths to hear the KYN message. Designed and pretested for use with adults, KYN needed to be adapted for implementation with adolescents.

Adaptation Framework

The U.S. Centers for Disease Control and Prevention (CDC) Map of Adaptation Process (MAP) provided a framework for the adaptation process.[1] The MAP has been successfully used to adapt an HIV prevention intervention originally developed for African American families for use in western Kenya.[2] Figure 1.1 outlines the five steps of MAP: Assess, Select, Prepare, Pilot, and Implement.

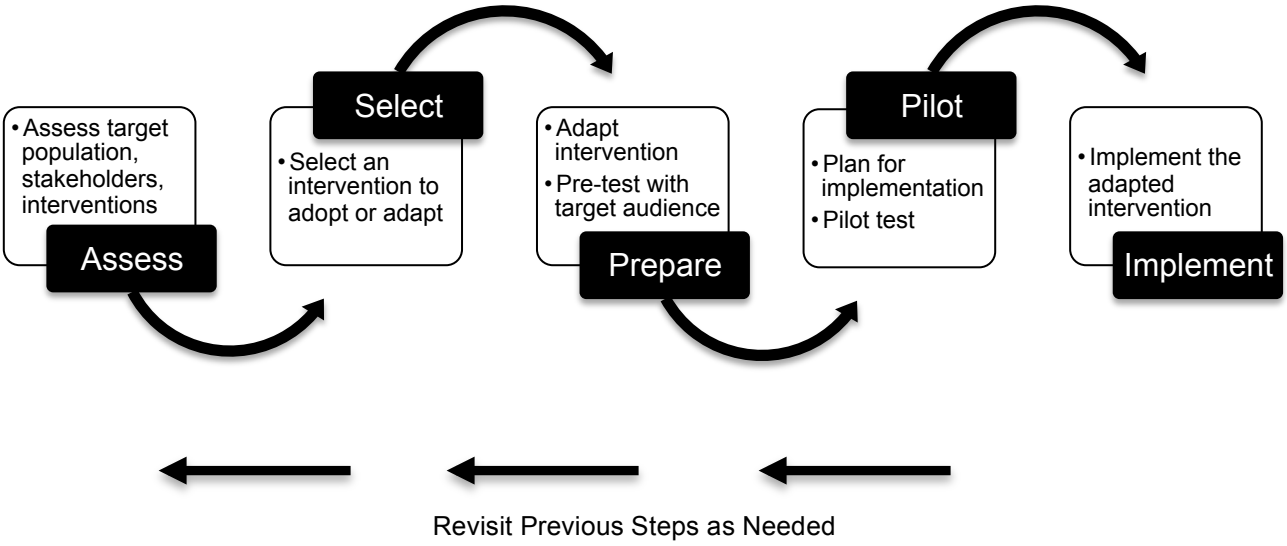

Figure 1.1. Overview of CDC's Map of Adaptation Process

MAP developers included feedback loops to allow implementers to initiate adaptation at different steps, and revisit previous steps as needed, thereby recognizing the iterative process of community-based adaptation. This dissertation study represents the first step in the adaptation process — assessment of the target population, stakeholders, and intervention, specifically, KYN.

Dissertation Research

To initiate the adaptation process in rural Kenya for use with adolescents, the specific goals of this dissertation research were to:

1. Describe the characteristics of rural west Kenyan adolescents' sexual debut and the patterns of sexual partnerships in adolescence and young adulthood.
2. Examine the prevalence of concurrent, or temporally overlapping, sexual partnerships in west Kenyan adolescents.
3. Assess the feasibility and acceptability of the first component of the KYN concurrency reduction intervention for use with adolescents aged 13 to 17.

Background and Significance

Global Epidemiology of HIV/AIDS

Worldwide, an estimated 34 million people are living with the Human Immunodeficiency Virus (HIV), the virus that causes Acquired Immune Deficiency Syndrome (AIDS).[3] Since its discovery in 1983, HIV has led to the deaths of more than 25 million people from AIDS. Though the widespread introduction of highly effective anti-retroviral therapy (ART) in mid-2000s led to a sharp decline in AIDS-related morbidity and mortality,[3,4] HIV/AIDS remains the fifth leading cause of premature death and disability worldwide and the leading cause in southern and eastern sub-Saharan Africa.[5]

Globally, HIV incidence peaked in 1997 and has declined on a nearly annual basis. While progress in HIV prevention and treatment has led to marked declines in HIV incidence, the Joint United Nations Programme on HIV/AIDS (UNAIDS) estimates 2.5 million people were newly infected with HIV in 2011.[3] Approximately 70% of incident and prevalent infections are found in sub-Saharan Africa,[3] where just 13% of the world's population resides.[6] HIV incidence and prevalence estimates vary widely between and within countries in sub-Saharan Africa. The greatest burden of disease is found in southern and eastern sub-Saharan Africa, where HIV prevalence ranges from 10% to 26% and 0.7% to 7%, respectively. The overwhelming majority of new HIV infections in the region are heterosexually transmitted,[7] and youth are at the forefront of the epidemic.[8,9]

An estimated 41% of all new HIV infections among adults occur in 15 to 24 year olds, and young women shoulder a disproportionate burden of these incident infections.[10] In 2011, United Nations member states committed to focusing on youth as part of the UNAIDS strategy to

reduce sexual transmission of HIV by 50% by 2015. Reducing sexual transmissions among youth requires a clear understanding of their risks. There is a dearth of age- and sex-specific information on young people's behavior to inform HIV prevention efforts,[10] which is one gap in the literature this dissertation research seeks to fill.

The east African nation of Kenya is experiencing a generalized HIV epidemic, with an estimated national HIV prevalence of 6.7%.[11] In Kenya, HIV prevalence varies by a number of demographic factors including age, sex, income, ethnic group, and region. Kenyan women have nearly double the HIV prevalence of men, 8% compared with 4.3%, respectively. The sex disparity in Kenya is particularly evident in youth — among people aged 15 to 24, prevalence in females is approximately four times higher than in males. However, the largest disparity in HIV infection is by ethnic group. There are nine major ethnic groups in Kenya, and among them HIV prevalence ranges from less than 1% in the Somali to 20% in the Luo. HIV prevalence is greatest in Nyanza Province, where 14% of residents are infected; however, this regional disparity is likely confounded by ethnicity, as the Luo are the predominate ethnic group in Nyanza.[11]

The Historical Sociocultural Context: Sexuality and Gender Roles in Luo Nyanza

Sexual norms exist in a sociocultural context that is often germane to HIV prevention efforts. In preparation for field work, the historical ethnographic and anthropological works on the Luo were reviewed and synthesized.

Defining What It Means to Be Luo

The Luo are part of the West Nilotic linguistic group whose language and oral histories suggest southward migration from the Sudan to the shores of Lake Victoria in western Kenya.[12]

Historical ethnographies define the Luo by their language and geographic location whereas recent works consider how Luos define what it means to be a Luo.[12,13] While acknowledging a number of potential markers of Luoness (name structure, appearance, language, being uncircumcised), Shipton posits "a Luo is someone who considers him-or herself a Luo and is so deemed by other people…to be a Luo it can be important to be (or to act) among other people so considered, and thus a part of something bigger than oneself" (p. 71). Cohen and Odhiambo confirm that the essence of being Luo is belonging:[14]

> *"In Siaya the individual is synonymous with the stranger…You do not in an important sense exist until you reveal your networks, and more importantly, until this network can be verified…"(p. 27)*

Giessler and Prince[13] also prefer a more fluid conceptualization of Luo identity that stands in contrast to earlier works that they consider important but "essentialist descriptions of Luo society or custom" (p. 47). They hypothesize women's movement between patrilineages (vis a vis marriage) is primarily responsible for maintaining Luo ideals and practices over time. That is not to say that the practices and ideals are fixed — they are not, and Giessler and Prince maintain that it is precisely the negotiation of culture rather than its hegemony that creates a social group.

The Luo Life Trajectory in the Past

Childhood. To be Luo is to be part of a community of ancestors and relatives, and a Luo child's interaction with the community begins shortly after birth. Newborn boys are presented to the community on their fourth day of life, and girls are presented on the third day.[15] Geissler and Prince note child rearing is a cornerstone of domestic life, and children are the desired outcome of the Luo's efforts to keep life moving forward. Children are considered one with their mothers early in life, and later, as they begin to eat from the communal pot of food and drink cow's milk rather than breast milk, they become intertwined with the larger community.[13]

In the past, small boys and girls played together under the watchful eye of older children (typically female relatives). Beginning around age five, boys and girls were expected to help with the household chores assigned to their sex; boys' chores were located outside of the home (e.g. tending to livestock, fishing) whereas girls' chores centered around the home (e.g. fetching water and firewood, tending to children).[16] Traditionally and as late as the 1950's, three primary institutions trained Luo children in community norms: the *duol*, the *siwindhe*, and the *simba*[17]. The *duol* was the head of the homestead's hut, in which men gathered to eat and to discuss community matters. The likely themes of an evening's discussion in the *duol* were bravery, wars, hunting expeditions, animals and their behavior, and plants and grasses and how they should be used. Young boys attended the discussions, and learned about their clan's history and behavioral norms.[18,19]

Boys and girls slept in their mother's hut until about age seven. Older children were not allowed to sleep under the same roof as their parents, because their growing bodies and reproductive capacities could interfere with their mother's fertility.[13,15,16,19] Therefore, children aged 7 to about 13 lived in the *siwindhe*, a hut headed by a *pim* (a menopausal woman). The *pim* told the children about social customs, kinship, marriage, childbirth, health, illness, and death.[14] She taught girls about their sexuality and the expectations of a married woman. She discussed potential marriage partners (carefully screening matches to ensure the boy and girl were not too closely related), taught her charges to prevent pregnancy, and she occasionally arranged for the girls to see their boyfriends or lovers.[14,16,19,20] The relationship between the *pim* and her charges was marked by openness and affection, allowing the alternate generations to communicate freely about subjects that are taboo for adjacent generations. While changes in migration and land use patterns over the last 50 years have changed the Luo homestead structure,[21] Prince and Geissler note that the unique bond between grandmothers and their grandchildren persists

today, and Luo youth describe their grandmothers in terms of love, affection, and appreciation.[22,23]

Adolescence. Unlike other ethnic groups in Kenya, the Luo did not have a public ceremonial rite of passage to mark puberty or the transition to adulthood. However, until the 1950's or 1960's, males and females underwent the *nak*, a private and personalized procedure in which the lower incisors were extracted to symbolize that the child has become an adult.[19] [12]The *nak* was generally performed around age 14 or 15, and after its completion boys moved to the *simba*, while girls remained in the *siwindhe*. Flirtation and sex play between boys and girls was tolerated and encouraged to some extent. Girls could visit boys in the *simba*, sometimes staying for overnight visits that allowed adolescents to learn about and prepare for sexual relationships. Girls were taught (usually by the *pim)* to avoid pregnancy and defloration by engaging in intra crural sex, or *chodo*.[24,25]

Marriage and Establishing a Home. As recently as two generations ago, a Luo marriage was a complex and lengthy negotiation of the merger of two families. The Luo traditionally practice polygyny and spousal order dictates marital arrangements such that the eldest son of the first wife should marry before any of his siblings.[12] When a father thought his son was old enough to get married, he encouraged the son to look for a girl from a respected family of another clan. When a suitable match was identified, both families enlisted negotiators, jogam, who were charged with vetting the potential mate and conferring with his or her relatives about the marriage proposal. The vetting and negotiating process could take months. It required the *jogam* to ensure the bride and groom were not related, and to 'test' the couple to see if both parties would resist attempts to discourage the marriage.[19]

Once both families agreed to the marriage proposal, the groom traveled to visit the bride and her family, to formally ask permission to marry her. With the parents' consent to marry, the

groom and his negotiator and another man would try to “kidnap” the girl to take her back to his homestead. The girl was supposed to make a show of resisting so that everyone would know she was enacting the steps in proper marriage ceremony and was not simply eloping with a suitor. Once “captured,” the bride was taken to the groom’s homestead where his family celebrated her arrival. Later, the couple was expected to have sexual intercourse in the presence of three married women and two married men who verified the bride’s virginity by looking for blood on the groom’s genitals. Blood was scraped onto pieces of a clay pot and shown to the groom’s family before the proof was carried home to the bride’s family, who celebrated her virginity and then sent slaughtered meat to her and her new family. The bride made several trips between her new home and her natal home, and was more or less free to travel back and forth until the bride wealth was sent to her parents.

Shipton’s Luo informants describe the bridewealth as an expression of honor and thanksgiving, rather than payment; they maintain that humans cannot be bought or sold. The goods and services transferred from the groom’s family to the bride’s acknowledges that that they are gaining her labor and the benefit of the children she will bear for the groom’s family. Payments are not simply exchanges between two individuals or even two nuclear families. The groom must often rely on cattle borrowed from his uncles or gained through his sisters’ bridewealth payments, thus the marriage and transfer of animals becomes a complex system of entrustment between many members of several families, giving all a stake in the marriage and its outcome.[12]

Once married, a man and woman are expected to join in sexual intercourse to exchange bodily fluids, and “open the way” for others.[13,15] Geissler and Prince offer a thorough discussion of what it means to open (or to block) the way forward, and how this concept governs daily life in Luo communities:

> *"Growth is not so much about territorial expansion, but about relations…all relations are generational: they all make life grow. To do so they must be aligned in a sequence…This temporal and spatial sequencing of acts, things and relations lies at the core of the customary chike and their prescribed and prohibited practices…Whatever one does is intertwined with equivalent series of actions by one's parents and ancestors, older and younger siblings or older and younger wives, and one's ability to progress depends upon the more senior peoples' progress" (pp.119-123).*

Married Luo couples are expected to engage in sexual ritual on a number of occasions, including: family marriages and births, establishment of homes (one's own or a relative's), and at the beginning of food production cycles (cultivation, planting, harvesting).[13,15,26]

Acting in a way that could block the natural flow of life can cause *chira*, which has been alternately defined as: an illness marked by diarrhea and wasting,[12] a sickness that can cause infertility or death,[13] suffering or punishment,[19] and adverse consequences.[26] *Chira* can befall the transgressor and/or his or her relatives, and may manifest as a constellation of misfortunes, physical illness, or death. Geissler and Prince note that for decades chira has been a dominant cultural idiom for misfortune among Luo men living even in urban areas of Nairobi. Ocholla-Ayayo says that *chira* underlies all moral acts; it governs marriage and sexual relationships, and keeps sexual behavior in check by threatening misfortune and suffering for rule breakers.[19]

Older Age. Most ethnographers describe the Luo as patrilineal and virilocal. The rare exceptions are Cohen and Odhiambo, who argue that ethnographers' reiteration of patrilineality as the Luo organizing structure has suppressed observations pointing to the greater importance of marital alliances and the construction of a shared identity. They suggest that lineality is the outcome, rather than the "central motor," of Luo social existence.[24] Whether alliances or lineality were the driving organizational force, older men invariably occupied the seat of power in Luo homesteads. Men's role in negotiating the transfer of women and cattle between clans, planning

and carrying out cattle raids, serving on the council of elders, and as the recorders and enforcers of *Chike Luo* (literally: Luo ways) gave them considerable power over Luo social life.

Married women also gained social standing with age, particularly through enacting their roles as mother-in-law, senior wife, and *pim*. Shipton advises his readers to scratch beneath the surface of gender relations to see the power ascribed to women, and their subsequent ability to shape family and community life. Cohen and Odhiambo's account confers with Shipton's, not only in the folk songs that tell of women's inescapable powers, but also in their careful attention to the critical social role of the *pim*, who "transformed the social intelligence of the young, broadening it to include knowledge of the more extended field of marriage and adulthood, and toward the contingencies, associations, alliances, coalitions, dangers, and opportunities lying beyond the enclosure" (p. 94). While women had important social roles, these should not be conflated with power. Potash's study of Luo marriages illustrates this point; without land inheritance rights or the right to return to her natal home, a woman had few options for supporting herself. Her food stores and cash remittances were inextricably linked to her husband, and even her children technically belonged to him. If a woman left her husband, she was required to leave her children, too.[27] Potash argues that women's reluctance to abandon their children combined with few income generating opportunities, creates remarkable marital stability in Luo communities.

A woman's ties to her husband and his kin are not severed by his death. Nilotic societies have long practiced the levirate, "the continuation of a creative marital union after the death of a husband by one of his classificatory brothers"[13] (p. 261). The Luo call this practice *tero*, or *tero mon* ('to take the wife/woman'), and in English it is called 'widow inheritance.'* Widow inheritance serves a number of purposes for the Luo and other Nilotic societies, but has been

* Agot (2001) provides a thoughtful discussion on the inappropriateness of the English translation of tero mon. While she ultimately chooses to use the term 'widow inheritance,' she points to the "inadequacy of using a foreign language to describe a practice that is instituted in a culture different from where the language orginates" (p.87).

broadly characterized as a ritual of social transition[28] that cleanses the widow of the dead man's spirit, thereby restoring her place in community life.[26] The practice has been posited as one reason for the continued spread of HIV/AIDS in western Kenya,[29] and has received attention from the Kenyan press and government as well as HIV researchers.[26,28,30-32]

Luo Life in the 21st Century

Geissler and Prince's ethnography of a rural Luo village at the dawn of the 21st century presents a picture that is in some ways contrasting and in others congruent with historical works. Stiff competition for land, economic downturn, migration, Western influence (vis a vis the media and the Christian Church), and HIV/AIDS have all altered the Luo cultural landscape. The "typical" life trajectory, if one exists, is quite a bit different for a Luo child than it was for his grandparents or great-grandparents. Whether the new trajectory holds more promise for a healthy and full life is the subject of much debate. Here we focus on adolescence, the transition from childhood to young adulthood, the focus of this dissertation research.

Adolescence. After 1930 there were few siwindhe in western Kenya, which Cohen and Odhiambo attribute to the lure of better opportunities for children's education in the cities (Nairobi, Mombasa, and Kisumu) and to the economic constraints that made it harder for families to take responsibility for an elderly woman to whom they were not related.[14] The emphasis on girls' virginity, and thus the practice of *chodo*, seems to have faded with the *siwindhe*.[22] By the time of Cohen and Odhiambo's 1980s field work in Siaya, unwed teenage mothers were common. Having "sex in the grass" (in the open, outside the *simba*) has replaced the sanctioned and somewhat supervised visits between girls from the *siwindhe* and boys from the *simba*.

In Nyanza today, males and females begin having sex in their mid-teens, and females report the lowest median age (19 years) at first birth in the country.[11] In a recent survey of households in

rural, Luo Nyanza, the median reported age at marriage was 18 for females and 23 for males.[33] In the same survey, HIV prevalence was high adolescent girls and young women — 8.6% and 33.7%, respectively. The alarmingly high prevalence of HIV among young women in Nyanza warrants further study of their risks and intensified efforts to mitigate them.

Epidemiology of HIV/AIDS in Kenya

In their analysis of the key modes of HIV transmission in Kenya, Gelmon et al[34] report the majority of new cases of HIV in Kenya are heterosexually transmitted, and a significant proportion occur in the steady partners of men and women who engage in casual sex with others. In Nyanza Province, an estimated 92% of incident HIV infections are heterosexually transmitted, and three main epidemic drivers have been identified: social acceptance of concurrent, or overlapping sexual partnerships, lack of male circumcision, and suboptimal rates of condom use (particularly at sexual debut and within stable partnerships).[34,35]

Nyanza Epidemic Driver 1: Concurrency

Along with other east and southern sub-Saharan African nations,[36] Kenya's government has identified concurrent, or overlapping, sexual partnerships as a key driver of its generalized epidemic.[34,37] UNAIDS defines concurrency as an act of sex with one partner that occurs between two acts of sex with a different partner.[38] Put simply, concurrency is a special case of multiple partnering in which a new sexual partnership begins before the previous one has ended. Concurrency has important effects on disease transmission at the partnership and population levels that extend beyond the effect of multiple partnering.[39-42]

To understand concurrency's effects at the partnership level, consider three actors A, B, and C. The actors are illustrated in Figure 1.2, in which nodes represent the actors and lines represent sexual partnerships. In Figure 1.2a, Actor A is in concurrent partnerships with Actors B and C. In

contrast, Figure 1.2b depicts the same actors in the same partnerships, but partnerships A-B and A-C are sequential, rather than concurrent.

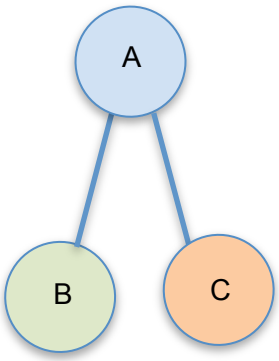

Figure 1.2a

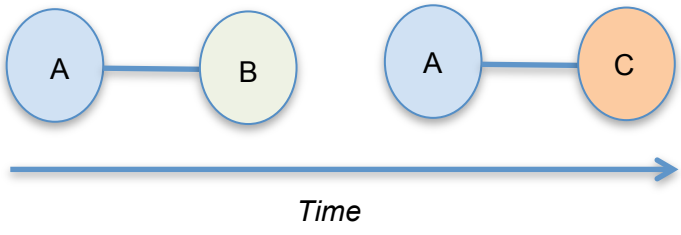

Figure 1.2b

Figure 1.2. Graphical depiction of concurrent (1.2a) and sequentially monogamous partnerships (1.2b).

Assume Actor C is infected with HIV while Actors A and B are uninfected. In the concurrency scenario (Figure 1.2a), Actor C's infection may reach Actor B through sexual contact with Actor A. By contrast, in the sequential monogamy scenario (Figure 1.2b), Actor C's infection cannot reach Actor B. In both scenarios, Actor B has only one partner but concurrency creates risk of exposure to HIV through secondary transmission from Actor A. This is concurrency's critical effect at the partnership level — a monogamous partner's increased risk of exposure to sexually transmitted infections without a concomitant increase in "risky" behavior (i.e. multiple partnering).

At the partnership level, concurrency's effect on HIV transmission is seen in the partner of the person who practices it. This point is important because it poses a challenge to empirical studies of concurrency's impact on disease transmission and has subsequently created significant debate over the role concurrency plays in generating HIV epidemics.[43-50] Several

studies have failed to find an association between HIV infection and concurrency because the authors examined the link between an individual's HIV status and the same individual's concurrency.[51,52] This is the wrong approach. Concurrency has no effect on the person who practices it beyond the expected effect of having multiple sexual partners.[41]

To see the effect of concurrency on HIV transmission in partnerships, one must examine the HIV status of stable couples, preferably over time. Epstein and Morris[53] examined evidence from eight published studies of HIV transmission in stable sub-Saharan African couples and found that 60% to 84% of incident HIV infections in the couples were acquired outside the partnership. This is critically important in the west Kenyan context, where the largest proportion of new infections occurs in stable partnerships.[34] Partnerships are embedded in the larger context of communities, which can be represented by a sexual partnership network. Figure 1.2a depicted the A-B-C triad in isolation, but any of the actors may have other partnerships that could link the triad to a larger sexual network such as the one shown in Figure 1.3.

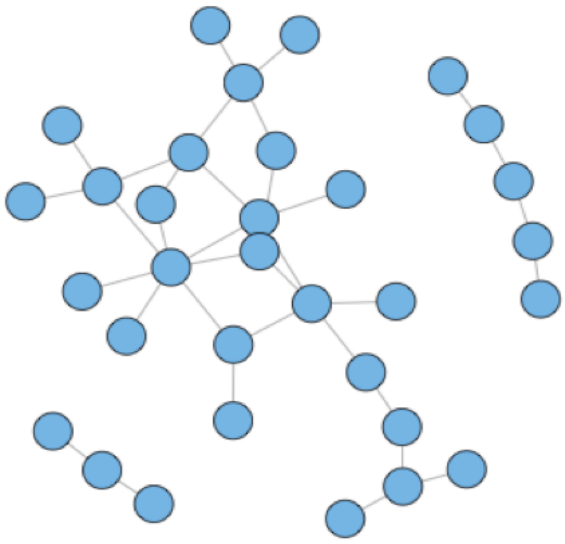

Figure 1.3. Sexual network.

In comparison to serially monogamous partnerships, concurrent sexual partnerships have two main effects on disease transmission in a sexual network. First, they remove the protective effect of partner sequencing, creating a backwards path for disease to travel (e.g. Figure 1.2a, in which Actor C's infection has a path through Actor A to travel to Actor B) where no such path exists in serial monogamy (e.g. Figure 1.2b).[41,53] Second, in serially monogamous partnerships, an incident infection would be "trapped" in the partnership in which it was transmitted until the

partnership dissolves and the incident case finds a new sexual partner. Concurrency eliminates or reduces the wait time for viral spread by ensuring an incident case has the opportunity to transmit the virus to someone else during the relatively short acute phase of infection, when the probability of HIV transmission is highest.[54,55] Mathematical models indicate the interaction between concurrency and the higher probability of disease transmission during acute HIV infection is a key determinant of the size of an HIV epidemic in a population.[55,56]

The combination of low rates of male circumcision, suboptimal condom use, and high rates of concurrent sexual partnerships are fueling the concentrated HIV epidemic in Nyanza Province, Kenya. The Kenyan government has identified these risk factors as primary targets for biomedical and behavioral interventions.[37,57,58] While there has been a significant investment in condom promotion and VMMC in Kenya, concurrency reduction has received less attention though it holds promise for reducing the spread of HIV at a low cost to benefit ratio.[59]

While there have been studies of concurrency among west Kenyan older youth[60,61] and adults,[62] little is know about the prevalence of concurrency among west Kenyan adolescents. This study fills that gap by examining not only the prevalence of concurrency in adolescence, but also early sexual partnership patterns and their relationship to subsequent sexual behavior associated with HIV infection. This information will inform KYN adaptations as well as plans for future HIV prevention programs within this population.

Nyanza Epidemic Driver 2: Lack of Male Circumcision

The Luo are the only major ethnic group in Kenya that does not traditionally circumcise young men, and they also are the ethnic group with the highest burden of HIV infection. Scientists have long pointed to an ecological association between circumcision and HIV prevalence in sub-Saharan Africa,[63,64] and three major clinical trials of voluntary medical male circumcision (VMMC) demonstrated a collective 58% efficacy in preventing female to male transmission of

HIV among newly circumcised men.[65-67] The Kenyan Government issued a policy statement promoting VMMC for HIV prevention,[68] and set a national target to provide VMMC to 80% of uncircumcised men between ages 15 and 49 by the end of 2013.[58]

At the end of 2012, approximately 391,000 Kenyan men were circumcised, 80% of them from Nyanza Province. Cherutich et al. identify two major challenges that threaten the national goal to circumcise 860,000 uncircumcised Kenyan men aged 15 to 49. First, there is a low rate (27%) of compliance with post-operative follow-up, which may result in the underreporting of adverse events. Second, the service is underused by men aged 25 and older, who represent just 14% of men presenting for VMMC.[57] Beyond these immediate challenges implementing the VMMC program in Kenya, there are broader questions about the long-term net benefit of VMMC in moderate to severe HIV epidemic settings. Prospective cohort studies have failed to demonstrate a protective benefit to the female partners of circumcised men,[69,70] though mathematical models of population level effects suggest women may benefit in the longer term.[71] At present, the long-term population level effects of VMMC on epidemic size are unknown, underscoring the need to address other drivers while monitoring the impact of VMMC among the Luo.[11]

Nyanza Epidemic Driver 3: Suboptimal Rates of Condom Use

Condom use in Kenya remains the exception rather than the rule despite their high effectiveness in preventing heterosexually transmitted HIV.[72] One key reason for the suboptimal use of condoms may be their dismal availability. Gelmon et al. collated data from the Kenyan National AIDS Control Council (NACC) and reported a condom distribution in Nyanza of 1.06 condoms per eligible person per year; the figure includes condoms that are free and condoms that are for sale. It is therefore unsurprising that studies of Nyanza adults reflect low levels of consistent condom use,[35,33] particularly in stable partnerships.

In the 2008/2009 Kenya Demographic and Health Survey (KDHS) about 25% of Nyanza youth (aged 15 to 24) reported using a condom at first sexual intercourse. The rate of condom use at debut in 2008/2009 was higher than that reported by males and females in the 2003 KDHS (14% and 11%, respectively). Despite the positive trend, low rates of condom use at first sex are concerning because condom use at sexual debut is positively and significantly associated with subsequent condom use.[73,74]

Emerging Approaches for HIV Prevention

A New Prevention Paradigm: Combining Prevention Approaches That Cut Across Levels of Risk

The last five years have brought a shift in prevention paradigms. Rather than delivering a single, individual-centered prevention method for all populations, international policymakers, funders, and global health organizations are asking scientists to consider the context of a particular epidemic, and then to combine a suite of efficacious approaches into a prevention package tailored to the target population.[75 3 76] Assembling such a package that cuts across individual, couple, network and structural level risk factors is a challenging task[76] that is being addressed by several international study teams[77] that are combining new prevention tools developed in the last decade.

New Tools for a New Paradigm

Three biomedical strategies have demonstrated efficacy in preventing sexual transmission of HIV: voluntary medical male circumcision (VMMC), early initiation of anti-retroviral therapy in infected persons — called treatment as prevention (TasP), and pre-exposure chemoprophylaxis in uninfected persons (PrEP). In addition to these new biomedical approaches, increasing attention has focused on the implementation of structural interventions, in particular the

provision of cash transfers to young people and their families. Each of these new approaches is discussed below.

Voluntary Medical Male Circumcision. Between 2005 and 2007 each of three randomized controlled trials of VMMC demonstrated an approximate 60% reduction in heterosexually acquired HIV infection among men in the treatment (circumcision) arm compared to the control arm.65-67 Subsequently, scientific consultants to the World Health Organisation (WHO) and the Joint United Nations Programme on HIV/AIDS (UNAIDS) recommended VMMC as an integral component of HIV prevention for heterosexual men in generalized epidemic settings in which there are low rates of male circumcision.[78] Questions remain, however, about the long-term net benefit of VMMC in moderate to severe HIV epidemic settings. Prospective cohort studies have failed to demonstrate a protective benefit to the female partners of circumcised men,69,70 though mathematical models of population level effects suggest women may benefit in the longer term.[71]

Treatment as Prevention (TasP). Viral load is a key determinant of the probability of HIV transmission from an infected partner to a susceptible partner. In the absence of treatment, viral load fluctuates during three stages of infection: viral load is highest during the typically brief (3 month) acute phase; declines, remaining relatively low during the long (8-9 year) asymptomatic phase; and increases again in the late-stage of infection, which occurs between 10 and 19 months before death.[54] Such observed differences in seroconversion rates across time since onset of a discordant partner's infection[79] led to the hypothesis that increasing viral load leads to elevated risk for transmission, and thus if viral loads could be suppressed, so might the risk of onward transmission. In 2010, a post-hoc analysis of data from a longitudinal cohort study of 3,381 serodiscordant African couples demonstrated after 24 months, ART initiation resulted in a 92% reduction in genetically linked transmissions (N=103) within stable, serodiscordant partnerships in which the infected partner initiated ART (N=339) compared to those in which the

infected partner did not initiate treatment (N=3,042).[80] Shortly thereafter, the HPTN 052 trial of early ART initiated for infected partners in serodiscordant couples (N=1,763) on four continents demonstrated a 96% reduction in genetically linked transmissions among those randomized to early ART initiation compared to those in the control arm.[81] These studies indicate that, in addition to the primary role of ART in preventing HIV-related morbidity and mortality, viral suppression of infected persons provides a secondary benefit to their uninfected sexual partners and may provide a population level benefit as treatment efforts are scaled up around the globe.

Pre-Exposure Prophylaxis (PrEP). Bolstered by the effectiveness of ART for prevention of mother-to-child-transmission, scientists are currently studying the effect of chemoprophylaxis for prevention of sexually transmitted HIV infection. Five randomized trials of PrEP are complete, another was stopped for futility,[82] and two are ongoing. Four of the five completed trials demonstrated 39%,[83] 44%,[84] 62%[85] and 69-75%[86] reductions in incident HIV infections with intent-to-treat analyses, and higher efficacy based on post-hoc analyses of study participants with detectable drug levels.[87] The fifth completed trial rendered null results; women in all three study arms had low rates of adherence to their assigned daily treatment regimens, which may partially explain the disparate results among some of trials.[88] While these strategies are promising, their efficacy depends on availability, adherence, and knowledge of one's HIV risk, all of which present challenges in the sub-Saharan African setting, especially for young women.

Cash Transfers. There is growing interest in structural approaches to HIV prevention, and especially in the provision of cash payments to youth and their parents, as a means of addressing socioeconomic HIV risk factors, such as poverty and low rates of school attendance.[89] Pettifor et al. provide a comprehensive review of completed and ongoing cash payment programs designed to reduce HIV risk.[89] To date, one program has released results on HIV or sexually transmitted infections (STI) outcomes. The Schooling Income and HIV Risk study, a cluster randomized trial (N=1,289) of cash transfers to young Malawian women (ages

13 to 22) and their families, demonstrated a 64% reduction in the prevalence of HIV and 76% reduction in the prevalence of herpes simplex virus in the treatment arms (conditional and unconditional cash transfers) compared to the control arm.[90] The longer term implications of cash transfer programs, both in terms of sustainable delivery and effectiveness, are unclear at this time, underscoring the importance of continuing the search for efficacious prevention methods that young women can access and implement on their own volition.

Incorporating New Approaches in Kenya

Kenya's most recent four-year National AIDS Strategic Plan (KNASP) was developed in 2009 prior to the release of results from TasP and PrEP studies. Presently, prevention efforts in Kenya are largely focused on VMMC provision. Since its endorsement of VMMC for HIV prevention,[68] the Kenyan Government has made significant progress toward the national goal to circumcise 80% of uncircumcised men by the end of 2013.[58] By late 2012, approximately 391,000 Kenyan men had been circumcised, 80% live in Nyanza Province, where circumcision rates are lowest. In spite of notable gains in the effort to circumcise Kenyan men, Cherutich et al. point out that low uptake of VMMC among men aged 25 and older remains a challenge.[57] In addition to these challenges, little is known about the long-term effect of VMMC on couple- and population-level transmission dynamics, which warrants consideration of combining VMMC with complementary prevention approaches.

Numerous research studies are underway in Kenya, the results of which will inform the next KNASP. One study of particular relevance to youth HIV prevention, funded by NIH, is a combination of HIV prevention packages for west Kenyan youth aged 15-24. Researchers developed gender-specific prevention packages to address HIV risk for youth, which will be pilot tested this year to determine their feasibility, acceptability, cost, and reach.[91] This is the first HIV prevention program using a combination of packages tailored to the epidemic drivers among

west Kenyan youth, and will likely shape youth-focused prevention efforts in western Kenya in the coming years.

Placing Know Your Network in the Context of HIV Prevention in Kenya

As discussed earlier, Kenya's National AIDS Coordinating Council identified concurrency reduction as a desired and expected outcome of KNASP 2009-2013. In addition to congruence with Kenya's national HIV prevention strategies, the *Know Your Network* (KYN) program complements new HIV approaches in three significant ways. First, KYN addresses a different aspect of the HIV transmission system. TasP and PrEP operate at the individual level to reduce infectiousness and susceptibility, respectively. KYN, on the other hand, is a community-level equivalent of the barrier method, which works in a different but synergistic way. It operates at the community sexual network-level to interrupt and limit network pathways by which disease may travel. Second, concurrency reduction addresses an aspect of couple-level HIV transmission that TasP overlooks. Viral suppression of the infected partner prevents HIV transmission *within* serodiscordant partnerships. In other words, treating the infected partner only prevents HIV infection in the susceptible partner, if s/he does not have an infectious concurrent partner. Research indicates this is often not the case. A sizeable portion of infections in serodiscordant couples originate outside stable partnerships,[53] making concurrency reduction important for enhancing TasP prevention efforts.

Third, there are serious gaps in the treatment of HIV infected persons, some due to resource constraints and some to human behavior.[3,92] Concurrency reduction is a prevention option that does not rely on the availability of medical care funding to support widespread implementation, individuals' willingness to be tested for HIV, or high levels of adherence to medications. Unlike TasP and PrEP, KYN — and concurrency reduction more broadly — is a low-cost prevention option that can be readily implemented by individuals and communities with little need for

external support. Thus, to build comprehensive and effective HIV prevention programs, it will be essential to partner with Kenyan communities to design and implement concurrency reduction programs such as KYN that are appealing to youth, feasible to implement, and culturally and developmentally appropriate.

Dissertation Structure

This dissertation is written in the form of three related studies to address the overall dissertation aims. The first study (Chapter 2) presents a description of characteristics and patterns of debut among rural west Kenyan men and women, and characteristics of sexual partnerships across age cohorts in adolescence (13-19) and young adulthood (20-34). The second study (Chapter 3) describes the prevalence of concurrent sexual partnerships among west Kenyan adolescents (aged 13 to 19) and its implications for HIV prevention. The third study (Chapter 4) presents west Kenyan adolescents' and adult stakeholders' perspectives regarding the KYN intervention and its use with a target audience of 13 to 17 year olds. Chapter 5 provides a summary of findings and implications for future research as well as nursing practice.

CHAPTER 2: SEXUAL DEBUT IN RURAL NYANZA PROVINCE

Introduction

Adolescence is a life stage in which the foundation for adulthood is set – health promoting and health damaging behaviors may become habits with long-term consequences.[8,93,94] It is a time of transitions that frequently includes sexual debut and the subsequent development of sexual partnerships. In sub-Saharan Africa HIV/AIDS is the leading cause of death among young people,[94] which means that the window of opportunity for primary HIV prevention for sub-Saharan African youth is relatively narrow. Cross-sectional surveys demonstrate a high prevalence of HIV among rural Nyanza females ages 15 and 19,[33] in particular, highlighting the need to understand the context of sexual debut in Nyanza, and how it shapes the unfolding sexual lives of adolescents and young adults.

Background

The world's population of adolescents is larger than ever before, and there is galvanizing interest in ensuring healthy transition of youth into adulthood.[95] Nine of every ten adolescents live in low- and middle-income countries, where their health is central to ambitious sociopolitical agendas for sustaining economic and human development.[8] Kenya is one such country, and in 1999 its government declared HIV a national disaster. The AIDS epidemic continues to be "one of the central impediments"[96] to Kenya's national health and development, and in its 2011 report on the state of the epidemic, the National AIDS Control Council (NACC) acknowledged the epidemic trajectory will be determined by the outcome of efforts to prevent HIV's spread among Kenya's sizeable adolescent population.

Therefore, there is a pressing need for efficacious HIV prevention programs for Kenyan adolescents,[97] particularly those living in Nyanza Province, the epicenter of the national epidemic. The prevalence of HIV infection in Nyanza is more than double the national average, and 15 times higher than in North Eastern Province, which has the lowest HIV prevalence. In Nyanza an estimated 92% of new infections are heterosexually transmitted,[34] and like many other sub-Saharan African settings,[98] young people bear the brunt of incident infections.[96] In their analysis of the modes of HIV transmission in Kenya, Gelmon et al.[34] note the importance of first understanding the nature of behaviors that put people at risk of HIV infection, and then planning to intervene on those behaviors.

Numerous studies have identified sexual behaviors associated with prevalent HIV infection in Kenyan men and women. For both genders,† cumulative number of sexual partners, inconsistent condom use, transactional sex, self-reported history of treatment for any sexually transmitted infection, and infection with herpes simplex virus have been associated with prevalent HIV infection.[51,99,33] For Kenyan males, additional sexual risks include not being circumcised,[65] unprotected sex with a sex worker,[51] and having sex with a woman during her menses.[51] For Kenyan females, early sexual debut has also been associated with HIV infection.[11]

Several explanations have been proposed to account for the relationship between early debut and HIV infection in girls and women: girls who have sex at a young age may be less empowered to negotiate safer sex, they have a longer duration of HIV exposure than girls who debut later, they may be more likely to engage in other high risk sexual behaviors after debut,

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† The author acknowledges the words “sex” and “gender” are not synonymous. This dissertation uses the word “gender” in place of “sex” because most of the observed differences between males’ and females’ HIV prevalence and HIV risk are social, not biological, which suggests gender is the more appropriate of the two referents.

and their sexual partners may be older and thus more likely to be infected than a same-age partner.[100 9] A recent systematic review of the literature found significant bivariate associations between early sexual debut and HIV infection among younger females in sub-Saharan Africa, and in some studies these associations persisted after controlling for duration of sexual activity (i.e., time since debut) and demographic characteristics.[9]

In Kenya, the timing of sexual debut has received significant attention,[11,37,99,101-103] and delaying sexual debut is one of the cornerstones of the Kenya National AIDS Strategic Plan to prevent HIV in youth.[37] However, there are likely many variables along the (unobserved) causal pathway between age at debut and HIV infection, and age at debut may be just one of several characteristics of debut that shape its trajectory. This study was undertaken to better understand the characteristics of sexual debut and early sexual partnerships in Nyanza Province, Kenya.

Aims

To understand the experience of sexual debut in Nyanza and how it shapes the unfolding sexual lives of adolescents and young adults, we examined survey data collected between 2003 and 2005 by the CDC and the Kenya Medical Research Institute (KEMRI) in the neighboring rural communities of Asembo and Gem, Nyanza Province, Kenya. Specifically, for males and females in rural Nyanza we sought to:

1. Describe individual, partner, and partnership sexual debut characteristics, and examine characteristics of sexual partnerships across age cohorts and by time since debut for adolescence (13-19) and young adulthood (20-34).
2. Describe typologies of sexual debut based on a configuration of debut characteristics associated with STI/HIV risk

Methods

Asembo and Gem Baseline Cross-Sectional Surveys

The Asembo and Gem Baseline Cross-Sectional Survey (BCS) research materials and procedures were reviewed and approved by ethics committees of the CDC, the Kenya Medical Research Institute, the Institute for Tropical Medicine (Antwerp, Belgium) and the London School of Hygiene and Tropical Medicine. The survey methods are reported in detail elsewhere.[33,104] The purpose of the two surveys was to document the prevalence of HIV and other sexually transmitted infections (STIs), and their associated risk factors, among youth and young adults aged 13 to 34 living in rural western Kenya. The Asembo BCS used stratified random sampling to enroll 1,822 individuals aged 13 to 34. The Gem BCS used village level cluster sampling to enroll 924 individuals between ages 15 and 34 for the full study of behavior and STI prevalence, and an additional 166 adolescents aged 13 and 14 for a sub-study of behavior only.

For the original surveys, eligible respondents were between ages 13 and 34, permanent residents in the study region, and able to provide informed consent (or assent in the case of minors). Respondents completed face-to-face interviews regarding their sexual behavior and reproductive health. Data were collected using optical character recognition-enabled forms that were completed by the interviewer and later scanned into a database using Teleform version 8 and imported into Access 2000. Asembo respondents aged 13 or older and Gem respondents aged 15 or older received a complete medical history and physical that included testing for pregnancy, HIV and other STIs. Individuals received appropriate treatment for health concerns identified on exam. Respondents who reported rape or sexual violence were provided with free counseling from a study team member trained in supporting victims of sexual assault, and were offered the opportunity to seek free legal counsel from the International Federation of Women

Lawyers in Kenya. Investigators also worked with local chiefs to prepare the community for potential negative social repercussions from disclosure of rape and other forms of sexual abuse during the survey.

The Asembo and Gem BCS surveys included information on the characteristics of respondents' first sexual experience that were used in the present study to describe the context and patterns of sexual debut. The research procedures for the study reported here were reviewed and approved by the University of Washington Institutional Review Board. Senior scientists at the CDC also reviewed and approved the proposed research plan; following agency protocol the survey data were de-identified and released to the investigator for use in this study.

Sample

The neighboring communities of Asembo and Gem are demographically similar. They are both subsistence-farming communities populated almost entirely (>95%) by members of the Luo ethnic group. For the present study, the survey data from the two samples were combined; the sample derivation process is illustrated and explained in Figure 1.

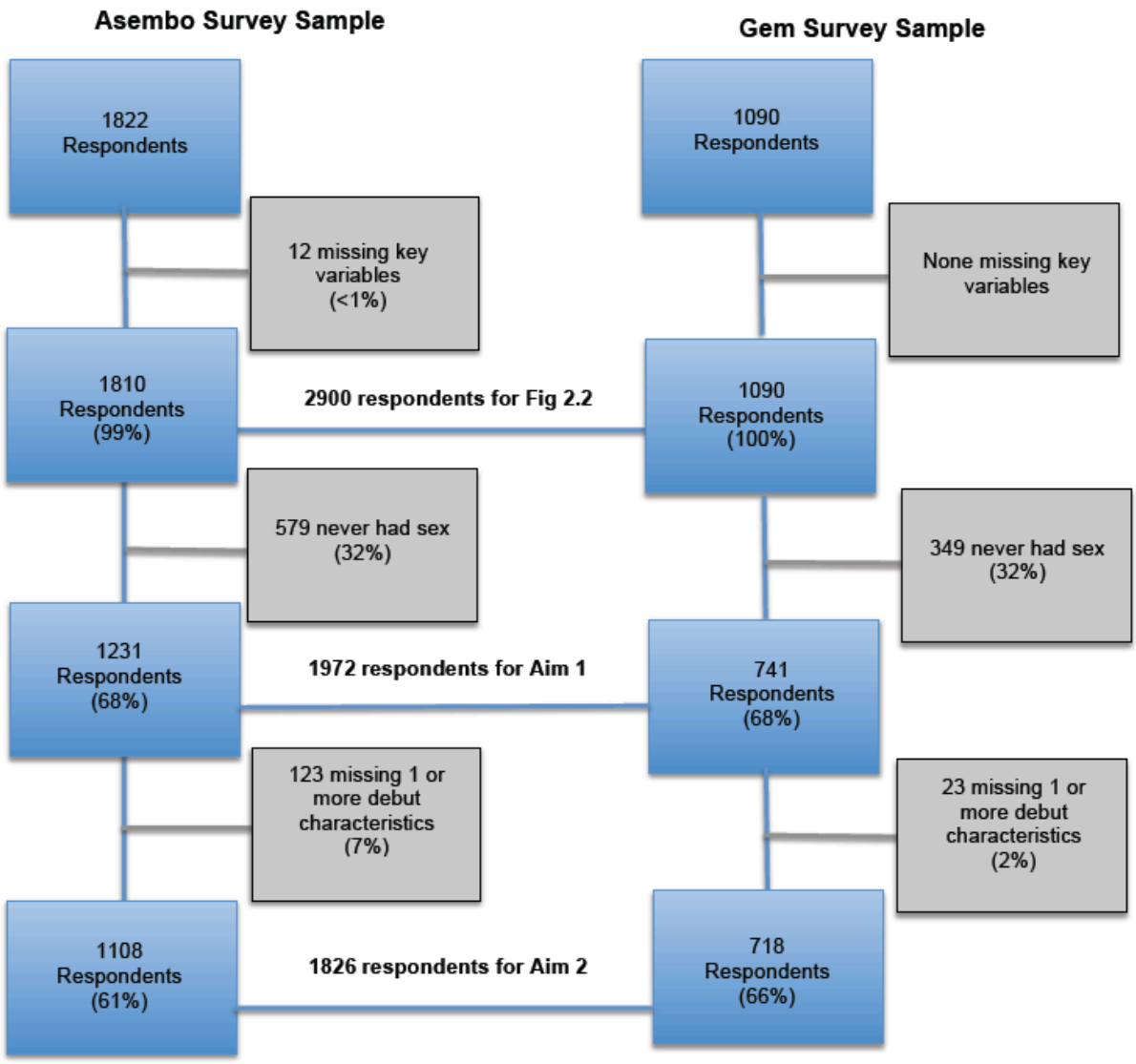

Figure 2.1. Sample derivation process.

The blue boxes enumerate respondents who remained in the sample at each step of the process. The text on the blue horizontal lines enumerates the combined total of respondents who remained in the sample. The grey boxes enumerate cases dropped from the sample for one of the following reasons: 1) case missing value(s) for variable(s) that determined skip patterns in the survey instruments; 2) respondent reported never having had sexual intercourse; 3) case missing data on one or more of the debut characteristics used in the analyses reported in this chapter.

Measures

Debut Characteristics

In the survey, data about *sexual debut* were collected separately for single, never married respondents versus respondents who were currently or previously married. The former were directly asked if they had ever had sexual intercourse (defined as penile-vaginal penetration), and if so, they were asked a series of questions in order to characterize respondents, debut partners, and debut partnerships. Respondents who had been married were presumed to have had sexual intercourse. They were first asked questions about their spouse(s), and then whether the first spouse also was their first sexual partner. If the debut partner was different from the first spouse, the respondent answered the full series of questions about debut. Respondents whose debut partner was the first spouse answered the full series of debut questions in the Gem BCS and an abbreviated set of questions in the Asembo BCS. Therefore, Asembo respondents who married their debut partner (N=37) were missing some values for debut characteristics.

Respondent Characteristics at Debut. Measures were age at debut, and a categorical description of debut: *wanted to have sex, did not plan to have sex but it happened anyway, wanted to delay sex but felt pressured, did not want to have sex but was physically forced*. In preparation for cluster analysis, debut age was recoded into a categorical indicator of early debut. For females, debut age was dichotomized to indicate whether it occurred before menarche. For males, debut age was collapsed into three categories: early (below the 25th percentile), average (between the 25th and 75th percentiles, inclusive), or late (above the 75th percentile).

Debut Partner Characteristics. Debut partner (DP) characteristics included categorical measures of DP's age relative to the respondent's age; occupation, and marital status at the

time of debut; and the frequency with which the DP gave the respondent gifts, money, or favors in exchange for sexual intercourse (categorized: *yes, always; yes, sometimes/occasionally; no, never*).

Debut Partnership Characteristics. Measures included length of time the respondent knew the DP prior to sexual intercourse (categorized: *1 day or less; 2 to 14 days; 15 to 30 days; 1 to 3 months; 4 to 12 months; > 1 year*); whether or not the couple used a condom at debut; condom use at subsequent sexual intercourse; duration of the partnership (categorized: *ongoing, 1 day or less; 2 to 14 days; 15 to 30 days; 1 to 3 months; 4 to 12 months; > 1 year*); and whether or not the couple had sex again (categorized: *no; yes, fewer than five times; yes, more than five times*). For measures of time in the debut partnership (e.g. time to first sex, duration of partnership), the categories *2 to 14 days* and *15 to 30 days* were combined into one category of *2 to 30 days*.

Post-Debut Sexual Behaviors

Respondents were asked about their sexual behaviors subsequent to sexual debut, including reported cumulative number of lifetime sexual partners and reported condom use. The *cumulative number of lifetime sexual partners* was a self-reported count of the total number of people with whom the respondent had ever had sexual intercourse, up to the date of interview. An estimate of the *annual rate of partner acquisition* was constructed by dividing the count of sexual partners by time (in years) since sexual debut, and then examined by sex, age, and marital status. *Reported condom use* within the context of each partnership reported in the Asembo and Gem BCS was measured using responses to two questions about condom use: at debut, with spouse (i.e., person to whom respondent was currently married or with whom respondent was living as married), and with up to three other partners with whom the respondent had sex in the six months prior to the interview date.

First, respondents were asked whether they used a condom during their first sexual encounter with the named partner.‡ Then, if they reported having sex with the partner more than one time, they were asked to indicate frequency of condom use with this partner as: *never, sometimes, most of the time, always.* The *prevalence of condom use* was measured based on reported coital frequency (one time, more than one time) and partnership type (spousal, debut, and other).

Demographic Characteristics

Sex, age, and marital status were self-reported, using categories specified in the survey as reported in Table 2.1. The measure of educational attainment was constructed based on three survey questions: *Have you ever attended school? Are you currently enrolled in school? What is the highest level of education you reached (until now)?* Females were asked if they had ever been pregnant, and if so, their age at first pregnancy and total number of pregnancies.

Analysis Plan

Preliminary Analysis. Data were examined for outliers as well as illogical and missing values. Where values were missing, an attempt was made to recover information based on other variables. If debut partner's age was missing but the debut partner was the first spouse, and the first spouse's age was reported, the value for debut partner age was recoverable. Outliers, illogical and missing values were primarily confined to the variable containing debut age. Nearly 5% of respondents (N=95) had anomalous values for debut age — 20 respondents reported their age at sexual debut was younger than 8 (outlier values), 8 reported a debut age that was older than their current age (illogical values), 12 respondents provided no response, and 55 said they did not know the answer. Outlier values for debut age were retained if the respondent

‡ Respondents were not asked if they used a condom during first sex with a spousal partner.

reported his/her debut was pressured or forced (N=4), otherwise they were treated as missing (N=16). Illogical values also were treated as missing. The only other variable of interest with missing values for more than 2% of cases was DP's relative age — 3% of respondents (N=62) did not know their debut partner's age or his/her relative age. The "Do not know" category was included in the analyses rather than treating these responses as missing data, and deleting these 62 cases.

Analysis for Aim 1. For continuous measures, the mean, standard error, median and range of values were reported as well as appropriate parametric test statistics where statistically significant differences existed. For categorical measures, the unweighted percentage of respondents in each category was reported in addition to measures of association where statistically significant associations existed. For descriptive statistics listwise deletion was used for cases with missing values (including *No response* and *Don't know,* unless otherwise noted [e.g. debut partner's relative age]). Means, medians, and proportions were used to describe the characteristics of sexual debut reported by survey respondents.

Analysis for Aim 2. Person-focused cluster analysis (SPSS TwoStep) was used to determine whether there were distinct patterns of sexual debut. Similar approaches have been used to study risk behavior patterns among U.S. adolescents.[105] HIV prevalence peaks significantly earlier for females compared to males,[11] suggesting that sexual trajectories, including patterns of sexual debut, may differ by sex. Thus, the analyses were conducted separately for males versus females.

The TwoStep method was designed to manage large datasets containing a mix of continuous and categorical variables[106] and extends hierarchical clustering methods and model-based distance measures for categorical and continuous measures, respectively.[106,107] Cases are clustered in two stages. First, cases are scanned and a log-likelihood-based distance criterion is

used to determine whether each case should be merged with a previous group or remain on its own. This process creates a cluster feature tree with summary statistics for dense regions of the data. Second, a hierarchical clustering algorithm is used to combine dense regions of the data. The number of clusters for each model is assessed using the Bayesian Information Criterion (BIC), and the ratio of change in distance between clusters at each merger. The overall goodness of fit is summarized by the measure of cohesion/separation — a measure of distance between objects that ranges from -1 to +1, with values higher than 0.5 indicating a good clustering solution.[108]

The cluster analyses by sex began with seven input predictors. The data were prepared for cluster analysis by creating an identification number used to sort respondents randomly to minimize the potential effect of case order.[107] The full model was examined; for poorly fitting models, variables were selected for removal based on the measure of their respective contributions to the model. The final cluster solution was chosen based on the measure of cohesion and separation as well as model parsimony and scientific relevance. The clusters were used to identify typologies of sexual debut for males and for females, with typologies named according to the key debut characteristics that distinguished each cluster, determined by the measure of within cluster predictor importance (ranging from 0 to 1).

Results

Sample Description

Males comprised 49% and females 51% of the subsample (Table 2.1). Most respondents were affiliated with a major sect of Christianity (Anglican, Catholic, or Protestant). The majority (69%) of males were single and never had been married, whereas the majority of females had been married and remained married (53%), were separated/divorced (2%) or widowed (7%). Slightly

less than one-third (29%) of respondents still were enrolled in school at the time of the survey. Among the majority of respondents out of school, 90% quit prior to completing secondary school. Male and female respondents most often cited lack of money to pay for school fees, books, or uniforms as the reason for quitting school prior to completion. Among females, the second most cited reason for quitting school was pregnancy (cited by 21% of female dropouts).

Table 2.1. Demographic characteristics of the combined sample from the Asembo and Gem Baseline Cross-Sectional Surveys (N=1972)

	Males N=958		**Females** N=1014	
Marital Status				
Single, never married	664	69%	388	38%
Married	259	27%	536	53%
Divorced/Separated	24	3%	16	2%
Widowed	11	1%	74	7%
Educational Attainment				
Still attending school	358	37%	214	21%
Did not finish primary school	205	21%	379	37%
Finished primary school	229	24%	263	26%
Did not finish secondary school	59	6%	85	8%
Finished secondary school	86	9%	49	5%
Some post-secondary education	14	2%	8	1%
Never attended school	6	1%	15	2%
Child-Bearing (Females)				
Ever been pregnant	-	-	688	68%
Median age at first pregnancy (Range)			17 (11,31)	
Median number of pregnancies (Range)			3 (1, 9)	

Aim 1 Results: Characteristics of Sexual Debut and Subsequent Partnerships

Respondent Characteristics

To capture the pattern of sexual activity among Kenyan youth and young adults using this cross sectional sample, we examined the proportion of males and females reporting “ever” having had sex. Figure 2.2 reveals the pattern by age cohort, categorized by two-year increments through age 20 to illustrate the dominant trend. Among young adolescents aged 13-14, 29% of males and 19% females reported having ever had sexual intercourse. Thereafter, the proportion of respondents reporting having had sex increases rapidly and steadily through age 20, for both males and females. By age 20, 90% or more of the sample reported having had sex.

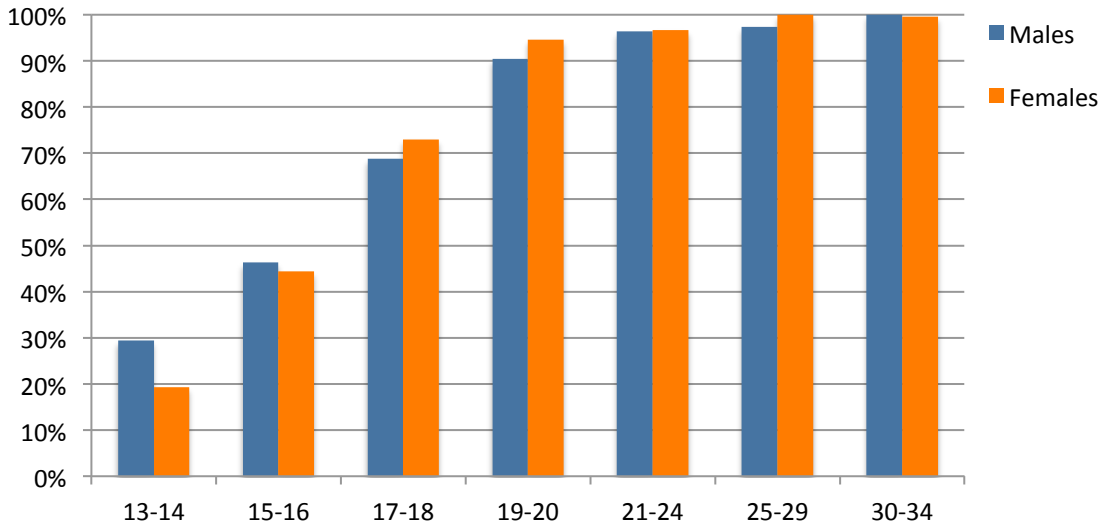

Figure 2.2. Proportion of Asembo and Gem respondents (N=2900) who report having had sex summarized by age category and sex.

Males reported a younger median age of sexual debut compared to females — 14 years compared to 15 years. Age at debut ranged from 6 to 31 for males and 6 to 32 for females.

Nearly 25% of females reported their age at sexual debut younger than their age at first menses.

When asked to choose one of four statements that best described their very first sexual experience (Table 2.2), males described their sexual debut significantly differently than females: 82% of males said they wanted to have sex at debut, compared with 58% of females. Females were more likely (OR=4.37; 95% CI: 3.3-6.1) to report either feeling pressured (14%) or being physically forced to have sex (6%) compared to males (4% and 1%, respectively).

Table 2.2. Description of sexual debut

How would you describe the very first time you had sexual intercourse? Would you say…	Males	Females
You wanted to have sex	82%	58%
You did not plan to have sex but it happened anyway	13%	22%
You preferred to delay sex but you felt pressured	4%	14%
You did not want to have sex but were physically forced	1%	6%

Partner Characteristics

Table 2.3 details characteristic of the respondents' debut partners. Briefly, a significantly larger proportion of males reported their DP was younger or about the same age (84%) compared to females (24%). More than two-thirds of females reported their DP was older than them, and the vast majority (74%) of those with an older DP reported he was less than five years older. While most respondents (76%) reported their DP was a student at the time of first intercourse, there were differences by gender — females were significantly less likely (OR 0.20, 95% CI: 0.16, 0.26) than males to report the DP was a student.

Table 2.3. Characteristics of respondents' debut partners

	Males N=958	**Females** N=1014	***P*[b]**
	%[a]	%[a]	
Age of Debut Partner, Relative to Respondent			<0.001
>10 years older	<1%	4%	
5-10 yrs older	2%	16%	
<5 yrs older	11%	52%	
More or less the same age	43%	22%	
< 5 yrs younger	38%	2%	
5-10 yrs younger	3%	-	
>10 yrs younger	<1%	-	
Unknown	3%	4%	
Debut Partner's Occupation			<0.001
Farmer/Fisherman	-	4%	
Professional/salaried worker/Business owner/Self-employed	1%	14%	
Skilled laborer	<1%	3%	
Unskilled laborer/casual worker	2%	6%	
Student	90%	64%	
Homemaker	4%	4%	
Unemployed	2%	5%	
Other	1%	1%	
Debut Partner's Marital Status			<0.001
Single, never married	99%	96%	
Married	<1%	3%	
Separated/Divorced	-	<1%	
Widowed	<1%	<1%	
Gave Respondent Gifts, Money, or Favors in Exchange for Sex			<0.001
Yes, always	<1%	21%	
Yes, sometimes or occasionally	4%	36%	
No, never	96%	43%	

a. Excludes respondents who did not answer question, did not know the answer, or for whom data were otherwise missing (<3% of respondents per question).

b. *P* value from χ^2 test of overall association between sex and debut partner characteristic.

Males almost universally (99.9%) reported their DP was unmarried at the time of first intercourse. Three percent of females reported their DP was married, and these respondents (n=30) accounted for 80% of the females with a DP more than five years their senior. More than half of female respondents reported their DP sometimes or always gave them money, favors, or gifts in exchange for sexual intercourse. The odds of the DP giving gifts, favors, or money in exchange for sex were 29 times higher (95% CI: 21.59, 42.76) for females compared to males.

Partnership Characteristics

A small minority (2%) of respondents married their first sexual partner. Among those who did not, there were significant differences by gender in the reported length of debut partnerships (Table 2.4). The debut partnership lasted less than three months for the majority of males and more than three months for the majority of females. While 41% of respondents had sex with their DP only once, these debut partnerships do not fit the definition of "once off" partnerships or "hook ups." Fewer than 3% of respondents reported knowing their DP for one day or less prior to having sex. Most knew their DP for at least one month prior to intercourse, and one-third knew him/her for more than one year before having sex. Furthermore, 34% of respondents who reported not having sex with their DP again (N=736) reported their relationship with the debut partner lasted one day or less, while 30% said 2 to 30 days, 15% 1 to 3 months, 14% 4 to 12 months, and 8% said the duration was greater than one year.

Reported condom use at sexual debut was uncommon — 11% of all respondents reported using a condom at debut. Females were significantly less likely to report using a condom at debut compared to males (OR 0.59,), though this difference did not persist for subsequent condom use with their debut partner. More than half of respondents who used a condom at debut and had sex with their DP again reported using a condom always or most of the time with their DP.

Table 2.4. Characteristics of debut partnerships for male and female respondents

	Males N=958	Females N=1014	P[b]
	%[a]	%[a]	
Length of Time Respondent Knew DP Prior to Sex			<0.001
1 day or less	3%	2%	
2-30 days	24%	20%	
1-3 months	23%	28%	
4-12 months	13%	20%	
>1 yr	36%	30%	
Subsequent Intercourse with Debut Partner			0.017
No	42%	36%	
Yes, but less than 5 times	26%	28%	
Yes, 5 or more times	32%	36%	
Partnership Duration[c]			<0.001
1 day or less	16%	12%	
2-30 days	23%	15%	
1-3 months	16%	17%	
4-12 months	21%	32%	
More than 1 year	24%	24%	

a. Excludes respondents with missing values
b. *P* value from χ^2 test of overall association between sex and debut partnership characteristic
c. Among respondents whose debut partnerships had ended.

Characteristics of Sexual Partnerships by Age and Time Since Debut

To understand the increasing risk of HIV exposure across the debut process, we examined the cumulative number of sexual partners by age cohort and by time since sexual debut. Males reported a median of 4 lifetime sexual partners (range 1-80), while females reported a median of 2 (range 1-25). As illustrated in Table 2.5, the median cumulative number of sexual partners varied by age cohort, peaking with a median of 8 sexual partners among male 25-29 year olds. Compared to males, we observed less variation in females' reported cumulative number of

sexual partners, overall, as well as less variation by age. Figure 2.3 illustrates, by age cohort, the interquartile range of the cumulative number of partners reported by males and females. To improve presentation and interpretation of data in Figure 2.3, the sexual partner count was truncated by recoding 4% of males (n=28) who reported having more than 25 partners into a count category of >25 category, represented in the figure.

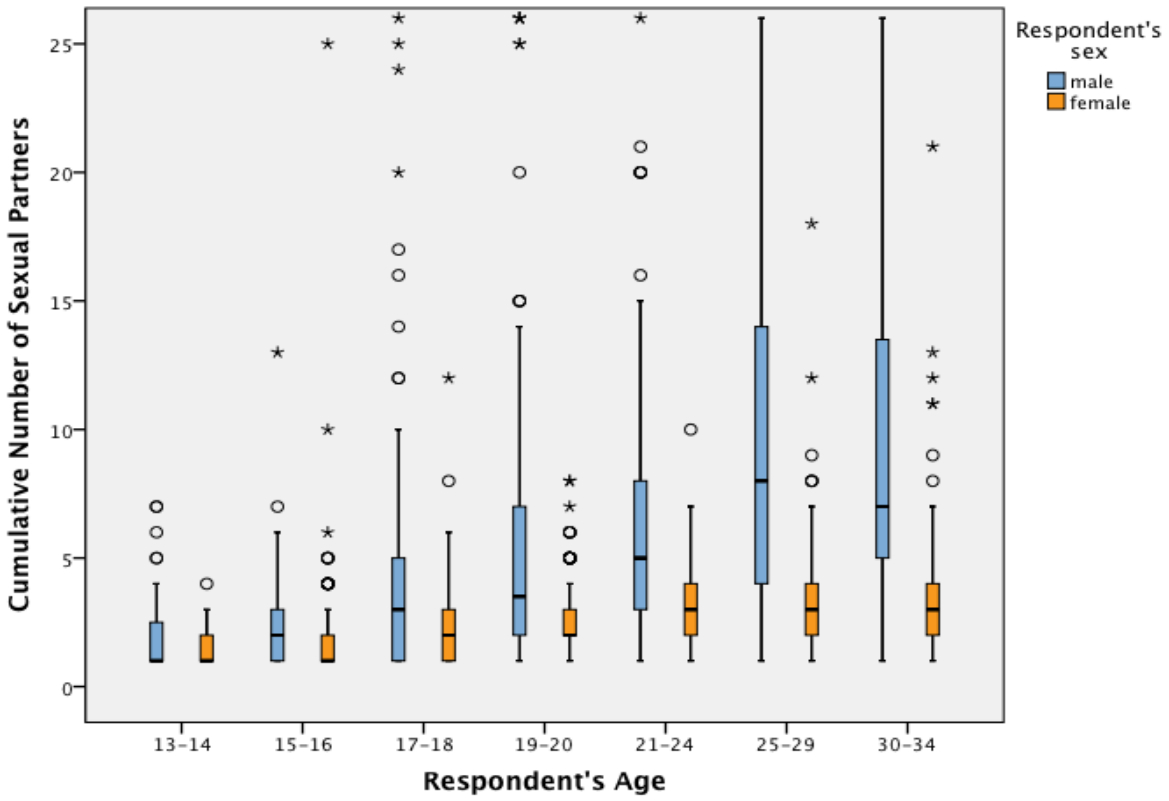

Figure 2.3. Box plots of reported cumulative number of sexual partners by respondent sex and age cohort.

Table 2.5. Summary of reported cumulative number of sexual partners (median, mean, and standard error) among Asembo and Gem respondents by sex and age cohort

	Males (N=958)			Females (N=1014)		
	Median	*Mean*	*Std. Error*	*Median*	*Mean*	*Std. Error*
Age Category						
13-14	1	1.91	.157	1	1.46	.094
15-16	2	2.33	.149	1	2.10	.208
17-18	3	4.10	.363	2	2.43	.114
19-20	3.5	6.18	.782	2	2.68	.118
21-24	5	6.69	.494	3	3.18	.137
25-29	8	11.10	.811	3	3.39	.153
30-34	7	10.73	.932	3	3.52	.155

Table 2.5 and Figure 2.3 suggest that females accumulate their lifetime sexual partners relatively early, compared to males. This may be partly explained by gender differences in age at first marriage. The median age at first marriage was 18 for females, and 81% of females older than age 17 were married. Women may stop accumulating partners after marriage, or married women may underreport extra-marital partners in face-to-face surveys like the Asembo and Gem BCS.

We also examined cumulative number of sexual partners by time (in years) since debut to better understand the relationships between sexual debut, cumulative number of sexual partners, and age. Figure 2.4 illustrates the interquartile range of reported number of sexual partners by gender and time since sexual debut (categorized by years). The plot is similar to Figure 2.3, reflecting the strong association between age and time since debut. Overall, respondents reported a mean of 7 years (SE=0.19) between sexual debut and the time of the survey. There were no significant differences in mean duration of sexual activity by gender ($t = -.235$; $p=0.814$) despite significant gender differences in the mean and median reported cumulative number of sexual partners.

Figure 2.4 and Table 2.6 indicate most females accumulate all their lifetime sexual partners in the first 3 years after sexual debut, whereas males continue to accumulate partners as the interval of sexual activity expands. It is possible that these observed differences in partner accumulation are due to biases in reporting (men may exaggerate, women may underreport) in a face-to-face survey like the Asembo and Gem BCS. Alternatively, the observed differences may be due to earlier average age at first marriage for Nyanza women (18 years) compared to men (23 years), which shortens their premarital sexual careers.

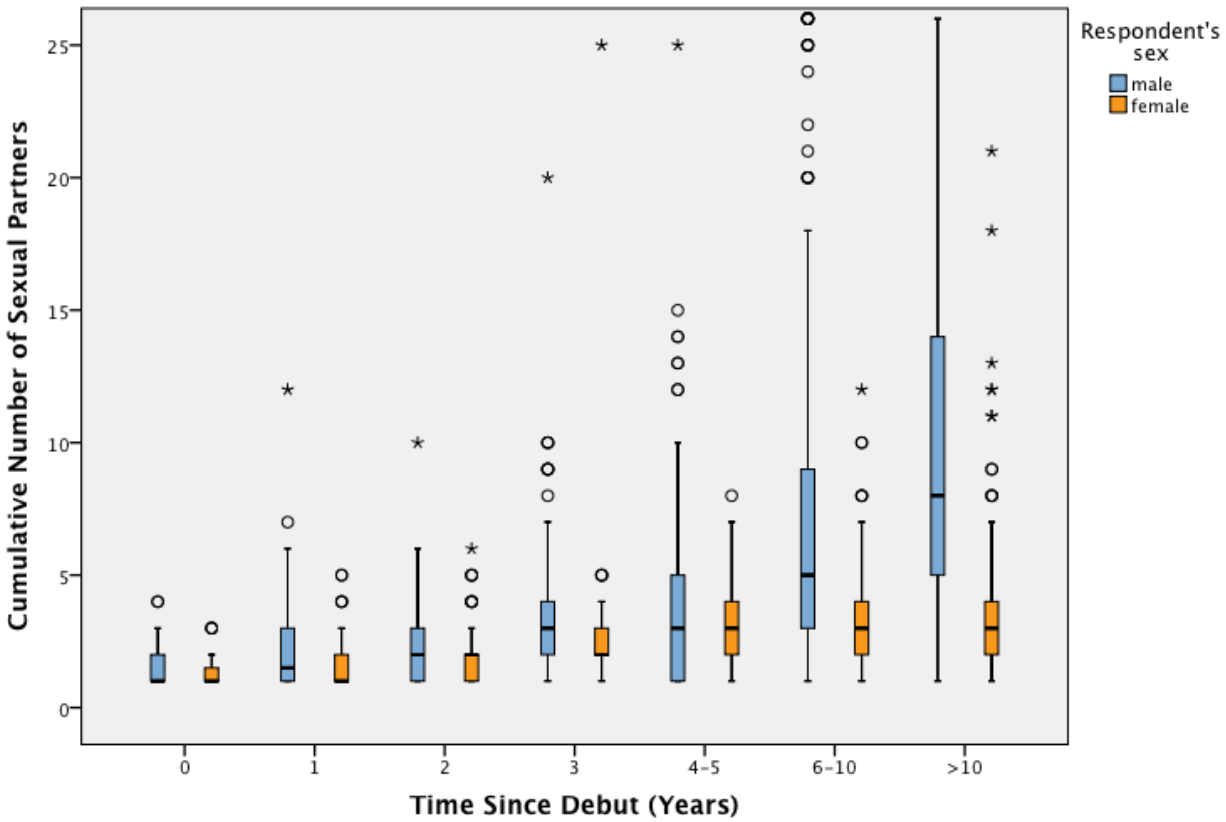

Figure 2.4. Box plots of reported cumulative number of sexual partners by respondent sex and time since debut.

Table 2.6. Reported cumulative number of sexual partners (median, mean, and standard error) by years since debut

	Males			Females		
	Median	*Mean*	*Std. Error*	*Median*	*Mean*	*Std. Error*
Years Since Debut						
0	1	1.43	0.129	1	1.3	0.069
1	1.5	2.15	0.209	1	1.63	0.104
2	2	2.38	0.176	2	1.88	0.097
3	3	3.41	0.301	2	2.63	0.267
4-5	3	4.01	0.301	3	3	0.113
6-10	5	7.63	0.612	3	3.34	0.14
>10	8	11.67	0.728	3	3.57	0.128

Given the potential effects of short vs. longer intervals between sexual debut and marriage, we explored the relationship between the length of the premarital sexual career and the cumulative number of sexual partners. Among married sexually experienced respondents (N=795), the mean number of years from debut to first marriage was 3.5 years (SE=0.12) for females and 8 years (SE=0.23) for males. Of particular relevance, males reported a median of 5 sexual partners during the interval between debut and marriage, while females reported a median of 2 sexual partners in the same interval. This suggests that for females, age at marriage may be a more important determinant of cumulative number of sexual partners than time since debut.

Rate of Partner Acquisition

We were also interested in estimating how quickly, on average and relative to time of sexual debut, men and women acquire sexual partners. This information is important to effective targeting of prevention programs to periods in which men and women are accumulating sexual partners most rapidly, both in terms of total HIV exposure as well as increased probability of concurrency during such periods. Therefore, the annual rate of partner acquisition was

calculated for each respondent by dividing his or her reported cumulative number of sexual partners by the number of years since sexual debut. The findings reveal that on average, males acquired a median of 0.75 partners per year, while females acquired a median of 0.5 partners per year. The rate of partner acquisition for both sexes varied by the length of time since debut (Figure 3), with the median rate peaking at 1 partner per year three years after debut for males and two years after debut for females.

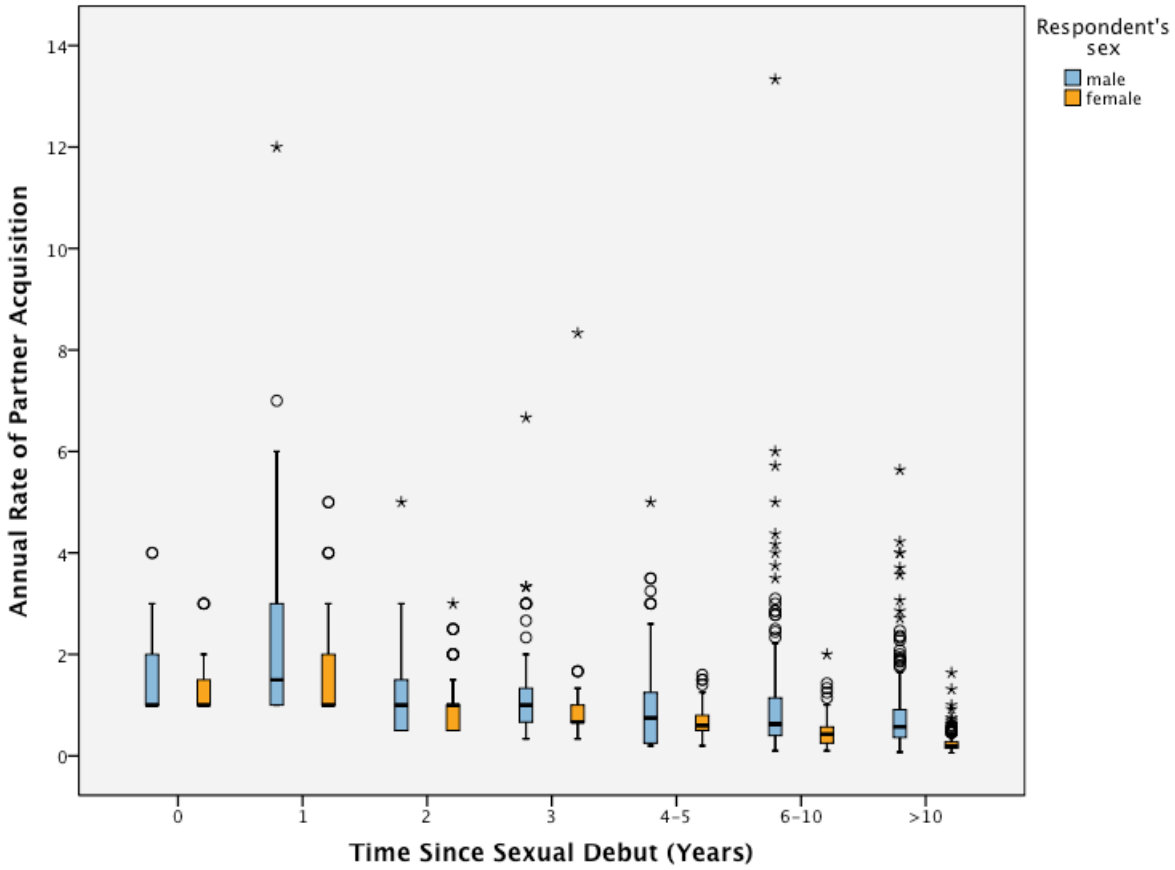

Figure 2.5. Box plot of respondents' annual rate of partner acquisition (vertical axis) by time since sexual debut (in years, on horizontal axis). For presentation of findings, respondents reporting >25 partners are collapsed for all cases in each time since debut category.

Condom Use Across Age Cohorts

All sex is not equal in terms of HIV risk. One person could have multiple partners with whom he consistently uses condoms, while another has a stable partner with whom she never uses condoms. Understanding how reported condom use varies across persons and partnership types relative to age is important to optimize strategies and timing of culturally and developmentally appropriate prevention efforts, particularly those designed for youth in early and middle adolescence.

We investigated the prevalence of condom use by age, sex and partnership type (spousal, debut and other). Condom use was lowest within the relational context of marriage — 86% of all married respondents (N=795) reported they had never used a condom during sexual intercourse with their spouse. Condom use with the debut partner was also low. Approximately 83% of respondents reported they had never used a condom with their debut partners. A greater proportion of respondents reported condom use with non-spousal, non-debut partners ("Other Partners" 1-3), consistent with condom use patterns observed in a range of studies that show low rates of condom use in marriage and higher rates of use in casual partnerships.[11,33,109] The partnerships identified as "other" were not cohabiting or marital, and are likely to have been, for the most part, less stable partnerships. Figure 2.6 shows the proportion respondents who reported they had used a condom at least once, by age cohort and partner type.

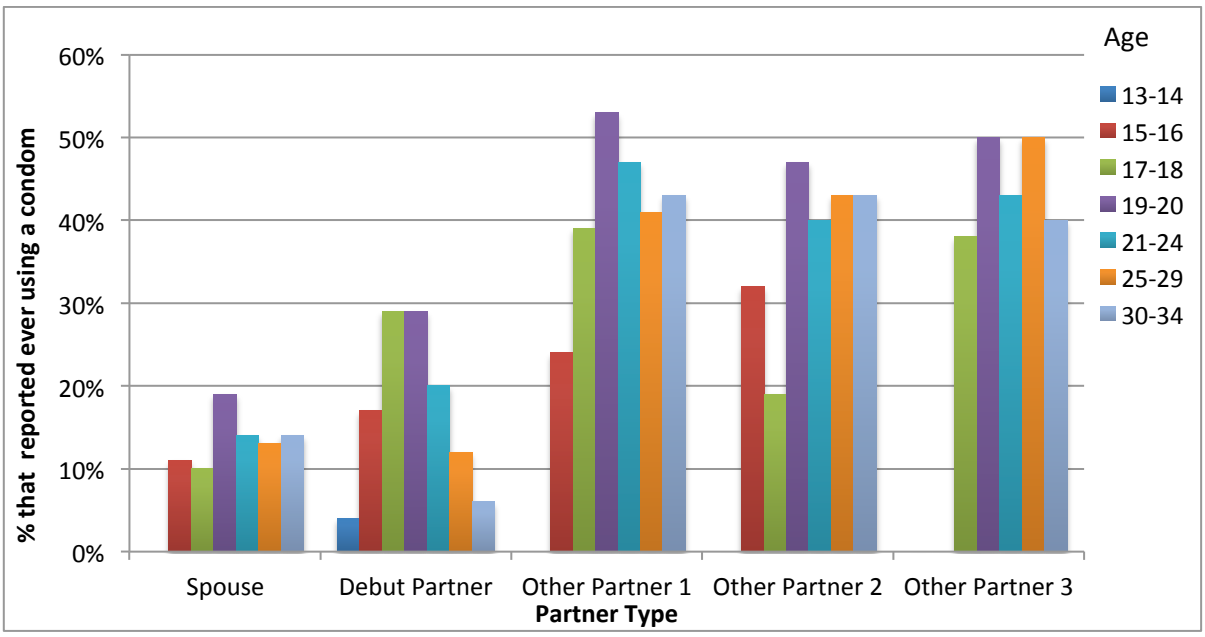

Figure 2.6. Proportion of respondents, by age cohort, who reported use of condom at least once with a spouse, debut partner or other partner(s) (1-3) listed in the survey.

A larger proportion of 17-18 and 19-20 year olds reported using condoms with their debut partners, compared to 25-34 year olds, which may represent a generational effect — the 25-34 year olds reached debut before 1990, and they were likely less aware of HIV and its prevention compared to younger respondents who reached debut during the peak of the pandemic. Table 2.7 describes the number (N) of respondents, by age cohort, who reported each partner type and the proportion (%) who reported having used a condom at least once with the partner.

Table 2.7. Reported condom use by age and partner type

	13-14		15-16		17-18		19-20		21-24		25-29		30-34	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Spouse	0	-	9	11%	50	10%	88	19%	125	14%	255	13%	266	14%
Debut Partner	133	4%	274	17%	336	29%	288	29%	209	20%	339	12%	323	6%
Other Partner 1	19	0%	67	24%	102	39%	102	53%	62	47%	78	41%	56	43%
Other Partner 2	4	0%	19	32%	36	19%	36	47%	20	40%	21	43%	14	43%
Other Partner 3	1	0%	5	0%	16	38%	12	50%	7	43%	6	50%	5	40%

Aim 2 Results: Typologies of Sexual Debut

For Aim 2 we explored for typologies of sexual debut based on characteristics of sexual debut. Sexual debut variables used for cluster analyses, listed in Table 2.8, were selected from 11 debut measures available in the dataset, and created a coherent set of factors reflecting key respondent, partner, and partnership characteristics that reflected relational aspects of HIV risk (e.g. condom use, age difference between partners). Where variables were conceptually redundant (e.g., the measure of debut partnership duration and the measure of subsequent sexual intercourse with the debut partner), a single variable was selected for the initial model input. Thus, seven sexual debut measures were chosen for the modeling: 1) age at debut; 2) characterization of debut sexual experience; 3) debut partner's age; 4) whether the debut partner gave gifts, money, or favors in exchange for sex; 5) length of time the respondent knew the debut partner prior to intercourse; 6) subsequent sexual intercourse with this partner; and 7) condom use at debut.

Respondents with missing values for any of the seven measures (N=146; 7% of sexually experienced respondents) were dropped from the cluster analyses. Table 2.8 below summarizes the specific types of missing values (e.g. missing because respondent did not provide a response, missing due to respondent difficulty recalling the answer) for each of the seven sexual debut characteristics used in this research. Generally, the overall proportion of missing values was low for the debut characteristic variables with respondent's age at debut having largest percent (5%) missing. The Asembo BCS questionnaire instructed interviewers to skip over two questions about the debut partner if the respondent eventually married that partner. Therefore, most Asembo respondents who married their debut partner (N=37) were not asked whether the debut partner provided gifts/favors or whether they had sex again with debut partner.

Table 2.8. Summary of missing values for sexual debut variables used in cluster analyses

	Source of Missingness				
Debut Characteristic	No Response	Don't Know	Valid Skip	Missing	N (%) Respondents with missing values
Respondent age at debut	12	55	0	24	91 (5%)
Respondent description of debut	0	0	0	0	0
DP relative age	0	62*	0	5	67 (3%)
DP gave gifts/favors/$	7	0	31**	0	38 (2%)
Had sex w/ DP again	1	0	30**	0	31 (2%)
Time knew DP prior to first sex	1	17	0	3	21 (1%)
Used a condom at debut	0	2	0	0	2 (<1%)

*Included “Don’t know” DP partner’s age as a valid response;
**Valid skip if respondent married the debut partner

Respondent age and the seven sexual debut variables were collapsed by recoding to eliminate analytic problems in the cluster analyses related to small or empty cell sizes. Table 2.9 summarizes the recoded variables and their distributions, by sex.

Table 2.9. Distribution of age and debut characteristics for 1826 respondents with valid values for all seven debut characteristics used in the cluster analyses.

	Males		Females	
	N=887		N=939	
Respondent Age				
13-14	72	8%	47	5%
15-16	134	15%	127	14%
17-18	155	18%	170	18%
19-20	136	15%	148	16%
21-24	97	11%	106	11%
25-29	164	19%	160	17%
30-34	129	14%	181	19%
Debut Characteristics: Respondent (R)				
Debut Age				
Early	148	17%	122	13%
Average	574	65%	646	69%
Late	165	18%	171	18%
Description of Debut				
Wanted	728	82%	544	58%
Unplanned	108	12%	203	22%
Unwanted	51	6%	192	20%
Debut Characteristics: Debut Partner (DP)				
DP Age				
Older	118	13%	684	73%
Same age	384	43%	216	23%
Younger	367	42%	16	2%
Don't Know	18	2%	23	2%
DP Gave Gifts/Favors/$				
No	848	96%	395	42%
Yes	39	4%	544	58%
Debut Characteristics: Debut Partnership				
Time R knew DP before first sex				
1 day	26	3%	20	2%
< 1 year	547	62%	636	68%
>1 year	314	35%	283	30%
Condom use at debut				
No	810	91%	803	86%
Yes	77	9%	136	14%
Had sex with DP again				
No	378	43%	341	36%
Yes	509	57%	598	64%

Results from the cluster analysis showed that for males, the best clustering solution included five clusters derived from three of the seven debut characteristics: time the respondent knew the DP prior to first sexual intercourse, whether or not the respondent had sex with the debut partner again, and condom use at the debut sexual encounter. This model resulted in a silhouette measure of cohesion and separation=0.9. The cluster sizes ranged from 77 to 282 (Table 2.10). Condom use (non-use) at debut was the most important variable in the model, followed by length of time the respondent knew the DP prior to first sex, and then whether or not the respondent had sex again with the DP. Table 2.10 describes each cluster and its defining characteristics for males, which are listed in order of within-cluster importance.

Table 2.10. Males debut clusters

Cluster Label	Size	Defining Features of Cluster
1. Typicals	282	Had sex with DP > once; knew DP < 1 year prior to first sex; did not use condom at debut
2. Waiters	179	Knew DP > 1 year prior to first sex; had sex with DP > once; did not use condom at debut
3. Condom users	77	Used condom at debut; had sex with DP > once; knew DP < 1 year prior to first sex
4. One time waiters	132	Knew DP > 1 year prior to first sex; had sex with DP one time only; did not use condom at debut
5. One timers	217	Had sex with DP one time only; knew DP < 1 year prior to first sex; did not use condom at debut

For females, the best clustering solution included four input variables that were, in order of model importance: condom use at debut, DP's age relative to respondent's, length of time respondent knew the DP prior to first intercourse, and receipt of gifts, favors, or money from the DP in exchange for sexual intercourse. These four variables categorized females into five clusters or typologies (measure of cohesion and separation=0.6). The typologies are described in Table 2.11, with the defining features listed in order of within-cluster importance. For instance, for 'waiters' the defining feature was knowing the debut partner for more than one year prior to fist sex. The cluster solutions yielding these typologies are discussed and compared in the discussion.

Table 2.11. Females debut clusters

Cluster Label	Size	Defining Features of Cluster
1. Typicals	261	Received gifts, favors, or money from DP in exchange for sex; knew DP for < 1 year prior to first sex; DP older than respondent; did not use condom at debut
2. Peer partners	230	DP same age as respondent; did not use condom at debut; knew DP for < 1 year prior to first sex; received gifts, favors, or money from DP in exchange for sex*
3. Condom users	136	Used a condom at debut; received gifts, favors, or money from DP in exchange for sex; DP older than respondent; knew DP for < 1 year prior to first sex
4. Waiters	154	Knew DP > 1 year prior to first sex; DP older than respondent; did not use condom at debut; received gifts, favors, or money from DP in exchange for sex
5. No favors	158	Never received gifts, favors, or money from DP in exchange for sex; knew DP for < 1 year prior to first sex; DP older than respondent; did not use condom at debut

Discussion

In an effort to elucidate the relationship between sexual debut and sexual trajectory, this study examined the characteristics of debut and subsequent sexual behaviors that contribute to HIV risk in western Kenya. Looking across the debut characteristics, the findings sketch the form of the typical adolescent at sexual debut in rural Nyanza. If female, the adolescent most likely experienced debut willingly around age 15. Her partner was no more than five years older, and an unmarried student at the time of debut. She knew him for at least a month prior to first sex, and did not use a condom at debut. It is difficult to know whether her debut partnership had a transactional element. She likely had sex again with her debut partner. The typical male adolescent debuted willingly around age 14. His partner was most likely an unmarried student around his age or no more than five years younger. He did not receive gifts, favors, or money in exchange for sexual intercourse, and most likely had sex with the debut partner again.

The rural Nyanza men and women in the sample reached sexual debut at an early age — 88% of males and 90% of females had sex prior to age 18. This pattern is consistent with a nationally representative sample of Kenyans,[11] in which women and men living in rural areas and those living specifically in Nyanza Province are more likely to initiate sexual activity before age 18 compared to their counterparts living in urban areas or other Kenyan provinces. This underscores the importance of reaching out to young adolescents to provide sexual education as well as targeting HIV prevention messaging. Also of importance is that twenty percent of the sample reported having had sex prior to age 13, drawing attention to the need to equip preteens with developmentally appropriate knowledge and skills necessary to prevent pregnancy and sexually transmitted infections. The high proportion of school-going adolescents in the sample suggests that schools may be an effective setting for such outreach to young adolescents. However, researchers have identified multiple obstacles to AIDS education in Kenya's public

school system, including lack of time and training for teachers,[110] a singular focus on abstinence, and moral or religious views that conflict with risk-reduction messages (particularly instruction on condom use).[111,112]

The rate of condom use at sexual debut was notably low for both males and females, and significantly lower than the rate reported in the 2008/2009 Kenya Demographic and Health Survey (KDHS) in which 25% of Kenyans reported using a condom at first intercourse.[11] However, the rates of condom use at first intercourse reported in the 2008/2009 KDHS represented a significant increase from the earlier 2003 KDHS report This suggests that condom use rates reported in rural Nyanza communities may be higher today than at the time the data used in the present study were collected.

Cluster analysis identified patterns in sexual debut characteristics for male and female respondents. For males, typologies were defined by condom use, time the respondent knew the DP prior to first sex, and whether or not the respondent had sex again with the DP. Two small groups of males reported atypical debut features that were expected to — but did not — distinguish male debut typologies. That is, about 5% of males received gifts, money, or favors for sex and 5% reported having an older debut partner. The cell size of these seldom-reported characteristics appear to have been too small to influence the clustering solution.

In comparison to male debut typologies, female typologies were defined by description of their partner or his behavior. The most important within-cluster feature for four of the five clusters was either a partner characteristic (age) or behavior (condom use, gift giving). This highlights a major challenge in designing effective prevention programs for Kenyan girls — gender inequality and the role of their partners' behaviors in promoting HIV risk.[11,96]

Study Limitations

Several limitations warrant discussion. First, the collection of self-reported data on past sexual behavior may be subject to recall bias. On average, nearly seven years had passed since our respondents' sexual debut, and they may have had difficulty recalling some debut characteristics accurately. While an "I don't know" option was available, some respondents may have answered inaccurately instead of admitting to not knowing the answer. The data were collected during face-to-face interviews that may be subject to social desirability bias.[113] The findings about sensitive behaviors and events, such as the prevalence of early sexual debut and sexual violence, are similar to those reported in other studies,[11] including those using self-administered questionnaires.[103] Moreover, females' reports of receiving gifts or favors for sex are substantially higher in our sample,[101] providing some evidence that respondents felt comfortable answering questions.

Second, the data were collected between 2003 and 2005, when awareness of HIV may have been lower than it is today; subsequently, sexual behavior may have changed. There is evidence condom use has increased in Kenya as a whole and in Nyanza more specifically since 2003.[11] While the proportion of Kenyan women who report having sex prior to age 15 is declining, early debut remains more common in rural areas and in Nyanza than in other regions of Kenya.[96] It is thus possible the defining features of sexual debut today would be different than those identified. Finally, the data were collected in cross-sectional surveys, and cannot be purported to define causality.

Conclusion

This study examined the context of sexual debut in rural, predominately Luo communities in Nyanza Province. The median age of sexual debut was younger than has been reported in

other parts of Kenya,[11] and 20% of the sample had had sex prior to age 13. These data are congruent with concerns articulated by parents about early sexual initiation and the need to provide sexual education to young children (Knopf, Agot, Sidle, Naanyu, Morris, forthcoming). Condom use at debut was the exception rather than the rule, and was an important feature that defined both male and female debut typologies. Despite increases in the proportion of Kenyans who report using a condom at debut,[11,96] condom use in Nyanza remains sub-optimal.[35] Features of sexual debut can be used to construct typologies of debut that may be associated with subsequent sexual behaviors that contribute to HIV risk. A useful next step would be to examine the association between debut typologies and later sexual behaviors, such as reported condom use by partner type, concurrency, and rate of partner acquisition. Such an analyses would advance understanding about the multiple pathways between sexual debut and HIV infection.

CHAPTER 3: CONCURRENCY AMONG NYANZA ADOLESCENTS

Introduction

Recent studies in western Kenya's Nyanza Province reveal high rates of HIV infection among youth. Concurrent, or temporally overlapping sexual partnerships have been identified as a driver of Kenya's epidemic and a target for HIV prevention efforts.[34] In a recent pilot study of *Know Your Network* (KYN), a new concurrency reduction intervention developed by Dr. Martina Morris, adults living in Nyamware North, Nyanza Province advocated for its implementation with school-aged adolescents in the village (Knopf, Agot, Sidle, Naanyu, and Morris; forthcoming). As a foundation for understanding the youth experience and thus for adapting intervention, characteristics of sexual partnerships reported by rural west Kenyan adolescents who participated in the Asembo BCS and Gem BCS were assessed.

Background

Along with other sub-Saharan African nations,[36] Kenya's government identified concurrent sexual partnerships as a key driver of its epidemic.[37] In lay language, concurrency occurs when a new sexual partnership begins before the current one ends. The technical definition of concurrency is an act of sex with one partner that occurs between two acts of sex with a different partner.[38] Concurrency has important effects on transmission of HIV and other sexually transmitted infections (STI) at the individual and population levels that extend beyond the effect of having multiple partners serially.[39-41]

There has been significant debate recently over the role concurrency plays in generating HIV epidemics.[43-49,114] The initial evidence for concurrency's effect on HIV epidemics came from mathematical models of disease transmission.[39,40,42] The modeling studies were followed by

empirical ones that used traditional epidemiological approaches to correlate self-reported concurrency with HIV status or prevalence of concurrency and prevalence of HIV at the community or national level and found no effect.[51,52,115,116] However, Epstein and Morris provided a thorough discussion of problems in these studies that prevented accurate measurement of concurrency or its effect.[53]

The best way to examine concurrency's effect at the individual level is to measure incident HIV infections that occur within stable partnerships. Biomarkers from longitudinal studies of stable couples indicate that 42 to 72% of incident infections come from a source outside of the couple.[53] Given the high proportion of incident infections attributable to sexual transmission, this indicates concurrency contributes significantly to HIV exposure at the individual level.[3] While the debate rages on about concurrency's role in creating generalized epidemics of sub-Saharan Africa, two critical questions about concurrency are ignored. First, is there a scalable, replicable concurrency reduction intervention that significantly reduces the prevalence of concurrency in a generalized epidemic setting? And if so, is the consequent reduction in concurrency sufficient to significantly reduce HIV incidence?

The KYN research team, headed by Dr. Morris, seeks to answer both questions in a community-randomized trial of the intervention with HIV incidence as the primary outcome measure. KYN is still in the pilot phase, and is currently being tested for its effect on adults' self-reported sexual behavior. Adults who participated in one of the first pilots of KYN asked the research team to deliver the intervention to adolescents in the village. They lobbied for inclusion of children as young as 13. However, there are no published estimates of concurrency among young adolescents, making it difficult to assess whether a risk reduction intervention like KYN is appropriate for them.

Study Aim

This study aims to describe the point and cumulative prevalence of concurrent sexual partners among 13 to 19-year-old west Kenyan adolescents.

Methods

Sample

A secondary analysis of the Asembo and Gem BCS (described in detail in Chapter Two) data was undertaken to describe early sexual partnership patterns and to estimate the point and cumulative prevalence of concurrency among adolescents. The sample for this study included 1,841 respondents — 1064 from Asembo and 777 from Gem — between the ages of 13 and 19, with nearly equal number of males (N=917) and females (N=924). Figure 3.1 describes the sample derivation process.

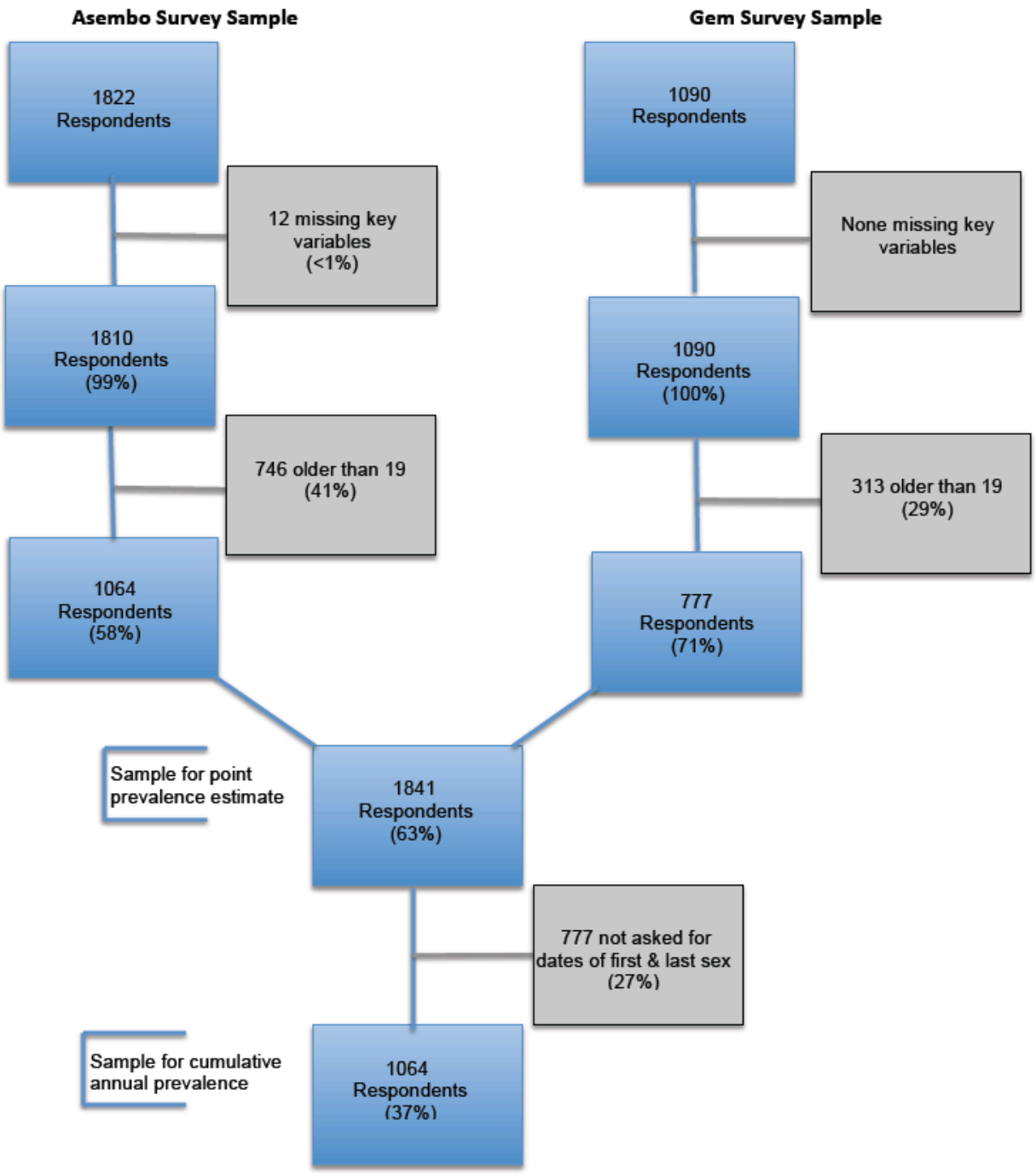

Figure 3.1. Sample derivation process. The blue boxes enumerate respondents who remained in the sample at each step of the process. The grey boxes enumerate cases dropped from the sample for one of the following reasons: 1) case missing value(s) for variable(s) that determined skip patterns in the survey instruments; 2) respondent was older than 19; 3) case missing data necessary for analyses reported in this chapter.

Measures

To calculate the point and cumulative prevalence of concurrency, select measures were examined at three levels: respondent, partnership, and partner pair. At the respondent level demographic characteristics, age at sexual debut, and cumulative number of sexual partners were examined. At the partnership level, partnership start and end dates and their proxies, which are described in further detail below, were examined. Finally, concurrency between pairs of reported partners was measured. For example, if a respondent reported one primary spouse and also a debut sexual partner in the survey modules, a dummy variable indicating the existence of the partner pair Spouse1-DebutPartner (abbreviated S1DP) was created, and the partnership intervals for Spouse 1 and the Debut Partner were examined for overlap. The Asembo BCS instrument elicited data for up to 10 partners for male respondents and seven for female respondents, creating a maximum of 45 possibly concurrent partner pairs in the data for males and 21 for females. The Gem BCS instrument elicited data on up to five partners for all respondents, creating a maximum of 10 possibly concurrent partner pairs in the data file for males and females. Table 3.1 identifies all the possibly concurrent partner pairs in both survey communities.

Table 3.1. Possibly concurrent partner pairs in Asembo (A) and Gem (G)

	Spouse 1	Spouse 2	Spouse 3	Spouse 4	Debut Partner	Partner 1	Partner 2	Partner 3	Partner 4	Partner 5
Spouse 1		A*	A*	A*	A, G	A, G	A, G	A, G	A	A
Spouse 2			A*	A*	A*	A*	A*	A*	A*	A*
Spouse 3				A*	A*	A*	A*	A*	A*	A*
Spouse 4					A*	A*	A*	A*	A*	A*
Debut Partner						A, G	A, G	A, G	A	A
Partner 1							A, G	A, G	A	A
Partner 2								A, G	A	A
Partner 3									A	A
Partner 4										A
Partner 5										

* Males only.

In 2009, in an effort to standardize concurrency measurement, the UNAIDS Reference Modeling Group[38] recommended three questions about each of the three most recent sexual partners in the last year: 1) When did you first have sex with this partner? 2) When did you last have sex with this partner? 3) Are you still having sex with this partner? Data elicited from these three questions permit construction of partnership intervals, anchored by the date of first sex (DFS) and date of last sex (DLS). Concurrency is defined by overlap between partnership intervals in a reported partner pair.

The Asembo and Gem BCS were conducted before UNAIDS published its guidelines for concurrency measurement, and the surveys did not include all three questions for all recent partners. The Asembo BCS instrument elicited partnership start and end dates or allowed for their proxy measurement, permitting the measurement of the point prevalence and annual cumulative prevalence of concurrency. However, the Gem BCS did not elicit partnership start

and end dates so only the point prevalence of concurrency can be estimated. The key differences between the two surveys are summarized in Table 3.2.

Table 3.2. Summary of differences between Asembo and Gem BCS instruments

	Asembo		Gem
	Males	**Females**	**Males and Females**
Spouse	N=4	N=1	N=1
DLS	Elicited	Elicited	
DFS	Constructed	Constructed	
Ongoing	Elicited	Elicited	Elicited
Debut Partner	N=1	N=1	N=1
DLS	Elicited if ongoing Constructed if ended	Elicited if ongoing Constructed if ended	
DFS	Constructed	Constructed	
Ongoing	Elicited	Elicited	Elicited
Other Partner	N=5	N=5	N=3
DLS	Elicited if ended Constructed if ongoing	Elicited if ended Constructed if ongoing	
DFS	Elicited	Elicited	
Ongoing	Elicited	Elicited	Elicited
N Partners Reported	**10**	**7**	**5**

N represents the maximum number of partners a respondent could report. "Elicited" means the survey instrument directly elicited the data by a question or constraints on the partner name generator, whereas a proxy variable was used for measures labeled "constructed." Appendix I explains the variable construction in detail.

Analysis Plan

Data were examined (Statistical Package for the Social Sciences [SPSS], version 20) for internal consistency, missingness, and outliers. Five cases were removed from the sample due to missing values for variables essential to the concurrency analysis.* Outlying values that were

*Key variables: 1) Have you ever had sexual intercourse? 2) Have you ever been married? 3) Have you had any sexual partners in the last six months other than your first sexual partner or your spouse(s)?

illogical (e.g. age at sexual debut > current age) or attributable to data entry errors (e.g. 13-year-old single female with a valid value for age of her third spouse) were recoded as missing.

Point prevalence of concurrency was determined for both samples by dividing the number of survey respondents with two or more active partnerships on the date of interview by the total number of survey respondents. *Cumulative annual prevalence* of concurrency was measured by identifying overlap between reported partner pairs in the year prior to the interview. Appendix 2 details the methods used to compute the Asembo cumulative annual prevalence of concurrency.

Results

Concurrency and multiple partnerships among 1,841 adolescents are reported here. Demographic characteristics of the adolescents are summarized in Table 3.3. Approximately 30% of the sample was younger than age 15 (N=551). Nearly all of these younger adolescents (98%) were still enrolled in school, none had been married, and one reported ever having been pregnant.

Approximately two-thirds of older adolescents (aged 15 to 19) were still attending school, and most who were not in school reported dropping out prior to completion. Among older adolescents, the odds of having left school prior to completion were significantly lower for males compared to females (OR 0.46; 95% CI: 0.36, 0.58). Older females were more likely to be married than their male peers, especially in Gem. Approximately 25% of older female adolescents had ever been pregnant, and in both communities a median of 1 prior pregnancy was reported. Few males (7%) were circumcised, though the surveys were conducted before VMMC was recommended for HIV prevention.

Table 3.3. Demographic characteristics of adolescent Asembo and Gem BCS respondents

	Asembo								Gem							
	Males (N=501)				Females (N=563)				Males (N=416)				Females (N=361)			
	13-14		15-19		13-14		15-19		13-14		15-19		13-14		15-19	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Marital Status																
Single, never married	176	100%	324	100%	209	100%	312	88%	96	100%	318	99%	70	100%	223	77%
Married or cohabiting	0	-	1	<1%	0	-	37	10%	0	-	2	<1%	0	-	66	23%
Separated/divorced	0	-	0	-	0	-	2	1%	0	-	0	-	0	-	2	<1%
Widowed	0	-	0	-	0	-	3	1%	0	-	0	-	0	-	0	-
Educational Attainment																
Currently a student	174	99%	252	78%	205	98%	232	66%	92	96%	227	71%	70	100%	145	50%
Never attended school	1	<1%	0	-	0	-	2	<1%	0	-	1	<1%	0	-	1	<1%
Quit before Form 4	1	<1%	65	20%	4	2%	114	32%	4	4%	82	26%	0	-	136	36%
Completed secondary	0	-	8	3%	0	-	5	1%	0	-	10	3%	0	-	9	3%
Orphanhood																
Both parents living	109	62%	192	59%	137	66%	211	60%	49	51%	173	54%	46	66%	173	59%
One parent deceased	50	28%	92	28%	56	27%	104	29%	34	35%	97	31%	15	21%	74	26%
Both parents deceased	17	10%	41	13%	16	8%	39	11%	13	14%	49	15%	9	13%	45	15%
Circumcision																
Yes, circumcised	19	11%	29	9%	-	-	-	-	3	3%	17	5%	-	-	-	-
Pregnancy																
Ever pregnant	-	-	-	-	1	<1%	79	22%	-	-	-	-	0	-	90	31%
Median No. Pregnancies	-	-	-	-	1		1		-	-	-	-	-	-	1	

*Self report; denominator includes females who answered “I don’t know”

Sexual Debut

Approximately half the sample (51%) reported having experienced sexual intercourse. Asembo females were less likely to report having had sex compared to males (OR 0.76, 95% CI: 0.60, 0.97), but in Gem there was no significant difference by gender. Males reported a younger median age at sexual debut compared with females — 13 years versus 14 years old, respectively. Sexually experienced respondents reported a median of two sexual partners, with partner count ranging from 1 to 54 for males and 1 to 25 for females.

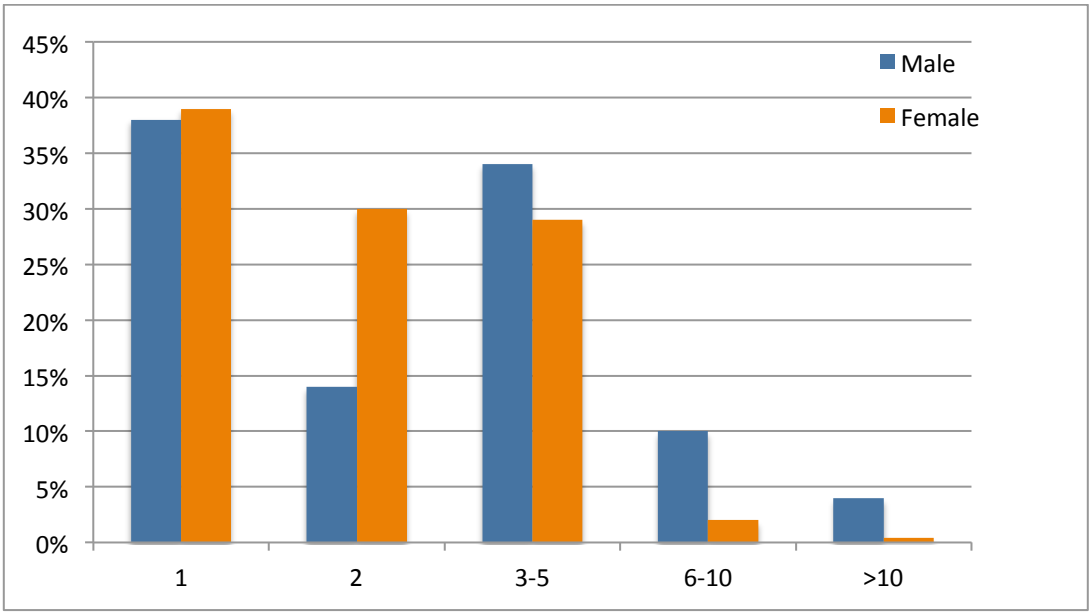

Figure 3.2. Cumulative number of sexual partners since sexual debut

Adolescents reported a total of 1,408 partnerships in the survey modules. Most (66%) of these partnerships were between the respondent and debut partner. Approximately 27% were between the respondent and a non-spousal, non-debut partner, and very few (7%) were spousal. Asembo adolescents' partnerships were examined for concurrency on the date of interview and throughout the year prior, and Gem adolescents' partnerships were examined for concurrency on the date of interview.

Point Prevalence of Concurrency

The point prevalence of concurrency among all adolescents in both communities combined was 2.2%. Among all sexually experienced adolescents the point prevalence was 4.4%. In Asembo only, the point prevalence of concurrency on the date of interview was 1.8%. Among sexually experienced adolescents, the point prevalence of concurrency was 3.8%, and among adolescents with multiple partners, it was 6.7%. Sex-specific point prevalence estimates are reported in Table 3.4. In Gem only, the point prevalence of concurrency on the date of interview was 2.8% among all adolescents and 5% among sexually experienced respondents. Among adolescents who reported multiple partners, 7.1% were in concurrent partnerships on the date of interview. The odds of being in a concurrent partnership on the date of interview were 2.5 times higher for males compared to females (95% CI: 1.3, 4.9). Younger adolescents (aged 13 to 14) were far less likely (OR 0.12; 95% CI: 0.03, 0.48) to be in a concurrent partnership on the date of interview compared to older adolescents (aged 15 to 19). If we restrict the sample to older adolescents (N=1290), the point prevalence among all respondents is 3.1%, and the point prevalence among sexually active respondents (N=801) is 5%.

Table 3.4. Point prevalence of concurrency by community and sex

	Asembo		Gem	
	Males	**Females**	**Males**	**Females**
All respondents	2.8%	0.8%	3.6%	1.9%
Sexually experienced	5.5%	2.0%	6.8%	3.3%
Has had 2+ partners	9.2%	3.9%	9.8%	4.6%

Cumulative Annual Prevalence of Concurrency, Asembo

Asembo adolescents reported a total of 715 sexual partnerships, resulting in 305 partner pairs to examine for concurrency. The majority of the partner pairs were between a debut partner and other non-spousal, non-debut partner.

Missing data limited the classification of 20% of the Asembo partner pairs, necessitating construction of lower and upper bound estimates for annual concurrency. To determine the lower bound, unclassified pairs were treated as sequential, not concurrent. To derive the upper bound, unclassified partner pairs were considered concurrent. For the Asembo sample, the upper boundary of annual concurrency estimate for all respondents and for sexually experienced respondents was approximately two-fold higher than the lower boundary of the estimate (Table 3.5).

The lower and upper bound estimates of cumulative annual prevalence of concurrency among all Asembo respondents were 2.9% and 5.8%, respectively. Among sexually active respondents, the lower bound of the estimate was 6.2% and the upper bound 12.4%. Finally, among respondents reporting at least two sexual partners in the last year, the annual prevalence was between 48% and 91%. Sex-specific estimates can be found in Table 3.5. Compared to older adolescents, younger adolescents were significantly less likely to have been in a concurrent partnership in the year prior to the interview (OR 0.32; 95% CI: 0.16, 0.64); younger adolescents accounted for just 16% of concurrent sexual partnerships identified in Asembo. Compared to females, males were more likely to have been in concurrent sexual partnerships in the last year (OR: 2.5; 95% CI: 1.4, 4.3).

Table 3.5. Lower and upper bounds of cumulative annual prevalence of concurrency

	Males		Females	
Sample includes	Lower Bound	Upper Bound	Lower Bound	Upper Bound
All respondents	4.4%	8.4%	1.6%	3.6%
Sexually experienced respondents	8.7%	16.6%	3.7%	8.1%
Respondents who had multiple partners in the last year	49.0%	89.3%	47.3%	95.2%

Four types of missing data created uncertainty for classifying Asembo partner pairs: 1) inconsistent reporting (e.g. date of first sex comes after date of last sex), 2) respondent recall (e.g. respondent answered "I don't know"), 3) questionnaire design (e.g. not directly eliciting dates of first sex with spouse(s) and debut partners) and 4) invalidly missing data (e.g. no answer recorded when one should have been).

Additional analyses revealed the influence of these four types of missing data differed by partner pair type. Partner pairs that included a spouse or debut partner were most often unclassified due to questionnaire design, whereas other partner pairs (e.g. Partner 1 and Partner 2) most often were unclassified due to inconsistent reporting. Very few cases (N=4) were rendered unclassified due to invalidly missing data. No pairs were unclassified due to respondent refusal to answer the question.

Discussion

This study examined concurrent sexual partnerships in two rural west Kenyan communities in response to a similar community's concerns about concurrency among adolescents. The concurrency indicators recommended in the UNAIDS guidelines for concurrency measurement among adult populations were examined:[38] 1) point prevalence among all respondents, 2) cumulative annual prevalence among all respondents, and 3) cumulative annual prevalence

among respondents reporting multiple partnerships in the last year. The point prevalence of concurrency on the date of interview was measured because the questionnaires' structure prohibited estimation six months prior.

Point and cumulative annual prevalence of concurrency among all respondents were reported but the estimates for sexually experienced respondents were more germane to discussion given the large proportion of adolescents who had not reached sexual debut. Among sexually experienced adolescents from both villages, the point prevalence of concurrency was 4.4% and among sexually experienced Asembo respondents the cumulative annual prevalence was between 6% and 12%.

The results represent a conservative estimate of concurrent sexual partnerships among west Kenyan adolescents for two reasons**.** First, the Gem data do not allow the measurement of cumulative annual prevalence of concurrency, which was nearly double the point prevalence of concurrency in Asembo. Secondly, the name generator for non-spousal, non-debut partners restricted reporting to partners with whom the respondent had sex during the six months prior to the interview rather than 12 months prior; this likely resulted in an underestimate in the cumulative annual prevalence of concurrency.

The prevalence of concurrency in the sample was substantially lower than rates reported from surveys of Nyanza adults (summarized in Table 3.6). Westercamp et al. report point prevalence of concurrency of 28%, and cumulative annual prevalence of 58% from their study of the sexual histories of young men who were screened for a male circumcision trial. Voeten and colleagues studied 15 to 29 year olds in urban and rural settings and found the prevalence of concurrency on the date of interview ranged from 11 to 27% for men, and between 2 to 7% for women.[62] Finally, Xu et al. used a relationship history calendar to examine concurrency among urban,

sexually active 18 to 24 year olds in Kisumu, and reported 4% point prevalence among males and females.[117]

Table 3.6. Summary of concurrency indicators from other studies in Nyanza Province

	Sample Size **Age Range** **Sampling**	**Men**		**Women**	
		Point Prevalence	Cumulative Annual Prevalence	Point Prevalence	Cumulative Annual Prevalence
Voeten, Egesah, Habbema (2004)	584 15-29 years Random	Married		Married	
		11%[a]	-	3%[a]	-
		21%[b]	-	2%[b]	-
		Unmarried		Unmarried	
		26%[a]	-	6%[a]	-
		27%[b]	-	7%[b]	-
Westercamp, Mattson, Bailey (2013)	1,368 18-24 years Non-random	28%	58%[c]	-	-
Xu, Luke, Zulu (2010)	1,275 18-24 years Random	4%	10%	4%	5%

a. Urban residents (Kisumu); b. Rural residents (Siaya/Bondo Districts); c. 6-month cumulative prevalence

The higher rates of concurrency reported by other authors may be explained by differences in eligibility criteria and sampling strategy. Westercamp's study participants were older (18 to 24), sexually active males who volunteered for the Nyanza trial of medical male circumcision; therefore, higher rates of concurrency and other HIV risk factors in a non-random sample of young men volunteering for an HIV prevention trial are expected. Xu et al. and Voeten et al.

enrolled older respondents, more of whom were sexually active — 86% and 90%, respectively — compared with 51% of this sample. If concurrency measurements are restricted to the subsample of sexually experienced older adolescents, the findings are similar to Xu et al.

These results, when considered with the other studies, create a more complete picture of the trajectory of concurrency from sexual debut through early adulthood and marriage. They indicate that early intervention for concurrency is important in order to prevent it before the behavior becomes normative. Few younger adolescents were sexually active, and this group was far less likely to be involved in concurrent sexual partnerships than their older peers, suggesting a pre-risk approach to concurrency education is appropriate for them. The point prevalence of concurrency among sexually active 15 to 19 year olds in our study was 5%, indicating a risk reduction approach is warranted for them.

Study Limitations

First among study limitations is that the data were collected between 2003 and 2005, prior to the implementation of several mass media campaigns about concurrency and HIV in Kenya, and adolescent sexual behavior may have changed. Nonetheless, more recent studies[60,117] report similar or higher rates of concurrency in older adolescents and young adults, which reduces the limitation concern regarding possible dramatic behavior changes since these data were collected. Second, these data were collected during face-to-face interviews, which may be prone to social desirability bias. Adolescents may have been reluctant to disclose their sexual behaviors to interviewers for fear of repercussion, resulting in underreporting of sexual partnerships and concurrency. Finally, missing data created some uncertainty around the estimates of cumulative annual prevalence of concurrency in Asembo, but this limitation was addressed by reporting both the upper and lower bounds of the estimates.

Conclusions

The Asembo and Gem BCS collected sexual behavior data from young adolescents, which provides a unique opportunity to examine sexual partnerships at the beginning of the sexual trajectory. Other studies of concurrency indicators among randomly selected, rural adolescents as young as age 13 are unknown, which renders this study an important baseline for future studies of concurrency among adolescents and youth. While there were some measure limitations due to questionnaire structure, two discoveries are encouraging: none of the uncertainty around the estimates was due to respondents' refusal to answer questions, and most of the uncertainty would be resolved by use of the recently published UNAIDS guidelines for concurrency measurement. This study, taken together with other studies of young adults, indicates a pre-risk approach to concurrency education is best for younger adolescents, while a risk-reduction approach is warranted for older adolescents and youth, particularly those who are already sexually active.

CHAPTER 4: ADOLESCENT AND ADULT STAKEHOLDERS SHAPE A CONCURRENCY REDUCTION INTERVENTION FOR YOUTH

Introduction

In spite of a global decline in new HIV infections over the last decade,[118] new infections outpace treated cases two to one.[119] An estimated 41% of incident infections occur in youth aged 15 and 24,[119] and UNAIDS has called on researchers to make children and adolescents central to promising new HIV prevention efforts.[120] This study answers that call by directly involving adolescents, their families, and community leaders in the adaptation of a new HIV prevention intervention developed with input from a Kenyan community disproportionately affected by the HIV epidemic.

Background

Youth in sub-Saharan Africa, where an estimated 70% of new infections occur,[118] are particularly vulnerable.[8] HIV/AIDS has significantly hindered human health and development in a number of sub-Saharan African countries, including the east African republic of Kenya. The most recent Kenyan Demographic and Health Survey indicated 6.3% of Kenyans aged 15 to 49 are infected with HIV. However, there are large differences in HIV prevalence by ethnic group, with the Luo ethnic group disproportionately affected. Several factors are thought to drive the concentrated HIV epidemic among the Luo, including: lack of male circumcision, infrequent condom use, and concurrent sexual partnerships. In predominately Luo Nyanza Province, research and public health efforts are underway to offer voluntary medical circumcision to Luo men, and to distribute and promote the consistent and correct use of condoms.[37] This research complements such efforts by focusing on the third factor, concurrency.

Sexual partner concurrency is defined as one sex act with a partner that occurs between two sex acts with a different partner.[38] Concurrency is a special case of multiple partnering, in which an individual begins a new sexual partnership before ending the previous one. Concurrency affects disease transmission at both the partnership and population levels, and mathematical models suggest that small reductions in the prevalence of concurrent partnerships will have large effects on epidemic size.[40,41,55,56,121,122]

Results from the second dissertation study (Chapter 3) indicated the need for a risk-reduction approach to concurrency education for older adolescents. In that study, 5% of sexually experienced 15 to 19 year olds were in concurrent partnerships on the date of interview. One approach to risk reduction for this age group is the "Know Your Network" (KYN) intervention, developed in collaboration with ethnically Luo communities (Knopf, Agot, Sidle, Naanyu, Morris; forthcoming). KYN is a single-session educational intervention designed to be delivered during an indigenous community gathering called the *baraza,* typically used for information gathering or dissemination, social alignment, and community mobilization.[123] KYN interactive activities and media to raise awareness of the effect of concurrency on HIV transmission in the community. The goal is to spark a community discussion about concurrency, providing the foundation, mechanism and skills to create normative change.

Overview of KYN Intervention

The KYN intervention design is based on a conceptual model that draws on two broad classes of behavior change theory: those emphasizing mediators between information and individual behavior change (e.g., attitudes, self-efficacy, intentions)[124-126] and those emphasizing the interaction between individuals that leads to the diffusion of changes in norms and behaviors through populations.[127] The conceptual model for KYN (Figure 1) is founded on the work of Rotheram-Borus and colleagues[128] who identified common elements of effective interventions

that cut across individual- and population- centered theories of behavior change.

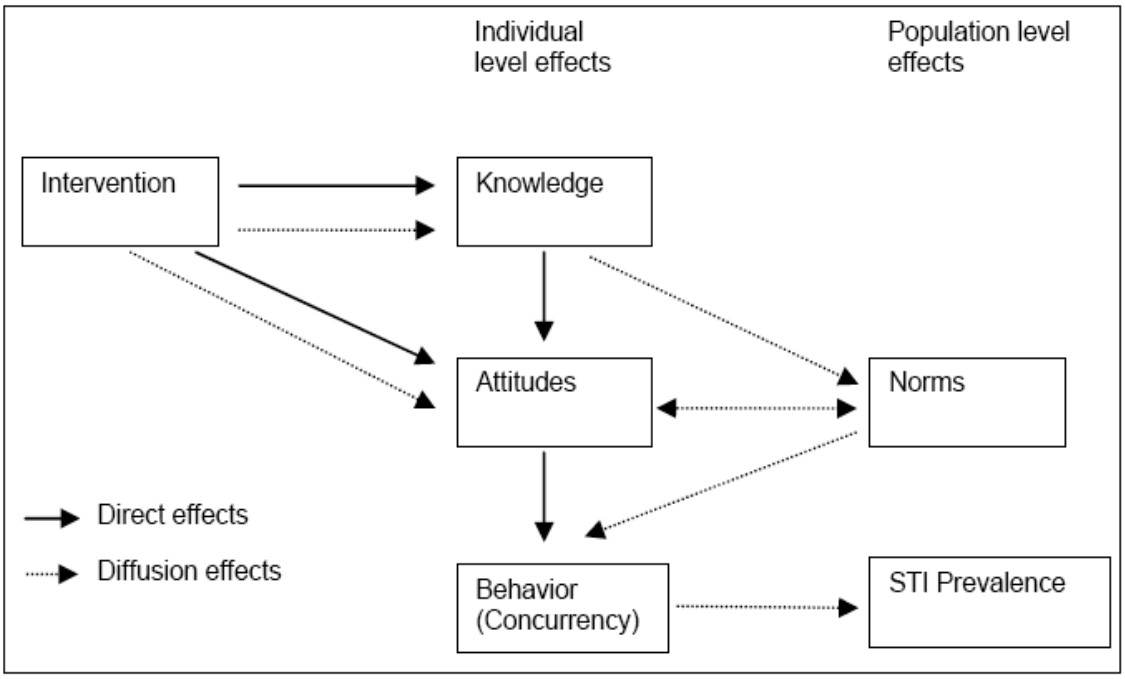

Figure 4.1. KYN conceptual model of behavior change and its effects, courtesy Dr. Martina Morris

KYN focuses on the link between individual and population level effects (designated by dotted arrows in Figure 4.1). Individual level changes influence population-level outcomes through a diffusion process. KYN is designed to generate interpersonal discussion among community members about the critical behavior to be changed (concurrency). This in turn is hypothesized to lead to discussion outside the intervention context, reaching even more community members.

The three primary components of the KYN intervention are described in Table 4.1. The first component uses a combination of lecture, interactive exercises, and high-impact graphics to explain concurrency and its implications for STI diffusion.

Table 4.1. Overview of KYN Intervention Components

	Primary Aim	Activities	Time Required
Component 1	Introduction to the concepts of concurrency and disease transmission through sexual networks	Interactive exercises High impact visuals (network graphs, film depicting disease transmission through a dynamic sexual network)	30 min
Component 2	Simulation of local network through anonymized participant data	10 question survey Cross-sectional network simulation	45 min
Component 3	Community-level discussion of normative change	Review of local network and its implications Discussion in a *baraza* style	60 min

The interactive exercise, illustrated in Figure 4.2, is designed to communicate the difference in the "reachable path" of HIV infection in a network networks, one in which everyone has two partners sequentially, and one in which everyone has two partners concurrently.

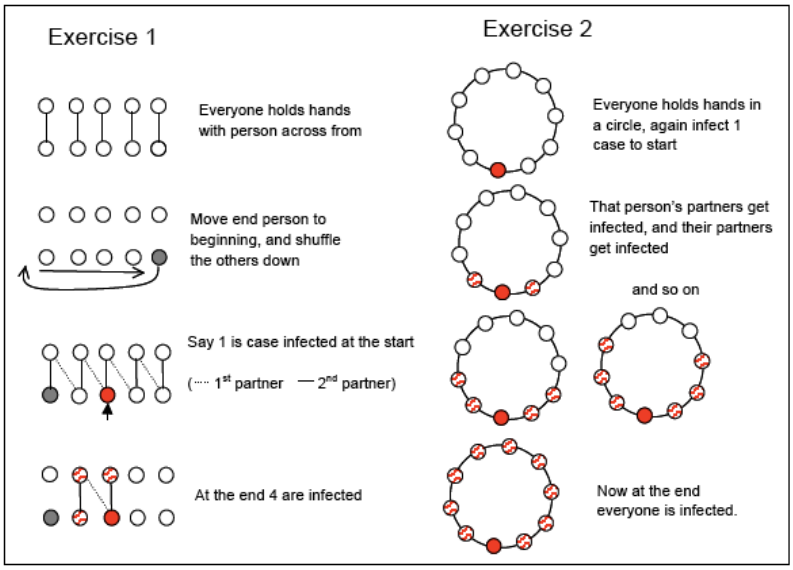

Figure 4.2. Illustration of KYN interactive exercise, courtesy Dr. Martina Morris

The exercise is followed by a discussion of Figure 4.3, which shows how varying levels of concurrency affect connectivity in a cross-section a partnership network, even if no one has more than three partners and most have only one or two.

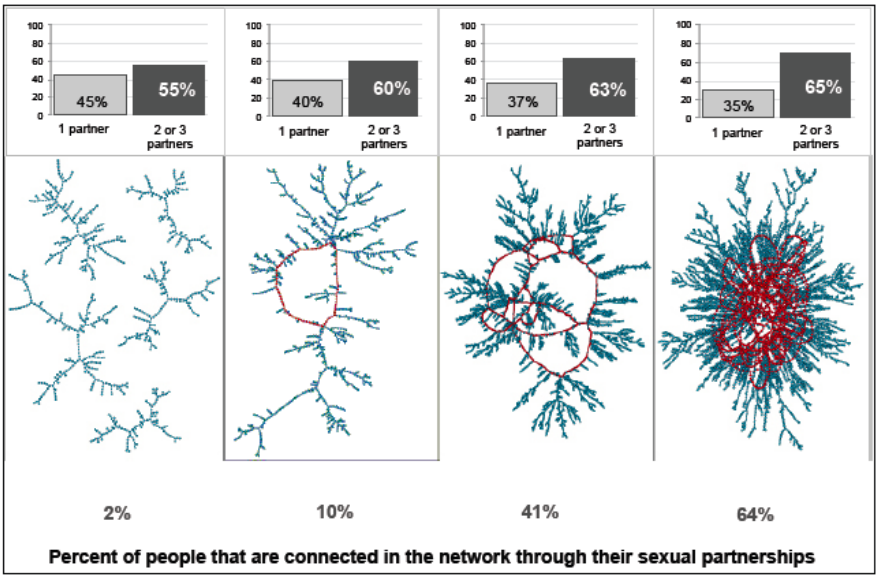

Figure 4.3. Network graphic, courtesy Dr. Martina Morris. The grey and black bars show the percent of people in the network with 1 partner or 2-3 partners. The figures below each bar graph show the network effect of small increases in the proportion of people with concurrent partnerships.

During the *baraza* the explanation of Figure 4.3 first emphasizes risk — a small increase in the number of concurrent partners significantly raises connectivity — and then focuses on the positive implication: because small changes have large impacts, it may only take a small reduction in concurrency to dramatically reduce connectivity in sexual networks. Finally, a short film (http://youtu.be/r3LYA5kirjA), developed by Dr. Martina Morris and colleagues, is shown to illustrate the growth of the reachable path of HIV infection in a dynamic network over time.

The second component is a local network survey and simulation. It begins by asking participants if they want to see an anonymized picture of their own network. If they agree,

trained interviewers use personal digital assistants to administer an anonymous, 10-question survey that elicits the data recommended for concurrency measurement.[38] Interviewers record participants' gender and then ask for each of up to three recent sexual partners: the date of first sex, the date of last sex, and whether the participant expects to have sex again with the partner. The data are downloaded onto a central laptop, and exponential random graph model theory and methods[129] are used to produce a simulated cross-sectional representation of participants' sexual network, like the one shown in Figure 4.3.

The third component facilitates group conversation about concurrency. It involves discussion with participants that begins with a traditional question and answer period to clarify and consolidate key concepts. Then the moderators ask participants questions to stimulate discussion of their perceptions of the community norms about concurrency, the reasons for concurrency, and the obstacles individuals might face in trying to change their own or their partner's concurrency. During the last part of the discussion, the moderators encourage participants to role-play how they might talk about concurrency with their friends and partners.

In summary, the KYN intervention objectives are to: 1) increase general knowledge about what concurrency is and how it affects STI diffusion through a network, 2) give participants specific knowledge about their own network, and 3) give participants the skills to discuss concurrency issues with their friends and partners. As depicted in the intervention conceptual model (Figure 1) KYN is expected to influence knowledge and attitudes about concurrency, which in turn influence individual behavior (concurrent sexual partnerships), community norms, and ultimately, HIV and STI incidence.

In 2010, KYN was pre-tested and piloted with Luo men and women living in North Nyamware, Kenya. Participants ranged in age from the late teens to elders in their sixties and seventies. They found the intervention practical and important. In all nine focus groups discussions (FGDs)

convened to evaluate KYN, adult participants advocated for including adolescents in intervention sessions and/or discussed mechanisms for delivering the intervention's message to them (Knopf, Agot, Sidle, Naanyu, Morris; forthcoming). In a meeting convened to disseminate the pilot study findings, community members welcomed additional research and requested assistance with their efforts to prevent HIV infection among village youth. This study was undertaken in response to their request, and consonant with public health efforts, to deliver the concurrency reduction message to adolescents.

Study Purpose

The specific purpose of this study was to assess the feasibility and acceptability of the main elements of KYN for use with rural west Kenyan adolescents aged 13 to 17. The intervention was considered *feasible* if it could be implemented with and understood by the target audience. It was considered *acceptable* if both adult and adolescent stakeholders found it appropriate and relevant to their community.

Early discussions amongst the PI and Kenyan research team led to the decision to focus on pre-testing only Component 1 of KYN (Table 1), omitting the second and third components at this time. It was important to first discern whether adolescents could understand the concepts of concurrency and sexual networks *before* assessing the relevance of the second and third KYN components with adolescents. Also, early analyses of the point prevalence concurrency among adolescents suggested that a cross-sectional network simulated from data collected from young adolescents would be fairly sparse, and thus might weaken the impact of the intervention message. The first component of KYN has three main parts implemented and assessed in this study (Table 4.2).

Table 4.2. Brief description of KYN Component 1 elements

Activity	Purpose	Key Message
Interactive Exercise	Demonstrate the difference in risk of exposure to HIV in a network in which everyone is serially monogamous compared to one in which everyone has concurrent partnerships	Holding the cumulative number of partners constant, disease spreads more efficiently in networks in which concurrency is the norm compared to those in which serial monogamy is the norm
Network Graphic	Illustrate how the prevalence of concurrency affects network connectivity	Small changes in prevalence of concurrency can have large impacts on network connectivity
Network Movie	Illustrate how people become exposed to HIV infection through a network of partnerships that form and dissolve over time	Many more people are exposed to HIV through concurrent partnerships compared to mutually monogamous partnerships (85% vs. 15%, respectively)

Methods

All research activities associated with this study were reviewed and approved by the Institutional Review Boards of the University of Washington, Seattle, WA and the Kenya Medical Research Institute, Nairobi, Kenya. The Principal Investigator (PI) and research assistants were all certified in ethical research with human subjects. There were no unexpected or adverse events during the course of this study. Participants were given a modest transportation allowance (300 Kenyan Shillings, approximately equivalent to four United States dollars) as a token of gratitude for their contributions to the research project.

Research Setting

Research activities took place in the villages of North Nyamware, a semirural region 15 kilometers from the city of Kisumu, in the Kisumu East Administrative District, Nyanza Province, Kenya. Its population of approximately 6,100 is predominately Luo, and the local language is DhoLuo, though Kiswahili and English also are spoken. The primary income-generating activity

in the village is fishing, followed by rice and subsistence farming. There are three schools in the village — two primary and one secondary.

The landing beach, where fishermen bring their catch morning and night, is a central hub of village activity. There are numerous “hotels” (small bars that serve food) and informal food stalls around the beach, which is crowded with fish traders, boat owners and repairmen, and fishermen sleeping or preparing to go out on the lake. The Beach Management Unit (BMU) is responsible for maintaining safety and order on the beach through supervision of its members. One part club, one part union, and one part policing agency, the BMU exerts a fair amount of authority over the beach. It maintains records of all the boats, fishing crews (four men per boat), and fish traders. It holds monthly meetings that provide a venue for education on health (e.g. HIV testing, voluntary medical male circumcision); discussion of environmental regulations to prevent overfishing; and public, collective management of problems on the beach.

There are several social service organizations operating in the village, at least one of which focuses on the needs of orphaned and vulnerable children. There are several Catholic and Protestant churches, and a least one HIV testing center. Official government and community business is handled by the Chief and Assistant Chief, who facilitated the PI’s entrée to the village and appointed two community members — the BMU Secretary and a social worker with one of the social service agencies — to assist with this study. The BMU secretary and the social worker, henceforth called community mobilizers, assisted with recruitment of study participants as well as familiarizing the team with the village and its gatekeepers.

Study Procedures

Data were collected in two phases that occurred three months apart. During Phase I, a *baraza* was convened with adult stakeholders living in North Nyamware to discuss the project, elicit

advice about recruiting adolescent participants, and hear parents' and community leaders' ideas for adapting KYN for adolescents. During Phase II, six focus group discussions were convened with North Nyamware adolescents between ages 13 and 17 to pre-test the first component of KYN and elicit their feedback about it. Participant recruitment and research activities for both phases are described in detail below.

Study Procedures: Phase I

Participant Recruitment. The village Chief and the community mobilizers recruited a convenience sample of 50 adults for a research *baraza*. Recruitment efforts focused on parents, guardians and community leaders who had routine, direct contact with adolescents in the target age range of 13 to 17 years. In an effort to recruit a diverse group, mobilizers were instructed to recruit roughly equal numbers of male and female participants from across the village and to avoid inviting multiple members of the same family. Participants were given a recruitment letter, which they brought to the study site to indicate they were invited to participate in the study.

Consenting Procedures. When participants arrived to the venue, a script for oral consent was read aloud verbatim in DhoLuo. Participants were given time to ask questions and were permitted to leave the venue if they did not wish to participate. Remaining participants provided oral consent for participation but were notified they could leave at any point. To protect their privacy, participants were assigned a number to use during the discussion in lieu of their names.

Measures. The PI developed a discussion guide for the *baraza.* The guide was divided into the three sections that corresponded with the three primary goals of the session. The first goal was to explore adults' perceptions of youth behavior to better understand the nature of their concerns about adolescents' HIV risk and whether KYN would address them. Rather than asking participants to describe their own children's behavior in a public forum, data were

presented from a nearby community (Asembo) and participants were asked how they thought village youth's behavior and HIV risk compared to the Asembo context.

The PI and Kenyan research team chose five key results from the Asembo BCS to use as a launching point for discussion of adolescent HIV risk, including: youths' preferred sources of information about sexuality, the proportion of 13 to 17 year olds who reported having sexual intercourse, the cumulative number of sexual partners reported, venues where youth had casual sex with persons they met the same day, and HIV prevalence. The *baraza* moderators and research assistants helped the PI modify the data presentation for use with a lay audience of adult stakeholders in the village — charts were simplified, and a short DhoLuo script was created for moderator use during the presentation. After the presentation, the moderators asked questions like "*Do these results seem typical, or more or less what you would expect, if we surveyed youth in this village?" "Did anything about the results surprise you?"* The purpose of these questions was to generate a general conversation about youth behavior that would reveal adults' concerns.

The second goal of the session was to demonstrate the elements of the first component of KYN (interactive exercises, network graphic, network movie) and elicit adults' suggestions for adapting it for use with adolescents. Stakeholders' perspectives were elicited regarding whether 13 to 17 year olds could understand the intervention, and how it could be modified to address the community's concerns about adolescent HIV risk behavior. Moderators demonstrated each element and asked questions like: "*What modifications could be made to the interactive exercise?" "Do you think that youth will understand the network graphic?"*

The third goal of the session was to discuss the next phase of the project with adults and obtain their advice on several aspects of the research approach. Specifically, advice was sought for the recruitment approach, research venue, and most convenient time to convene research

activities with adolescents. Feedback was also elicited about the FGD stratification plan as well as input about what sort of person (i.e. age, gender, affiliation with the village) would be ideal (from adults' perspectives) to lead the FGDs.

In summary, the discussion guide for the *baraza* (Appendix Six) was designed to:

1. Explore adults' perceptions of youth HIV risk behavior
2. Demonstrate the first component of KYN and elicit adults' suggestions for adapting the first component of the intervention for village adolescents
3. Gather stakeholder (parents, educators, social service and health providers) input about the most appropriate method for recruiting adolescent participants into Phase II of the study

The guide was reviewed in detail with the trilingual, ethnically Luo moderators to be sure they understood the goals of each section and how the questions related to the goals. The moderators then translated the guide into DhoLuo for use during the session.

Data Collection and Management. The *baraza* was audio-recorded using a digital recording device. The PI and a research assistant sat to the side and took field notes[130] during the session. The PI captured impressions of participants' engagement with the subject matter, and the research assistant summarized each participant's comment to maintain a record of the event in case of equipment failure. The research team (PI, two moderators, field note taker) met immediately after the *baraza* to discuss impressions of the event. The PI took detailed field notes during this debriefing that were used to supplement the analyses. The note taker transcribed her field notes and distributed them to the research team shortly after the *baraza.* The audio recordings were transcribed and translated into English verbatim.

Data Analysis. The moderators and PI read through the transcripts individually and met to discuss the major themes. The PI used content analysis[131-134] to identify key themes in the

baraza transcript and developed a set of codes based on the themes (Appendix 9) and their relationship to the research questions. Several steps were taken to support the trustworthiness of the data and credibility of the data interpretation. First, the PI and a trilingual research assistant separately coded the data by hand and then met to compare codes and discuss their initial interpretations. Secondly, the research assistant listened to sections of each recording to compare the English translation to the DhoLuo recording to ensure that participants' comments were accurately represented. Finally, the data analyses and interpretation were triangulated through discussions with the two moderators and other members of the Kenyan research staff, including the PI's local research supervisor. After returning to the United States, the transcript was uploaded to Atlas.ti for final analyses and interpretation.

Study Procedures, Phase II

Participant recruitment. Four trilingual research assistants worked with the community mobilizers to recruit a convenience sample of adolescent participants for the second phase of the study. Each mobilizer took one male and one female research assistant to visit homes with eligible adolescents. Each team had a list of the number and type of adolescents (age, gender, school going/out-of-school) needed for each FGD. The mobilizers divided the village into sections and each team was responsible for half the sections — this provided some assurance of recruiting adolescents from different parts of the village. Recruiters were instructed to recruit only one adolescent from each household.

Consenting procedures. The community mobilizers greeted the head of household and briefly introduced the study, then asked if the parent/guardian of an eligible adolescent would be interested in hearing more about the study. If the parent/guardian was interested in learning more, the research assistants explained the study in detail and then obtained written parental consent for adolescent participation. The adolescent was then asked if s/he was interested in

participating in the study, and if so, the study was explained fully and written assent was obtained. Once the consent and assent forms were signed, the parent/guardian and adolescent names were placed on a roster. Adolescents were instructed to arrive at the research venue with their assent forms, which were checked against a roster to ensure all the participants had parental consent to attend. Since youth were recruited in their homes and may have experienced parental pressure to participate, the voluntary nature of the research was discussed again at the beginning of each FGD. Participants were informed that they could leave before the FGD started or at any time during the session, and there would be no penalty for leaving. All of the adolescents remained and participated in the FGD.

Measures. During the first half of the FGD the moderators engaged participants in the first component of the KYN intervention, described in Table 2 above. Following the demonstration, the moderators used the semi-structured interview guide (Appendix 9) with questions designed to:

1. Determine whether the elements of KYN Component One were feasible for use with young adolescents and older adolescents
2. Elicit feedback about the acceptability of the intervention and its components
3. Assess adolescents' concerns about HIV and whether those concerns are or are not being met through other prevention programs and venues

Our operating definition of feasibility was: intervention elements are implemented as planned and the target audience understands their key messages. Feasibility of the intervention was assessed through participants' answers to questions designed to gauge their understanding of each intervention element and the intervention message more broadly. For example, to assess whether participants understood the gist of the network graphic, moderators asked them to explain the difference between the network graphic's far left panel and far right panel. To assess

broad understanding, moderators asked "*If you were to tell a friend what you learned today, what would you say?"*

Our operating definition of acceptability was: participants find the intervention elements interesting and relevant to their lives. Acceptability was assessed through questions like: "*Did you find any parts of this intervention interesting?" "What parts were interesting?" "Were there any parts you did not like?" "What changes would you make to the [intervention element] if this were your program?"*

Finally, the FGD guide included questions to gauge adolescents' opinions about HIV prevention more generally. We were interested to hear their perspectives on whether youths are concerned about becoming infected with HIV, and whether there are existing resources in the village to address their concerns. Moderators asked questions like: *"Do you think youth your age are concerned about becoming infected with HIV?" "Where would a young person in this village go if s/he wanted information about HIV?" "Do you think youth your age have the information they need to protect themselves against HIV?" "What could adults do to better meet the needs of youth?"*

Data collection. Six FGDs were convened. They were stratified by gender, age, and school attendance (school going or out-of-school). The stratification scheme was based on *baraza* participants' advice. A female moderator led the girls' groups and a male moderator led the boys' groups. Note takers and research assistants also were the same gender as the participants. At the beginning of each session the moderator reviewed the study purpose, the range of topics to be discussed, and emphasized the voluntary nature of participation. Participants were assigned a number to use during the session, in lieu of using their real names. Data collection procedures were the same as for the *baraza:* audio-recorded on a digital device, and supplemented by field notes taken by a trilingual research assistant and the PI (girls' groups

only, as PI was female). Two FGDs were held per day for three (non-consecutive) days. At the end of each day the entire team met to review and discuss their impressions of the FGDs.

Data analysis. Using a content analysis approach, field notes and transcripts were reviewed carefully, line by line; during focus group debriefings the research team discussed preliminary interpretations. The PI developed a coding structure that she and a research assistant used to code the transcripts. They met several times during the analysis phase to discuss their coding and interpretation. Upon return to the United States, the data were uploaded to Atlas.ti for analyses and interpretation.

Results

Table 4.3 provides a brief description of the participants in each research event. The results from Phase I and Phase II are described below.

Table 4.3. Description of research events

Event	Description of Participants	Length of Meeting	N Participants
Baraza	Parents, teachers, clergy, village leaders	2 h 50 min	46
FGD 1	School-going females aged 13-14	1 h 52 min	12
FGD 2	School-going males aged 13-14	2 h 29 min	11
FGD 3	School-going females aged 15-17	2 h 16 min	11
FGD 4	School-going males aged 15-17	2 h 25 min	11
FGD 5	Out-of-school females aged 15-17	1 h 48 min	11
FGD 6	Out-of-school males aged 15-17	2 h 23 min	11

Phase I Results

Sources of Information: Discrepancy between the Actual and the Ideal

Throughout the *baraza* participants articulated a discrepancy between adolescents' current sources of information about sexuality and HIV and adults' perspectives on where they ideally should get such information. Adolescents learn about sexuality by observing village life (including parents' behavior), talking with friends and older siblings, and through exposure to various forms of media. Broadly, participants considered these sources — including the parents — suboptimal. Several participants argued that parents have set a poor example for their children:

> *[…]Mothers have also left their responsibilities to their children. The girl child does everything. They cook for their fathers, cook for the visitors and do every other chores in the household. So the girls begin to think that being a wife is not so hard after all. Let us take up our responsibilities as parents […] men should also show a good example because the Bible says that they must show a good example to the children. When a parent comes back home so late contrary to what they're always telling their children not to do — what can the children learn from that? (P14)*

and that the onus for behavior change should shift from youth to their parents:

> *I think that the main thing is behavior change especially on our part as adults. It's adults who are involved with parking girls* [prostitutes] *and the children only learn from them. Let's change our attitude and behavior. (P_{32})*

Despite the pervasive view that parents have failed to model moral behavior, the majority of participants indicated parents are the ideal source of information on sexuality. The tension between parents' behavior and the idea they should provide instruction in sexual matters led to a lively discussion. Some participants argued children were too rebellious to listen to their

parents, and therefore sexual education should be left to churches and schools. Others suggested the difficulty lies with parents whose discomfort prevents them from speaking freely about sexuality with their children. Participant 35 countered this perspective, arguing parental discomfort should not stop the flow of dialogue between a parent and child:

> *I can add that we as parents should be free to discuss any subject with our children. We shouldn't be selective in what we discuss with them. There are so many seminars now that educate parents on how to communicate with their children so we should be free to talk to them about anything including sexuality. (P_{35})*

A few participants shifted the locus of responsibility away from parents to the community at large, pointing out the benefits of working together and monitoring each others' children. They also asked that parents respect the discipline given to children by teachers and other adults in the community, and see it as a collective effort toward a common goal. Some remarked on the way that times have changed, saying

> *Today's children are also different from children in the past. Nowadays as early as 10 years old a child is already spoilt* [meaning sexually active] *so we need to start talking to them about sexuality even at age 9. (P_{48})*

Participant 49 talked about how past community norms included talking to children about sexuality, and warning them of the consequences of early sex:

> *In those days a girl for instance was told that 'if you get pregnancy out of wedlock then you will be married off to a very old man... It's now acceptable in the society for a girl to have a baby at home or before marriage, leave the baby with us and just move on with life as if nothing ever happened. In the long run they acquire HIV and die and leave us with these orphans. Let this be a communal affair. (P_{49})*

Adolescent Sexual Behavior: Squaring up Perceptions and Data

Most participants agreed that Nyamware youths' sexual behavior was either similar to Asembo youths' or more risky. There was some disagreement amongst participants about whether Asembo, like Nyamware, is situated on the shores of Lake Victoria. Those who thought of Asembo as lakeside said Asembo and Nyamware youth were similar:

> *I think the Asembo percentages are very high and I think ours too are high. This is because there are many sources of income for children in this place. Let's look for a way of helping them like prohibiting them from going to the lake. Let us come together to help our children because if mine is spoilt, he or she will spoil yours and vice versa. (P_{32})*

Those who did not consider Asembo a lakeside village argued that Nyamware youth might have more risky behavior or higher HIV prevalence:

> *When I compare the two I see some difference. The percentage in our village could be higher than the other one because we live by the lakeside and we have a lot of school dropouts. Also the income-generating activities at the lake encourage immorality[…]. (P_{37})*

The subtle difference between perspectives underscored a common thread throughout the baraza discussion: The lake was a risk environment for adolescents in general and girls in particular. A careful read of the exchange revealed that participants were not arguing that village youth were inherently different, or that mores were different. The debate over how similar Asembo and Nyamware youth are really hinged on proximity to the lake and income-generating potential. References to the relationship between the lake, income potential, and sexual risk were somewhat euphemistic — most participants who mentioned the lake as a risk venue simply alluded to it being a place where children could exchange sex for money. Only one participant articulated the relationship somewhat clearly:

> *The reason why they* [Asembo and Nyamware youth] *could be similar is because* (toddler shouting) *children do not value education so much because they can still make money by the lake even without an education. The girl child has more needs than a boy child and parents may not be in a position to cater for these needs. A child like this ends up finding help from the wrong sources who ask for sex in return. I think these regions are similar in a way. (P_{20})*

When asked if anything about the data on youth behavior was surprising, one participant said it revealed to her the world has really changed. Another indicated that she did not have a frame of reference for the data, but would be very interested to hear the findings in North Nyamware. Several agreed the data indicated a need for parents to "rise up" and take responsibility for educating their children (and other children in the village) about sexuality and the risks involved.

Adapting KYN for Youth: High Drama for High Stakes

Moderators demonstrated the first element of KYN to adult participants, about 20% of whom had been exposed to the intervention during the team's previous field work. Then they sought for ideas for adapting the first element for use with adolescents. Participants thought the interactive exercise should be more like a play — longer, and showing different types of people, including: those who abstain and stay healthy, those who warn others to stay away from infected persons, those who take anti-retroviral medications and live well with HIV, and those who become very sick and die from HIV. Most comments reflected an interest in portraying the severity of HIV and its social consequences:

> *I think the first exercise can be ended differently like the infected people dying and some sort of sorrow and sadness at the end. The youth should see that someone died and this person and that person were the next on the line. They can then see the end of the whole thing is death and sorrow. (P_{50})*

> *Let one of the infected persons carry a cross to show that they already died and are no longer alive* (laughter from the crowd). *The youth can learn that some of the infected persons do actually die and not everyone survives. (P_{18})*

In addition to advocating for the explicit recognition of human death and sorrow, participants wanted infected persons in the play to show symptoms of illness (e.g. bodily sores, coughing, diarrhea), or wear some symbol for danger (a red cloth or ribbon) or pending death (e.g. a dried, dying leaf).

Others wanted to give adolescents reason to be hopeful about prevention:

> *Let's have at least someone who survives the whole thing because they refused to get into a sexual relationship so that the youth can see the difference between those who got into a sexual relationship and those who did not. (P_{33})*

> *I want to say let's have people in the play who are informed of the dangers of HIV so that we have them abstaining from sex and those who agree to having sexual partners, so that the youth can see that those who abstain end up like this and those who don't end up in a certain way…(P_2)*

Adults expressed confidence that adolescents could understand the network graphics and accompanying bar charts. They suggested replacing the "dots" in the network graphic and the network movie with diagrams of humans, which some said should be made to look sick to show that HIV is a serious illness.

Several participants suggested the network movie include people who abstain and stay healthy:

> *[…] Let's have those who stay healthy to the end so that people who are trying so much to be careful can also be encouraged to continue. Let's have people who stay healthy. (P_{49})*

Advice on Phase II of the Study: "You cannot just pick anyone"

Participants were asked to advise on the best location to convene FGDs with youth. While a few suggested schools, several were adamantly opposed to holding the session in a school, arguing students would fear their teachers were listening and out-of-school youths would feel uncomfortable in a school environment. It was ultimately decided to use the True Jesus Church in Nyamware because of its central location and private setting. Participants advised recruiting youths and convening the groups over the Easter holiday because boarding-school students would be home and available to attend during that time.

Much time was devoted to discussing the ideal characteristics of the FGD moderators. A few participants suggested the moderator be fairly young, but not too close to the participants' age. Another suggested that a man should speak with the males and a woman speak with the females "*because young people can only talk about certain things with people of the same sex*" (P_9). While these were ideal traits, participants galvanized around one critical feature of the moderator: she or he must be experienced in working with children:

> *Must be trained in guiding and counseling […] not just anyone with their own views.*
>
> (Laughter)
>
> *An expert in the field of dealing with young people, can be male or female (P_8).*

Others agreed with Participant 8, and suggested the person be understanding, patient, and adept at answering questions from youth.

Summary of Phase I Results and Implications for Phase II

Adult stakeholders expressed concern about youth sexual behavior, and identified several risk environments, the most prominent of which was the beach. They discussed the need for parents

to "*rise up"* and take responsibility for: openly discussing sexuality with children, modeling moral behavior, and monitoring their children's whereabouts. Participants indicated youths prevention needs were not being sufficiently met, and considered parents both a part of the problem and a critical part of the solution.

Broadly, they expressed confidence that youth would understand the KYN elements we planned to demonstrate, particularly because youths aged 13 to 17 are typically school going and should have learned about graphs and percentages. However, they had a number of suggestions for improving KYN elements for use with youth most of which centered on making the elements less abstract and more realistic. For example, they requested that we make the interactive exercise longer, more like a play, and with explicit demonstration of the health and social consequences of HIV (physical symptoms, death, and sorrow). Also, they asked that the network images in the graphic and movie depict humans, and not dots that represent humans. Finally, they expressed interest in portraying a broader spectrum of behavior, including abstinence, in the elements of the KYN Component One.

Adults agreed with our plan to convene separate discussion groups with school going and out-of-school adolescents, as well as separating males and females. Initially, opinions were mixed about characteristics of an ideal moderator, but ultimately the most important feature appeared to be experience working with youth and a personality or demeanor that makes them feel understood. Importantly, *baraza* participants indicated the Easter holiday (which began two months after the *baraza)* would be the best time to convene the FGDs with youth because many village youth attend boarding schools and would only be available to participate on school holidays.

We followed adult stakeholders' advice about the timing of FGDs and prepared to convene them over the holiday. The short time frame (less than two months) prohibited major revisions to the

intervention elements. In addition, the team members agreed that logically, it would be prudent to first elicit youth's suggestions for modifying the intervention rather than modifying it based on adults' input alone. Therefore, we demonstrated the KYN elements as originally designed, and planned to compare adults' and youths' suggestions to determine how it should subsequently be modified for use with youth.

Phase II Results

Feasibility of KYN Component 1

Interactive exercise. Females in FGD 1 (13 to 14 year olds, school going) and FGD 3 (15 to 17 year olds, school going) were initially hesitant to participate, but the moderator was able to engage them with some persistence and light-heartedness. For example, when she needed the girls to form a circle she sang a nursery school song and they joined in and giggled, appearing more at ease. The majority of females in FGD 1 and FGD 3 quickly demonstrated understanding of the exercise — they identified which participants (in the exercise) were at risk of exposure to HIV infection, and they correctly explained why:

> *M: So what is the difference between the first play and the second one? Yes?*
>
> *P: In this play the first person has a sexual partner who also has another sexual partner who also has a sexual partner like that throughout the circle, so the virus spreads to everyone.*
>
> *(Moderator and Participant FGD 3)*

In comparison to FGD 1 and FGD 3, females in FGD 5 (15 to 17 year olds, out-of-school) needed prompting to articulate the key point of the exercise:

P: *In the first play the spread of the virus is lower but in the second play everyone can get infected.*

M: *Why?*

P: *That's because everyone has two sexual partners (laughing).*

M: *Yes, go on, each person has two sexual partners and?*

P: *And so one person infects someone who also infects another who also infects another but in the first play you cannot infect other people*

(Moderator and Participants, FGD 5)

The younger males in FGD 2 (13 to 14 year olds, school going) required more prompting and assistance from the moderator to predict how HIV would spread compared to the older males in FGD 4 (15 to 17 year olds, school going) and FGD 6 (15 to 17 year olds, out-of-school).

Across groups, the participants appeared most engaged during the exercise, and by the end of the session they could summarize its meaning reasonably well. When asked what they learned from it, participants said they learned they should only have one sexual partner, or that having more than one partner can lead to the spread of HIV. Some added it is important to know a partner's status:

> *From the hand-holding exercise we see that one could have a sexual partner who already had the virus from a previous relationship and may not know about it. They may be faithful to each other but still realize when they go for testing that they both have the virus because one person came into the relationship with the virus. (P_7, FGD 4)*

Network Graphic. The network graphic was more difficult for participants to understand. When asked to tell the moderator what they saw in the graphic, females in FGD 1 and FGD 3 said they saw flowers or "leaf-like images." None of the participants were able to connect the graphic to

the interactive exercise, or to the concept of a sexual network more generally, without prompting. Moderators spent a significant amount of time explaining percentages and assessing whether participants could understand the concept of changing proportions; participants in groups 1 and 2 seemed to have a particularly difficult time understanding. For example, when the male moderator asked participants to explain the difference between the first panel and the last one (i.e. a 10% increase in concurrent partnerships dramatically changes network connectivity), the following exchange transpired:

> *M: Okay, do you remember this picture? So what I am asking is the difference between this panel and this one. Number 4.*
>
> *P_4: (No response)*
>
> *M: Okay, who can assist Number 4? Number 10?*
>
> *P_{10}: Five people can infect everyone.*
>
> *M: Number 10 says five people can infect everyone. Thank you. Any other? Number 9.*
>
> *P_9: Two people can infect everyone.*
>
> *M: […] What do you think other youth your age would learn from these graphs?*
>
> *(No response)*
>
> *M: Do you think they would understand them?*
>
> *P_9: Yes*
>
> *M: Why?*
>
> *R_9: It's related to sex.*
>
> *(Moderator and Participants, FGD 2)*

In comparison, older male and female participants were more readily able to explain the differences in the network images, if not precisely then at least in terms of the implications for HIV transmission in a partnership:

> *I saw that one can have one sexual partner but may not know what other kinds of partnerships his or her partner has so they can also end up getting the virus […] (P_4, FGD 3)*

Or in a community:

> *It's easier for those people* [in the last panel's network] *to get the virus because everybody is connected: one person is connected to another who is also connected to another.* (P_5, FGD 3)

> *[…] We see in the village for instance someone has a wife and has also inherited a widow and when he goes out to drink he sleeps with another girl and so the virus spreads more in the community. This graph therefore teaches us to have only one sexual partner or two because we see that the virus is less in the first graph than in the last graph. It teaches us to control ourselves and our network connectivity should fall under the first graph. (P_4, FGD 6)*

*Network Movie***.** Participants had a difficult time grasping the network movie's key message. Two participants (an older female in FGD 3 and an older male in FGD 6) were able to articulate the main point of the movie (that more people are put at risk of HIV infection through concurrent partnerships compared to monogamous partnerships) very precisely. However most other participants revealed a broad interpretation of the main point:

> *One person has many sexual partners. ($P_?$, FGD 2)*

> *It is better to have one partner. (P_6, FGD 3)*

What was happening is that sexual connectivity was very high and most people had two or three concurrent partners (P_7, FGD 4)

What I learnt is that everyone got infected with HIV. (P_4, FGD 5)

When the participants gave broad answers, the moderator tried asking more specific questions to gauge understanding. For example, the FGD 6 moderator asked participants if they could explain the difference between the blue and red branches. The responses to this question were mixed:

M: What is the difference between the blue and the red branches?

P_4: There is no difference.

M: Number four does not see a difference. Number 6?

P_6: There is a difference in that the red branches are more than the blue branches.

M: Thank you […] Any other difference? Number 2?

P_2: Nothing to say.

M: Number 1?

P_1: HIV spreads more among those with two or three sexual partners than among those with only one sexual partner.

(Moderator and Participants in FGD 6)

Feasibility of Program as a Whole. Broad questions such as “Does the program make sense to you?” or “Would other youths understand this program?” were met with silence by the younger

females and males. However, when the moderators asked what participants would tell a friend about what they learned from KYN, younger participants volunteered answers such as:

> *I can tell them not to have many sexual partners. (P_1,FGD 1)*
>
> *He should not have many girlfriends because they will cause him to get infected. (P_9, FGD 2)*

Older adolescents answered the broad feasibility questions more readily, and said the program made sense:

> *Yes, it makes sense. It makes us know as young people how we can be connected and have only one sexual partner. You can learn that it is good to have only one sexual partner. (P_3, FGD 4)*
>
> *This program is interesting and makes sense to me and also teaches us not to have many sexual partners because we can get infected from different people. (P_4, FGD 6)*

Acceptability of KYN Component One

Interactive Exercise. Participants liked the interactive exercise because of its practical nature:

> *I liked the play because it shows us how people should control themselves in the community and the problems that can arise when people have many sexual partners. (P_5, FGD 6)*
>
> *The handholding exercise was good because we learnt that if you have one sexual partner then it's not easy for the virus to spread. We also saw in the circle exercise that if one has more than one sexual partner and one got infected then all got infected. So it teaches us to have one partner. (P_7, FGD 4)*

They thought of it like a play or drama and suggested expanding it with more "skits" and "songs about HIV."

Network Graphic. Older participants in FGD 4 and FGD 5 endorsed the idea of using the network graphic with other groups of adolescents, and said they could use it to tell other youths about the risks of concurrent partnerships:

> *I can use it and tell them to have one sexual partner whose HIV status they know because having concurrent partners increases the spread of HIV. (P_2, FGD 5)*

Another participant said he would take copies of the graphic to the beach and teach others to "*reduce or stop immorality*". Out-of-school females agreed, and said the graphic was useful for instructing youths to have one sexual partner or to abstain. Overall, participants in FGD 4 and FGD 5 indicated they liked the graphic because it was "clear" and "straightforward," and they did not have any suggestions for changing it.

Network Movie. Opinions of the network movie were mixed. When asked directly if they would or would not use the movie to teach other youth, one older out-of-school participant said she would use it "*because I have learnt something from it*" *(P_6, FGD 5)*. However, another female her age in the school going females' group recommended using the interactive exercise instead of the movie:

> *I think the interactive exercise is more interesting than this one because they will ask so many questions but in the other one they will see the actual scenarios. (P_2, FGD 3).*

Participant 2 added the exercise was better "*because people will be talking and seeing what is actually going on*." A male in FGD 6 said he thought the movie should be acted out as the circle exercise, but the majority of the other participants in his group said the movie should be retained. The only modification two of them suggested was using human figures instead of dots in the movie. The older males in FGD 4 were generally in agreement with FGD 6; they thought the movie was informative and had potential to change behavior:

[…] This movie can help them see that sexual partnerships can lead to getting HIV and other diseases and death. Some would change their behavior and reduce the number of sexual partners they have. ($P_{7,}$ FGD 4)

Several of the males in FGD 4 said they thought the movie made more sense than the interactive exercise and the network graphic.

Other participants voiced negative opinions about the network movie; their statements reflected different foci for their opinions. Some seemed to object to the movie as a teaching tool, whereas others seemed to object to the behaviors implied by the movie, and in some cases both occurred. For example, the FGD 4 moderator asked if there was anything participants did not find appealing, and one said:

What I did not like is when we saw [a person in the movie] *with two sexual partners and he may not have known the HIV status of his partners. (P_{11}, FGD 4)*

The moderator for FGD 5 asked if there was anything not interesting about the program, and one participant said:

Your partner should not lie to you that you are the only one; he can have others on the side that can cause you to the get the virus (giggling). (P_4, FGD 5)

When the moderator asked males in FGD 2 what they liked about the program, Participant 10 said he did not like anything about it because he "*saw that everybody gets infected with HIV*." Other males followed his statement with a list of dislikes that included: "*HIV virus" (P_9), "having many sexual partners" (P_1)* and *"A boy can get HIV if he has many girlfriends" (P_4)*. However, later in the session the moderator asked whether participants would use the movie to teach others, and participants 9 and 10 said they would use it.

*Acceptability of Program as a Whole***.** Moderators asked participants if they thought the program would be interesting to other youths, or meaningful to their lives. Younger participants demonstrated reluctance to answer this question. For example, in FGD 1 the moderator asked the question three times, reframing it slightly each time, and assuring females she wanted them to *"just be bold and say what you think."* And, still there was no answer. When she asked if there was anything they did not like about the program the participants began to giggle. In FGD 2 the moderator faced similar obstacles to assessing the acceptability of KYN as a whole — some participants did not respond and others provided unclear answers:

> *M: […] Anybody else? Just say what you think. Number 11? (No response) Nobody will punish you or judge you. Number 9?*
>
> *P_9: It makes people have sex and get infected.*
>
> *M: It makes people have sex, why?*
>
> *P_9: Because of love.*
>
> *M: This program teaches us how we can reduce concurrent sexual partnerships. Any other opinion?*
>
> *(No response)*
>
> *M: Is there anything that was not interesting? Number 1?*
>
> *P_1: (no response)*
>
> *M: What do you think other youth your age, like your friends, would say about this program? Number 10?*
>
> *P_{10}: I wasn't lifting up my hand.*

Broadly, older participants thought the program could be meaningful for other youths. Out-of-school females said they could teach other youths what they learned, and other youths would change their attitude if they saw KYN. School-going males said they liked the program because it showed how HIV can spread in the community, and taught that sexual partnerships were not safe. The older males in FGD 4 and FGD 6 were most vocal about KYN's relevance for other youth:

> *What I think about this teaching is that once you know how you are connected with others in the village, you can learn and find out how you can be helped. If you have extensive connectivity you can then stop and reduce the number of partners you have so that you don't extend it too much. ($P_{7,}$ FGD 4)*

> *It can be meaningful to their lives because young people do not know about the future but we know HIV is real and so if we know how it is transmitted then we can decide how our future will be while we're still young. ($P_{1,}$ FGD 6)*

The comment above from Participant 1 in the out-of-school, older males' group captures an opinion many participants in the older males' and females' groups expressed — one aspect of KYN they found interesting was that it showed how HIV is transmitted.

Assessment of Youth Prevention Needs: Concerned and in Need of Answers

Youth Concern about HIV. Across all groups, participants acknowledged that youth their age are concerned about HIV. Most of them articulated a grim view on life with HIV infection:

> *...Once one is infected other problems arise like dropping out of school for a young person, or other family problems with children and seeking medication if one is a parent. ($P_{11,}$ FGD 5)*

> *Youth are concerned because once one is infected with HIV then all your friends can abandon you and that can cause one to commit suicide. ($P_{3,}$ FGD 3)*

Participants were aware of the availability of HIV treatment, but the stigma associated with treatment was one of the concerning aspects of HIV that created fear among youth:

> *Yes, they are concerned because when one gets infected his friends laugh at him, gossip behind his back and one cannot freely move around with friends again. Then one will not be free also to pick drugs from hospital. (P_7, FGD 4)*

Others agreed that obtaining medications and staying healthy while taking them is difficult and stressful. One youth mentioned some youth might not be concerned about HIV, referring specifically to youth who were infected perinatally and living well with the virus.

Sources of Information. Broadly, participants said their current sources of information on HIV and sexually transmitted infection were inadequate. Schools were the most frequently identified source of information for participants in FGD 1 through 4, but information from school was insufficient because the time allotted was too short and the educational sessions infrequent. FGD 5 and FGD 6 participants commented that they could get information at voluntary counseling and testing centers (VCT), but acknowledged that people do not like to visit VCT because of stigma and fear*:*

> *M: […] I can hear Number 11 saying people don't go to VCT centers. Why do you think people don't like VCT centers? Number 11.*
>
> *P11: They fear turning out positive because that causes a lot of emotional stress.*
>
> *M: […] Why else do you think people don't attend VCTs?*
>
> *P11: Stigma associated with VCTs. Any time one goes to a VCT center, they are labeled as having the virus.*
>
> *M: So one has to always look over their shoulder before getting into or out of a VCT center.*

(Laughter)

(Moderator and P_{11}, FGD 5)

Other current sources of information that were mentioned included: radio (FGDs 2, 3, 5, and 6), hospitals or doctors (FGDs 1 and 2), and parents (FGDs 2, 4, and 5).

Participants named a variety of places they *preferred* to get information about HIV prevention. Younger males and females preferred to get information at school and/or from teachers as well as parents. Younger males also mentioned hospitals and VCT centers, and females agreed hospitals could be a good source. Older, school-going males and females generated a more extensive list of preferred information sources about HIV, which included: schools, youth groups, non-governmental organizations, beaches, markets, sporting events, churches, seminars, posters and banners. When asked if parents should also be a part of the education, females in FGD 3 said no:

> *Youths do not feel free where parents are* (giggles) *so parents should not mix together with youths in such a forum. They will not give their opinions. (P_2, FGD 3)*

Older, out-of-school males preferred talking amongst themselves or listening to TV or radio. Older, out-of-school females said they preferred VCT centers, and more specifically they preferred mobile, home-based testing compared with tents or brick-and-mortar testing centers. About half of this group preferred parents as a resource.

What Youth Need to Know. Participants were asked what they think teenagers need to know about preventing HIV. Many said youth need to know their HIV status — this was the most commonly identified informational need across groups. In addition to knowing their status, participants thought other youth wanted to know more about where HIV comes from, how it is transmitted, and how to prevent it. School-going older males in FGD 4 had many questions

about male circumcision. They wanted to know how it reduces a person's chances of getting infection, whether condoms still work after circumcision, whether condoms work if one is not circumcised, and what it means to have a 60% reduction in chance of infection. Older out-of-school males in FGD 6 had broader questions about HIV, such as:

> *If I am negative and my partner is positive, what can we do to protect ourselves? (P_7)*
>
> *What happens to me if I get infected, and what will other people feel if I infect them? (P_4)*
>
> *How is it transmitted and if one is infected, what can be done to help the person? (P_1)*

Discussion

There is a pressing need for HIV prevention interventions for Kenyan youth. This study takes the first step toward adapting the KYN intervention for use with adolescents aged 13 and 17. Stakeholders — parents, community leaders, youth — participated in two phases of the adaptation research. In Phase I, adult members of the community identified concerns about youths' sexual behavior and lack of appropriate education about HIV and sexuality. They also contributed ideas for modifying KYN for use with youth and helped plan the second phase of the project. In Phase II, adolescents participated in the first component of the KYN intervention and gave their opinions about what other youths would learn from it and how it might help them. Adolescents also discussed the adequacy of currently available resources for information about HIV and its prevention and described what sources and content would be ideal to them.

To understand adults' perceptions of youth behavior and their concerns about adolescents' HIV risk, findings from an earlier study of Asembo youth were used to elicit perceptions of the North Nyamware village youths' behavior and risk. While many of the adults thought North Nyamware

and Asembo youth were similar in terms of risk behavior, some argued that HIV risk was higher in North Nyamware because of its proximity to Lake Victoria and the opportunity for transactional sex there.

The local ecological and economic systems create high-risk environments in Kenyan fishing communities.[135] The lakeshore is a gendered economy in which men have nearly exclusive access to fishing and its earning potential; women's economic stability hinges on the sale of fish or cash from the fishermen. The shortage of fish creates competition for the predominately female fish traders who exchange sex with fishermen to secure access to their catch, a practice that is called "*jaboya*" meaning "customer."*Jaboya* is cited as a possible explanation for the high prevalence of HIV and other STI in Nyanza's fishing communities.[34]

Baraza participants' comments alluded to money enticing adolescents to have sex. Youth participants also alluded to the beach as a risk environment, and linked the role of money to girls' sexual behavior. Adults suggested keeping youths away from the beaches and restricting their mobility to decrease risk. In contrast, adolescent girls recommended that adults should provide for children's basic needs so that girls would not have to seek men to provide for them.

These findings reflect a larger, global concern about the role of transactional sex in the HIV epidemics in Kenya,[29,136] and in sub-Saharan Africa more generally.[137] In recent years scientists have tested the efficacy of cash transfer programs for HIV prevention among adolescent girls. Several trials report positive social outcomes[89] and one demonstrated a positive effect on HIV prevalence among schoolgirls after 18 months.[90] The long term effect of cash transfers on HIV infection in adolescents remains to be seen, but several studies are underway that use HIV incidence as a primary outcome measured up to three years after enrollment.[138]

Adults provided suggestions for improving elements in the KYN program for adolescents. Their recommendations included making the consequences of HIV visible and ensuring that messages also offered hope for avoiding such negative consequences. Adults put forth several ideas for making the risks of HIV more salient for youth through the KYN intervention that included: extending the interactive exercise into a drama or play that depicts a range of possible outcomes (avoiding infection, manifesting physical symptoms of HIV, death), enhancing message relevance by using youthful figures in the network graphics, and using symbols to highlight the spread of infection and death. While the adult participants wanted KYN to portray the gravity of HIV, they also recommended modification of KYN elements by providing positive consequences associated with avoidance of HIV risks, such as including healthy people in the interactive exercise and network graphics who heeded others' warnings or remained abstinent.

Adults did not express concern over the feasibility of implementing the first component of KYN with youth. They thought it was relevant and comprehensible for youth. The very young adolescents, on the other hand, had a difficult time understanding the network graphic and movie. When asked what they learned, they were reluctant to answer or provided answers that did not reflect sufficient understanding. Few adolescents were able to articulate the key intended message of the network image and network movie. Most of the older adolescents were able to discern the broader messages conveyed by the graphics and movie. Likewise, they understood a key message of KYN — concurrency creates more connections in a sexual network, leading to faster and further spread of disease within one's community. Adolescents struggled, however, with the conceptual link between being faithful and the relevance of mutual monogamy. Interestingly, only the older, out-of-school girls identified the importance of mutual monogamy.

The majority of older adolescents liked the intervention; older, in-school males and older, out-of-school females were particularly enthusiastic about the idea of sharing the KYN message with other youths. Adolescents liked that the intervention showed how HIV spreads in a community. Some mentioned, however, that they did not like seeing how fast HIV spread and how everyone became infected in the end. Adults also disliked this aspect of the network graphic and movie, which might reflect misinterpretation. That is, the network graphic does not depict HIV, but there was a tendency for participants to interpret red lines and corresponding percentages as the portion of the population infected with HIV. The network movie shows only individuals in the network who end in the reachable path of HIV infection; it does not show the 9, 400 people never exposed to HIV. Another potential detraction to understanding was that participants seemed to associate the color red with HIV infection, which may have impeded understanding the intended message of the network graphic and movie.

Adolescents perceived HIV as a serious threat to one's physical and emotional health. They also indicated that other kids their age were concerned about becoming infected, and were particularly worried about how HIV would affect their futures and friendships. Adults seemed concerned that youth may not understand the gravity of HIV, but youth clearly articulated awareness of HIV's effects. Adults and youth agreed that adolescents lack sufficient information on HIV and sexuality. While adults saw parents as part of this solution, older youth did not. Younger youth (13 to 14 year olds) more frequently mentioned parents as a preferred source of information compared to older youth. School going adolescents preferred to get information from schools and hospitals, whereas out of school adolescents preferred VCT centers.

Adolescents had broad questions about HIV, the answers to which are critical to successful prevention. For instance, they wanted to understand more about how HIV is transmitted, and how circumcision and condoms work. They also wanted to know how to prevent infection in

serodiscordant partnerships, and suggested partner counseling and testing. When asked what youth most need or want to know about HIV, one of the most responses was “they should know their HIV status.” While adolescents acknowledged VCT centers and mobile testing clinics exist, they said social stigma and fear prevent adolescents from accessing these resources.

Study Limitations

In this study, participants were asked for their opinions and critique in a focus group setting. Participants may have felt uncomfortable giving opinions or asking questions in a group setting. To promote honest discussion, moderators encouraged participants to speak freely and reminded them there would be no penalty for disagreeing or raising questions. Some participants expressed negative opinions, and others sought clarification when a concept or question was unclear. Others chose not to respond to questions and their opinions may not be represented here.

The youngest girls (FGD 1) were the most reticent. They sat quietly in their seats and were reluctant to speak when called upon. When they did speak, they often hid their faces behind their hands or participant numbers (printed on a standard sized sheet of paper). The moderator made multiple attempts to reassure them there was no “right” answer to the questions she posed, and they could feel free to voice any opinion without repercussion. However, in the debriefing after FGD 1 the moderator said she did not think the girls understood what KYN was about but were reluctant to admit they did not understand. She offered several possible explanations. First, in rural Luo communities, it is unacceptable for a child to contradict an adult, especially a stranger, so it was easier for them to simply agree or nod than to say what they did not like or did not understand. Secondly, young girls in rural communities have very little exposure to strangers, which has implications not only for their interactions with the moderator

but also for their exposure to ideas and information, particularly about sexuality. The moderator was dubious about the girls' understanding of KYN and of sexuality more generally.

The data were translated from the local language into the English language, which may have resulted in loss of richness or meaning. To guard against this, a trilingual, ethnically Luo research assistant read and coded the transcripts in English, and also listened to portions of the recordings and compared them to the English translations to ensure meaning was not lost. While this process revealed that the recordings were accurate, some English words do not have DhoLuo equivalents (e.g. "connectivity" or "network") and vice versa (e.g., "jaboya" literally means "customer," but in DhoLuo refers to complex system of economic dependencies). In such cases, the research assistant assured that the transcriptionist had made reasonable approximations in her translation. Nonetheless, the language difference and accuracy of translations remain a noteworthy limitation of cross-cultural research.

Conclusion

Adolescent and adult participants in this study voiced specific concerns about HIV infection among youth, and agreed that youth lack the information they need to protect themselves. Adults thought KYN should be expanded to more explicitly show the consequences (health, emotional, social) of HIV infection. They also thought the intervention elements should depict people who were abstinent, or heeded the warnings of others and stayed out of the path of HIV infection. Younger youth had a difficult time understanding the KYN elements, suggesting that a different approach to concurrency prevention is likely warranted for this age group. Broadly speaking, the intervention was feasible and acceptable for use with older youths. They found it interesting and applicable to their lives, and two groups were especially interested in sharing the message with others. Similar to a previous study with adults (Knopf et al, forthcoming), KYN prompted discussion of the need to know one's own and one's partner's HIV status. This is a

promising finding given the current push for couples HIV counseling and testing and the broad scientific interest in treatment as prevention, which relies heavily on willingness to be tested for HIV infection.

CHAPTER 5: SUMMARY AND CONCLUSIONS

This dissertation research examined the sexual behaviors and HIV prevention needs of west Kenyan adolescents as a first step toward adapting a concurrency reduction intervention, "Know Your Network" (KYN), for 13 to 17 year olds. There were three research goals:

1. Describe the characteristics of rural west Kenyan adolescents' sexual debut and the patterns of sexual partnerships in adolescence and young adulthood.
2. Examine the prevalence of concurrent sexual partnerships in west Kenyan adolescents.
3. Assess the feasibility and acceptability of the first component of the KYN concurrency reduction intervention for use with adolescents aged 13 to 17.

Each dissertation research goal was addressed in a different study, the key findings of which are summarized below.

Study 1: Patterns of Sexual Debut and Early Partnerships

In Chapter 2, data from the Asembo BCS and Gem BCS were examined to understand the experience of sexual debut in Nyanza and how it shapes the unfolding sexual lives of adolescents and young adults. Descriptive statistics sketched the form of a typical Nyanza adolescent at sexual debut, and revealed minor differences by gender. The typical female debuted around age 15 and described her first intercourse as either "wanted" or "unplanned but happened anyway." Her partner was older, but most likely within five years of her age. He was probably a student she knew for at least one month, likely longer. The typical male debuted earlier, around age 14 and described his first intercourse as "wanted." He did not use a condom, and his partner was a student his own age or less than five years younger than him. He likely knew her for more than one month before they had sex.

There were notable variations on “typical,” and cluster analysis was used to sort adolescents into distinct groups defined by the typology of their sexual debut. The analyses began with seven debut characteristics, and the cluster model for each gender was selected based on an overall balance of its summary measure of performance, parsimony, and descriptiveness. Male debut clusters were defined by three variables: length of time the respondent knew the debut partner prior to first sex, reported condom use at debut, and whether or not the respondent had sex with the debut partner again. Female debut clusters were defined by the debut partner’s relative age, reported condom use at first sex, length of time respondent knew the debut partner prior to first sex, and receipt of gifts, favors, or money from the debut partner in exchange for sex.

This study contributed to the larger body of work on sexual debut in several important ways. First, there are few published studies of sexual behaviors among very young adolescents, especially those living in a rural region with high burden of HIV. This gap in the literature has been identified as a stumbling block to prevention efforts with youth, and the analyses from this study could be used to inform future prevention programs.[139] Second most studies examine a single feature of sexual debut and its association with either HIV infection or HIV-related behaviors. This study considered sexual debut a multidimensional event defined by respondent, partner, and partnership characteristics, and therefore provides a more complete picture of an important transitional event in adolescence. Finally, this study laid the ground work for future studies of the pathway between sexual debut and HIV infection. The cluster analyses will be used to inform future analyses of the association between the identified debut typologies and the post-debut HIV-related sexual behaviors Asembo and Gem respondents reported.

Study 2: Concurrent Sexual Partnerships Among Rural Nyanza Adolescents

Chapter 3 reported the prevalence of concurrency among adolescents aged 13 to 19 using existing data from the Asembo BCS and Gem BCS. The study was undertaken to inform the adaptation of KYN for youth. Specifically, the results helped determine whether the goal of KYN for youth should be primary prevention or risk reduction. The point prevalence of concurrency among all adolescents was 2.2%; among sexually experienced adolescents it was 4.4%; and among adolescents reporting multiple partners, it was 6.9%.

Males were more likely to report having concurrent sexual partnerships on the date of interview compared to females (OR 2.5, 95% CI: 1.3, 4.9), and reports of concurrency among younger adolescents (13 to 14 year olds) were rare (N=2). Questionnaire structure prohibited measurement of cumulative annual prevalence of concurrency in Gem, and required estimation of the upper and lower boundaries of cumulative annual prevalence of concurrency among Asembo adolescents. Among all Asembo respondents, the lower bound of the estimate of cumulative annual prevalence of concurrency was 2.5% and the upper bound estimate was 5.8%. Among sexually experienced respondents, the cumulative annual prevalence was between 6.2% and 12.4%. Finally, among respondents reporting at least two sexual partners in the last year, the annual prevalence was between 48% and 91%.

This study was the first to estimate the prevalence of concurrency in younger rural Nyanza adolescents, and provided important information for concurrency reduction efforts in the region. First, the low prevalence of concurrency (0.4%, or 2 cases) among the youngest adolescents (13 to 14 year olds) suggested a primary prevention strategy would be appropriate for this age group. This was significant because research indicates it is more difficult to change patterns of risk behavior than it is to prevent them.[93]

Second, and more importantly, the point prevalence of concurrency among older, sexually experienced adolescents was 5%, which has significant implications for HIV transmission in this population. Eaton, Hallet and Garnett[56] modeled the interaction between concurrency and the infectivity profile of HIV and found that primary infection amplifies the effect of concurrency on epidemic spread. With staged transmission (three different probabilities, one for each stage of HIV infection), the epidemic begins to spread when the point prevalence of concurrency is 9%.

One might conclude that concurrency was an unimportant risk factor for adolescent populations because the point prevalence of concurrency was below the threshold required for epidemic persistence. However, the HIV prevalence data from Asembo and Gem suggested most infections in 15 to 19 year olds are incident, not prevalent infections.[33] Compared to 13 to 14 year olds in the same community, HIV prevalence rose sharply in 15-19 year-old-females — 1.5% versus 8.6%, respectively. Prevalence rose more slowly in males, but the pattern was the same. Among 13 to 19 year-old-males, HIV prevalence was <1% compared to 10.4% among 20 to 24 year-olds. In an age group whose infections are primarily incident, transmission probability is higher, which means the point prevalence of concurrency required to have an impact on transmission dynamics is lower. Therefore, a 5% point prevalence of concurrency among adolescents may be sufficient to heighten risk of HIV transmission in this age group, which is a question to be examined in a future study.

Study 3: Feasibility and Acceptability of the Know Your Network Intervention for Youth

Chapter 4 described the results of a qualitative study of the feasibility and acceptability of the KYN intervention for use with adolescents aged 13 to 17. There were two phases of the study. In the first phase, adult stakeholders — parents, educators, community leaders — discussed their concerns about HIV and sexual behaviors among village youth and gave their opinions

about how KYN could be modified to address their concerns. In the second phase, the three elements of KYN Component One were implemented with adolescents to determine whether they understood them (feasibility) and found them interesting and relevant (acceptability). Adolescents also were asked to describe their concerns and questions about HIV and how they would like to have those concerns and questions addressed.

Adults expressed concern about the risk environment for youth, particularly the role the lakeshore played in enticing youth into sex in exchange for money. Their interest in having the KYN intervention explicitly demonstrate negative health and social consequences of HIV suggested a perception that youth were unconcerned about becoming infected, or perhaps unaware of the severity of HIV. However, FGDs with youth revealed significant concern about HIV infection across genders and age groups, and clear gaps in knowledge about HIV and its prevention.

Younger adolescents struggled to understand several parts of the KYN intervention, which was not entirely surprising given the results of Chapter 3. Concurrency was unusual in this age group, and they simply may have had no frame of reference for the somewhat abstract concepts of serial monogamy, concurrency, and sexual networks. The FGD format also seemed inappropriate for this age group, especially for girls.

Older adolescents grasped the general concepts of KYN and found it interesting and relevant to their lives. While most of them could not precisely articulate the key messages of intervention elements, they understood its broader message was about faithfulness and partner reduction. Some of them were able to grasp the importance of mutual monogamy, recognizing that one could be faithful and still be exposed to HIV through a partner who has concurrent partners. Still others were able to take this message one step further, and articulated a need to be mutually monogamous with a partner whose HIV status is known.

Youth had broader questions about HIV that KYN does not address. For example, they wanted to understand more about where HIV originated, how it is transmitted, and how it can be prevented. They indicated their current sources of information were insufficient, and their preferred sources of information varied by age group and educational status. Younger adolescents preferred parents and schools; older, school-going adolescents preferred to get information at school; and older, out-of-school adolescents preferred VCT centers and hospitals as information sources. Adults and youth identified barriers to bridging the real and the ideal sources of information; parental discomfort and youth "rebellion" prohibit open dialogue between parents and adolescents, the duration and frequency of sexual education at school is inadequate for addressing youths' concerns, and stigma prevents youth from accessing VCT centers for counseling and HIV testing.

This study contributed to the scientific literature on HIV prevention among youth in several ways. First, it highlighted the need for comprehensive sexual education for young people in Nyanza. In a region inundated with HIV research projects and social service organizations, it was surprising to hear youth had basic questions about HIV infection and prevention. Second, the findings suggested youth were aware of the severity of HIV and worried about its potential to negatively affect their health, education, and friendships. The perception of social stigma was high. Several adolescent participants pointed out that youth were concerned about becoming infected with HIV because accessing treatment would be difficult due to stigma. In the new era of treatment as prevention, the fear of stigma associated with HIV treatment was an important finding of this study. Finally, youth found the KYN message acceptable and relevant to their lives, which indicated primary prevention and risk reduction efforts may be successful in this population.

Future Directions: Implications for HIV Prevention for Nyanza Adolescents

This study pointed to several avenues for future research, including the following questions:

- The research reported in Chapter 2 sets the foundation for future study that explores the relationship between debut typologies and the HIV-related sexual behaviors reported by Asembo and Gem respondents. This would help elucidate the pathway between sexual debut and HIV infection.
- The research reported in Chapter 3 revealed a 5% point prevalence of concurrency among sexually experienced 15 to 19 year olds. While this point prevalence is lower than that required for epidemic persistence in the general population,[56] it may be sufficient for elevating HIV transmission risk in the adolescent population whose infections are more likely incident (and therefore more virulent) than prevalent. This question could be answered by reparameterizing the Eaton, Hallett, Garnett model with the HIV prevalence and age mixing structure observed in Asembo and Gem.
- Research with adult and adolescent stakeholders (Chapter 4) revealed adolescents have broad questions about HIV that are not addressed by KYN. It would be useful to determine whether KYN could be part of a broader youth-focused educational intervention about sexual health.
- Adults and some adolescents indicated interest in expanding KYN into a drama or play (Chapter 4). Having adolescents write the script for such a play might reveal effective ways to communicate the KYN message more clearly to other youth. Some questions in the FGD guide were designed to capture how the adolescent participants would communicate the KYN message to other youth, but most participants did not seem to understand the question (e.g. they often said things such as, “I would tell them to know their status” or “Be abstinent”); Asking youth to write a script and act it out may be a more effective way to learn how they would communicate the KYN message to other youth.

Conclusion

In conclusion, this dissertation study contributed meaningfully to the body of research on HIV prevention in Nyanza Province by focusing on rural youth, an understudied population at high risk of HIV infection. It sheds light on the patterns of sexual debut, estimated the prevalence of concurrency among adolescents, and described adolescents' concerns and unanswered questions about HIV and its prevention. Today's adolescents are tomorrow's adults, and early intervention to support their health has important implications for the future.

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APPENDIX 1: STEPS IN THE CONSTRUCTION OF PROXY VARIABLES FROM ASEMBO BCS DATA

I. Initial Steps

a. Recode the variable *hadsex* (indicating whether or not a respondent had ever had sexual intercourse; only asked of never married respondents) from "sysmis" to "yes" for all respondents who had ever been married.

b. Construct a dummy variable, *hadpX,* to indicate whether or not a respondent reported each of the ten possible partners (where X=S1-S4 for the four spouses, DP for the debut partner, and P1-P5 for the five non-spousal, non-debut partners):

   i. *HadpX*=1 if a case had a valid, non-missing value for any question about partner X or partnership X

   ii. *HadpX*=0 otherwise

c. Cross tabulate *HadpX* by 1) partner X's age (*PXage)* and 2) the duration of partnership X *(PXdur);* these two variables were the most likely of all the partner/partnership variables to have non-missing values and were therefore used to test the specificity of the *hadpX* coding.

d. Construct a variable, *npnet,* that sums over all the *hadpX* variable*s* for the total number of partners each respondent reported in survey sections 3-5.

e. Cross tabulate *npnet* by other key variables (e.g. *hadsex,* lifetime number of partners *[numpart]*, marital status [*marstat*]) to identify and correct any coding errors.

f. Begin construction of all partner-specific concurrency variables

Overview of Concurrency Variables by Partner Type, Asembo

	Active Status	Date of Last Sex (DLS)	Date of First Sex (DFS)
Spouse	Constructed; all considered active	Directly elicited by questionnaire	Constructed proxy using length of marriage
Debut	Directly elicited by questionnaire	Directly elicited if ongoing; if ended, constructed proxy using relationship duration	Constructed proxy from length of time since sexual debut
Other	Directly elicited by questionnaire	Constructed proxy using coital frequency in last month, if ongoing; otherwise, used the date the relationship ended	Directly elicited by questionnaire

II. Spousal Partners (S1-S4)

a. For S1 through S4

b. Construct Dummy Variable for Active Status. Coding structure:

i. *ActiveSX* (where X=1-4) = 1 “Active” for all spouses for two reasons: 1) the constraint around the name generator for each spouse was “current spouse or partner,” and 2) 92% of married adolescent respondents had sex with their spouse within the month prior to interview.

ii. *Active SX* (where X=1-4) = 998, “valid skip,” for all single, divorced, separated, widowed respondents.

c. Compute DLS. DLS is stored in one of two variables — *SXDLS_M* if last sexual activity with Spouse X was > 4 weeks ago, and *SXDLS_D* if last sex with Spouse X was within the previous 4 weeks. Therefore, *DLSSX* was computed as follows:

i. *DLSSX* (where X=1-4)=*SXDLS_M* * 30.41, where DLS measured in months

ii. *DLSSX* (where X=1-4)=*SXDLS_D*, where DLS measured in days

iii. *DLSSX* (where X=1-4) = 9997 if ”don’t know” *DLSSX*

iv. *DLSSX* (where X=1-4) = 9998 if did not report Spouse X

v. *DLSSX* (where X=1-4) = 9999 if invalidly missing

d. Compute DFS. Respondents were not asked for the DFS with spousal partners, so a proxy is constructed using duration of marriage with Spouse X (*mardurX)*, measured in years.

i. *DFSX* (where X=1-4) = MardurX*365 if mardurX is gt 0

ii. *DFSX* (where X=1-4) = 0 if married this year
iii. *DFSX* (where X=1-4) = 9997 if ”don’t know” *mardurX*
iv. *DFSX* (where X=1-4) = 9998 if did not report Spouse X
v. *DFSX* (where X=1-4) = 9999 if invalidly missing

III. Debut Partners (DP)

a. Construct a Dummy Variable for Active Status (*ActiveDP).* Coding structure:
   i. *ActiveDP*=1 if the respondent said the partnership was “still continuing” when s/he was asked how long the relationship lasted *(DPdur)*.
   ii. *ActiveDP*=0 if *DPdur* gt 1 and lt 998 (where 1=still continuing, 998=valid skip)
   iii. *ActiveDP*=998 if *hadsex*=0 or the debut partner was spouse 1 (DP=S1)
   iv. *ActiveDP*=999 if the missing *DPdur*.
b. Compute/Construct DLS. Only respondents in ongoing partnerships with the DP were asked for DLS, so there were different steps to compute/construct DLS, depending upon active status:
c. <u>For active debut partnerships</u> DLS is stored in one of two variables-*DPDLS_M* if last sexual activity with DP was > 4 weeks ago, and *DPDLS_D* if last sex with DP was within the previous 4 weeks.
   i. First convert time measured in months to days by multiplying *DPDLS_M* * 30.41
   ii. Then combine *DPDLS_M* and *DPDLS_D* into one variable, *DLSDP*

   <u>For inactive debut partnerships</u>, construct a proxy for DLS:
   iii. Compute years since sexual debut (*YsinceD*) = *(Age-debutage)*
   iv. Convert *YsinceD* to days since debut (*dayssinceD*) = ((*Age-debutage*)*365)
   v. *DPdur* is stored in four different variables with different time measurement units (years, months, days). Convert all *DPdur* variables into days and combine into one variable, *DurDP*
   vi. Compute *DLSDP*=(*dayssinceD-DurDP)*

   Finish coding as follows:
   vii. *DLSDP*=*dayssinceD* if *DurDP*=1 day
   viii. *DLSDP*=9995 if (*Age-debutage*=0) or (dayssinceD-DurDP=0) — can’t determine end date for these cases

ix. *DLSDP*=9996 if respondent refused to answer *DPDLS_M and DPDLS_D* or *DurDP*

x. *DLSDP*=9997 if "don't know" date of last sex or partnership duration

xi. *DLSDP*=9998 if *hadsex*=0 or DP=S1

xii. *DLSDP*=9999 if invalid missing

d. Construct DFS. Respondents were not asked for the DFS with debut partners, so a proxy is constructed using current age *(age)* and age at sexual debut *(debutage)*.

i. *DFSDP* = ((*Age-debutage*)*365)

ii. *DFSDP* = 0 if *age=debutage*

iii. *DFSDP* = 9997 if "don't know" *debutage*

iv. *DFSDP* = 9998 if never had sex or DP=S1

v. *DFSDP* = 9999 if invalidly missing or *debutage>age*

IV. Other Partners (P1-P5)

For P1 through P5

a. Construct a Dummy Variable for Active Status. Coding structure:

i. *ActivePX* (where X=1-5)=1 if the respondent said the partnership was "still continuing"

ii. *ActivePX* (where X=1-5)=0 if the respondent indicated partnership had ended

iii. *ActivePX* (where X=1-5)=998 if *hadsex=0* or did not report PX

iv. *ActivePX* (where X=1-5)=999 if invalid missing

b. Construct DLS. Respondents were not directly asked for the date of last sex with P1-P5, but the name generator constrains DLS to the last six months. DLS is constructed from: coital frequency in last 4 weeks with Partner X *(PX_1mofreq)* or date that the relationship ended *(PXend;* stored in one of two variables- PXend_Mo or PXend_D-measured in months or days, respectively*).* Coding as follows:

i. *DLSPX* (where X=1-5)=9991, "within last 28 days" if partnership is active and *PX_1mofreq* gt 0 and lt 998.

ii. *DLSPX* (where X=1-5)=9990, "within last 183 days" if partnership active but *PX_1mofreq* eq 0.

iii. *DLSPX* (where X=1-5)=*PXend_Mo**30.41 if partnership inactive and end date measured in months

iv. *DLSPX* (where X=1-5)=*PXend_D* if partnership inactive and end date measured in days
v. *DLSPX* (where X=1-5)=9998, valid skip, if *hadsex*=0 or *hadpX*=0
vi. *DLSPX* (where X=1-5)=9999, invalid missing, otherwise

c. Compute DFS. All respondents were asked for DFS with P1-P5, but the dates are stored in three different variables with different time unit measurements: *PXdfs, PXdfs_Mo* and *PXdfs_D.* DFS is stored in *PXdfs* alone if DFS was > 1 year ago or 1 day or less ago, otherwise it's stored in *PXdfs* plus one of two variables- *PXdfs_Mo* or *PXdfs_D* for time measured in months or days, respectively. Coding as follows:
    i. *DFSPX* (where X=1-5) = 366 if *PXDFS* > 1 yr ago
    ii. *DFSPX* (where X=1-5) = *PXDFS_M**30.41 where PXdfs measured in months
    iii. *DFSPX* (where X=1-5) = *PXDFS_D* where PXdfs measured in days
    iv. *DFSPX* (where X=1-5) =1 if *PXDFS* = 1 day ago or less
    v. *DFSPX* (where X=1-5) =9997, if respondent didn't know the DFS
    vi. *DFSPX* (where X=1-5) =9998, valid skip, if *hadsex* = 0 or *hadpX*=0
    vii. *DFSPX* (where X=1-5) =9999, invalid missing, otherwise

d. The questionnaire structure for partners 1-5 permitted some recapturing of missing data. If a respondent reported partnerX and two of the following variables: *PXdur PXDFS PXDLS,* missing value for the third could be recovered. For example, if *hadp1*=1, *DFSP1*=91, *P1Ddur*=30, and *DLSPX*=missing, the value for *DLSPX* was computed by (*DFSP1-P1dur*) and the missing value recoded. All cases with recoded missing values were flagged to examine the impact of these imputations on the concurrency analyses.

APPENDIX 2: SYNTAX FOR ESTIMATING CUMULATIVE CONCURRENCY IN ASEMBO

In Asembo there were 45 possible partner pairs that were classified into four pair types: Spouse and Debut Partner (SXDP), Spouse and Other Partner (SXPX), Debut Partner and Other Partner (DPPX), and Other Partner and Other Partner (PXPY). Table 1 describes the syntax for identifying concurrency in the year prior to interview between partner pairs in each of the four partner pair types.

Table 1. Syntax for Determining Concurrency Between Partner Pair Types*

Pair Type	Assumptions	Concurrent If	Not Concurrent If	Unclassified if
SXDP	DP preceded SX	StartSX=StartDP and DPdur > 364 EndSX=0 and EndDP=0	EndDP-StartSX > 364	EndDP=StartSX and DPdur < 365 EndDP-StartSX < 365 EndDP>StartDP ≥2 missing values for SX or DP
SXPX		SXdur > 364 and EndPX < 365 EndSX=0 and EndPX=0		StartSX=0 or DurSX<365 EndPX>StartPX ≥2 missing values for SX or PX

DPPX	DP preceded PX	EndDP=0 and StartPX=valid value EndDP=0 and EndPX=0	EndDP-StartPX > 365	(StartPX=366+ and (EndPX=0 or EndPX=msg or DurPX=msg)) EndDP-StartPX ≤ 365 EndDP>StartDP; EndPX>StartPX ≥2 missing values for DP or PX
PXPY		*If PX more recent than PY:* EndPY-StartPX < 1 *If PY more recent than PX:* EndPX-StartPY < 1 *Regardless of order*: StartPX=StartPY and (DurPX or DurPY gt 29) EndPX=0 and EndPY=0	*If PX more recent than PY*: EndPY-StartPX > 29 *If PY more recent than PX:* EndPX-StartPY > 29	*If PX more recent than PY*: 0 < EndPY-StartPX < 30 *If PY more recent than PX:* 0 < EndPX-StartPY < 30 *Regardless of order*: StartPX=EndPY; StartPY=EndPX Start=End and Dur > 29 Start-End=Dur±29 EndPX>StartPX; EndPY>StartPY ≥2 missing values for PX or PY

*Start=DFS, End=DLS (0 if partnership is active), Dur=Duration of partnership. Time is measured in days, relative to DOI.

APPENDIX 3: SCRIPT FOR ORAL INFORMATION STATEMENT AT *BARAZA* (ENGLISH VERSION)

INFORMATION STATEMENT SCRIPT FOR CONSENT TO PARTICIPATE IN *BARAZA*

Study title: Know Your Network — Youth Adaptation

Baraza Facilitator: Please read the following script to participants verbatim. Instructions to you are in bold font, like this sentence.

1. Introduce yourself and the research team:

Hello. My name is: _____ and I am from _____. We thank you for finding time to come. We would like to inform you that today's baraza is part of a research study. I need your consent to participate in the research. I will explain it to you first. After I have finished reading this statement, there will be time for you to ask questions. When I have answered your questions, you can decide if you want to participate or not. If you do not want to participate, you may leave now or at any time during the meeting.

The purpose of the study is to get community feedback about how we can make changes to the *Know Your Network* intervention to make it youth-friendly. Know Your Network is an educational intervention we have developed to explain how HIV transmission in the community is affected by concurrent sexual partnerships or concurrency. Concurrency is when a person starts a new sexual partnership before ending the previous partnership, so both partnerships are going on during the same time.

2. Explain what will happen during the *baraza*:

If you agree to participate, this is what participants will do today:

- Listen to a short presentation about what we have learned about Luo youth's beliefs and sexual behavior. We gathered this information from research papers published in scientific magazines. We also studied data from a survey that KEMRI conducted in two Luo villages.
- Participate in a group discussion about how the results in the papers and the survey compare with what you see and hear about youth behavior in this region
- Listen to some of our preliminary ideas about how to change the intervention to make it more appropriate and relevant for youth
- Participate in a group discussion about the ideas and tell us your opinion of them
- Provide any advice you would like to give to help us make the intervention useful to the youth in your community and other similar villages

This baraza will take about 3 hours.

3. Explain that participation is voluntary, and they may leave now, or at any time during the baraza, with transport fees provided.

Your participation in this research is voluntary. You can decide whether or not you want to take part, or you can decide to leave any time during the course of the research activities. We will provide transport reimbursement whether or not you decide to participate.

4. Explain how we will use the information we collect today.

Once we have your permission, we will begin recording this session with an audio recorder, a machine that captures sound. The machine does not take pictures or videos. We are recording the conversation so that we can review it more than once, if necessary. There will also be an assistant here from Dr. Kawango's research staff, who will take notes about the general ideas discussed by the group. After the meeting, an assistant will listen to the audio recording and write it out in DhoLuo. The writing will be translated into English and typed in a word processing program so the researchers can review it and make notes about what you have told us. The researchers will use this information to plan the next steps in the study, which are to make changes to the intervention according to your advice, and then to gather some small groups of youth to ask them their opinion about the new intervention.

It is possible that we will use the information collected today to guide future studies, too. The information will be used to write a report for a scientific magazine, so that other researchers can learn about what we are doing and how this study turned out. No names or identifying information about participants will be included in the reports.

5. Explain what will happen to the data, and how privacy will be protected.

The recording of this meeting and the hand-written transcription of it will be stored in a locked cabinet at Dr. Kawango's research office. Only research staff will have access to it. The recording and the written version of it will be destroyed 12 months after the meeting. However, the electronic file will be kept indefinitely. None of the files will have your name on it. Your privacy is very important to us, so we will keep the electronic files on a computer that has a password that only the researchers know.

Ask if anyone has any questions.

Do you have any questions about the discussion group or the research? ***[*Study staff to answer all questions*]***

Is there anything else you would like to ask before we get started?

Give Contact Information

Anyone may contact the research team with questions or concerns. You may reach Dr. Agot at (best number) or you may also call the Kenya Medical Research Institute Ethics Review Committee Secretary at (best number).

State again that anyone who does not wish to participate may leave at this time.

We will begin the baraza now. If you do not wish to participate you may choose to leave now or at anytime during the group discussion.

Name of researcher providing Information Statement: ……

Date: ……

Sub location: ……

Village: ……

APPENDIX 4: PARENTAL CONSENT FORM FOR CHILD'S PARTICIPATION IN FOCUS GROUP DISCUSSION (ENGLISH VERSION)

IMPACT RESEARCH AND DEVELOPMENT ORGANISATION and UNIVERSITY OF WASHINGTON

KNOW YOUR NETWORK-YOUTH ADAPTATION STUDY

PERMISSION FOR CHILD TO PARTICIPATE IN FOCUS GROUP DISCUSSION

Investigators:

Dr. Kawango Agot, Executive Director, Impact Research and Development Organization, Kisumu, Kenya +2542020132

Dr. Martina Morris, Professor of Sociology and Statistics, University of Washington, Seattle, WA, +0012066853402

Dr. Elaine Thompson, Professor of Nursing, University of Washington, Seattle, WA, +0012062216635

Ms. Amy Knopf, PhD Candidate, University of Washington, Seattle, WA, +0012063569430

Researcher's statement

We are asking your child to be in a research study. The purpose of this consent form is to give you the information you will need to help you decide whether your child can be in the study or not. Please read the form carefully. You may ask questions about the purpose of the research, what we would ask your child to do, the possible risks and benefits, your child's rights as a volunteer, and anything else about the research or this form that is not clear. When we have answered all your questions, you can decide if you want your child to be in the study or not. This process is called "informed consent." We will give you a copy of this form for your records.

PURPOSE

We want to do a research study. There are high rates of HIV in Nyanza Province. We think that one way that so many people get infected is by having more than one sexual partner at a time. Adults in this village thought it was important to talk to youth about how overlapping sexual partnerships can create connections between people that make it easy for HIV to spread. We have developed an educational program to help explain this to young people. We are looking for youth ages 13-17 from this village that are willing to hear about the program and give us their opinion about it.

PROCEDURES

If you agree, we will ask your child to join a discussion group. During the discussion, we will ask your child to participate in a demonstration of our educational program. After the demonstration, we will ask you for your child's opinions about the program. For example, we will want to know if your child thinks it makes sense, and whether your child thinks it would be meaningful to other people his or her age. In addition to asking questions that help us understand your child's opinion of the program, and we will ask for your child's suggestions about how to make it more youth-friendly. We will not ask your child to talk about his or her own sexual partnerships or behavior. The discussion will take between 1.5 and 2 hours.

RISKS, STRESS, AND DISCOMFORT

It could be embarrassing or upsetting to talk about sexual partnerships and HIV, even when your child is not talking about his or her own behavior. Your child does not need to answer any question that he or she does not want to answer. Your child is free to leave the discussion at any time, for any reason. Your child's transportation will reimbursed even if he or she decides to leave the discussion before it is over.

BENEFITS

There is no direct benefit to your child. However, by participating you will help us make our program better. After it has been improved using your opinions and feedback, we will test the program in another village to see if it helps prevent HIV infection.

OTHER INFORMATION

The discussion will be audio-recorded by a machine that records sounds but not pictures or video. After the meeting, someone will listen to the tape and write down everything that was said. Then he or she will type it into a word-processing program to make an electronic file, so the researchers can use the information to improve the educational program. We want to protect your child's privacy. Instead of using your child's name, we will give him or her a number and we will use the number to call on your child when he or she wants to answer a question or give an opinion. That way, your child's name will not be recorded in the tape. The tape and the hand-written transcript will be kept in a locked cabinet in the research office for 12 months from the date of the discussion. After 12 months, the tape and the hand-written transcript will be destroyed. We will keep the electronic copy of the transcribed recording indefinitely, because it might help us with future studies. The electronic file will be stored on a computer that is password protected. We may use the information your child gives us to write a paper for a scientific magazine, so that other researchers can learn about this study and how it turned out. We won't tell anyone your child took part in this study. Your child doesn't have to take part in this study if you don't want him or her to do so. Even if you give permission for the child to

participate, he or she may decide not to do so. If your child decides to participate and changes his or her mind during the discussion, he or she is free to leave.

_____ _____

Signature of researcher Date

_____

Printed name of researcher

Participant's statement:

This research study has been explained to me. I agree to allow my child to take part in this study. I have had a chance to ask questions. If I have more questions, I can ask the study staff.

_____ _____

Signature of parent (*If the participant is unable to read and sign this consent form, please have witness sign the witness statement, below*) Date

_____

Printed name of parent

_____

Printed name of child

Witness statement:

This consent form was read aloud in its entirety to the participant. By my signature below, I indicate that the participant has agreed to allow his/her child to take part in the research study. The study has been explained to him/her, and he/she has had time to ask questions.

_____ _____

Signature of witness Date

_____

Printed name of witness

_____

Relationship of witness to participant (*Important note: members of the research team are not allowed to serve as witnesses to consent)*

APPENDIX 5: YOUTH ASSENT FORM FOR PARTICIPATION IN FOCUS GROUP DISCUSSION (ENGLISH VERSION)

IMPACT RESEARCH AND DEVELOPMENT ORGANISATION and UNIVERSITY OF WASHINGTON

KNOW YOUR NETWORK-YOUTH ADAPTATION STUDY

FOCUS GROUP DISCUSSION ASSENT FORM

Investigators:

Dr. Kawango Agot, Executive Director, Impact Research and Development Organization, Kisumu, Kenya +2542020132

Dr. Martina Morris, Professor of Sociology and Statistics, University of Washington, Seattle, WA, +0012066853402

Dr. Elaine Thompson, Professor of Nursing, University of Washington, Seattle, WA, +0012062216635

Ms. Amy Knopf, PhD Candidate, University of Washington, Seattle, WA, +0012063569430

Researcher's statement

We are asking you to be in a research study. The purpose of this consent form is to give you the information you will need to help you decide whether to be in the study or not. Please read the form carefully. You may ask questions about the purpose of the research, what we would ask you to do, the possible risks and benefits, your rights as a volunteer, and anything else about the research or this form that is not clear. When we have answered all your questions, you can decide if you want to be in the study or not. This process is called “informed consent.” We will give you a copy of this form for your records.

PURPOSE

We want to do a research study. There are high rates of HIV in Nyanza Province. We think that one way that so many people get infected is by having more than one sexual partner at a time. Adults in this village thought it was important to talk to youth about how overlapping sexual partnerships can create connections between people that make it easy for HIV to spread. We

have developed an educational program to help explain this to young people like you. We are looking for youth ages 13-17 from this village that are willing to hear about the program and give us their opinion about it.

PROCEDURES

If you agree, we will ask you to join a discussion group. During the discussion, we will ask you to participate in a demonstration of our educational program. After the demonstration, we will ask you for your opinions about the program. For example, we will want to know if you think it makes sense, and whether you think it would be meaningful to other people your age. In addition to asking questions that help us understand your opinion of the program, and we will ask for your suggestions about how to make it more youth-friendly. We will not ask you to talk about your own sexual partnerships or your own behavior. The discussion will take between 1.5 and 2 hours.

RISKS, STRESS, AND DISCOMFORT

It could be embarrassing or upsetting to talk about sexual partnerships and HIV, even when you are not talking about your own behavior. You do not need to answer any question that you do not want to answer. You are free to leave the discussion at any time, for any reason. Your transportation will reimbursed even if you decide to leave the discussion before it is over.

BENEFITS

There is no direct benefit to you. However, by participating you will help us make our program better. After it has been improved using your opinions and feedback, we will test the program in another village to see if it helps prevent HIV infection.

OTHER INFORMATION

The discussion will be audio-recorded by a machine that records sounds but not pictures or video. After the meeting, someone will listen to the tape and write down everything that was said. Then he or she will transcribe the hand-written copy into a word-processing program to make an electronic file so the researchers can use the information to improve the educational program. We want to protect your privacy. Instead of using your name, we will give you a number and we will use the number to call on you when you want to answer a question or give your opinion. That way, your name will not be recorded in the tape. The tape and the hand-written version of the recording will be kept in a locked cabinet in the research office. Both files will be destroyed 12 months from the date of the discussion. We will keep the electronic copy of the transcribed recording indefinitely, because it might help us with future studies. The electronic file will be stored on a computer that is password protected. We may use the information you give us to write a paper for a scientific magazine, so that other researchers can learn about this study and how it turned out. We won't tell anyone you took part in this study. You don't have to take part in this study if you don't want to. If you decide to participate and change your mind during the discussion, you are free to leave. No one will be mad at you.

_____ _____

Signature of researcher Date

_____

Printed name of researcher

Participant's statement:

This research study has been explained to me. I agree to take part in this study. I have had a chance to ask questions. If I have more questions, I can ask the study staff.

_____ _____

Signature of participant Date

_____

Printed name of participant

Witness statement:

This consent form was read aloud in its entirety to the participant. By my signature below, I indicate that the participant has agreed to allow his/her child to take part in the research study. The study has been explained to him/her, and he/she has had time to ask questions.

_____ _____

Signature of witness Date

_____

Printed name of witness

_____

Relationship of witness to participant (*Important note: members of the research team are not allowed to serve as witnesses to consent)*

APPENDIX 6: *BARAZA* DISCUSSION GUIDE

Know Your Network Youth Adaptation Baraza Cover Sheet

Date: _____

Baraza Location:_____

Baraza Moderator(s): _____

Baraza Field Note Taker:_____

Number of Participants:_____

Oral Information Statement Read Aloud to Participants: Yes / No

Participants' Verbal Consent Obtained: Yes / No

Length of *Baraza*: _____ hours and _____ minutes

Know Your Network Youth Adaptation Study Baraza Guide

General Notes for the Moderators and Research Assistants

The *baraza* will be convened in a large community setting such as a local church, school, or other community meeting place. Before we depart for the venue, we will ensure that the microphones and audio recording equipment are in working order and we have spare batteries in case there is a loss of power. When we arrive to the venue, we will arrange the chairs in a semi-circle to facilitate discussion. One microphone will be stationed near the moderator and a research assistant will manage the second microphone, passing it to participants who wish to speak. The same research assistant will manage the recording process, and s/he will not begin the recording until after the Information Statement has been read aloud *and* participants have given their verbal consent.

Overview of the Introduction and Consent Process

Before beginning the *Baraza* discussion, we will:

- Welcome participants and introduce ourselves
- Participants will be given respondent ID numbers as they entered the facility. We will use these numbers to call on persons who would like to speak. For example, if respondent #6 raises his hand, we will say something like "Respondent 6 would like to speak now." This will help us maintain the participants' anonymity in the audio recording, and identifying speakers by number will help us determine how different participants' opinions are similar or different.
- Distribute and explain the purpose for the respondent ID numbers (to protect privacy and avoid using names)
- Complete the consent process — read the oral information statement verbatim and obtain verbal confirmation of consent to participate
- Allow anyone who wishes to leave to do so
- Emphasize that we will not be asking about participants' own behavior or their children's behavior. **To ensure privacy we will talk about village youth generally, and <u>not</u> about specific people or events**.

Overview of the Discussion

There are three purposes of the *Baraza* discussion:

1. Review and discuss findings from the analysis of CDC data collected with Luo youth in Asembo and Gem between 2003-2006.
2. Describe the *Know Your Network* intervention and elicit ways that it might be adapted
3. Obtain feedback from participants about the potential adaptations.

Important points to remember during the discussion:

- Summarize or repeat comments/questions so that the entire group can hear what is being said
- Acknowledge each speaker by stating his or her respondent ID number

- Make an effort to call on different groups of people — men, women, younger and older people, parents and educators — so we can hear all perspectives
- After each question in this guide, there are "probes" in italic font *(like this*) — use these to rephrase a question if no one is responding
- Avoid agreeing or disagreeing with participants' opinions — we don't want to give the impression that there is a "right" or "wrong" opinion
- If one participant dominates the discussion, ask him or her to allow someone else to speak
- If a participant's comments are substantially off topic, politely redirect him or her to the question at hand

End of the discussion:

- Allow time for final comments/questions
- Thank participants for taking the time to attend for their contributions to the project
- Give instructions for securing their transport reimbursement

Topic Guide and Questions

Part 1: Introduce the study

1. Describe the *Know Your Network* pilot study, and its relationship to the present study
2. Describe the specific purpose of this research project: To adapt KYN for 13-17 year olds, as village requested
3. Describe the study phases (data collection with community adults, youth focus groups)
4. Provide overview of today's discussion

Part 2: Discuss results of secondary analysis of Gem/Asembo survey data

1. When and where data were collected
2. Key results (illustrated with graphics)

    a. Most Important source of information on sexuality
    b. % of 13-17 year olds who have had sexual intercourse
    c. Total number of sex partners up to now, by age group
    d. Venues where youth are having casual sex
    e. Distribution of HIV in population surveyed

Questions:

1. From your perspective, who or what is the best source of information on sexual health for young people?

    Probes: In other words, whose responsibility is education about sexual health? Where do you think that young people should get this information? Where do you think they get it? If ideal and actual are discrepant, why is this the case? What can be done to ensure that youth get information from the people and places that you think are best? If parents or relatives are mentioned: what is parents' level of comfort talking with their own teenagers about sexuality? What about grandparents and other relatives?

2. How do the survey results compare with your perception of youth sexual behavior?

    Probes: Do these results seem typical or more or less what you would expect if we surveyed youth in this village? Did anything about the results surprise you? Is there anything that seems very different than what you have observed or heard about youth in your village? Have you heard of any other comparable findings or studies?

Part 3: Adapting the KYN Intervention

a. Review each component of the KYN Intervention. Discuss ways in which each might be adapted for youth

1. Interactive exercise
2. Network graphics and Network movie
3. General discussion

b. Mention that we have decided to eliminate the data collection and network simulation because survey data indicate that more than 80% of 13-17 year olds have had either no sexual partners at all or only 1 sexual partner. Therefore, we suspect that the simulated network would look very sparse and the message of the intervention could be lost. Please allow time for participants to respond to this information so that we can hear their opinions about it.

Question:

What additions or modifications should be made to the intervention components?

Probes: How could we make the intervention best fit the needs of village youth?

Part 4: Planning the next phase of the study

Review the plan for phase II:

a. We will convene 5 focus groups with 13-17 year olds to gather their opinions about the adapted version of KYN
b. We will divide the groups by age and sex, so that we have 1 group of 13-14 year old girls, 1 group of 13-14 year old boys, 1 group of 15-17 year old girls, and 1 group of 15-17 year old boys, and then one mixed group.
c. We will seek parent or guardian permission before inviting a teenager to participate in the focus group discussions
d. We will use the information from the focus groups to continue to make changes to the intervention so that it can be used successfully with teens.

Question

1. What places would be best for holding the discussion groups?

   Probes: Where will youth feel most comfortable attending? Might it differ by educational status (i.e. in school youth vs. out of school youth) or age?

2. What type of person would be most suitable for leading the discussion groups?

   Probes: Should we have a younger research assistant lead the discussion, should we match on gender?

Part 5: Closing Remarks

1. Mention that we've asked all our questions, and then ask:
2. Are there any further questions or comments about what we've discussed today?
3. If no additional comments/questions, please thank participants for their time and assistance.

APPENDIX 7: KNOW YOUR NETWORK YOUTH ADAPTATION

FGD GUIDE

To be completed by Field Staff:

FGD Date: _____(D/M/Y)

FGD location:_____

FGD moderator(s): _____

FGD field note taker:_____

Number of participants:_____

Group type (circle all that apply): Females Males

Ages 13-14 Ages 15-17

In School Youth Out of School Youth

Signed parental consent form received from each participant: Yes / No

Oral Information Statement read aloud to participants: Yes / No

Participants' verbal assent obtained: Yes / No

Length of FGD: _____ hours and _____ minutes

Know Your Network Youth Adaptation Study

Topic Guide and Questions

Part 1: Introduce the study

Describe the purpose of this research project in lay terms, including these points:

- Researchers have developed an HIV prevention program, called Know Your Network (KYN), which is about how different types of sexual partnerships can influence the spread of HIV.
- Adults have participated in this program, but youth have not. Adults in this community recommended the program be modified for youth.
- The research team would like to know what young people think of the program.
- We have invited you here to see this program, and tell us what you think about it.
- Your opinions will help the researchers decide how to adapt the program before it is used with young people like you.

Provide a brief overview of today's discussion in lay terms, including:

- First, we will show the HIV prevention program — KYN — which has three main parts.
- Then we will ask you to discuss what you think about the KYN program overall.
- Next, we will ask for your assessment of each part of the KYN program, and for your suggestions for program modifications or improvements.
- Lastly, we will ask for your thoughts on what resources or information youth your age need to know how to protect themselves from HIV.

Part 2: Demonstrate each element of the Know Your Network intervention

- Interactive exercises — this involves 10 people holding hands to demonstrate how HIV travels in a community when people have sequential partners compared to when they have concurrent partners.
- Network graphics — four graphs show how the connections between people in a community change with the proportion of people in the population who have concurrent partnerships. That is, more people are connected together in a network as concurrency increases, and fewer are connected when concurrency decreases.
- Animated network graphics — this four-minute animation uses lines and dots to represent partnerships (lines) between people (dots), and shows how HIV can spread through a population as partnerships begin and end.

Part 3: Discussion

1. Broad questions about the KYN program
    a. What do you think about the KYN program?

        Probes: Does the program make sense to you? Is it interesting? If so, what is

interesting about it? If not, why wasn't it interesting?

b. What do you think other youth your age would say about the KYN program?

Probes: Do you think they would find it meaningful to their lives? Why or why not?

c. What did you like about KYN?

Probes: Was there anything about the program that was appealing? If so, what?
*[**Moderator:** if the youth do not like anything about KYN please move on to next question]*

d. What did you not like about KYN?

Probes: Is there anything that you did not find appealing? Anything that was not helpful?

e. Imagine telling a good friend about KYN. What would you say is the main idea of the program?

Probes: In other words, how would you explain the message you got from this program?
For instance complete this statement: "Today I attended a program that was about …
***[Moderator**, ask youth to complete the sentence]*

2. Questions about the KYN components

Okay, let's look at the three parts of the program, beginning with the hand holding exercise….

a. In your opinion, what was the main point of that exercise? (The one where we held hands first in a line, and then in a circle)?

Probes: What did you think was happening during that exercise?

*[**Moderator**, if youth have trouble answering, give them hints, such as — 'It showed the difference between different kinds of partnerships…']*

b. If this were your program, what would you do differently in the hand holding exercise to convey the same message?

Probes: Imagine that you wanted your friends to understand the difference between sequential partnerships and concurrent partnerships — can you think of ways to show them the idea?

c. Let's look at the network graphs again. What do the graphs tell you?

Probes: What is the difference between the first picture and the last one? Tell me what you think other youth your age would learn from these graphs. Would most youth understand them? Why or why not?

d. What would you change about the graphs to make them more understandable?

Probes: Would you do something differently to make the same point? Would you use these graphs to help youth your age understand how different levels of concurrency make a network more or less connected?

e. What did you learn from the movie that we showed?

Probes: Describe what was happening in the movie. When all the partnerships were collapsed into 'branches' at the end of the movie, what was the difference between the blue branches and the red branches?

f. What changes would you make to the movie?

Probes: Is there anything that could make it more useful? More interesting? Would you use this movie to help other youth your age see what happens as HIV moves through a community or network over time? Tell me why you would want to use this movie or why you would not use the movie. If you were going to use it, is there anything you would change? If you would not use it, what would you do differently to make the same point?

3. Discussion about other HIV prevention approaches

Probes: Do you think youth are concerned about becoming infected with HIV? Why or why not? How do you know that they are concerned (e.g. do they talk about it)?

a. From your experience, what do teenagers want to know about preventing HIV infection?

Probes: Do teenagers have questions about how to protect themselves from HIV? If so, what sort of questions might they have? If not, do you think they have the type of information that they need? Do they have sufficient information? Tell me more about [based on reply]…

b. Where do teenagers get their information about HIV *prevention*?

Probes: If a teenager in this area wanted to know about how to avoid becoming infected with HIV, where would he/she look for this information? Is there someone in particular that he/she would talk to? Someplace that he/she would go?

c. Where would teenagers prefer to get information about HIV prevention?

Probes: In other words, we talked about how youth get information from

*[**moderator,** restate the sources from previous question]. Is there somewhere else they might prefer to get information, if they had the choice?*

d. If you were trying to help youth protect themselves from HIV infection, what would you do?

Probes: In other words, how would you go about helping other youth learn about preventing HIV infection? What sort of program or resources would you design?

4. Wrap up discussion

Moderator: mention that we are nearing the end of our discussion, but want to take any final comments, then ask:

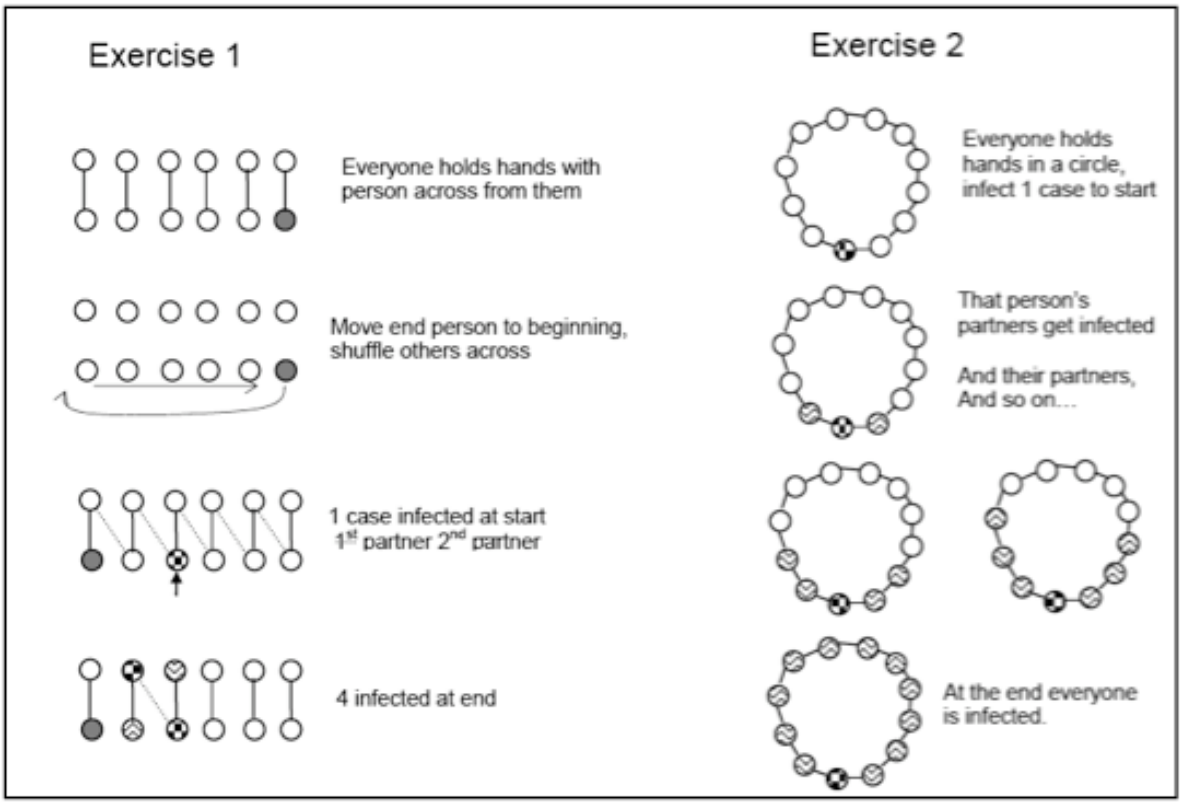
a. What else would you like to add to our discussion today?

Probes: Is there anything else you think we should know about helping youths your age? Something we have not talked about today?

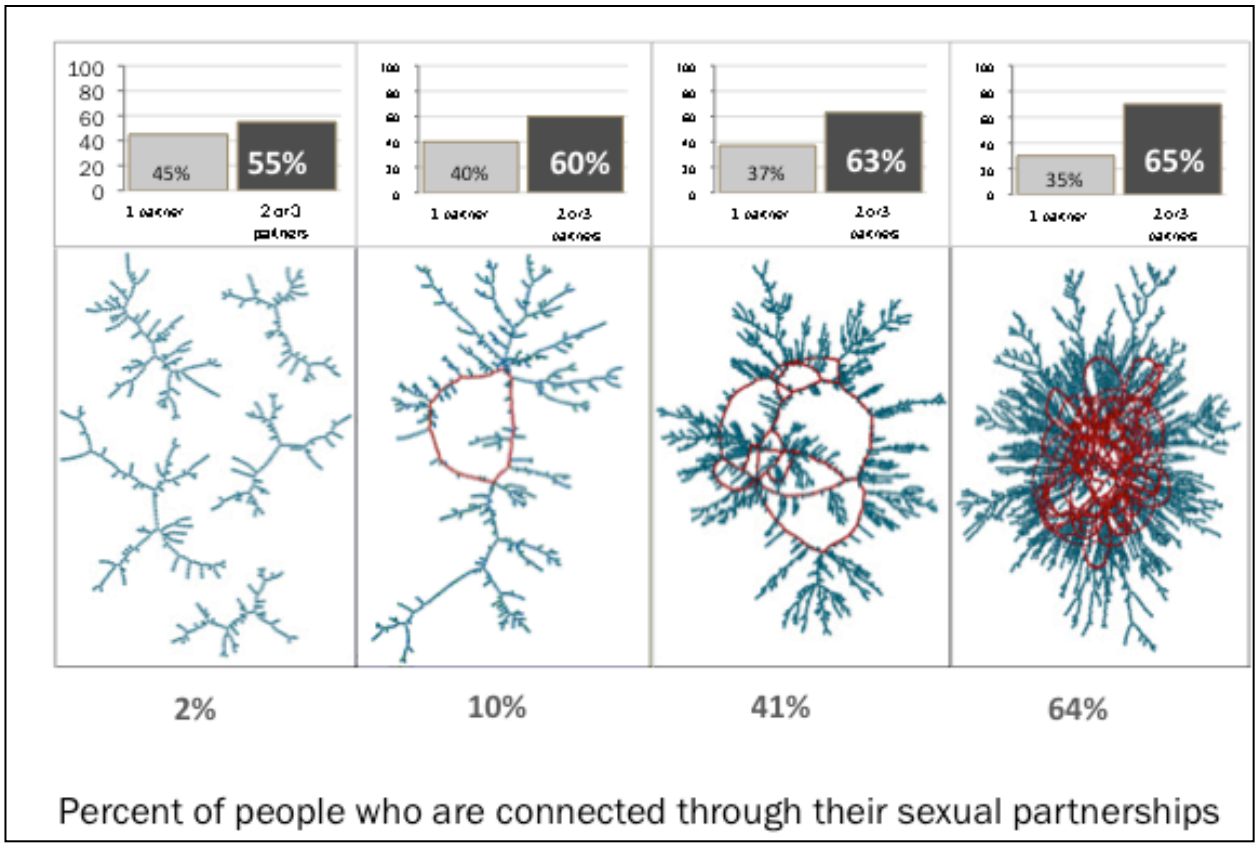
Moderator: thank participants for their time and tell them how to obtain their transport reimbursements.

APPENDIX 8: MODERATORS' ABBREVIATED GUIDE TO KYN

Part 1, Interactive Exercise: Take 10 volunteers from audience to perform exercises in figure below.



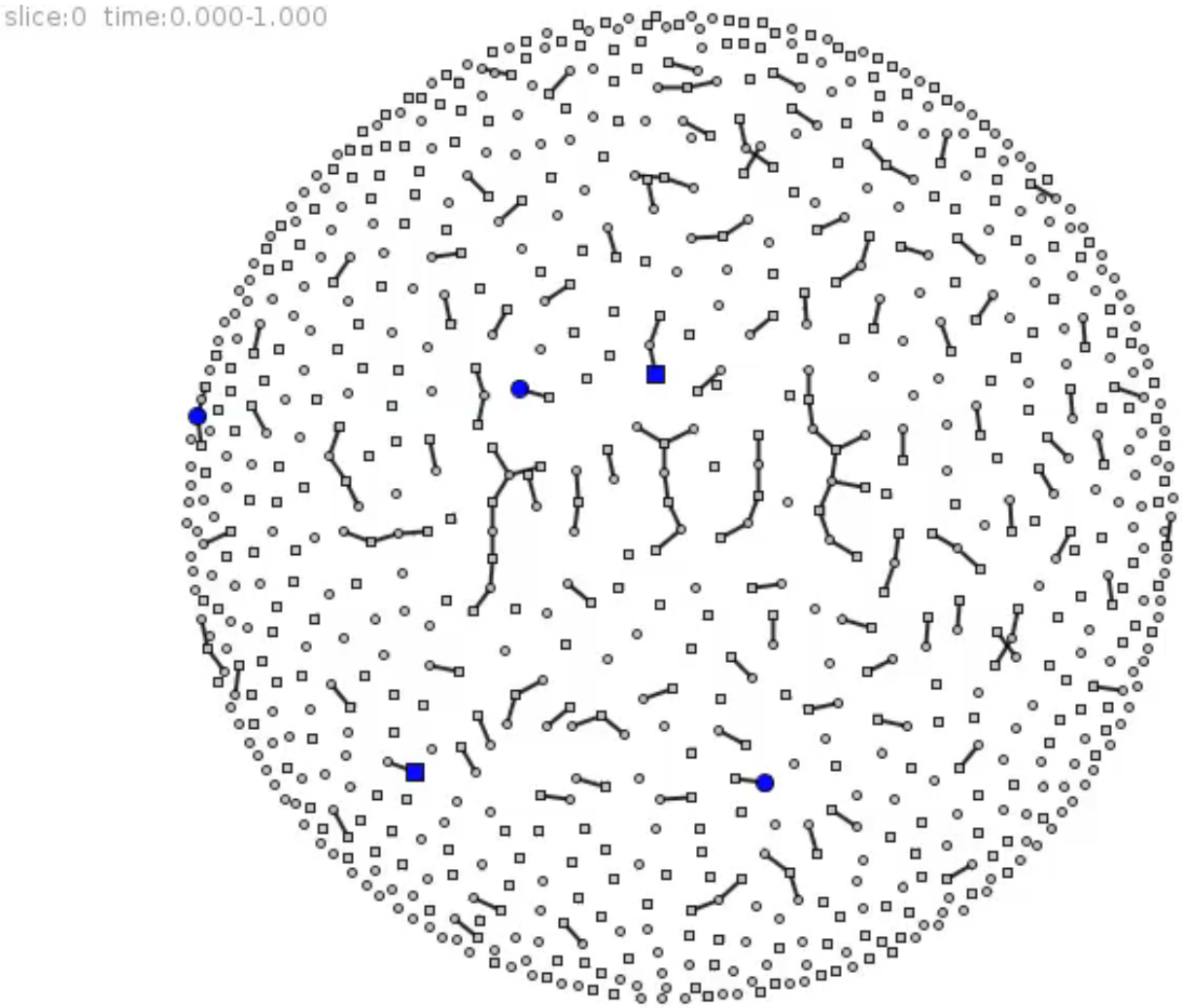
Part 2, Discussion of 4-panel graphic



Explanation of 4-panel graphic: This figure shows how concurrency can lead to very high levels of connectivity in a cross-sectional slice of a partnership network, even if no one has more than three partners, and the vast majority (80-90%) have only one or two. Moving across the panels from left to right shows how a small increase in the number of concurrent partners (the distribution is shown in the histogram on top) can have threshold impacts on network connectivity. Here, a small 0.02 difference in the mean number of current partners (from 1.68 to 1.87) leads to a massive increase in network connectivity, with the proportion of the population in the largest connected component rising from 2% to over 60%. The connectivity in the dynamic versions of these networks would be even higher, as partnerships form and dissolve, linking new groups together. **But by the same token, moving across the panels from right to left shows how little change would be required to disconnect the network: if 10-15% of those with concurrent partners would drop back to one partner at a time, network connectivity would be reduced dramatically.**

Part 3: Show network movie

Movie file:



Movie Script:

We are going to see how a network becomes connected over time. In this "network movie" we follow the population forward for 10 years, allowing the partnerships to start and end. This allows us to see how people become exposed to infection through the network, and the role that concurrency plays in creating the reachable path for infection.

We start with 5 persons infected (the 5 big blue nodes at the start). Some of these first infections are women (the circles) and some are men (the square nodes). The infection can spread from these first seeds across active partnership links. The network we use for this

simulation has 10,000 persons, so it is quite large. But the movie focuses on the people who get exposed to infection (about 600).

The partnerships here have 3 colors:

- Black link (all are black to start) -- this is a currently active partnership, but not in the path of infection
- Red link -- a concurrent partnership in the path of infection (bright red means it is still active, light red means it has ended)
- Blue link -- a monogamous partnership in the path of infection (bright blue means it is still active, light blue means it has ended)

When a person is exposed to infection they turn either red or blue.

- Red node means they were exposed by a concurrent partnership,
- Blue node means they were exposed by a monogamous partnership.

So what you are seeing is the growth of the reachable path from each intially infected person, through the set of partnerships that occur over the next 10 years.

At the end of 10 years, you can see all of the people who have become exposed to infection, and as we move the diagram to a different position (the trees), you can see at the top of each path the originally infected person, and then each "generation" of infection below them: the partners they exposed, the people their partners exposed, etc.

What you see here is that, even though concurrency is not that common on any particular day, these concurrent partnerships still play the key role in spreading infection. At the end of 10 years, 85% of persons in the path of infection were put at risk by a concurrent partnership, compared to only 15% who were exposed through a mutually monogamous partnership.

Keep in mind that a person does not have to practice concurrency themselves to be put at risk by it. If their partner has concurrent partners, then it's their partners concurrency that puts them at risk.

APPENDIX 9: BARAZA CODING SCHEME

The aims of the baraza with North Nyamware adults were to:

1. Learn how adults' perceptions of village youths' behavior compares with findings from Asembo
2. Elicit suggestions for intervention adaptation
3. Gather adults' opinions about where and how youths should obtain HIV prevention information
4. Seek advice about some of the logistical aspects of the FGD with youth, specifically:
    a. Where they should be held
    b. Who should moderate
    c. How we should stratify the groups

With these research questions in mind, the following coding scheme can help us sort the data into meaningful segments of text:

Perceptions of Youth Sexual Behavior			
Code	**Code Definition**	**Related Questions from Baraza Guide**	**Use when**
SvyComp	Comparison of Nyamware youth to those surveyed in Asembo	How do you think these survey results compare with your perception of youth sexual behavior in this region. What do you think are the similarities or the differences with your perception of youth sexual behavior in this place? Are there any areas that are shocking to you or do you think they are similar or different with what we see in north Nyamware? Is there anyone that was surprised by these results or has a different opinion? .Have you heard of any other comparable studies to the one we have shown you on Asembo or this is the first time you have heard of such findings or studies?	Respondent is describing how s/he thinks North Nyamware youths' behaviors or infectious disease prevalence compares to Asembo youths'
OutHand	Out of hand	N/A	Respondent expresses exasperation over youths' behavior, describes parental inability to control youths' behavior, indicates helplessness or hopelessness over youths' behavior
Past2Pres	Comparing the past to the present	N/A	Respondent discusses how today's youths/families differ from those of the past
Way4wd	"The Way Forward"	What do you think we can do to ensure that the youth get this information from the best source? What services or on what areas do you think young people need counseling?	Respondent offers suggestions (prompted or unprompted) for the way forward, the way out, or the way to handle HIV spread
RiskEnv	Risk environments for youth	My question is, where exactly are the youths in your region getting information on sexuality?	Respondent is describing a high risk environment: e.g. a place where people are "morally loose," a place where transactional or intergenerational sex occurs

TransSex	Transactional Sex		Respondent is specifically referring to sexual intercourse that involves some sort of exchange of goods/services
Feedback about KYN Intervention			
IE_adapt	Suggested adaptations/changes to the interactive exercise	From all the components we've seen i.e. hand held exercises, the graph presentation and this sexual network movie, what do you think we can add so that youths of 13-17 can [adapt it]? Any different opinion? What do you think we can add to the 1st exercise so that it can be adapted by 13-17 yrs old	Respondent suggests changes/ways to improve the interactive exercise
IE_retain	Keep the interactive exercise as it is	From all the components we've seen i.e. hand held exercises, the graph presentation and this sexual network movie, what do you think we can add so that youths of 13-17 can [adapt it]? Any different opinion? What do you think we can add to the 1st exercise so that it can be adapted by 13-17 yrs old	Respondent indicates the interactive exercise should be left as it is w/o making any changes
4p_adapt	Suggested adaptations/changes to the 4-panel graphic	From all the components we've seen i.e. hand held exercises, the graph presentation and this sexual network movie, what do you think we can add so that youths of 13 -17 can [adapt it]?	Respondent suggests things that should be changed about the 4-panel graphic ("graphs") to make it easier for youth to understand or to make it more interesting
4p_retain	Keep the 4-panel graphic as it is	From all the components we've seen i.e. hand held exercises, the graph presentation and this sexual network movie, what do you think we can add so that youths of 13-17 can [adapt it]? What modifications do you think can be made on the graph to suit 13-17 years olds.	Respondent indicates the graphs should be retained exactly as they are
Mov_adapt	Suggested adaptations/changes to the movie	From all the components we've seen i.e. hand held exercises, the graph presentation and this sexual network movie, what do you think we can add so that	RESpondent suggests changes or improvements to movie

		youths of 13-17 can [adapt it]? Okay let's move to the movie. What modifications do you think could be made to it?	
Mov_retain	Keep the movie as it is	From all the components we've seen i.e. hand held exercises, the graph presentation and this sexual network movie, what do you think we can add so that youths of 13-17 can [adapt it]? Okay let's move to the movie. What modifications do you think could be made to it?	Respondent indicates that movie is fine/good the way it is
Sources of Information on Sexuality and HIV/AIDS			
Csourc	Current sources of information on sexuality and HIV/AIDS	My question is, where exactly are the youths in your region getting information on sexuality? We said parents can give the information but where do they get the information? We have asked about where they should be getting this information but my second question is about where they actually get the information	Respondent is describing where youth *currently do* learn about sexuality and/or HIV
Psourc	Preferred sources of information on sexuality and HIV/AIDS	In your opinion or from your perspective, who or what is the best source of information on sexual health for young people? What do you think we can do to ensure that the youth get this information from the best source. Is there anyone with a different opinion or who thinks that it's not a parent who should give this information?	Respondent is describing shwere youth *should* learn about sexuality and/or HIV
Parents	Parent-child communication about sexuality and HIV/AIDS	What do you think is the parents' level of comfort talking with their own children about sexuality? What do you think we can do to ensure that the youth get this information from the best source.	

Advice for convening FGDs			
Locate	Best locations for FGDs	Where do you think would be the best places to hold these FGDs for the youths?	When respondent is suggesting a place where FGDs should be convened
Mod	Best person / characteristics of person who should moderate the FGDs	The question is what type of person do you think would be most suitable for leading these discussion groups	When respondent is describing what type of person should moderate the discussion
Strat	FGD stratification plan	Do you think it might differ for youths that are school going and those out of school?	When respondent is describing how the youth FGD should be stratified (i.e. separate the out of school youths from in school youths)

APPENDIX 10: FGD CODING GUIDE

Major goals of KYNYA Focus Group Discussions:

1. Determine whether KYN is **feasible** and **acceptable** for use with adolescent population.
    a. Feasibility issues:
        i. Willingness to assent to participate
        ii. Willingness to participate in interactive exercise
        iii. Ability to understand intervention components and key message
    b. Acceptability defined as:
        i. Do participants find the intervention interesting and/or meaningful?
        ii. Would participants recommend using KYN with other youths their age?
        iii. Are there elements of KYN participants like? If so, what, specifically, do they like?
2. Understand youth's HIV prevention needs more broadly, including:
    a. Perceptions of concern about HIV among youth
    b. Current sources of HIV information, if any
    c. Preferred sources of HIV information
    d. Perceptions of information youth need
    e. Ideas about how informational needs could/should be met

These goals suggest the following coding structure can help us organize the data into meaningful segments of text.

If other themes arise, we can add to this list.

Theme: Feasibility			
Code	**Code definition**	**Related Questions from FGD Guide**	**Use When**
FeasKYN	Feasibility of KYN as a whole	Does the KYN program make sense to you? Would it make sense to other youths your age? Imagine telling a friend about KYN, what would you say is the main message?	Participant is referring to the KYN program as a whole, as opposed to specific intervention components
FeasIE	Feasibility of the interactive exercise	Questions the moderator asks during the interactive exercise, e.g. "How many people are at risk now?" or "What is the difference between this part of the exercise and the previous part where we stood in lines?" Think about the exercise. What was the main point, in your opinion?	Participant is: ▪ Answering moderator questions during IE ▪ Referring specifically to IE when the moderator is asking about what they understood from it
FeasGr	Feasibility of the 4-panel graphic	What is the difference in the first panel/graph and the last panel/graph? What do the graphs tell you? Would most youth understand this graph? What would you do differently to communicate the same message? What would you change about this graph?	Participant is ▪ Answering moderator questions that indicate understanding/not understanding the 4-panel graphic ▪ Referring specifically to the graphic when the moderator asks questions later about what they understood from it
FeasMo	Feasibility of the network movie	What did you learn from the movie that we showed? Describe what was happening in the movie. What was the difference between the blue branches and the red branches?	Participant is ▪ Answering moderator questions that indicate understanding/not understanding movie ▪ Referring specifically to the movie when the moderator asks questions later about what they thought about it, or understood from it

Theme: Acceptability			
Code	**Code definition**	**Related Questions from FGD Guide**	**Use When**
AccKYN	Acceptability of KYN as a whole	What do you think other youth would think about this program? Would other youth find it meaningful? Is the program interesting? What did you like about KYN/not like about KYN	Participant is referring to the KYN program as a whole, as opposed to specific intervention components
AccIE	Acceptability of the interactive exercise	Any comments the youth make about liking/not liking the exercise, or finding it interesting/useful	Participant is referring specifically to IE and discussing likes/dislikes, and/or changes s/he might make to it
AccGr	Acceptability of the 4-panel graphic	Would you use this graph to help other youths understand how different levels of concurrency make networks more or less connected? How might you change this graphic to make it more understandable/useful/better	Participant is referring specifically to the 4-panel graphic and discussing likes/dislikes, and/or changes s/he might make to it
AccMo	Acceptability of the network movie	Would you use this movie to help other youths understand how HIV moves through a community over time? Tell me why you would or would not use this movie How might you change this movie to make it more understandable/useful/better	Participant is referring specifically to the movie and discussing likes/dislikes, and/or changes s/he might make to it
Theme: HIV Prevention Needs			
Code	**Code Definition**	**Related Questions from FGD Guide**	**Use When**
Worry	Worry about becoming infected with HIV	Do you think youth are concerned about becoming infected with HIV? How do you know that they are worried about it?	Answering the two related questions
KnowGap	Gaps in youth's knowledge about HIV	In your experience, do youths have questions about HIV?	Answering the related questions, or when asking spontaneous questions about HIV transmission, prevention.

		What do teenagers want to know about HIV? Do youths get sufficient information about HIV?	
InfoSourc	Current sources of information about HIV	Where do youths get information about HIV?	When answering related question
PrefSourc	Preferred sources of information about HIV	Where would youths prefer to get information about HIV? Who should deliver this kind of information? What about parents, relatives, schools/teachers, churches/pastors?	When answering related questions. When making spontaneous suggestions about whom they'd like to hear from/talk to
PrevSugg	Suggestions for youth HIV prevention programming	If you were trying to help youth protect themselves from HIV infection, what would you do? What is the most helpful thing that adults could do to help youths protect themselves?	When answering related questions, or making spontaneous recommendations