

**IMPROVING THE VALIDITY
OF SELF-REPORTED
SEXUAL CONCURRENCY IN
SOUTH AFRICA**



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EXECUTIVE SUMMARY

Background

It has been posited that sexual partner concurrency may help to explain the hyper-epidemics of HIV in sub-Saharan Africa. Concurrency is generally defined as a condition in which an individual has sexual relationships with more than one person which overlap temporally. Definitions of concurrency vary in both time frame and number of partners covered and typically do not consider stable partnerships.

The goal of this study was to develop a brief instrument to measure sexual partner concurrency and related sexual risks for HIV acquisition and transmission within stable partnerships and to test this instrument among heterosexual couples living in Soweto, South Africa. The study also aimed to compare this measure with an instrument based on recent UNAIDS recommendations for measuring concurrency.

Methods

This study had a qualitative and quantitative component and both were conducted in Soweto, South Africa, in control communities for Project Accept (a Phase III Randomized Controlled Trial of Community Mobilization, Mobile Testing, Same-Day Results, and Post-Test Support for HIV in sub-Saharan Africa and Thailand; <http://www.cbvct.med.ucla.edu/>). The qualitative component was conducted in the community of Diepkloof and the quantitative component was conducted in the community of Slovoville. Three stages of qualitative research were conducted which included 10 key informant interviews, 8 couple and 16 individual in-depth interviews and 8 cognitive debriefing interviews. In the quantitative research phase, couples were first interviewed with concurrency measure A, an “indirect” concurrency measure based on UNAIDS recommendations. Then, two weeks later, these couples were interviewed with concurrency measure B, a “direct” concurrency measure grounded within a sexual partnership of the longest duration and that was based on the qualitative phase of this study as well as a review of the literature, previous measures, and UNAIDS recommendations.

Key findings

Qualitatively, we found that the concept of “main” partner is subject to interpretation and that a more objective reference point for measuring concurrency may be “longest” sexual partner. In addition, recall of the date of first sex with a partner was poor. Qualitative interviews suggested that probing participants about the time since last sex (days, weeks or months ago) and duration of relationship was more effective.

Quantitative data (measure A and measure B) were collected from 154 couples. Our results showed that in our study population of young, predominately unmarried heterosexual couples, concurrency was highly prevalent at approximately 43% and was higher among men than women (53% versus 34%). The data also showed that among participants reporting concurrent relationships the majority had two sexual partners in the past 6 months, both of whom were commonly described as “boyfriends” or “girlfriends,” and that these relationships overlapped in time for a year on average. In 42% of couples reporting concurrency, only the man reported concurrency, among 40% of concurrent couples both the

man and woman reported concurrency, and among 17% of concurrent couples only the woman reported concurrency. Programming aimed at reducing HIV risk associated with concurrent partnerships may need to appreciate the permanency and stability inherent in both relationships.

Conclusions and recommendations

This study compared an indirect (measure A) and direct (measure B) method of measuring concurrency. Prevalence and patterns of concurrent behavior estimated by each measure were comparable. The indirect method (measure A) may be more suitable when research requires estimates of the duration of relationships and length of overlap between relationships. The direct method (measure B) may be sufficient and more efficient, however, if the prevalence of concurrency is all that is required.

INTRODUCTION

Defining concurrent sexual partnerships

The concept of sexual partner concurrency as a potentially powerful contributor to the epidemic spread of STIs, especially HIV, was introduced in the 1990s (Watts & May, 1992; Kretzschmar & Morris, 1996; Morris & Kretzschmar, 1997). More recently, it has been posited that this behavior may help to explain the hyper-epidemics of HIV in sub-Saharan Africa (Epstein & Morris, 2011; Mah & Shelton, 2011). Concurrency is generally defined as a condition in which an individual has sexual relationships with more than one person which overlap temporally (Mah & Halperin, 2008). The UNAIDS Reference Group on Estimates, Modelling and Projections: Working Group on Measuring Concurrent Sexual Partnerships recommends that concurrency be defined as “overlapping sexual partnerships in which sexual intercourse with one partner occurs between two acts of intercourse with another partner” (UNAIDS Reference Group, 2010). Concurrency is differentiated from multiple partnerships, which is the total number of partners, and serial partnerships, in which an individual has a sexual relationship with only one partner and there is no overlap between that sexual partner and subsequent sexual partners (Mah & Halperin, 2008).

Measuring concurrent sexual partnerships

A variety of instruments have been developed to measure concurrency, and national questionnaires, such as the Demographic and Health Surveys (DHS), include questions that allow for the measurement or calculation of concurrency. Several studies have also independently assessed concurrency in populations in sub-Saharan Africa and elsewhere. Measures of concurrency vary in several respects. They may ask respondents to report on sexual relationships which have occurred in the last month (Helleringer & Kohler, 2007), the last 3 months (Chopra et al., 2009) the last 6 months (Eaton & van der Straten, 2009), the last year (Adimora et al., 2007), the last 3 years (Harrison et al., 2008), or sometime since the beginning of a sexual relationship which the respondent had in the past 12 months (Richardson et al., 2008). The number of partners respondents are asked to report on can range between 2 and 15 or may be open ended. Concurrent partnerships may be established using an “indirect” methodology of collecting dates of first and last sex with each partner or by “direct” methodology of asking participants whether they have concurrent relationships. It is not clear whether the “indirect” or “direct” methodology ensures greater accuracy (Nelson et al., 2007; Xu et al., 2010).

Stable partnerships are rarely considered in these measures, although some measures distinguish between regular/stable relationships, infrequent/casual partnerships or one-time partnerships. Some questionnaires ask respondents about their partners’ behaviors and whether respondents believe that their partners may have had other partners or paid for sex during their relationship. Respondents have also been asked if they are aware of HIV risk associated with concurrent partnerships or whether family and friends might disapprove of the respondent being involved in concurrent partnerships.

HIV and concurrency in South Africa

South Africa has the largest population of people living with HIV (PLHIV) in the world. In 2009 it was estimated that the total number of PLHIV in the country was 5.6 million, and approximately 1.9 million

children have been orphaned as a result of AIDS. The HIV prevalence among all adults (aged 15-49 years) in the general population was estimated to be 10.6% in 2009 (UNAIDS, 2009). The estimated HIV incidence in the total population was 1.3% in 2008 (Department of Health, 2009). Prevalence among pregnant women (15-49 years) attending antenatal clinics (ANC) is routinely measured via the antenatal HIV sero-prevalence survey. Findings from 2008 suggested a prevalence of 29% among this population. Notably, HIV prevalence more than doubled among pregnant women between 1996 (14%) and 2008 (29%), reinforcing the seriousness of the epidemic in South Africa (Department of Health, 2009).

HIV prevalence has been shown to vary by region in South Africa. There are nine provinces in the country. This study was conducted in Soweto which is located in Gauteng, the smallest province in size with the highest population and among the highest HIV prevalences (33%) in the country, following KwaZulu Natal (40%) (Department of Health, 2009).

Women are disproportionately affected by HIV and AIDS in South Africa. According to UNAIDS, approximately 60% of all PLHIV in the country are women (UNAIDS, 2009). Young women, below 30 years of age, are the most vulnerable to HIV. The highest 2008 prevalences of HIV were found among women 25-29 years of age (33%) and men 30-34 years of age (25.8%) (Department of Health, 2009). Adolescents (15-24 years) are also hugely burdened by HIV/AIDS in South Africa, particularly women. Despite statistics suggesting HIV prevalence has stabilized among young South African women over the past 3 years, rates continue to be unacceptably high, and significantly higher than those found in young men of the same age ranges (15-19 years: women, 16%, men, 3%; 20-24 years: women, 30%, men, 6%) (Department of Health, 2006; SAFAIDS, 2011; Pettifor et al., 2005).

Several studies have examined the prevalence and correlates of sexual concurrency among young (15-24 years) South Africans. One study, conducted in the Cape Metropolitan Area found 13% of respondents self-reported concurrency during their last sexual partnership (Mah, 2010). Another nationally representative study found that in the past year, men were more likely to report having concurrent (24.7%) versus serial partners (5.7%), whereas among women, concurrency and serial monogamy were equally common (4.7%). Respondents defined sexual concurrency as having multiple ongoing partners and the median length of relationship overlap was found to be approximately 4 months for women and 3 months for men. With respect to sexual risk behaviors, those in concurrent sexual relationships reported less consistent condom use, less transactional sex (among women) and more problems negotiating condoms and refusing intercourse when compared to serial monogamists (Steffenson et al., 2011). The Cape Area Panel Study (2005) asked young men and women to share information about up to 10 intimate relationships. In response to the question, "Did you have any other sexual partners during the time that you and (partner) were having a sexual relationship?" 17% of men and 10% of women responded affirmatively (Maughan-Brown & Venkataramani, 2011). Finally, a recent population-based study from KwaZulu-Natal found an age-standardized estimated point prevalence of concurrency among men of 31.5% (range 4.0-76.3%) (Tanser et al., 2011).

The context of sexual concurrency in South Africa

The context in which sexual concurrency and related HIV-risk behaviors take place is socially complex. Factors from multiple levels (individual, relational, societal, community) influence a person's decision to

have sexual relationships with more than one person at the same time. Jana and colleagues (2008) describe several contextual factors, varying by age and gender, which have been found to contribute to sexual concurrency, including emotional, sexual, and financial dissatisfaction with a steady partner; the desire for money or material goods; sexual desire, and cultural and social norms. Alcohol use has also been found to increase risk for sexual concurrency by reducing inhibitions and particularly when consumed in the enabling environment of an alcohol venue (USAID/R2P/Project SEARCH, 2011). Here we briefly review some of the literature on the context of sexual concurrency in South Africa.

Individual-level factors

At the individual level, knowledge about one's partner having his/her own concurrent partner(s) and perceived risk of HIV have been significantly associated with one's own concurrent sexual behaviors. In Mah's (2010) research with young adults in the Cape Metropolitan Area of South Africa, individuals who reported their sexual partner had one or more concurrent sexual partners were more than five times more likely to report concurrency themselves as compared to respondents who reported monogamous partners (aOR = 5.52, $P < 0.01$). These findings were duplicated in Kenyon and colleagues' (2012) analysis of Cape Area Panel Survey (CAPS) data. Self-perception of being at high risk for acquisition of HIV was also a strong predictor of respondent concurrency in the CAPS study. Amongst colored CAPS respondents, self-perception of high HIV risk was associated with a more than doubling of concurrency rates. These patterns did not hold among Africans (Kenyon et al., 2010).

Desire for money or material goods

The desire for money or material goods is thought to be a main driver of concurrent sexual practices (Jana et al., 2008). Kaufman and Stavrou (2002) examined the economic context of young people's risky sexual practices in South Africa and found that adolescents seek multiple partners as a strategy for increasing the resources available to them. Half of participants who reported multiple partners were 18 to 19 years old, suggesting that this age group may be particularly prone to sexual concurrency. Leclerc-Madlala (2008), however, challenges the idea that sexual concurrency is primarily driven by lack of resources among South Africans. Instead she posits that women's risky sex practices result more from media images and ideals that portray transactional sex as "normal" or even desired. Leclerc-Madlala (2008) argues that "globalization and the rapid pace of change" in South Africa have greatly impacted the nature of sexual relationships. Thus, women who pattern their behaviors on these new "norms" and engage in transactional sex are also more likely to normalize sexual concurrency for themselves and, more often, among their male partners.

Sexual history/behaviors

Other strong predictors of sexual concurrency in South Africa include age at sexual debut, time since sexual debut (e.g., years sexually active), and multiple lifetime partners. Mah's (2010) research in Cape Town suggests that individuals who were sexually active for 5 to 6 or 7+ years were significantly more likely to have concurrent sexual relationships compared to those who debuted in the previous 2 years. Among colored participants, an older age of sexual debut (above 16 years of age) was protective against concurrency (Kenyon et al., 2010). Individuals who reported multiple lifetime partners (more than 4 or 5) were significantly more likely to also report concurrency (Mah, 2010; Kenyon et al., 2010).

Cultural and social norms

Gender norms, norms about masculinity, and power dynamics between men and women have been found to significantly affect rates of concurrency in South Africa. Selikow's (2004) research from urban townships in South Africa found that male sexuality was defined by the number of sexual partners a man had. Further, being sexually assertive was a necessary component of being identified as a "real man" (ingagara) as opposed to an isithipa who "does not have many girlfriends, does not wear fashionable clothes, is often employed and does not do crime and wants to achieve educationally" (Selikow, 2004). This type of sexual culture clearly encourages men to be ingagara and adopt a sexuality of promiscuity and multiple partners.

Alcohol use

Kenyon et al. (2010) analyzed data from the CAPS cohort to explore the impact of alcohol use in the past month on concurrency in South Africa. They found alcohol consumption to be correlated with increased concurrency rates among Africans but not colored participants.

Study objective

Partners are typically unaware of new (Drumright et al., 2004) or main partners' concurrency (Eaton & van Der Straten, 2009) and being married has been associated with a greater likelihood of concurrency (Sandoyl, Dzekedzekel & Fylkesnes, 2010). For the advancement of research in this area, there is a need for, and a need for a reliable and well-validated tool to assess sexual partner concurrency within the context of a stable relationship. A brief and valid questionnaire that reflects existing research and could be used in a variety of settings would fill this need.

The overall objective of this study was to construct a brief instrument to measure sexual partner concurrency and related sexual risks for HIV acquisition and transmission within stable partnerships, and to test this instrument among heterosexual couples living in Soweto, South Africa. Development of the instrument was based on qualitative research assessing the characteristics of sexual partner concurrency including types, length, and acceptability of concurrent partnership. The structure of qualitative interviews was guided by a review of existing measures of concurrency as well as a review of the literature surrounding the measurement of concurrency and its associated risks. This study also aimed to compare the measure developed here with an instrument which reflected recommendations for measuring concurrency from the UNAIDS April 2009 "Consultation on Concurrent Sexual Partnerships."

METHODS

Research setting

This research was conducted in two communities in Soweto, South Africa, in collaboration between the Johns Hopkins Bloomberg School of Public Health and the University of Witwatersrand's Perinatal HIV Research Unit (PHRU) Project Accept team. Project Accept was a Phase III Randomized Controlled Trial of Community Mobilization, Mobile Testing, Same-Day Results, and Post-Test Support for HIV in Sub-Saharan Africa and Thailand (<http://www.cbvct.med.ucla.edu/>). Participants in the qualitative research phase of this research project lived in the Project Accept control community of Diepkloof while participants in the quantitative research phase lived in the Project Accept control community of Slovoville. Both communities have similar socioeconomic, demographic and geographic characteristics.

Study design

Interviews from a qualitative phase informed development of a concurrency measure that was piloted in a quantitative survey phase. Qualitative and quantitative research phases are discussed independently below.

Qualitative research

Qualitative interviews were conducted in three stages (key informant, in-depth and cognitive debriefing) in order to understand the qualities of concurrent partnership in Soweto, South Africa. Field guides for each set of interviews were based on a review of the literature and recommendations from the UNAIDS April 2009 "Consultation on Concurrent Sexual Partnerships" and were modified after careful review by the Soweto team. Potential participants for all qualitative interviews (stages 1-3) were selected purposively on age and gender by the Project Accept field staff in Soweto. Experienced and trained ethnographers on the Project Accept team conducted all qualitative interviews. Interviewers were trained intensively on interview techniques and guides in a 5-day in-person training. Key informant interviews were conducted in the Project Accept Field Office. In-depth interviews and cognitive debriefing interviews were conducted in a private place in or near the participants' homes. All qualitative interviews took an hour or less. Field guide questions were open-ended and interviewers used follow-up probes. Interviews were audio-taped and transcribed.

In stage 1, five interviews were conducted with key Informants who were members of community organizations currently working with, or involved in, media campaigns to reduce multiple concurrent partners for HIV prevention in Soweto. An additional five interviews were conducted with key informants who were either formal or informal community leaders (e.g., teachers, church leaders). Individuals selected to participate in key informant interviews were identified by Project Accept staff for their awareness of activities in the Diepkloof community. The purpose of these interviews was to learn about the presence of large-scale health programs, including media campaigns, that could potentially lead to a social desirability bias in participants' responses to questions about concurrency. Key informants were asked how widespread these programs were in Diepkloof, how long they had been running, and for an assessment of their effectiveness.

In stage 2, qualitative interviews were conducted with 4 heterosexual couples (n=8 individuals) and 16 heterosexual individuals. Members of heterosexual couples were interviewed separately in private locations to ensure confidentiality of responses. Interviews were designed to better understand communication about sex within and outside of couples, and to compare perceptions of partner's sexual risk with the partner's reported sexual behaviors. An index participant was recruited and included in the study if he or she was between 18 and 32 years of age, had a primary heterosexual partner (someone the participant has considered a primary sexual partner, of the opposite gender, for a minimum of 3 months) who was willing to participate in this study, had lived in the Diepkloof community for at least 6 months during the past 12 months and who had had sex (vaginal or anal) with two or more partners (including the primary partner) in the past 6 months. Primary partners were included if they were over the age of 18 and had sex at least once in the past 6 months with the index case.

Interviews with the 16 individuals were divided into 8 interviews (4 with women, 4 with men) to understand definitions of main partners and to explore concurrent partnerships in more depth, and 8 interviews (4 with women, 4 with men) to understand accuracy around recall of heterosexual partnerships (n = 8). For the 8 interviews designed to understand main and concurrent partnerships in greater depth, 4 women and 4 men were recruited and participated if they were between 18 and 32 years of age, had lived in the Diepkloof community at least 6 months during the past 12 months, and had heterosexual sex at least once in the past 6 months. In these interviews, individuals were asked to provide definitions and expectations of a main partner and provide narratives, recounting sexual partnerships since sexual debut. For the 8 in-depth interviews on recall, 4 men and 4 women were recruited and participated if they were between 18 and 32 years of age, had lived in the Diepkloof community for at least 6 months during the past 12 months and had had sex with two or more partners, including a primary partner, in the past 6 months. Individuals were asked to discuss their recall of the dates of sexual relationships and to evaluate their certainty about their recall.

Interviews from stages 1 and 2 were transcribed, translated (when interview was not conducted in English), entered into a word processor and imported into the software program Atlas.ti © (version 6.0) for coding and analysis. Because interviews in this study included upfront questions on sexual concurrency and stable partnerships, we did not use an inductive approach to develop a list of codes. Instead, we began our analysis with a pre-existing list of codes that covered major topics of interest. During the analysis process, as patterns emerged and new or more detailed information was noted, new codes were added to the list. Once transcripts were coded, Atlas.ti was used to identify recurring themes, concepts and terms relevant to the concurrency measure. Coding themes included motivating factors/reasons and personal experiences around engaging in concurrency, gender norms towards concurrency, types of partners, definitions and expectations of main partner, communication with main partner, perception of main partner's behaviors, and certainty about accuracy of recall. Analysis of data collected in stages 1 and 2 was integrated into the development of a draft concurrency measure.

In stage 3, 8 cognitive debriefing interviews were conducted with male and female residents of the Diepkloof community in Soweto. To be recruited and participate, individuals had to be between 18 and 32 years of age, had to have lived in Diepkloof for at least 6 of the previous 12 months and had had sex with two or more partners including the primary partner in the last 6 months. Four participants (2 men

and 2 women) were given concurrency measure A and four participants (2 men and 2 women) were given concurrency measure B. Cognitive debriefing interviews were conducted after participants completed their respective questionnaires. During these interviews, participants were asked if they understood the questions and concepts in the measure and if the questions were clear and acceptable. Information gathered in this third stage of qualitative research was used to finalize the concurrency measure for the quantitative pilot. Interviews from stage 3 were transcribed, translated (when necessary), entered into a word processor and imported into the software program Atlas.ti for coding and analysis.

In each stage of qualitative interview, individuals who were not able to provide written informed consent did not participate. If, for a specific individual, a condition existed that, in the judgment of the study staff, would make an individual's participation in the study unsafe, complicate interpretation of study outcome data, or otherwise interfere with achieving study objectives, that individual did not participate. All couples participating in the in-depth interviews were offered a referral to a center for psychological support.

All participants were provided snacks and monetary remuneration for their time.

Quantitative research

In the quantitative phase of this study, a cross-sectional study of randomly sampled community members and their primary heterosexual partners was conducted in which each participant was asked to complete two different questionnaires. Participants first completed "concurrency measure A" (based on UNAIDS recommendations for measuring concurrency). Then, two weeks later during their second study visit, they completed "concurrency measure B" (the measure developed in this project which reflects a review of the literature, previous measures, UNAIDS recommendations and is grounded within a primary partnership), as part of the test-retest validation of the survey. Each questionnaire was anticipated to last a half hour or less.

Participants were randomly selected from households that had been randomly selected for a Post-Intervention Assessment (PIA) of Project Accept in the control community of Slovoville. These households were mapped and enumerated by Project Accept staff. The field team approached each randomly selected household, provided the head of the household with an explanation of the study, and requested his or her assent. The head of the household did not have to be the "official" head of household, but someone in whom the other members of the household considered a responsible adult, aware of the ages and genders of all members of the household and able to give informal assent for the interview to take place in the home. If the head of household was not available at the first visit, repeat visits to the household (up to 3 visits) continued until contact with the head of the household was made. After assent, an enumeration of the members of the household was conducted with the head of household. The head of household and members of the household identified eligible people in the household, and one eligible person was randomly selected to participate in the PIA and this study. There were no differential recruitment targets or methods by gender in the selection of participants. If the selected participant was not at home during the time of enumeration and random selection, up to 3

repeat visits were made to the household to invite the selected household member (index participant) to participate in the study.

After they had completed the PIA interview, all those randomly selected to participate in this study (potential index participants) were asked if they would be willing to participate and to invite their primary partner to complete two surveys (2 weeks apart) in either their house or at the study's office. Interested index participants were asked for their oral consent to receive an invitation for themselves and their partner and for their contact information (first name and phone number). These basic identifiers were collected so that study staff could follow-up with the index participant to schedule a study visit. Index participants were asked either to invite their primary partner to be interviewed in their house or to return to the field office together with their primary partner. No contact information was collected on the primary partner of the index, as they were to be invited by the index participant. Participants gave written informed consent and were given a unique identification number at the point of enrollment into the study.

Prior to administering "concurrency measure A," whether in the home or at the field office, the index participant and the primary partner were asked to give oral consent to participate in the study and to complete a screening questionnaire to further assess their eligibility as a couple for the study. This step was put in place to verify that the participants were in a relationship. If both partners provided oral consent and were eligible to participate as a couple, they were then asked in separate, private rooms for their written consent for both study visits. If one or both members of the couple agreed to participate, the interviewer proceeded with administering concurrency measure A to participants who had given their written consent (Note: Refusal to participate by one member of the couple at the stage of written consent would not have precluded participation of the other member of the couple, although these results would not have been incorporated into final data analysis). Once participants completed concurrency measure A, project staff scheduled a second visit in 2 weeks for completion of concurrency measure B. All participants were provided snacks and monetary remuneration for their time. When necessary, transportation to the field study office was provided.

All participants were offered a referral for couples counseling or individual counseling to discuss issues that may have arisen as part of participation in the study. Trained counselors at the PHRU were available to provide counseling for those who requested it. .

To be eligible for the quantitative phase of the study, index participants had to have a heterosexual primary partner. Primary partner was defined as the sexual partner (of all current sexual partners, if more than one) with whom you have had the longest sexual relationship. This definition was derived from stages 1 and 2 of qualitative research and tested in stage 3 cognitive debriefing interviews. In this research sex was defined as vaginal or anal sex, exclusively. Oral sex was not included in the definition of sex. To be recruited and participate in this study, individuals had to be between 18 and 32 years of age, had to have a primary sexual partner (as defined above) of the opposite gender who was willing to participate in the study, had to have lived in Slovoville for at least 6 months during the past 12 months, and within those 6 months, had to have slept in the Slovoville household at least two nights every week. Primary partners had to be 18 years or older. Participants who could not provide informed consent were

excluded from participation in the study. If there were conditions that, in the opinion of the study staff, would make participation in the study unsafe, complicate interpretation of study outcome data, or otherwise interfere with achieving study objectives, participants were excluded from participation in the study.

Ethical considerations

The qualitative and quantitative phases of this research study were each approved by the Human Research Ethics Committee at PHRU and the Johns Hopkins Bloomberg School of Public Health's IRB committee.

RESULTS

Qualitative results

Our qualitative findings directly informed the development of a concurrency measure. Below, we describe the following: findings from our interviews on the context of concurrency in the Diepkloof community in Soweto, South Africa; the meaning of “main” partners in this context; and factors that may affect subjects’ recall of concurrent sexual partnerships.

Context of concurrency

During interviews, participants expressed conflicting norms around concurrency. A few participants explained that concurrency was acceptable, particularly for men.

It has been known from back in the days that men cannot stick to one partner. Men like to explore so I think that is the reason it is being acceptable. From back in the days it has been acceptable that a man can have multiple partners. (Female, 22 years)

However most participants consistently highlighted the importance of being faithful to one partner for both emotional and practical reasons including risk of diseases and discomfort with using condoms:

Yes it is important [to have one sexual partner] because it is nice to grow with someone that you have been with forever, someone you understand, someone who understands you. (Female, 22 years)

Nowadays it is not good [to have more than one sexual partner] because of these diseases. People are sick out there. (Male, 32 years)

While fidelity was highly valued in the community and by participants themselves, the majority perceived that concurrency was pervasive in their community and reported they were currently in concurrent relationships. Most reported that their main partner either did not know or was not pleased about their other sexual partners; however, a few described mutually open primary relationships:

When I go to the East he goes to the West. He has many sexual relationships and I also have other sexual partners. It is a common thing for both of us. (Female, 26 years)

Participants described a variety of reasons for engaging in sexual concurrency including their sexual drive, financial benefits, peer pressure, and revenge. Both men and women reported that they had multiple partners to satisfy their sexual needs:

With him being so far away I do have sexual desires and that is the only thing that makes me to have another sexual partner. (Female, 29 years)

Participants of both sexes noted a financial incentive for having multiple sexual partners:

I know if I sleep with X, he will give me R200 in the morning or maybe if I sleep with Y, he will give me R100 and if you combine those amounts, I can buy something for the house. (Female, 22 years)

As a man when you arrive at home to see your children and there is no food, you just go to your other sexual partner and have sex with her. I know she is going to give me R500.00 and I provide my family with food and again. I phone another one I know she is going to give me money to buy shoes. (Male, 32 years)

Other concurrency triggers for men and women were peer pressure from friends and finding out their main partner had other sexual partners.

My friend boasts about having 4, 5 or 6 sexual partners because now I have the one partner, the friend does not want to know about my one partner, he tells me about his 6 partners, so can you see the pressure there? So because I see him with 6 girls and I only have one, I will find a second one. (Male, 23 years)

You know as women sometime we like to be competitive and we start bragging to our friends about things like who is able to sleep with more guys than the others in a week, or sometime we discuss about which men has a bigger package, a big penis. (Female, 29 years)

Many participants acknowledged their internal contradiction about concurrency:

Nowadays it is not good [to have more than one person] because of these diseases people are sick out there...even though I still have another sexual partner on the side which is wrong. Whoever you choose to spend your life with you became faithful to that person, we need to have self-control even our children should know that it is not safe to have sex with multiple partners. (Male, 32 years)

I feel good [having sex with more than one partner] because I'm having it both ways. Yet, I do not think it is a good behavior. (Male, 21 years).

Additionally some expressed remorse about engaging in sexual partner concurrency:

It hurts sometimes when you think about it morally... And I do find that the ladies do get attached to me. You find that we meet the first time she doesn't but then we get to share this thing every now and then and then the person gets attached. ...So it hurts and it does not set me free because I always have to lie. (Male, 27 years)

It's guilt, I just felt so guilty and thought to myself that I have to let [my main partner] know and also I don't want to put his life at risk because it is totally wrong (Female, 25 years)

Meaning of “main” partner

In our study, we explored “main” partners in order to understand what a main partner means in a context where concurrency is pervasive.

Definitions of main partner

We found that definitions of main partners vary by individuals and that definitions are not predictable by gender or age. Four main dimensions of main partner emerged: emotional, financial, duration of relationship, and procreation.

The most commonly reported definition of a main partner was a person with whom they had an emotional bond. Both men and women stated a main partner was someone s/he loved and felt loved by.

Yes I would say [he’s my main partner] because he understands me better. No one is able to understand me better than him and he loves me. I know so. (Female, 26 years)

She makes me feel complete that is why I say to you she makes me feel like a man. I can even feel my heart being fulfilled when I am with her. (Male, 27 years).

Many men and women defined a main partner financially. One woman explains that for her, a primary partner plays a purely financial role:

A primary partner is a guy that whenever I ask for something he gives out, whenever I am in need for money he gives me, and whenever I want to go somewhere he is there for me, he does everything for me, but at the end there are consequences that I have to face. Let’s say he comes and picks me up for a date he can buy me whatever I want and whatever he wants in return I have to be with him, it can take a week or a month in close doors with him do you understand? The primary partner, when he touches me I feel like I can throw up because I do not love him. (Female, 25 years)

Others explained that a main partner is the longest sexual partner:

My main partner has been there for me for a long time but my other sexual partner is just someone I have known for a short while. (Male, 21 years)

The defining moment for a few participants was the birth of a child:

It was at the time when I found out that I am pregnant (Laughter) When I found out that I am pregnant...I knew that **** was my main partner. (Female, 28 years).

Often, a participant’s definition of main partner did not fall neatly into one category, but was a combination of different categories. For example, this male participant integrated both emotional and financial dimensions in his definition:

One thing for sure she loves me, she sacrifices everything for me to be happy, if I can call her now and ask her to come and see me she would come, for example if I can tell

her that I need R500.00 I know she would try by all means to give me that money.

(Male, 29 years)

Expectations around main partners

Expectations around main partners could be grouped into three primary areas: emotional, financial, and sexual.

First and foremost, participants felt that, emotionally, the primary partner should be honest, open and unconditionally supportive. They provided examples of emotional expectations ranging from unwavering support through a hypothetical accident leaving one maimed, to sharing all intimate thoughts:

She must be able to be there for me through thick and thin. Even if anything can happen to me for instance if I were to be involved in an accident she must not change her behavior towards me she must just be as she was before the accident. Let's say I was to lose my leg in an accident she must be able to love me like she did before the accident...

(Male, 27 years)

In addition, almost all female and some male participants stated that primary partners were expected to provide money when needed, including buying food, clothes and for transportation.

The majority of participants expected their main partner to be sexually exclusive although the vast majority were not exclusive themselves.

Intra-couple agreement about definition of main partner

Even within couples, participants defined main partnerships differently. Intra-couple variations were revealed during interviews with couples. In order to recruit couples, an index participant was asked to refer his or her “main sexual partner” for an interview. Among the four couples recruited none of the “main partnerships” were mutual—in other words, among the four index participants who recruited the people they felt were their main partners, none of these partners also considered the index participants to be their main partners.

Recall of sexual histories

In order to develop a measure that minimized recall bias, we qualitatively explored factors influencing participants' ability to accurately remember past sexual behaviors. Two main obstacles emerged: survey questions asking about specific dates and number of sexual partners.

During interviews, participants struggled to remember specific dates (e.g., date of the first time having sex with a sexual partner) and the challenge increased with time between the interview and sexual event. Participants found it easier to remember how many days, weeks, months and years from the time of the interview a sex event occurred as opposed to actual dates.

Interviewer: When were you first intimate with your recent concurrent partner?

Participant: I remember it was March. *Interviewer:* Was it March this year? *Participant:*

Yes it was this year.

Interviewer: Can you remember what date it was?

Participant: I do not remember the actual date but it was in March. No I do not think I can remember. I am not good when it comes to recalling dates. (Male, 22 years)

Given the relatively shorter time to event, time since last sex was easier for participants to recall than time since first sex with a partner. Interestingly, most participants were able to recall duration of a relationship more readily than the time since the first sex.

In addition to our in-depth interviews, our post-pilot cognitive debriefing shed light on the question “How many sexual partners have you had in the past 6 months?” Many participants did not include their spouse in their total number while others did, revealing a lack of standardized responses.

Overall, our qualitative findings informed the development of our concurrency measure, underscoring the importance of 1) using longest sexual partner instead of main partner as a reference point; 2) asking about days, weeks and months since an event instead of a specific date; 3) using last sex and duration of sexual partnerships instead of first and last sex; and 4) including the phrase “including your spouse” when asking about the number of sexual partners in the past 6 months.

Quantitative results

Participants

In order to recruit for the quantitative phase of this study, we approached 794 randomly selected households from the Slovoville community of Soweto, South Africa, which also participated in Project Accept. Of the 794 households approached, 320 households (40.3%) had a household member who was eligible to participate in Project Search. Conversely, 183 households (23.0%) did not contain a household member who was eligible to participate in Project Search. In 291 selected households (36.7%) there were no household members present at multiple attempted visits; therefore, we could not establish the eligibility or recruit members of these households into this study.

We recruited 320 index participants from the 320 Slovoville households that contained eligible potential participants. Of these, 154 index participants agreed to participate with their primary partners (48.1% of potential couples) and attended both study visits. Twenty-three potential index participants and 36 potential primary partners refused to participate, which resulted in a total of 59 potential couples (18.4%) that refused to participate. Lastly, 107 index participants (33.4% of potential couples) agreed to participate but did not attend the study visits, and therefore were considered lost to follow-up after several attempts to contact them.

Overall, we enrolled 154 couples and had a 48.1% response rate, a 33.4% loss to follow-up rate, and an 18.4% refusal rate for the quantitative study.

Study population

During data analysis, data from three individuals (two primary partners in measure A, and one primary partner in measure B) were found to be missing. Therefore for measure A we had a sample size of 306, with 152 complete couples and for measure B a sample size of 307, with 153 complete couples.

Data from measure A were used to describe the study population in Table 1. The index participants were much more likely to be women than men (69% versus 31%). During the baseline assessment of Project Accept in 2005-06, an enumeration of 4634 households in Soweto showed that 51.8% of household members were female (Genberg et al., 2008). Although we do not have demographic data on those recruited who did not attend or refused to participate, we would have expected that random sampling of eligible household members would have resulted in approximately equal numbers of men and women being surveyed.

Our study population was young (median of 24 years), with up to a secondary school education (median of 12 years of education), predominately single (90%), and primarily living with either their parents (48%) or with their sexual partner (24%). Men were more likely to have earned money for work in the past year than women (79% versus 53-54%), but most (80%) did not work at all or study away from home.

Male primary partners were significantly older than female primary partners. There was no difference by gender in either index or primary partners in education, marital status, living situation, whether participants were currently earning money, or whether they worked/studied away from home. The male primary partners of female index participants were significantly more likely to work away from home than female primary partners of male index participants (26% versus 7%).

Men had a significantly higher mean number of sex partners in the past 6 months than women, and this gender difference was greater among primary partners. The lower number of sexual partners among female primary partners, as compared to female index participants, could be evidence of selection bias. Male indexes were more likely to have a primary/main partner who had a lower number of sexual partners while female indexes were more likely to have a partner who had similar numbers of sexual partners.

In this study population, the prevalence of reported concurrent sexual relationships is high overall, and higher among men than women. Among index participants, 49% of men and 36% of women report having relationships with two or more sexual partners in the past 6 months that overlap in time. Among primary partners, 31% of women and 51% of men reported having concurrent sexual partners in the past 6 months.

Only 5 people (2%) in total reported having more than one non-overlapping sexual partner, i.e. serial monogamy, in the last 6 months. This finding is most likely an artifact of the sampling procedure where only individuals with a primary/main partner were eligible to participate. Consequently, individuals with shorter (thereby less likely to be primary/main) non-overlapping relationships were less likely to be eligible to participate. Therefore, in the context of couples in stable partnerships, the data show that just over half are monogamous and the rest have concurrent sexual relationships.

The data presented in table 1 suggest that this study population could be a biased representation of the source population, with both female indexes and male indexes that have female partners with relatively lower numbers of sexual partners being over-represented.

Table 1: Sociodemographic characteristics of members of the couples

	Index Participant		Primary Partner		Total
Gender (%)					
Male	47 (31)		107 (70)		154 (50)
Female***	107 (69)		45 (30)		152 (50)
Total	154		152		306
	Male	Female	Male	Female	
Median age (IQR)	25 (6)	23 (6)	27** (8)	21** (5)	24 (8)
Median years of education (IQR)	12 (1)	12 (2)	12 (1)	12 (1)	12 (1)
Marital Status (%)					
Single/never married	42 (89)	95 (89)	96 (90)	43 (96)	276 (90)
Married	5 (11)	12 (11)	11 (10)	2 (4)	30 (10)
Who do you live with at this time? (%)					
Sexual Partner	8 (17)	27 (25)	29 (27)	10 (22)	74 (24)
Parents	21 (45)	58 (54)	42 (39)	24 (53)	145 (48)
Alone	8 (17)	5 (5)	13 (12)	1 (2)	27 (9)
Extended Family	10 (21)	16 (15)	22 (21)	9 (20)	57 (19)
Other	0 (0)	1 (1)	1 (1)	1 (2)	3 (1)
In the past year, have you earned money for work? (%)*					
Yes	37 (79)	58 (54)	84 (79)	24 (53)	203 (66)
No	10 (21)	49 (46)	23 (21)	21 (47)	103 (34)
In the past 2 years, did you work or attend school away from your home (so that you could not sleep at home)? (%)					
Yes	13 (28)	17 (16)	28* (26)	3* (7)	61 (20)
No	33 (72)	90 (84)	78* (73)	42* (93)	243 (80)
Total number of sex partners in past 6 months (including spouse) - Mean (SD)*	1.73 (1.49)	1.70 (0.46)	1.75 (1.03)	1.30 (0.46)	1.74 (1.28)
Types of sexual partners in past 6 months*					
One sexual partner only	23 (48.94)	69 (64.49)	52 (48.60)	32 (71.11)	176 (58)
Two or more sexual partners with no overlap in time (serial monogamy)	2 (4.26)	0 (0.00)	3 (2.80)	0 (0.00)	5 (2)
Two or more sexual partners with at least two partners overlapping in time (concurrency)	23 (48.94)	38 (35.51)	54 (50.47)	14 (31.11)	129 (42)
Total	47 (100.00)	107 (100.00)	107 (100.00)	45 (100.00)	306 (100.00)

*P<0.05 ; **P<0.000; Standard Deviation (SD); Interquartile range (IQR); ***Missing data on two female primary partners in measure A, and one female primary partner in Measure B

Comparison of concurrency estimates by measure

Table 2, shows that measures A and B gave similar estimates of prevalence of concurrent sexual relationships in this study population, with an estimate of 42% concurrency in measure A, and 43% concurrency in measure B. Administered 2 weeks apart, these two measures have a moderate level of agreement, with a kappa of 0.43 (Altman 1991).

In measure A, the prevalence of concurrent sexual partners was calculated by assessing who had overlapping dates of first and last sex for each sexual partner reported in the last 6 months. In measure B, we asked participants to name their longest sexual partner, and whether or not they had sex with anyone else while with that person in the past 6 months. The specific question in measure B was:

“In the past 6 months, how many sexual partners have you had or did you have during your sexual relationship with [Partner #1: _____]?” ____ (# of people)”

For male participants, measure B gives a slightly higher estimate of the prevalence of concurrency compared to measure A (53% versus 50%). There was no difference in the estimate of concurrency for women between measure A and measure B (34% versus 34%). Concurrency estimates did not differ significantly by measure.

Men had significantly higher prevalence of concurrency than women in both measure A (50% versus 34%) and B (54% versus 34%). Overall, index participants did not have statistically different levels of concurrency from primary partners. However, when looking at the differences in prevalence of concurrency within each type of participant (index or primary partner) by gender, female index participants had slightly higher levels of concurrency than female primary partners, although this difference was not statistically significant.

Table 2: Number and proportion of participants reporting concurrency by measure (A or B), gender and type of participant

	Measure A (n=306)				Measure B (n=304)***			
Total No. (%) reporting at least one concurrent relationship by measure (kappa = 0.43)	129 (42.16)				132 (43.42)			
	Male (n=153)		Female (n=153)		Male (n=152)		Female (n=153)	
Total No. (%) reporting at least one concurrent relationship by gender* and measure (kappa = 0.46 for men and 0.41 for women)	77 (50.00)		52 (34.21)		80 (52.63)		52 (34.21)	
	Index Participant (n=153)		Primary Partner (n=153)		Index Participant (n=153)		Primary Partner (n=153)	
Total No. (%) reporting at least one concurrent relationship by type of participant and measure (kappa = 0.43 for index participants and 0.44 for primary partners)	61 (39.61)		68 (44.74)		61 (40.13)		71 (46.71)	
	Male (n=45)	Female (n=108)	Male (n=108)	Female (n=45)	Male (n=45)	Female (n=108)	Male (n=108)	Female (n=45)
Total No. (%) reporting at least one concurrent relationship by type of participant for each gender and measure (Kappa = 0.45 for male indexes; 0.41 for female indexes; 0.47 for male primary partners; 0.39 for female primary partners)	23 (48.94)	38 (35.51)	54 (50.47)	14 (31.11)	20 (44.44)	41 (38.32)	60 (56.07)	11 (24.44)
*p<0.05; **p<0.000; *** 3 participants missing data on concurrency variables								

Length of overlap and duration of relationships by measure

To calculate the mean length of overlap of concurrent relationships in days, we first calculated a “within person” mean length of overlap from the data on reported concurrent relationships (up to three). We then estimated a mean of these “within person” means by gender and type of participant for each measure (Table 3).

Table 3: Mean number of days of overlap in relationships and duration of relationships among participants reporting at least one concurrent relationship by measure (A or B), type of participant, and gender

	Measure A (n=129)			Measure B (n=132)		
Mean number of days of overlap in relationships by measure (SD)*	341 (423)			387 (461.6)		
Mean duration, in days, of relationship by measure (SD)	Partner 1 (n=129) 995 (922)	Partner 2 (n=129) 512 (811)	Partner 3 (n=40) 781 (1423)	Partner 1 (n=132) 992 (833)	Partner 2 (n=131) 548 (722)	Partner 3 (n=46) 635(1133)
	Male (n=77)		Female (n=50)	Male (n=77)		Female (n=50)
Mean number of days of overlap in relationships by measure and gender of participant (SD)	357 (426)		315 (423)	408 (547)		354 (272)
	Index Participant (n=60)		Primary Partner (n=67)	Index Participant (n=56)		Primary Partner (n=68)
Mean number of days of overlap in relationships by measure and type of participant (SD)	319 (407)		360 (440)	339 (270)		427 (573)

Table 3 shows that among participants with at least two partners overlapping in time (i.e. concurrent partners), the mean length of overlap of sexual partners in the past 6 months was 341 days (11.4 months) in measure A and 387 days (12.9 months) in measure B. In each measure, there was no significant difference in the length of overlap by gender or type of participant (index or primary partner). In measure B, the length of overlap was consistently higher than the length of overlap reported through measure A. This is likely due to the different methods for assessing overlap in each measure. In measure A, average overlap was calculated from data on time since first and last (most recent) sex for each partner, and measure B the average overlap was calculated from data on time since last (most recent) sex and duration of relationship.

When examining the duration of relationships (Table 3) of partners 1, 2 and 3 in measure A and B, partner 1 is on average the longest relationship (over 2 years on average), while the second and third partners are almost as long, explaining the large amount of overlap in relationships. Comparing measure A and B, the duration of relationships between partners 2 and 3 are slightly different while the cited duration of relationship for partner 1 is virtually the same. This suggests that participants cite the same

person to be partner 1 in both measures, but may cite their next two partners in a different order between measures.

Number and type of sexual partners reported in the last 6 months by measure

In measure A, among participants who report at least one concurrent sexual relationship, 67% report having sex with two sexual partners in the past 6 months and 20% report having three sexual partners in the past 6 months (Table 4a and Figure 1). A similar distribution is seen in measure B.

The vast majority of concurrent participants (65% in measure A and 54% in measure B) occur with two separate individuals that are both labeled as “girlfriends” or “boyfriends” (see figure 2). In this study population very few participants are married (see Table 1).

The different measures (A and B) appear to be comparable in their measurement of number of sexual partners and reported types of sexual partners.

Table 4a: The total number (%) of sexual partners reported in the past 6 months, among participants who report at least one concurrent sexual partner in the past 6 months

	Measure A			Measure B		
	Male (%)	Female (%)	Total (%)	Male (%)	Female (%)	Total (%)
The total number (%) of sexual partners in the past 6 months:						
2 sexual partners	47 (61.04)	39 (75.00)	86 (66.67)	45 (56.96)	41 (78.85)	86 (65.65)
3 sexual partners	17 (22.08)	9 (17.31)	26 (20.16)	16 (20.25)	7 (13.46)	23 (17.56)
4 sexual partners	7 (9.09)	3 (5.77)	10 (7.75)	9 (11.39)	2 (3.85)	11 (8.40)
5 or more sexual partners	6 (7.79)	1 (1.92)	7 (5.43)	9 (11.39)	2 (3.85)	11 (8.40)
Total	77 (100.00)	52 (100.00)	129 (100.00)	79 (100.00)	52 (100.00)	131 (100.00)

Table 4b: The total number (%) of participants reporting each combination of partner types, among participants who report two concurrent sexual partners in the past 6 months

	Measure A			Measure B		
	Male (%)	Female (%)	Total (%)	Male (%)	Female (%)	Total (%)
Combination of partner types for last 2 concurrent sexual partners in past 6 months:						
Spouse/cohabiting partner PLUS boyfriend/girlfriend	4 (9)	1 (3)	5 (6)	1 (2)	2 (5)	3 (4)
Spouse/cohabiting partner PLUS friend/casual acquaintance	2 (4)	0 (0)	2 (2)	3 (7)	3 (8)	6 (7)
BOTH partners reported as boyfriend/girlfriend	27 (57)	29 (74)	56 (65)	26 (59)	20 (51)	46 (55)
Boyfriend/Girlfriend PLUS friend/casual acquaintance	14 (30)	6 (15)	20 (23)	14 (32)	13 (33)	27 (33)
Boyfriend/Girlfriend PLUS one time partner	0 (0)	3 (8)	3 (3)	0 (0)	1 (3)	1 (1)
Total	47 (100)	39 (100)	86 (100)	44 (100)	39 (100)	83 (100)
*In measure B: among males the other combination represents spouse with co-habiting partner; among females other combination represents cohabiting partner with one time partner						

Figure 1: The total number of sexual partners reported in the past 6 months, among participants who report two or more concurrent sexual partners in the past 6 months

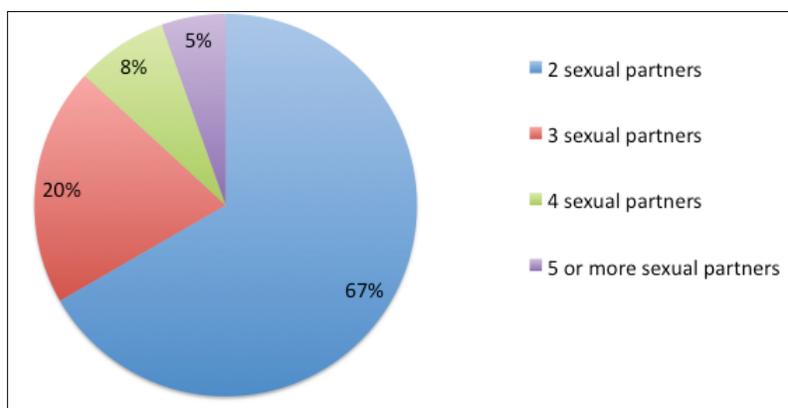
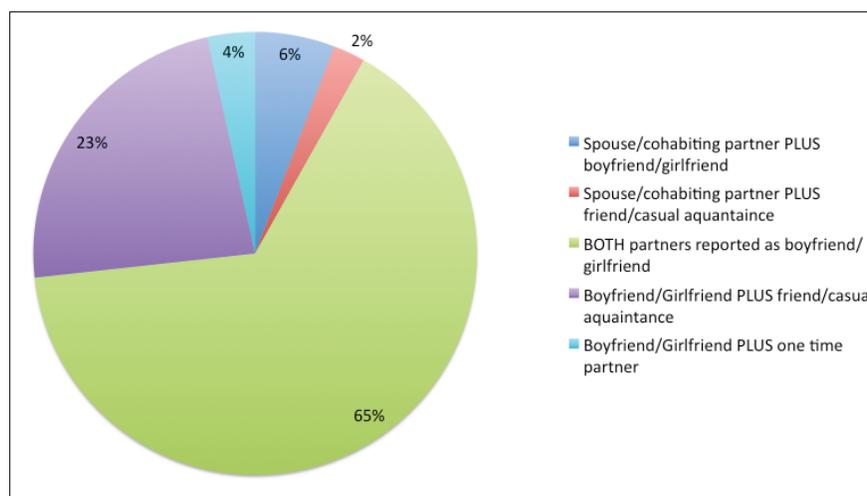


Figure 2: Measure A- Proportion of participants reporting each combination of partner types, among participants who report two concurrent sexual partners in the past 6 months



Concordance and discordance of concurrency by measure

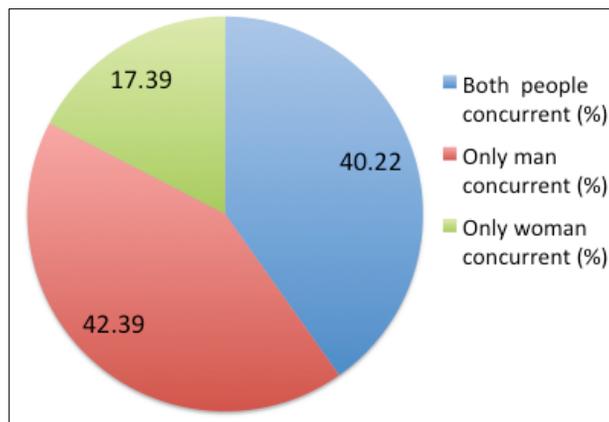
The data show (Table 5) that measures A and B do not differ significantly in the assessment of concordance (i.e., both male and female partners have concurrent relationships) and discordance (i.e., only one partner reported concurrency) among couples in the study population. In addition, the level of concordance and discordance in couples does not differ significantly by the gender of the index participant.

In 42% (measure A) and 44% of couples (measure B), only the man reported a concurrent partner (see Table 5 and Figure 3). In 40% (measure A) and 42% (measure B) of couples, both the man and the woman report concurrent sexual relationships, and in 17% (measure A) and 13% (measure B) of couples concurrency is reported by the woman only.

Table 5: The number (%) of couples where both people have had concurrent sexual behavior or only one member of the couple has had concurrent sexual behavior, by gender of Index Participant

	Measure A (n=124 participants) - Member of couple who is concurrent:				Measure B (n=132 participants) - Member of couple who is concurrent:			
	Both man & woman (%)	Only man (%)	Only woman (%)	Total (%)	Both man & woman (%)	Only man (%)	Only woman (%)	Total (%)
No. of couples where index participant is male:	10 (35.71)	13 (46.43)	5 (17.86)	28 (100.00)	7 (29.17)	13 (54.17)	4 (16.67)	24 (100.00)
No. of couples where index participant is female:	27 (42.19)	26 (40.63)	11 (17.19)	64 (100.00)	30 (46.15)	27 (41.54)	8 (12.31)	65 (100.00)
All couples	37 (40.22)	39 (42.39)	16 (17.39)	92 (100.00)	38 (42.22)	40 (44.44)	12 (13.33)	90 (100.00)

Figure 3: Measure A- Distribution of concurrency patterns by partner in couple, among couples where at least one partner has reported concurrency



Method of assessing first and last sex with partners in past 6 months

In measure A, occurrence of first and last sex with each sexual partner was asked in the format of time (days, weeks, months and years) since event. In measure B, we determined first and last sex by asking time since last sex (as in measure A), and the duration of the relationship in days, weeks, months or years. All participants were given a calendar to assist with recall. In both measures, if a participant found it easier to respond with a date (dd/mm/yyyy), we instructed interviewers to record the date on the survey and later transform this to a time since event variable (or duration variable in measure B). Table 6 describes the proportion of participants surveyed who preferred to report specific dates by measure and partner number.

In measure A, approximately 70% of participants preferred to report last (most recent) sex with their sexual partners, as a date rather than “time since event,” regardless of which partner they were referring to. A majority (approximately 68%) also preferred to report first sex with their sexual partners as a date rather than “time since event.” Measure B appeared to elicit more “time since event” responses with lower proportions choosing to respond with a date for both first and last sex. This may be due to the fact they were more accustomed to the survey design during the second visit, and were more able to respond in the time since event or duration format.

Transforming a date to a “time since event” variable or a duration variable can introduce a source of error. This error was commonly observed in this study when interviewers transformed dates during or directly after the interview. To correct these errors, we captured both the date and the time since/duration information during data entry, and transformed these dates systematically during data cleaning and management.

Table 6: The proportion of participants who preferentially gave a date (instead of time since event i.e. number of days, weeks, months or years, or duration of relationship) when they first and last had sex with a sexual partner (last sex within the past 6 months)

Proportion responding with a date for:	Measure A (Partners in order of recency)			Measure B (Longest partner first, then concurrent partners in order of recency)		
	Partner 1	Partner 2	Partner 3	Partner 1	Partner 2	Partner 3
First Sex (Duration of relationship in measure B) (%)	197 (66.11)	92 (68.15)	30 (69.77)	124 (40.52)	37 (28.24)	17 (36.96)
Total	298	135	43	306	131	46
Last (most recent) Sex (%)	202 (70.14)	96 (71.64)	30 (71.43)	133 (43.32)	70 (54.26)	24 (54.55)
Total	288	134	42	307	129	44

DISCUSSION

The potential impact of sexual partner concurrency on transmission dynamics within generalized HIV epidemics continues to be debated. There is some evidence that concurrency within main partnerships may enhance HIV risk. The goal of this study was to consider the measurement of concurrency within the context of stable partnerships. We decided on a direct method of measuring concurrency and qualitative interviews helped us to refine this measure in three important ways. They revealed that while concurrency is accepted, participants are also very cognizant of relationship and practical reasons for avoiding overlapping partnerships and that social desirability may be a concern in a questionnaire of this type. Our original plan was to anchor this direct measurement on an individual's "main" or "regular" partner. However, qualitative interviews highlighted that the concept of main partner in this cultural context is both nuanced and subjective. These results led us to employ the more objective descriptor of "longest sexual partner." Finally, our qualitative results showed that participants could not accurately recall dates of sexual events and were more successful recalling the days, weeks, months and years since a sexual event occurred. This finding was in concert with UNAIDS recommendations for this approach (UNAIDS Reference Group, 2010).

Our quantitative data showed that concurrency is common in this population, and while higher in men than women, it is high in both groups. Among individuals who report concurrent partnerships, the majority have not had more than two concurrent sexual partners in the last six months. Typically both of these partners are viewed as girlfriends or boyfriends. Concurrent relationships described in this study typically overlapped for, on average, 1 year. Concordance of concurrent behavior was also high in our study. Within couples where at least one partner reports concurrency, approximately 40% have both partners engaged in concurrent relationships. These findings suggest higher rates of concurrency than reported in previous studies among young South Africans (Maughan-Brown & Venkataramani, 2011; Steffenson et al., 2011; Tanser et al., 2011). However, our sample might not have been as representative as some of these previous studies. Regardless, results of this relatively small study of couples suggest that concurrency is prevalent, is not strictly a male behavior, and is far from transient or short term. Programming aimed at reducing HIV risk associated with concurrent partnerships may need to appreciate the permanency and stability inherent in both relationships.

Consistent with studies on concurrent sexual partnerships in Malawi and Tanzania (USAID/R2P/Project SEARCH, 2011), our qualitative findings also suggest conflicted feelings about the practice of concurrency. While fidelity was consistently mentioned as something highly valued among individual participants and the community at large, most participants were not themselves faithful to only one partner (at one time). Many participants felt that concurrency was normalized, especially for men. As was the case in Malawi and Tanzania (USAID/R2P/Project SEARCH, 2011) it also seems that *injunctive norms* (what people believe should be done) conflicted with *descriptive norms* (what people believe others are doing) in our South African study setting. Participants were able to articulate their reasons for engaging in sexual concurrency, including sexual drive and satisfaction of sexual needs, financial benefits, peer pressure, learning their own main partner had other sexual partners, and revenge. However, many of those who reported concurrency expressed conflict and even remorse about their

behaviors. Few individuals informed their partner about these relationships, posing a challenge to HIV prevention efforts within primary partnerships. These qualitative findings suggest that future HIV risk reduction programming should address the tension between injunctive and descriptive norms as well as the contextual drivers of concurrency, including gender norms and the larger socio-economic context within which these norms are situated.

The two measures used in this study did not differ in their estimates of the prevalence of concurrency. These results suggest that indirect and direct methodologies are comparable for estimating prevalence of concurrency in couples. The indirect method (measure A) may be more suitable when research, such as modeling exercises, requires estimates of the duration of relationships and length of overlap between relationships. The direct method (measure B) may be sufficient and more efficient (i.e. shorter and simpler for participants), however, if the prevalence of concurrency is all that is required.

Despite our qualitative results and the UNAIDS recommended approach, our quantitative results showed that the majority of participants preferred using specific dates to report first and last sex, as opposed to reporting time (days, weeks, months, years) since first and last sex. At the same time, about a third of our participants did prefer the “time since event” format. These results suggest that the best approach may be to offer two types of response options in surveys assessing concurrent sexual behavior. Both types of response options should be entered as separate variables into databases, to avoid error in calculations in the field; these variables can then be combined into a standardized variable at the stage of data analysis.

There are limitations to this study. Our qualitative findings reflect the community in which our participants live and therefore may not be generalizable to other settings, both within South Africa as well as more broadly. Further, while our qualitative participants were purposively selected to provide broad perspective on sexual partner concurrency, our conclusions are based on the insights of a relatively small group of individuals. At the same time, common themes and beliefs clearly emerged across genders and within both individuals and couples.

In our quantitative study, our response rate of 48% may appear low in the context of observational studies where a response rate of 70% or above is generally expected. It is important to recognize, however, the increased burden associated with participation in this study. Individuals had to have a partner who was willing to participate in a sexual behavior survey, and had to find a time that both they and their partners could jointly attend two separate study visits, which were two weeks apart. Men seem to have been less willing to participate as indexes and those who did participate appeared to have partners with lower risk. While we were very careful not to reveal that concurrency was the central purpose of our study, it is possible that in South Africa where concurrency messaging is pervasive and HIV prevalence is high, many individuals may be reluctant to participate in a couples study. We believe that our ability to pilot the measurement instrument, however, was not impacted by these observed rates and patterns of non-response. Individuals who decided not to participate in our study are unlikely to respond to questionnaire format (i.e. measurement style) differently than our participants. Additionally, our sample size is too small to provide any definitive conclusions or generalizations

regarding prevalence or patterns of concurrency among couples in South Africa or beyond. For purposes of piloting and validating a questionnaire, however, our sample size of 156 couples is adequate.

REFERENCES

- Adimora, A. A., Schoenbach, V. J., & Doherty, I. A. (2007). Concurrent sexual partnerships among men in the United States. *American Journal of Public Health, 97*, 2230-2237.
- Altman, D. G. (1991). *Practical Statistics for Medical Research*. London, England: Chapman and Hall.
- Chopra, M., Townsend, L., Johnston, L., Mathews, C., Tomlinson, M., O’Bra, H. & Kendall, C. (2009). Estimating HIV prevalence and risk behaviors among high-risk heterosexual men with multiple sex partners: use of respondent-driven sampling. *J Acquir Immune Defic Syndr 51*, 72-77.
- Department of Health. (2006). *National HIV and Syphilis Antenatal Seroprevalence Survey in South Africa 2005*. Pretoria, South Africa: National Department of Health Fed-Life Building.
- Department of Health. (2009). *2008 National Antenatal Sentinel HIV and Syphilis Prevalence Survey, South Africa*. Pretoria, South Africa: National Department of Health, Fed-life Building.
- Drumright, L. N., Gorbach, P. M., & Holmes, K. K. (2004). Do people really know their sex partners? Concurrency, knowledge of partner behavior, and sexually transmitted infections within partnerships. *Sexually Transmitted Diseases, 31(7)*, 437–442.
- Eaton, A., & van der Straten, A. (2009). Concurrent sexual partnerships among individuals in HIV sero-discordant heterosexual couples. *International Journal of STD & AIDS, 20*, 679–682.
- Epstein, H. & Morris, M. (2011). Concurrent partnerships and HIV: an inconvenient truth. *J Int AIDS Soc. 14(13)*, 1-11.
- Gorsuch, R. L. (1983). *Factor analysis, 2nd ed*. Hillsdale, N.J.:L. Erlbaum Associates, p. 425.
- Genberg, B. L., Kulich, M., Kawichai, S., Modiba, P., Chingono, A., Kilonzo, G. P., Richter, L., Pettifor, A., Sweat, M., Celentano, D. D., & NIMH Project Accept Study Team (HPTN 043). (2008). HIV risk behaviors in sub-Saharan Africa and Northern Thailand: baseline behavioral data from Project Accept. *J Acquir Immune Defic Syndr. 49(3)*, 309-319.
- Guilford, J. P. (1954). *Psychometric methods, 2d ed*. New York: McGraw-Hill
- Harrison, A., Cleland, J., & Frohlich, J. (2008). Young people’s sexual partnerships in KwaZulu-Natal, South Africa: patterns, contextual influences and HIV risk. *Studies in Family Planning, 39*, 295-308.
- Helleringer, S. & Kohler, H. (2007). Sexual network structure and the spread of HIV in Africa: evidence from Likoma Island, Malawi. *AIDS, 21*, 2323-2332.
- Jana, M., Nkambule, M., & Tumbo, D. (2008). *Onelove: Multiple and concurrent sexual partnerships. A ten country research report*. Soul City Institute Regional Program. Johannesburg, South Africa: Adelle Publishing.

- Kaufman, C. E., & Stavrou, S. E. (2002). *"Bus fare, please": The economics of sex and gifts among adolescents in urban South Africa (No. 166)*. Washington, DC: Population Council. Retrieved on June 12, 2012 from http://pdf.usaid.gov/pdf_docs/PNADA195.pdf.
- Kenyon, C., Boulle, A., Badri, M., & Asselman, V. (2010). "I don't use a condom (with my regular partner) because I know that I'm faithful, but with everyone else I do": the cultural and socioeconomic determinants of sexual partner concurrency in young South Africans. *SAHARA J.*, 7(3), 35-43.
- Kline, P. (1979). *Psychometrics and Psychology*. New York: Academic Press.
- Kretzschmar, M., & Morris, M. (1996). Measures of concurrency in networks and the spread of infectious disease. *Mathematical Biosciences*, 133(2), 165-195.
- Leclerc-Madlala, S. (2003). Transactional sex and the pursuit of modernity. *Social Dynamics*, 29(2), 213-233.
- MacCallum, R. C., Widaman, K. F., Zhang, S., & Hong, S. (1999). Sample size in factor analysis. *Psychological Methods*, 4 (1), 84-99.
- Mah, T. L. (2010). Prevalence and correlates of concurrent sexual partnerships among young people in South Africa. *Sex Transm Dis*, 37(2), 105-108.
- Mah, T. L. & Halperin, D. T. (2008). Concurrent Sexual Partnerships and the HIV Epidemics in Africa: Evidence to Move Forward. *AIDS and Behavior*, published online. doi: 10.1007/s10461-008-9433-x.
- Mah, T. L. & Shelton, J. D. (2011). Concurrency revisited: increasing and compelling epidemiological evidence. *Journal of the International AIDS Society* 14(33), published online. doi: 10.1186/1758-2652-14-33
- Maughan-Brown, B. & Venkataramani, A. S. (2011). Measuring concurrent partnerships: potential for underestimation in UNAIDS recommended method. *AIDS*. 25(12), 1549-1551.
- Morris, M. & Kretzschmar, M. (1997). Concurrent partnerships and the spread of HIV. *AIDS*, 11(5), 641-648.
- Nelson, S. J., Manhart, L. E., Gorbach, P. M., Martin, D. H., Stoner, B. P., Aral, S. O. & Holmes, K. K. (2007). Measuring sex partner concurrency: It's what's missing that counts. *Sexually Transmitted Diseases*, 34(10), 801-807.
- NIMH. (2012). *Project Accept*. Retrieved from: <http://www.cbvct.med.ucla.edu/overview.html#sites>
- Pettifor, A. E., Rees, H. V., Kleinschmidt, I., Steffenson, A. E., MacPhail, C., Hlongwa-Madikizela, L. et al. (2005). Young people's sexual health in South Africa: HIV prevalence and sexual behaviors from a nationally representative household survey. *AIDS*, 19(14), 1525-1534.

- Richards, J. E., Risser, J. M., Padgett, P. M., Rehman, H. U., Wolverton, M. L., & Arafat, R. R. (2008). Condom use among high-risk heterosexual women with concurrent sexual partnerships, Houston, Texas, USA. *International Journal of STD and AIDS, 19*, 768-771.
- Sandøy, I. F., Dzekedzek, K., & Fylkesnes, K. (2010). Prevalence and correlates of concurrent sexual partnerships in Zambia. *AIDS and Behavior, 14*, 59-71.
- Selikow, T. (2004). "We have our own special language". Language, sexuality and HIV/AIDS: A case study of youth in an urban township in South Africa. *African Health Sciences, 4*(2), 102-108.
- Shelton, J. D. (2007). Ten myths and one truth about generalized HIV epidemics. *Lancet, 370*, 1809-1811.
- Southern Africa HIV and AIDS Information Dissemination Service (SAFAIDS). (2011). *HIV & AIDS & STI Strategic Plan for South Africa: 2007-2011*. Retrieved on June 19, 2012 from: http://www.saf aids.net/files/S.A%20National%20HIVAIDS_STI%20Strategic%20Plan%202007-2011.pdf
- Steffenson, A. E., Pettifor, A. E., Seage, G. R. III, Rees, H. V., & Cleary, P. D. (2011). Concurrent sexual partnerships and human immunodeficiency virus risk among South African youth. *Sex Transm Dis., 38* (6), 459-66.
- Tanser, F., Bärnighausen, T., Hund, L., Garnett, G. P, McGrath, N., & Newell, M. L. (2011). Effect of concurrent sexual partnerships on rate of new HIV infections in a high-prevalence, rural South African population: a cohort study. *Lancet, 378*, 247-255.
- UNAIDS. (2009). *HIV and AIDS estimates for South Africa*. Retrieved on March 28, 2012 from: <http://www.unaids.org/en/regionscountries/countries/southafrica/>
- UNAIDS Reference Group on Estimates, Modeling, and Projections: Working Group on Measuring Concurrent Sexual Partnerships. (2010). HIV: consensus indicators are needed for concurrency. *Lancet, 375*, 621-622.
- USAID/R2P/Project SEARCH. (2011). *Understanding the dynamics of concurrent sexual partnerships in Malawi and Tanzania*. Retrieved on June 12, 2012 from: <http://www.jhsph.edu/sebin/g/o/concurrentpartnershipsweb.pdf>
- Watts, C. H. & May, R. M. (1992). The influence of concurrent partnerships on the dynamics of HIV/AIDS. *Mathematical Biosciences, 108*(1), 89-104.
- Xu, H., Luke, N., & Zulu, E. M. (2010). Concurrent sexual partnerships among youth in urban Kenya: prevalence and partnership effects. *Population Studies, 64*(30), 247-261.