Reported Partnership Concurrency and HIV Incidence among Married Couples in Two Population-Based Cohort Studies in Rural Uganda

Elizabeth Sully
Office of Population Research & Woodrow Wilson School of Public and International Affairs, Princeton University

Fred Nalugoda
Rakai Health Sciences Program

Kenneth Ekoru
Medical Research Council / Uganda Virus Research Institute

Tom Lutalo
Rakai Health Sciences Program

Georges Reniers
Department of Population Health, London School of Hygiene and Tropical Medicine

Janet Seeley
Medical Research Council / Uganda Virus Research Institute
Department of International Development, University of East Anglia

Abstract:

Concurrent partnerships are often considered a primary driver of the HIV epidemic in Sub-Saharan Africa. Due to data constraints, however, few studies have been able to demonstrate its effect using empirical data. In this paper, we test whether HIV transmission rates are higher for individuals with concurrent partners - an effect that is ascribed to the higher viral load shortly after seroconversion. Data spanning a 14-year time period are used from two rural community sero-surveillance sites in South-Western Uganda. Seroconcordant negative married couples are followed over time, examining the risk of seroconversion for couples exposed to concurrency. A discrete-time logit model is used to determine the risk of seroconversion among women whose husbands reported a concurrent partnership. We find mixed evidence for the effect of the husband's concurrency on the HIV incidence of their wives. Our preliminary findings suggest a need to better understand the variations in behaviors that may mediate the effect of concurrency, as well as the limitations of testing the concurrency hypothesis using self-reports.

Acknowledgements:

We would like to extend our thanks to the survey, data and statistics teams of the MRC/UVRI General Population Cohort Study (GPC) and the Rakai Health Sciences Program Rural Community Cohort Study (RCCS). We would also like to thank all of the respondents of the GPC and RCCS for their time and participation in the survey. This study was made possible with financial support from an NICHD Center Grant to the Office of Population Research at Princeton University (R24HD047879).

Correspondence:

Elizabeth Sully, Office of Population Research, 284 Wallace Hall, Princeton University, Princeton, NJ, 08544. esully@princeton.edu

Previous research has suggested that concurrent partnerships are a primary driver of the HIV epidemic in Sub-Saharan Africa. Concurrency is defined as two overlapping sexual partnerships, where sex with one partner falls in between two acts of intercourse with another partner (UNAIDS Reference Group on Estimates Modelling and Projections: Working Group on Measuring Concurrent Sexual Partnerships 2010). The theory holds that the overlap in partnership timing drives higher HIV rates due to the increased risk of HIV transmission immediately following seroconversion. The viral load, which determines infectiousness, peaks in the first few months following seroconversion (Boily et al. 2009; Wawer et al. 2005). In concurrent partnerships, individuals are quite likely to have sex during the highly infectious early phase of the disease, and to transmit the virus to a sero-negative partner. Models suggest that the risk of transmission is reduced in serial monogamy, as the likelihood of coitus with new partners during the highly infectious window is lower.

Even though the concurrency hypothesis has intuitive appeal and the mathematical models are very persuasive indeed, a considerable debate has evolved around the empirical evidence –or lack thereof (Halperin and Epstein 2004; Mah and Halperin 2009; Mah and Halperin 2010; Maas and Zijdeman 2010; Morris 2009; Lurie and Rosenthal 2009a; Lurie and Rosenthal 2009b; Lagarde et al. 2001; Larry Sawers and Stillwaggon 2010; Reniers and Watkins 2010). Using mathematical modeling, Morris and Kretzschmar (1997) were able to illustrate the effect of concurrency on epidemic size, suggesting that "concurrent partnerships are an important independent risk factor for HIV transmission." The empirical evidence, however, has provided mixed results: Sawers and Sillwaggon (2010) reviewed 28 country and city estimates and highlighted the high variability in concurrency prevalence estimates depending on the method of data collection. Recent research by Tanser et al. (2011) examined the geographic relationship

between men's reported concurrency and the HIV-incidence of women within the same area and found no association. While advancing the empirical evidence against concurrency, the assumption that sexual partnerships primarily occur within the same geographic space limits the reliability of these findings. Other studies have critiqued the concurrency models assumptions, such as an unrealistically high level of coital frequency occurring with each (concurrent) partner, arguing instead a coital dilution effect may in large part compensate for the elevated transmission rates in concurrent partnerships (Sawers, Issac, and Stillwaggon 2011; Reniers and Tfaily 2012; Gaydosh, Reniers, and Helleringer 2013).

An important, yet often misunderstood repercussion of partnership concurrency is that it only affects the probability of *transmitting* HIV, not the probability of *acquiring* HIV (Morris 2001). An individual who takes on a new partner may be at an increased risk of acquiring HIV, but this risk is not affected by the timing of the partnerships. The concurrency effect is about how the overlap in timing of partnerships makes the individual engaging in concurrency more likely to pass the virus on to their other partners. In other words, the concurrency hypothesis predicts a positive correlation between the index case's concurrency and the HIV status of their partners (but not their own HIV status). This last point has important methodological implications because it means that individual-level ego-centered studies of HIV risk factors cannot detect individual-level concurrency effects, and these are precisely the most commonly available type of data sources.

Current attempts to empirically test the concurrency hypothesis have been unsuccessful due to the lack of data on linked partnerships and HIV incidence over time. Cross-sectional data at both the individual and country level have been used to determine associations between concurrency and HIV prevalence. HIV prevalence captures cumulated exposure of a population

prior to the survey, while concurrency is usually measured at the time of the interview, or 6 months prior. Moreover, the risk of concurrency operates via increased transmission of the virus, which is best captured by measuring HIV incidence. Studies that do have HIV incidence data often focus on an index respondent's reported concurrent partnerships. Index respondent incidence data only allow for the measurement of HIV acquisition, which will most likely be higher due to the increase in the number of sexual partners the index respondent now has. Linked partnership data are needed to evaluate HIV incidence in the alters of the index respondents who report concurrency.

One sexual network study was able to use linked partner data, and found an association between concurrency and serodiscordance (Helleringer, Kohler, and Kalilani-Phiri 2009). However, having only cross-sectional data from a relatively small sample size (N=142), the authors were only able to look at HIV prevalence. Moreover, according to the concurrency hypothesis we could expect both partners to seroconvert within a short interval, making both partners seroconcordant positive, rather than serodiscordant.

Determining the effect of concurrency has two important implications for HIV research and policy. First, previous research has shown that one's partner's infidelity, one form of concurrency in marriage, greatly contributes to one's perceived risk of HIV (Anglewicz and Kohler 2009), and is associated with an increased risk of separation and divorce as a strategy to avoid the perceived risk from infidelity (Reniers 2008). There is a disconnect, however, between perceptions of risk and what that risk actually is. This paper fills this gap by measuring the effect of concurrency, and whether the perceptions of high risk are warranted. Second, measuring the effect of concurrency is important for HIV prevention policy in helping to determine whether

emphasis should be placed on the number of partnerships, or whether timing of partnerships is important, as concurrency would suggest.

In this paper we overcome the data limitations that have plagued previous studies by examining concurrency among married couples in a large population-based cohort in rural south-western Uganda. Using extra-spousal partnerships as a measure of concurrency, as well as the UNAIDS suggested measure in one of the two study sites, we examine men's reports of concurrency and their wives' HIV incidence over a 14-year period, starting in 1998. This is the first such study to overcome previous data limitations, using linked partner data and HIV incidence to significantly advance research on the concurrency hypothesis. The study will provide a test of the individual-level mechanisms the concurrency hypothesis proposes – that concurrent partnerships increase the likelihood of HIV transmission. We will not be able to test the population-level effect the concurrency hypothesis proposes, namely that concurrency creates a network structure that results in higher HIV risk. Using HIV incidence data among seroconcordant negative couples, we are also able to measure the extent of misreporting of concurrency. This is the first study to use this approach, highlighting the limitations to studying concurrency using self-reported sexual behaviors.

Question and Hypotheses

To determine the effect of concurrency on HIV transmission this paper asks what is the risk of seroconversion for women in partnership episodes where husbands have concurrent partners? To answer this question, we focus on measuring the risk to an individual exposed to concurrency. However, even if the risk is low, concurrency may still account of a large portion of the seroconversions that are occurring within marriage.

We hypothesize that while concurrency will be common in marital partnerships, the HIV risk faced by women exposed to their husband's concurrency will actually be quite small. Intuitively it seems that if the husband seroconverts, it would be likely that his wife would eventually seroconvert after repeated exposure to the virus. There are two reasons why this may not be the case, justifying the hypothesis that the risk from concurrency is smaller than modeling studies have suggested.

First, the concurrency hypothesis' proposed high risk is suggested to in part be the result of the high viral load following seroconversion. There is only a short three-month window in which transmission rates would be high. Depending on the frequency of coitus, exposure within this three-month widow may vary across partnerships. Following this three-month interval the viral load drops substantially. Continued exposure to an HIV positive partner may not result in the seroconversion of the negative partner in this longer interval with a lower viral load. Current research has found that serodiscordant partnerships account for only a small portion of sero-incident cases in a generalized HIV epidemic (Chemaitelly et al. 2012).

Second, it is possible that individuals in concurrent partnerships take precautionary measures that minimize the risk associated with concurrency or having multiple partners. Using detailed partnership data in one of the study sites, we will also explore how coital frequency, circumcision, and condom use may mitigate exposure.

Data

The data come from a two rural community sero-surveillance surveys in South-Western Uganda: the General Population Cohort (GPC) study conducted by the Medical Research Council and the Uganda Virus Research Institute (MRC/UVRI) in Masaka district, and the Rakai Community

Cohort Study (RCCS) conducted by the Rakai Health Sciences Program (RHSP) in Rakai district. The GPC and the RCCS are both open-cohort studies with longitudinal data on marital histories, linked partnerships, sexual behavior and HIV incidence. The GPC was established in 1989 and now covers all adults 15 years and older in 25 villages. We will be using a sub-sample of the GPC for which marital partnerships can be linked, providing a sample of 5,302 marriages from 1998-2011. The RCCS was established in 1994 and covers 50 villages with approximately 16,000 adults 15-49 years old. There are 12,376 linked partnerships in the RCCS sample.

The irreversible nature of HIV infection allows for backwards imputation of negative serostatus, and forward imputation of positive HIV status. When HIV status was missing in rounds between a negative and a positive HIV test, the assumption was made that HIV seroconversion occurred at the mid-point of the interval for missing data gaps of three years or less. When the gap between a negative and a positive HIV test was greater than three years, a negative HIV test was imputed forward a maximum of two person-years, and a positive HIV test was imputed backwards a maximum of two person-years. This method of imputation has been employed by other studies using the GPC and other similar sero-surveillance sites. We test the sensitivity of our results to the imputation of HIV status.

To determine the effect of concurrency on HIV infection, we limit our data to a sample of married adults 15 years and older with linked partnership data. To isolate the effect of concurrency, seroconcordant positive and serodiscordant couples are removed from the sample. It is not possible to rule out non-concurrency related transmission among serodiscordant couples, and seroconversion has already occurred in seroconcordant positive couples. In addition, HIV status was missing for one or both partners in 23% of linked partnerships. We therefore limit our

sample to couples who are seroconcordant negative at first observation (highlighted in Table 1), providing a sample of 11,298 seroconcordant negative couples.

Measuring Concurrency

We use two measures of concurrency in this paper. First, concurrency is measured as any report of an extra-spousal partnership in the preceding 12 months. The main assumption of this measure is that all individuals who are married are engaging in coitus with their spousal partner. Lacking exact relationship duration and coital frequency information, this is the best measure available for this analysis. While this does not adhere to the recommended UNAIDS measure (see below) for concurrency, it serves as a close proximate measure among married individuals. This measure is used first as it can be constructed for both the GPC and the RCCS data.

The second measure of concurrency is the UNAIDS recommended definition, where sex with one partner falls between two acts of sex with another partner (UNAIDS Reference Group on Estimates Modelling and Projections. 2009). The RCCS has data on dates of first and last sex for up to four sexual partners in the last 12 months. This is used to calculate the cumulative prevalence of concurrency in the previous 1 year. This measure will be compared to the first measure that is common across both datasets, providing an important sensitivity test.

The concurrency hypothesis is about the timing of partnerships, rather than the quantity of partners. However, our measure of concurrency does not differentiate between individuals with one or more extra-spousal partnerships. To take into account the effect of the number of partners, we do control in our models for number of partners in the previous 12 months. We also test the sensitivity of our measure of concurrency to the inclusion and exclusion of formal concurrency in polygynous unions.

We look only at seroconversions that occur in the year of the reported concurrency and in the subsequent year as we do not know when in the interval concurrency occurred. Between these measures, we should be capturing the three-month period of elevated viral loads. Figure 1 shows the 3 possible seroconversion trajectories that would indicate that concurrency does lead to HIV transmission. In each of these trajectories, both partners either seroconvert in the same time period, or one seroconverts, followed by the seroconversion of the other partner in the following time period.

The Comparison Group

This analysis measures the risk of concurrency by comparing HIV acquisition in wives whose husbands do and do not have concurrent partnerships. The ideal test of the concurrency hypothesis would compare concurrent to sequential partners to measure the effect of partnership timing. However, we only have linked partnership data for married couples. We do not have a sample of sequential partnerships with which to compare the concurrent partnerships. Assuming continued coitus during marriage, any new partner among married individuals is considered concurrent.

Comparing seroconcordant negative couples that are and are not exposed to concurrency is not without drawbacks. If sexual intercourse is the only pathway for exposure among married couples, couples not reporting concurrency would have a risk of 0. To address this issue, the unit of analysis will not be couples, but partnership episodes. Of the sample initially seroconcordant negative, it is possible that the husband seroconverts after taking on concurrent partners, but the wife does not seroconvert in time *t* or *t+1*.[1] If the husband is no longer engaging in concurrency in future years, the wife may still seroconvert in subsequent years. A partnership episode is

[1] *t* refers to the survey round, which normally spans across part of two calendar years.

therefore defined as a husbands' reported concurrency, or lack thereof, at time *t* or time *t-1*, and the seroconversion of wives at time *t*. Every survey round *t* that a couple is in the survey is counted as one partnership episode. Using partnership episodes for analysis, we count multiple episodes from the same marital partnerships, only some of which report concurrency. With this method, the incidence in the non-exposed group is no longer necessarily 0.

Methods

Descriptive analysis will be used to trace the seroconversions for all marital partnerships that are seroconcordant negative in the first round of observation. This analysis shows seroconversion differences among partnership episodes with and without concurrency, as well as traces which individual in the partnership seroconverts first. We also construct a new measure, the Concordant Positive Incidence Rate (CPIR), which is the incidence rate of the seroconversions that would suggest an effect of concurrency. This is measured by taking the incidence of originally seroconcordant negative couples that become seroconcordant positive, and dividing by the partnership-years in which concurrency is reported (equation 1).

(1)

$$CPIR = \frac{Number\ of\ (F+M+)Unions}{Partnership\ years\ with\ concurrency}$$

To determine the effect of concurrency on HIV transmission, this paper measures the risk of seroconversion for women in partnership episodes where husbands have concurrent partners. We estimate the risk of seroconversion ($h_{ij}(t)$) among wives using a discrete-time logit model (equation 2), where *t* is the discrete time-interval, *i* is the partnership episode and *j* is the marital

partnership. Our main predictor is husbands' reports of concurrency in each partnership episode, which is a time-varying covariate and estimated with β_1. A partnership episode is considered exposed to concurrency if the husband reports a concurrent partner at time *t* or *t-1* Controls are added for the wives age, and survey round dummies ($\alpha(t)$). Whether the wife reported a concurrent partner at time *t* is also controlled for as her seroconversion may result from her own increased number of partners, rather than from the risk of her husband. In a second model we add a control for the husband's number of partners in the previous year to see how controlling for quantum of partners affects the risk of seroconversion. Husband-level random effects, u_k, with variance σ_u^2 are used to take into account the multiple marriages men, and in particular polygnous men, contribute to the analysis. We test the sensitivity of these results to the inclusion and exclusion of polygnous unions.

$$logit\left[h_{ij}(t)\right] = \alpha(t) + \beta_1 Husband's\_Concurrency_{ij}(t) + \beta_2 Wife's\_Age_{ij}(t) + \beta_3 Wife's\_Concurrency_{ij}(t) + u_j \quad (2)$$

$$u_k \sim N(0, \sigma_u^2)$$

Misreporting of sexual behaviors may affect the validity of our findings. Previous studies have suggested that men are likely to over report their number of partnerships, while women, and in particular married women, are very likely to underreport sexual partnerships (Nnko et al. 2004). We use an innovative approach to measuring the misreporting: seroconversions among men or women not reporting concurrency whose spouse remains sero-negative would indicate there is underreporting of concurrent partnerships. We construct a measure of accuracy of concurrency reports among those who seroconvert first in their partnership, taking the number of individuals seroconverting who report concurrency but still have a sero-negative partner, divided

by the number of individuals seroconverting with a sero-negative partner (equation 3). Assuming only sexual transmission, if one's spouse is sero-negative, HIV can only enter marriage through concurrent partnerships. The closer to one the accuracy measure is, the less under reporting of concurrency among those who seroconvert.

(3)

$$Accuracy\ of\ Concurrency\ Reports\ among\ those\ seroconverting\ first = \frac{\#\ first\ seroconverters\ reporting\ concurrency}{\#\ seroconverters}$$

Results

Forthcoming. Please contact corresponding author.

References

Anglewicz, Philip, and Hans-Peter Kohler. 2009. "Overestimating HIV Infection: The Construction and Accuracy of Subjective Probabilities of HIV Infection in Rural Malawi." *Demographic Research* 20 (6): 65–96. doi:10.4054/DemRes.2009.20.6.

Boily, Marie-Claude, Rebecca F Baggaley, Lei Wang, Benoit Masse, Richard G White, Richard J Hayes, and Michel Alary. 2009. "Heterosexual Risk of HIV-1 Infection Per Sexual Act: Systematic Review and Meta-analysis of Observational Studies." *The Lancet Infectious Diseases* 9 (2) (February): 118–129. doi:10.1016/S1473-3099(09)70021-0.

Chemaitelly, Hiam, James D Shelton, Timothy B Hallett, and Laith J Abu-Raddad. 2012. "Only a Fraction of New HIV Infections Occur Within Identifiable Stable Discordant Couples in Sub-saharan Africa." *AIDS (London, England)* (October 17). doi:10.1097/QAD.0b013e32835ad459.

Gaydosh, Lauren, Georges Reniers, and Stéphane Helleringer. 2013. "Partnership Concurrency and Coital Frequency." *AIDS and Behavior* 17 (7) (September 1): 2376–2386. doi:10.1007/s10461-013-0525-x.

Halperin, Daniel T., and Helen Epstein. 2004. "Concurrent Sexual Partnerships Help to Explain Africa's High HIV Prevalence: Implications for Prevention." *The Lancet* 364 (9428): 4–6.

Helleringer, Stéphane, Hans-Peter Kohler, and Linda Kalilani-Phiri. 2009. "The Association of HIV Serodiscordance and Partnership Concurrency in Likoma Island (Malawi)." *AIDS (London, England)* 23 (10) (June 19): 1285–1287. doi:10.1097/QAD.0b013e32832aa85c.

Lagarde, Emmanuel, Bertran Auvert, Michel Carael, Martin Laourou, Benoit Ferry, Evina Akam, Tom Sukwa, et al. 2001. "Concurrent Sexual Partnerships and HIV Prevalence in Five Urban Communities of sub-Saharan Africa." *AIDS* 15 (7) (May): 877–884.

Lurie, Mark N., and Samantha Rosenthal. 2009a. "Concurrent Partnerships as a Driver of the HIV Epidemic in Sub-Saharan Africa? The Evidence Is Limited." *AIDS and Behavior* 14 (1) (June): 17–24. doi:10.1007/s10461-009-9583-5.

———. 2009b. "The Concurrency Hypothesis in Sub-Saharan Africa: Convincing Empirical Evidence Is Still Lacking. Response to Mah and Halperin, Epstein, and Morris." *AIDS and Behavior* 14 (1) (December): 34–37. doi:10.1007/s10461-009-9640-0.

Maas, Ineke, and Richard Zijdeman. 2010. "Beyond the Local Marriage Market." *Demographic Research* 23 (November): 933–962. doi:10.4054/DemRes.2010.23.33.

Mah, Timothy L., and Daniel T. Halperin. 2009. "The Evidence for the Role of Concurrent Partnerships in Africa's HIV Epidemics: A Response to Lurie and Rosenthal." *AIDS and Behavior* 14 (1) (October): 25–28. doi:10.1007/s10461-009-9617-z.

———. 2010. "Concurrent Sexual Partnerships and the HIV Epidemics in Africa: Evidence to Move Forward." *AIDS and Behavior* 14: 11–16.

Morris, Martina. 2009. "Barking up the Wrong Evidence Tree. Comment on Lurie & Rosenthal, 'Concurrent Partnerships as a Driver of the HIV Epidemic in Sub-Saharan Africa? The Evidence Is Limited'." *AIDS and Behavior* 14 (1) (December): 31–33. doi:10.1007/s10461-009-9639-6.

Morris, Martina, and Mirjam Kretzschmar. 1997. "Concurrent Partnerships and the Spread of HIV." *AIDS* 11 (5) (April): 641–648.

Nnko, Soori, J Ties Boerma, Mark Urassa, Gabriel Mwaluko, and Basia Zaba. 2004. "Secretive Females or Swaggering Males?: An Assessment of the Quality of Sexual Partnership

Reporting in Rural Tanzania." *Social Science & Medicine* 59 (2) (July): 299–310. doi:10.1016/j.socscimed.2003.10.031.

Reniers, G. 2008. "Marital Strategies for Regulating Exposure to HIV." *Demograph* 45 (2) (May).

Reniers, Georges, and Susan Watkins. 2010. "Polygyny and the Spread of HIV in Sub Saharan Africa: A Case of Benign Concurrency" 24 (2) (January 16): 299–307. doi:10.1097/QAD.0b013e328333af03.

Reniers, Georges1, and Rania2 Tfaily. 2012. "Polygyny, Partnership Concurrency, and HIV Transmission in Sub-Saharan Africa." *Demography* 49 (3) (August): 1075–1101. ofm. doi:10.1007/s13524-012-0114-z.

Sawers, L., A. Issac, and E. Stillwaggon. 2011. "HIV and Concurrent Sexual Partnerships: Modelling the Role of Coital Dilution." *Journal of the International AIDS Society* 14 (1): 44.

Sawers, Larry, and Eileen Stillwaggon. 2010. "Concurrent Sexual Partnerships Do Not Explain the HIV Epidemics in Africa: a Systematic Review of the Evidence." *Journal of the International AIDS Society* 13 (1): 34. doi:10.1186/1758-2652-13-34.

Tanser, F., T. Bärnighausen, L. Hund, G. P Garnett, N. McGrath, and M. L Newell. 2011. "Effect of Concurrent Sexual Partnerships on Rate of New HIV Infections in a High-prevalence, Rural South African Population: a Cohort Study." *The Lancet* 378 (9787): 247–255.

UNAIDS ReferenceGroup on EstimatesModelling and Projections. 2009. "Consultation on Concurrent Sexual Partnerships: Recommendations from a Meeting Held in Nairobi, Kenya." http://www.epidem.org/publications.htm.

UNAIDS ReferenceGroup on EstimatesModelling and Projections: Working Group on Measuring Concurrent Sexual Partnerships. 2010. "HIV: Consensus Indicators Are Needed for Concurrency." *The Lancet* 375 (February): 621–622.

Wawer, Maria J., Ronald H. Gray, Nelson K. Sewankambo, David Serwadda, Xianbin Li, Oliver Laeyendecker, Noah Kiwanuka, et al. 2005. "Rates of HIV-1 Transmission Per Coital Act, by Stage of HIV-1 Infection, in Rakai, Uganda." *Journal of Infectious Diseases* 191 (9) (May 1): 1403 –1409. doi:10.1086/429411.

Figure 1: Seroconversion trajectories that would indicate concurrency-related seroconversion among couples exposed to concurrency (red).

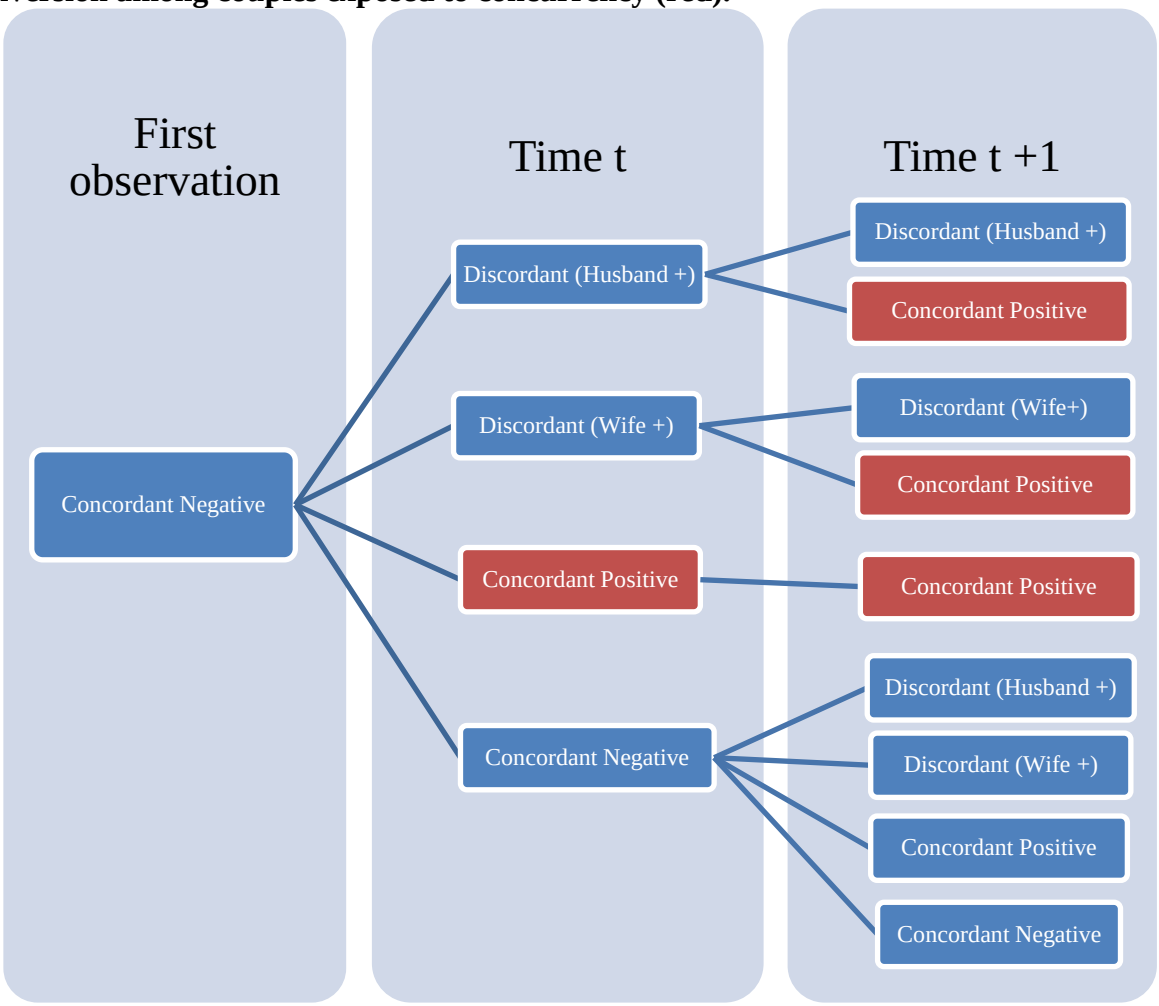

Table 1: Sero-status of couples at first observation

Masaka (N=5,302)		**Husband's Sero-Status**		
		Negative	Positive	Unknown
Wife's Sero-Status	Negative	2,872	142	978
	Positive	134	143	84
	Unknown	809	57	83

Rakai (N=12,361)		**Husband's Sero-Status**		
		Negative	Positive	Unknown
Wife's Sero-Status	Negative	8,426	538	794
	Positive	566	691	119
	Unknown	865	138	237

Table 2: Background Characteristics of Marital Partnerships and Partnership Episodes

	GPC (1998-2011)			RCCS (1999-2011)		
	N	%		N	%	
Partnership Characteristics						
Number of Parnterships	2,872			8,426		
Ever Reported an Extraspousal Parntership						
Wife 's concurrency	171	6.0				
Husband's oncurrency	1,547	53.9				
Ever UNAIDS Measure of Concurrency				521	6.2	
Wife 's concurrency				5,243	62.2	
Husband's oncurrency						
Polygnyous Union						
Yes	804	28.0		1,813	21.5	
	All	Concurrency (%)	p-value	All	Concurrency (%)	p-value
HIV Status (at last observation)			0.000			0.000
(F- M-)	2,759	53.0		8,143	61.5	
(F- M+)	50	75.7		126	87.3	
(F+ M-)	37	70.0		72	66.7	
(F+ M+)	25	88.0		85	91.8	
Wife's Age (at first observation)			0.000			0.000
15-24	1,181	59.4		4,803	62.7	
25-34	758.0	58.6		2,410	64.7	
35-44	436	54.6		942	58.0	
45-54	294	40.1		250	49.6	
55+	202	22.3		21	80.0	
Husband's Age (at first observation)			0.000			0.000
15-24	462	57.1		2,198	59.9	
25-34	957	61.4		3,696	66.4	
35-44	570	60.9		1,601	62.7	
45-54	334	51.8		625	52.8	
55+	548	31.8		306	54.1	
Ethnicity			0.000			0.000
Both Muganda	1,422	57.1		4,146	66.4	
Wife Muganda, Husband other	373	52.8		1,308	58.5	
Husband Muganda, Wife other	372	63.7		1,361	66.4	
Both other	704	42.6		1,611	51.0	
Religion			0.000			0.000
Both Christian	1,687	52.7		5,918	60.4	
Both Muslim	500	57.6		971	73.5	
Wife Christian, Husband Muslim	135	65.2		369	83.5	
Wife Muslim, Husband Christian	129	65.1		250	70.8	
Other	420	46.9		1,638	55.3	
Partnership Episode Characteristics	N	%		N	%	
Number of Parternship Episodes	30,021			36,565		
Reported an Extraspousal Parntership						
Wife 's concurrency	389	1.3				
Husband's oncurrency	7,446	24.8				
UNAIDS Measure of Concurrency						
Wife 's concurrency				1,043	2.9	
Husband's oncurrency				15,754	43.08	
Husband's # of Partners in Part 12 Months						
1	22,575	75.2		20,811	56.9	
2	5,068	16.9		10,495	28.7	
3+	2,378	7.9		5,259	14.4	
	All	Concurrency (%)	p-value	All	Concurrency (%)	p-value
HIV Status (in partnership episode)			0.021			
(F- M-)	29,343	24.7		35,558	42.8	0.000
(F- M+)	354	24.3		508	62.6	
(F+ M-)	195	33.9		247	33.6	
(F+ M+)	129	28.7		252	59.9	

Note: For partnership characteristics, the column on concurrency refers to marital partnerships where concurrency was ever reported by the husband. For partnership episodes, these are episodes in which concurrency was reported during that time period by the husband. For the RCCS, concurrency percentages refer to concurrency as reported using the UNAIDS measure.