# Patterns of Marital Concurrency and HIV Risk in Africa

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# Abstract

**Objective**

Research has identified sexual concurrency as an underlying driver of high HIV infection levels in sub-Saharan Africa, though few studies have explicitly examined the contribution of marital concurrency. The objective of this study was to assess the prevalence of different types of marital concurrency in sub-Saharan Africa and the association of marital concurrency with HIV infection in a diverse sample of countries.

**Methods**

Utilizing a multi-level model of Demographic and Health Surveys with HIV-biomarkers for sixteen African countries, this study assessed the relationship between individual HIV infection and formal sexual concurrency (polygamous unions) and informal sexual concurrency (extramarital partner past year) among married men and women controlling for covariates and national fixed effects. Regional-level variables (% polygamous unions, % extramarital partner past year) were constructed and modelled to test the contextual risk posed by living in a region with higher levels of formal and informal marital concurrency. Finally, for a subset of 6 countries for which multiple time points are available, regional data on historical prevalence of marital concurrency was utilized to assess changing patterns of sexual concurrency and the effect of historical marital concurrency on present day HIV patterns.

**Results**

Compared with monogamous unions, both formal and informal marital concurrency were positively associated with HIV infection at the individual-level controlling for covariates. However, the odds of having HIV were higher among individuals living in regions with more informal marital concurrency, but lower in regions with more polygamy, even accounting for individual-level marital concurrency. RESULTS FROM HISTORICAL ANALYSIS-in progress.

**Conclusions**

Across multiple African countries, both formal and informal marital concurrency was associated with greater HIV risk at the individual-level, but living in a region with greater polygamy was protective. Having a larger percentage of the population in extramarital partnerships increases HIV risk even for monogamous individuals living in a given area.



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# Background

Research has identified sexual concurrency as an underlying driver of high HIV infection levels in parts of sub-Saharan Africa (1, 2, 3, 4, 5), though this association remains contested (6, 7). Sexual concurrency (having more than one regular sexual partner overlapping in time) is believed to speed the transmission of HIV through two primary mechanisms. First, it increases the likelihood that an individual in a concurrent network will be exposed to the virus during the acute phase of infection when their infected partner is the most viremic and poses the most risk of secondary transmission (8, 9). The longer the duration of the overlap and the greater the coital frequency, the higher the risk posed. At a population level, sexual concurrency is believed to act as an HIV transmission "superhighway" because, if individuals unknowingly expose multiple partners during this acute phase, especially partners who are also linked into concurrent networks, HIV infection will spread much more rapidly than if the individual is monogamous and exposes only one other partner who is also monogamous (10, 11). Secondly, because HIV has a relatively low probability of sexual transmission per sex act, regular sexual contact with the same person (as opposed to one-off encounters) facilitates transmission of HIV even after the acute infection period (8, 9).

Sexual concurrency is believed to be quite common in Africa, but to date, behavioral data has shed little light on cross-national differences in HIV infection levels (12, 7). Critics of the concurrency thesis suggest there is little empirical evidence to substantiate the level of impact attributed to this sexual network structure. Skeptics note that most of the evidence on concurrency is drawn from statistical modeling exercises that rely on assumptions and are only as accurate as the parameter estimates entered in the models (6, 7). They further cite the lack of a common definition of concurrency used across studies, the inadequacy of available data on concurrency and the repeated citing of non-empirical studies or outdated data by researchers that advance concurrency as an underlying cause of HIV (6, 7).

Few studies have examined the prevalence of marital concurrency and its contribution to HIV even though much HIV transmission is believed to take place within marital partnerships (13). In Africa, marital concurrency takes two forms: polygamy (*formal marital concurrency*) and extramarital sexual relationships (*informal marital concurrency*). Much remains unknown about the prevalence of marital concurrency and the relationship between marriage and HIV in Africa. Studies on the relationship between marital status and HIV have in fact produced contradictory findings. For instance, some studies suggest that given the high HIV prevalence rates among young girls (age 15-24), many enter marriages HIV infected, perhaps infecting their male partners. Yet, other studies suggest that a substantial portion of men likely acquire HIV outside of marriage and infect their young brides (13). Furthermore, both early and late marriage has been found to be associated with HIV risk (14, 15). Recent studies of serodiscordant couples have suggested that women may be more likely than previously thought to introduce HIV into marriages (16, 17).

Though polygamy, as a form of marital concurrency, likely increases risk for HIV, research on polygamy and HIV has also revealed contradictory findings and polygamy has been dubbed by some a form of "benign concurrency" (19). Whereas several studies have found that individuals in polygamous unions are at increased risk for HIV (18), at the

ecologic level, places with more polygamous unions have been found to have lower HIV infection rates (19, 20). This suggests that at a population level, polygamy is protective, even though it increases risk at an individual level. In a multi-level analysis using Demographic and Health Survey data from multiple countries, Reneirs and Tfaily (20) find that the disproportionate recruitment of divorcees and widows into polygamous unions as second or third wives contributes to the positive individual-level association since these individuals are more likely to be HIV infected.

The effect of marital concurrency on HIV infection could be confounded by religion as Muslims may be more likely to be in polygamous unions, but may have a lower risk for HIV infection due to universal male circumcision and strong religious strictures against non-marital sex. Among non-Muslims that practice polygamy in Africa, little is known about how the practice of polygamy might affect their HIV risk apart from other forms of informal concurrency. Islam, for instance, has a limiting quantity on the number of wives with an upper threshold of four, compared with other African religious practices that allow for a potentially greater number of wives. Although both formal and informal marital concurrency is assumed to be widespread in Africa, few studies have looked at the prevalence of this practice and how it corresponds with HIV infection trends or individual risk of HIV infection.

Few, if any, studies have explicitly assessed the risk posed by extramarital concurrency, although this is proposed to be a leading source of infection for men (18). Extramarital sexual relationships are believed to be prevalent, but little is known about how common this practice is and its specific association with HIV risk separate from unmarried individuals with multiple partners. Qualitative research from Africa suggests a decline in formal marital concurrency as polygamy has become increasingly stigmatized and its increasing replacement with a pattern of informal secondary households. Few quantitative studies have explicitly looked at the prevalence of informal concurrency. Mishra Hong, Bignami-Van Assche & Barrere (21), have estimated the prevalence of marital faithfulness in four African countries using the Demographic and Health Surveys. They find that in each country, being unfaithful in marriage increases HIV risk compared with individuals who have always been faithful to their one spouse. They further find that having more lifetime partners, though riskier than lifetime faithfulness to one partner, poses less risk than having been unfaithful in the past year. This study examined only marital faithfulness rather than marital concurrency (having long-term extramarital partners) and excluded individuals in polygamous unions. Furthermore, while it examined patterns across four countries, it did not explicitly examine the impact of living in a place with higher rates of marital infidelity.

With the exception of Reniers & Tfaily (20), most previous studies have examined the impact of concurrency only at an individual level even though the real risk posed by concurrency accrues less to individuals who have concurrent partners and more to sexual networks and places in which concurrency is more widespread (22). Individuals who have multiple partners are only at heightened risk if their partners have multiple partners. For this reason, both informal and formal marital concurrency are likely riskier than serial monogamy for individuals, but the more fluid nature of informal marital concurrency should theoretically be riskier than polygamy (see **Figure 1**). It is therefore necessary to employ methods that can capture the population risk posed by this network structure. This study employs multi-level modeling to test the effect of living in a place where different types of marital concurrency are more common, controlling for individual level behavior.

The hypotheses for this study are as follows:

- Having an extramarital partner and being in a polygamous union should each increase an individual's risk of HIV infection, compared with monogamous unions.
- However, living in a region with more extramarital partnerships should increase risk, whereas living in a region where polygamy is common should be protective.
- The HIV risk from marital concurrency should endure even accounting for lifetime partners.
- In places where formal concurrency has been declining and informal concurrency increasing, present day HIV prevalence should be higher.

<<Insert Figure 1 about here>>

An understanding of the role of marital concurrency in generating HIV risk is important for policy and practice in HIV prevention. The findings can help shed further light on the relationship between marriage and HIV risk and risk factors within marriage. Adding to the evidence base on concurrency with representative, comparative cross-national is also critical given the questionable empirical support for sexual concurrency as an underlying driver of HIV. Furthermore, in order to resolve the contradictory findings that have arisen between research conducted exclusively at either the individual or population level, analytic methods that allow both levels of analysis to be addressed simultaneously are necessary. To that end, this paper aimed to leverage population data sources to assess the contribution of different types of sexual network structures on HIV risk and to add to the growing cross-national empirical evidence base regarding concurrency and marital HIV transmission.

# Methods

In order to assess the degree to which both informal and formal concurrency contribute to HIV infection in Africa, this study used Demographic and Health Survey data from 16 African countries with linked HIV biomarkers representing high, medium and low prevalence countries (see **Table 1**).

<<Insert Table 1 about here>>

*Measures and Instrumentation.*

*Dependent variable: HIV serostatus*. HIV serostatus was modelled as the dependent variable and was measured as the test result from the DHS HIV test. Although precise methods of collection may vary slightly from country to country, in all countries, blood samples were collected from willing and informed participants to test for HIV using two Enzyme-Linked Immunosorbent Assay (ELISA) tests that would also allow for sero-typing (23).

*Explanatory variables.* Formal and Informal Marital Concurrency. Men and women on the DHS are each asked respectively their number of wives and cowives. In addition, they are asked about the number of non-marital sexual partners they have had in the past year. Most surveys collect information on the duration of an individuals' last three sexual partners. Based on these questions, marital concurrency was measured in two ways. To measure informal marital concurrency, married men and women who reported having having at least one non-marital sex partner in the past year were coded as having an extramarital partner. Using extramarital partners as a proxy for concurrency rests on the assumption that if an individual is married and reports having sex with someone other than his/her spouse, that these sexual relationships are overlapping in time. This is not an ideal measure of concurrency since it does not capture the length of time an individual has known his/her extramarital partner. Based on the question regarding the length of duration that an individual has known a partner, a measure was created for individuals who have known at least one other sexual partner for one month or more and one year or more. This information was available for 14 of the 16 countries.

To measure formal marital concurrency, men who reported having 2+ wives and women who reported having at least 1 cowife were coded as being in a polygamous union. Men and women who reported having at least one non-marital sexual partner in the past year were coded as having an extramarital partner. An additional interaction term was created of individuals that were both in a polygamous union and reported having a non-marital partner in the past year. Thus, the comparison group was individuals in monogamous marriages (no additional reported spouses or extramarital partners in the past year). Individuals with cohabitating partners were excluded from the analysis as they might differ in significant ways from married individuals.

For regional measures of sexual concurrency, the percentage of individuals reporting an extramarital sexual partner in the past year was calculated and assigned to each region. Men and women were coded as being in a polygamous union if they reported having more than one wife/cowife and the % reporting more than one wife/cowife was calculated for each region. Though there is no direct measure of serial monogamy on the DHS, lifetime partners were also assessed for the twelve countries where this question was available to determine whether concurrency had an effect beyond the total number of sexual partners ever reported. In addition, for 6 countries, historical regional variables of marital concurrency were constructed.

*Control variables*. Given that male circumcision may confound the relationship between marital concurrency and HIV, a measure of regional measure of % men circumcised was created in order to capture the protective effect of male circumcision for women. Individual demographic variables including age, wealth, education, place of residence (urban versus rural), and sex (male/female) were also controlled for. Age at first sex and age at first marriage were also entered as controls along with whether an individual reported ever having a genital sore as have also been found to be associated with HIV risk.

*Analysis*. National prevalence estimates for different types of marital concurrency were calculated using the HIV sampling weights, taking into account the probability of men and women being selected into the HIV sample and are summarized in **Table 1**. All multivariate logistic regression models were run as three-level, hierarchical varying intercept and slope models adjusted for clustering at the regional level with the national level treated as fixed

effect. All data analysis was completed using Stata version 11 using the xtmelogit command (StataCorp; College Station, TX, USA).

Logistic regression models to assess HIV risk by extramarital partners and polygamy were first run separately and then run together with an interaction term capturing individuals who were both in polygamous unions and had extramarital partners. In Model 1, HIV status was assessed by formal and informal marital concurrency (individual and ecologic) with all controls entered except lifetime partners. In Model 2, lifetime partners were added to assess whether concurrency had an additional effect beyond the absolute number of partners an individual has been exposed to in his/her lifetime and years spent sexually active and single. Model 3 included all measures of marital concurrency together and Model 4 added variables capturing the length of duration of the relationship for extramarital partners.

For 6 countries, historical regional variables of marital concurrency were entered in the model as lagged variables. The ecologic relationship between historical polygamy and HIV prevalence was also examined.

## Results

**Table 1** shows the prevalence of different types of marital concurrency across the 16 countries. Polygamous unions (2+ wives or 1+ cowives) were common, especially in West Africa with a high of 47% in Guinea and a low of 2.4% in Lesotho (among women). Extramarital sexual partnerships were less common with wide variability across countries. In all countries, married men were more likely to report having an extramarital partner. Cameroon had the highest reported number of extramarital partners at 34.5% (46.7% for men, 22.6 for women). Niger had the lowest at 0.9%. In all countries except Ethiopia, a majority of individuals had known their extramarital partner for one month or more. Many though not a majority had known their extramarital partner for more than one year. Though extramarital sexual relationships were quite rare in Niger, 75% reported knowing their partner a year or more and 100% one month or more.

In examining the relationship between HIV and marital concurrency, both having an extramarital partner and being in a polygamous union increased the odds of an individual having HIV (OR=1.14, $p<0.01$; OR=1.25, $p<0.01$ respectively) adjusting for covariates (**Table 2**). However, at the regional level, the odds of having HIV was higher for individuals living in regions where extramarital partnerships were more common, but lower in regions with more polygamy (OR=1.03, $p<0.01$; OR=.98, $p<0.01$ respectively) (**Table 2**). Living in a region with more informal concurrency increased an individual's risk of HIV regardless of his/her own sexual behaviour and living in a region with more polygamy decreased an individual's odds of infection even as being in a polygamous union oneself increased HIV risk. In the models where lifetime partners were introduced for 12 countries, the number of lifetime partners was not significant and both informal and formal concurrency remained significant even after controlling for lifetime partners (**Table 2**).

The interaction between polygamy and extramarital partnerships was not significant though having an extramarital partner remained significant (**Table 3**). The length of time an individual had known their extramarital partner(s) was not associated with HIV infection beyond having had a partner in the past year.

**Table 4** shows the results of the historical analysis of marital concurrency patterns and HIV infections. TBD.

## Discussion and Conclusions

The findings from this study indicated that both formal concurrency and informal concurrency increase an individual's odds of being infected with HIV adjusted for covariates including the total number of lifetime sexual partners. The significance of both forms of concurrency in predicting risk for HIV infection at an individual level is consistent with suggestions from previous researchers (see Shelton & Mah, 2011 and Epstein & Stanton, 2010 for reviews of evidence), but this study is the first to produce empirical evidence of these effects using data from multiple countries and regions in SSA for both formal and informal concurrency. Also consistent with previous studies examining polygamy and HIV (Reiners & Watkins, 2010), this study found evidence of an ecologic paradox: Although at the individual level polygamy predicts HIV, at the ecologic level, HIV infection is lower in regions where concurrency is formalized in polygamous unions, in spite of the increased risk to individuals posed by this sexual relationship structure. Living in an area with more polygamy is collectively protective. This study goes beyond previous studies, however, by demonstrating the opposite effect for informal concurrency- living in a region with more informal concurrency further increases an individual's odds of being infected with HIV beyond the risk conferred by actually engaging in a concurrent relationship oneself. Thus, even if an individual is monogamous him or herself, her risk is increased by living in a region with more informal concurrency and decreased by living in a region with more formal concurrency.

One reason for this ecologic paradox may be that polygamous unions are more common in poorer settings, where traditional social mores concerning sex outside of marriage are more strictly enforced. Thus, among individuals who are in polygamous unions, they may be placed at greater risk by virtue of being part of a wider sexual network. But in places where polygamy is common, no sex outside of marriage may be more strictly enforced than in places where informal concurrency is more common.

This study has several limitations. The measures of sexual concurrency are imperfect as they do not allow for a mapping of actual sexual networks, limiting the analysis to a self-report from a single individual, even though risk from concurrency accrues to partners of individuals in a sexual network more so than the individual him/herself. The self-reported nature of sexual behavior measures can lead to social desirability bias as men tend to overreport and women underreport number of sexual partners. The cross-sectional and repeat cross-sectional survey design does not allow for longitudinal analysis and limits causal inference. Nevertheless, this paper adds to the evidence base for an understudied phenomena-marital concurrency in Africa.

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# Figures and Tables

**Table 1 - Country Sample**

| *Country* | *HIV Prevalence (C.I.)*[1] | *Tested Sample* | *Year of Survey* |
|---|---|---|---|
| Senegal | 0.7 (0.4, 1.0) | 7,823 | 2005 |
| Niger | 0.7 (0.5, 0.9) | 7,283 | 2006 |
| Ethiopia | 1.4 (1.2- 1.6) | 11,383 | 2005 |
| Guinea | 1.6 (1.2-1.9) | 6,912 | 2005 |
| Mali | 1.7 (1.5- 1.9) | 8,629 | 2006 |
| Burkina Faso | 1.8 (1.6- 2.2) | 7,790 | 2003 |
| Ghana | 2.2 (1.8-2.4) | 9,779 | 2003 |
| Rwanda | 3.0 (2.9-3.5) | 10,592 | 2005 |
| Ivory Coast | 4.7 (4.5- 5.4) | 8,570 | 2005 |
| Cameroon | 5.5 (5.0- 6.0) | 10,682 | 2004 |
| Kenya | 6.8 (6.0-6.9) | 6,360 | 2003 |
| Tanzania | 7.0 (5.9-7.2) | 10,957 | 2003 |
| Malawi | 11.7 (10.7-12.7) | 5,357 | 2004 |
| Zimbabwe | 18.1 (16.9-19.3) | 13,069 | 2005/6 |
| Lesotho | 23.2 (21.7-24.5) | 5,364 | 2004 |
| Swaziland | 25.9 (25.2-27.1) | 8,187 | 2006/7 |

Table 1: Prevalence of Monogamy and Marital Concurrency

| | Married | Married | Monogamous Union | Polygamous Union | Polygamous Union (married men) | Polygamous Union (married women) | Extramarital partner | Extramarital partner (married men) | Extramarital partner (married women) | Known extra-marital partner 1 m+ | Known extramarital partner 1 yr+ | Polygamous & extramarital partner | Monogamous- Neither Polygamous nor Extramarital Partner |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Count | % | % | % | % | % | % | % | % | % | % | % | % |
| **Senegal** | 4130 | 53.4 | 65.3 | 34.7 | 23.3 | 40.8 | 4.2 | 9.4 | 1.1 | 57.10 | 9.20 | 3.7 | 68.8 |
| **Niger** | 5927 | 77.2 | 69.5 | 30.5 | 22.2 | 35.3 | 0.9 | 1.8 | 0.40 | 100.0 | 75.0 | 0.8 | 66.4 |
| **Ethiopia** | 6627 | 60.2 | 89.8 | 10.2 | 12.2 | 6.4 | 0.50 | 0.9 | 0.2 | 20.50 | 9.5 | 0.1 | 87.3 |
| **Guinea** | 4593 | 66.4 | 52.6 | 47.4 | 37.8 | 53.3 | 7.8 | 16.7 | 2.5 | 64.6 | 6.4 | 7.0 | 38.8 |
| **Mali** | 4435 | 73.6 | 63.9 | 36.1 | 27.8 | 41.8 | 1.7 | 6.1 | 0.8 | 84.6 | 30.8 | 1.5 | 75.2 |
| **Burkina Faso** | 4610 | 60.3 | 57.8 | 42.2 | 30.5 | 49.9 | 4.6 | 10.5 | 0.6 | 77.2 | 41.6 | 0.8 | 63.8 |
| **Ghana** | 5181 | 51.5 | 81.8 | 18.2 | 12.3 | 22.6 | 4.3 | 10.1 | 0.3 | 79.5 | 38.5 | 4.9 | 66.5 |
| **Rwanda** | 3229 | 31.0 | 95.2 | 4.8 | 3.4 | 6.3 | 2.4 | 4.5 | 0.2 | 59.6 | 40.7 | 2.3 | 80.1 |
| **Ivory Coast** | 3738 | 37.6 | 78.7 | 21.3 | 11.8 | 27.5 | 10.3 | 20.1 | 3.4 | na | na | 1.5 | 44.8 |
| **Cameroon** | 2696 | 53.0 | 77.4 | 22.6 | 11 | 30.7 | 34.5 | 46.7 | 22.6 | 84.8 | 47.8 | 2.2 | 39.0 |
| **Kenya** | 7630 | 48.1 | 85.2 | 14.9 | 10.7 | 18.4 | 3.3 | 8.5 | 1.2 | 77.0 | 43.3 | 3.3 | 68.9 |
| **Tanzania** | 6452 | 58.8 | 90.0 | 10.0 | 1.1 | 10.1 | 13.2 | 24.6 | 5.0 | na | na | 1.5 | 66.8 |
| **Malawi** | 3489 | 67.1 | 85.2 | 14.8 | 10.6 | 18.4 | 3.2 | 6.6 | 0.5 | 69.0 | 20.4 | 3.0 | 79.0 |
| **Zimbabwe** | 6606 | 50.6 | 91.4 | 8.6 | 4.8 | 11.4 | 3.8 | 9.3 | 0.6 | 25.8 | 1.7 | 4.3 | 72.1 |
| **Lesotho** | 2511 | 47.0 | 97.6 | na | 2.4a | na | 15.2 | 28.2 | 12.7 | 85.7 | 58.8 | 0.1 | 78.8 |
| **Swaziland** | 2272 | 27% | 84.8 | 15.2 | 5.8 | 21.9 | 6.2 | 15.2 | 1.0 | 75.3 | 0.0 | 6.3 | 42.4 |

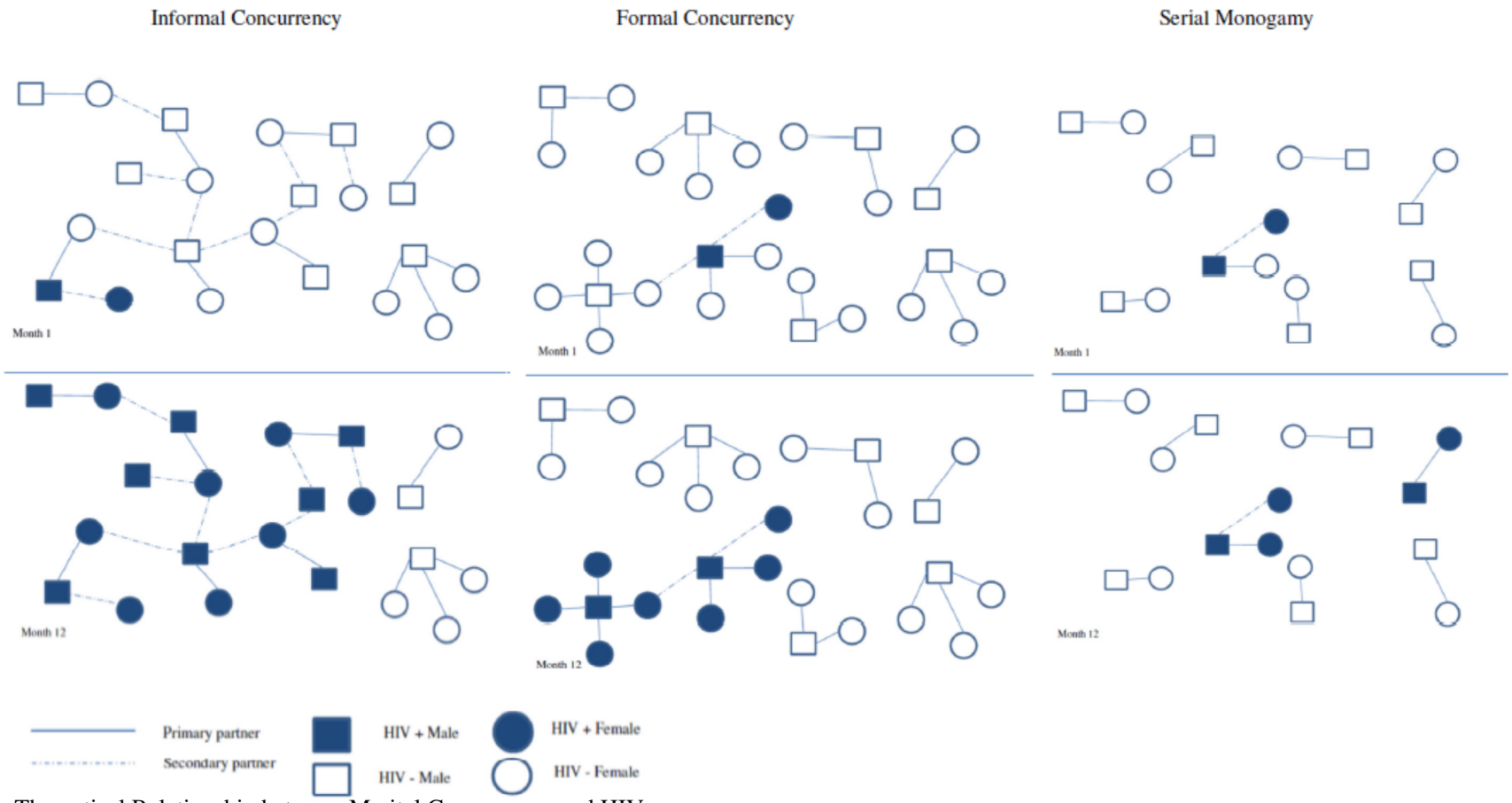


Figure 1: Theoretical Relationship between Marital Concurrency and HIV

* Adapted from diagrams by Stewart Parkinson (Population Services International) featured in Epstein, 2009.

**Table 2 - HIV Infection by Extramarital Partners and Polygamous Union**

| HIV Serostatus | Extramarital Partners OR(SE) | | Polygamous Union OR(SE) | |
|---|---|---|---|---|
| ***Contextual Variables*** | | | | |
| % Extramarital Partner | 1.03*** | 1.13*** | _ | _ |
| | (.006) | (.016) | | |
| % Polygamous Union | _ | _ | 0.98*** | 0.99 |
| | | | (.006) | (.014) |
| % Men Circumcised | 0.65** | 0.66** | 0.67** | 0.60** |
| | (0.120) | (0.110) | (0.180) | (.334) |
| ***Individual Level Variables*** | | | | |
| Extramarital Partner (last 12 months) | 1.14*** | 2.09*** | _ | _ |
| | (0.037) | (.271) | | |
| Polygamous Union | | | 1.28*** | 1.14** |
| | | | (0.065) | (.172) |
| Lifetime Partners (12 countries) | _ | 0.96 | _ | 0.93 |
| | | (.046) | | (.054) |
| Wealth | 0.97* | 1.10*** | 1.03 | 1.14** |
| | (0.018) | (.058) | (.026) | (.062) |
| Education | | | | |
| No education | ref | ref | ref | ref |
| Primary | 1.24*** | 1.08 | 1.35*** | 1.16 |
| | (.075) | .144 | (.079) | (.173) |
| Secondary+ | 1.23*** | 1.42** | 1.46*** | 1.39** |
| | (.086) | (.216) | (.097) | .242 |
| Location | | | | |
| Country | ref | ref | ref | ref |
| Town | 1.68*** | 1.81*** | 1.57*** | 1.74*** |
| | (.073) | (.250) | (.090) | (.262) |
| Large City | 1.36*** | 1.75*** | 1.38*** | 1.54* |
| | .101 | .380 | (.131) | (.375) |
| Age | 1.03*** | 1.01*** | 1.00 | 1.01 |
| | (0.002) | (.005) | (.002) | (.005) |
| STD(Sore) | 2.73*** | 2.98*** | 2.76*** | 3.10*** |
| | (0.002) | (.571) | (186) | (.621) |
| Gap btw age at first sex & age at first marriage | 0.97*** | 0.97*** | 0.97 | 0.96*** |
| | (0.005) | (.012) | (.005) | (.013) |
| **sd_cons, country** | 0.96 | 1.23 | 0.96 | 1.08 |
| | (.208) | (.289) | (0.193) | (.316) |
| **sd_cons, region** | 0.38 | 0.45 | 0.44 | 0.45 |
| | (.042) | (.071) | (.044) | (.076) |

**Table 3 - Further Specifications: HIV Infection by Extramarital Partners and Polygamous Union**

| | *Combined Model* | *Extra-Marital Partner 1m+* |
|---|---|---|
| ***Contextual Variables*** | | |
| % Extramarital Partner | 1.06*** | 1.04*** |
| | (.018) | (.008) |
| % Polygamous Union | 0.99 | |
| | (.014) | |
| % Men Circumcised | 0.58 | 0.32*** |
| | (.319) | (.151) |
| ***Individual Level Variables*** | | |
| Monogamous Union | ref | ref |
| Polygamous Union | 1.07 | - |
| | (.111) | |
| Extramarital Partner (past year) | 2.12** | 1.30*** |
| | (.736) | (.134) |
| Known Extramarital Partner btw 1m-1 yr | - | 1.30 |
| | | (.242) |
| Known Extramarital Partner at least 1 yr | - | 1.12 |
| | | (.293) |
| Extramarital Partner*Polygamous Union | 1.12 | - |
| | (.298) | |
| Lifetime Partners (12 countries) | 0.93 | - |
| | (.056) | |
| Wealth | 1.13** | 1.01 |
| | (.063) | (.028) |
| Education | | |
| No education | ref | ref |
| Primary | 1.24*** | 1.28*** |
| | (.075) | (.083) |
| Secondary+ | 1.49*** | 1.32*** |
| | (.086) | (.095) |
| Location | | |
| Country | ref | ref |
| Town | 1.65*** | 1.45*** |
| | (.073) | (.094) |
| Large City | 1.36*** | 1.28** |
| | (.101) | (.142) |
| Age | 1.01 | 0.99 |
| | (0.002) | (.002) |
| STD(Sore) | 2.73*** | 2.74*** |
| | (0.002) | (.198) |
| Gap btw age at first sex & age at first marriage | 0.99 | 0.99 |
| | (0.008) | (.003) |
| **sd_cons, country** | 0.96 | 0.76 |
| | (.208) | (.209) |

| | | |
|---|---|---|
| **sd_cons, region** | 0.38 | 0.48 |
| | (.042) | (.057) |

**Table 4 - Historical Marital Concurrency and HIV Risk**

TBD