More than the Sum of Their Parts: Couples and HIV in Zimbabwe

Danielle Denardo, Ph.D., Soka University of America

Introduction

Although HIV research and programming efforts continue to prioritize the role and experience of individuals, almost two-thirds of all new HIV infections throughout sub-Saharan Africa are now estimated to occur among stable (married/cohabitating) couples (Chemaitelly et al., 2014). The sexual risk behaviors and sexual mixing patterns of couples are therefore arguably more accurate, yet underused, sources of information for understanding the current HIV epidemic in this region and for developing effective prevention programs given the coexisting quality of couples as both paired individuals (unique sexual histories and risk factors) and as amalgams (shared sexual behaviors and risk factors).

Based on the combination of partners' individual HIV statuses, couples can be described as being HIV-negative concordant (both partners are HIV negative), HIV-discordant (one partner is HIV positive, one partner is HIV negative), or HIV-positive concordant (both partners are HIV positive). In addition, the HIV status of a couple can also change over time. Couples that form as HIV-negative concordant, by the joining of two HIV-negative individuals, can remain HIV-negative concordant or can become HIV-discordant (and later even HIV-positive concordant) through a relationship outside the couple. Couples that begin as HIV-discordant can remain HIV-discordant or become HIV-positive concordant (through seroconversion within the couple or infection from outside the couple). For couples that are HIV-negative concordant the goal is to remain HIV-negative concordant. For couples that are HIV-discordant the goal is to remain

HIV-discordant. For couples that are HIV-positive concordant the goal is to not become "superinfected" through re-infection with a different strain of HIV.

Each of these HIV statuses of couples, therefore, presents a specific set of challenges and needs with respect to HIV prevention and treatment. HIV-discordant couples have an especially unique set of needs since they are the only HIV-status couple type to experience seroconversion risk within the primary couple.   While HIV-discordant relationships pose unique risks for the HIV-negative partner due to the inherent higher likelihood of repeated sexual contact with a positive partner, they also pose distinct risks due to behavioral norms within stable couples, such as lower rates of condom use (Desgrees-du-Lou & Orne-Gliemann, 2008).

In order to provide prevention and treatment services needed by HIV-discordant couples, it is necessary to understand which past and present sexual behaviors are associated with HIV-discordant couples. Understanding past sexual behaviors is also necessary in order to determine the risk factors for HIV-discordant couples compared to HIV-negative concordant and HIV-positive concordant couples. While this is true for every country with a generalized HIV epidemic, it is especially important for a country like Zimbabwe where a dramatic HIV decline has started to slow and HIV funding has been reduced (Kates et al., 2017). Both of these factors make effective programming and effective targeting of that programming to at-risk populations even more crucial. In turn, Zimbabwe, as one of the few countries to experience a lasting HIV prevalence decline, offers a unique opportunity to gain insight into the relationship between HIV and couples

This study used 2015 Demographic and Health Studies (DHS) couple-level data for Zimbabwe to examine whether sexual risk behaviors and sexual mixing trends differ for HIV-

discordant couples when compared to HIV-negative concordant and HIV-positive concordant couples.

Background

The HIV Epidemic in Zimbabwe

2000-2015. After experiencing a dramatic rise in HIV prevalence rate for more than a decade, Zimbabwe reached a peak at close to 25% in the last years of 1990's. At this peak, Zimbabwe had the third highest national HIV rate in the world (AIDSinfo, 2017). The following decade, however, Zimbabwe experienced a significant decline in the HIV prevalence rate, a result due in part to a pronounced decrease in the rate of new infections (Halperin et al., 2011; Gregson et al., 2010; Mahomva et al., 2006). By 2009, the HIV prevalence rate was 16% (AIDSinfo, 2017). This accelerated decline in the HIV incidence rate, beyond natural epidemic dynamics, has been attributed primarily to high mortality rates in conjunction with changes in the sexual behaviors of individuals, specifically a reduction in concurrent sexual partners and lifetime number of partners, non-regular partners in particular, and an increase in consistent condom use outside of marriage (Halperin et al., 2011). This behavior change, which was greatest for men, was likely facilitated by several key underlying factors, namely, increased exposure to AIDS related deaths due to an increase in at-home care for family members dying of AIDS, prevention programs focused on interpersonal communication about the role of sexual behaviors in transmitting HIV, and a severe economic decline which reduced men's ability to pay for sex or to maintain multiple relationships (Halperin et al., 2011). Zimbabwe's HIV prevalence rate has continued to decline over the last decade, at a less pronounced pace, due to continued changes in sexual behaviors as well as a scale-up of prevention programs focused on

men's circumcision, prevention of transmission from mother to child, and treatment (and therefore also prevention) through ART.

Individual-level risk factors. With a current HIV prevalence rate of 13.5%, Zimbabwe has made remarkable progress in addressing the HIV crisis and yet with one in seven Zimbabweans currently living with HIV there is still much work left to be done in both treatment and prevention. As a generalized epidemic, unprotected sex between men and women continues to be the primary source for new infections in Zimbabwe and prevention efforts remain focused on the sexual risk behaviors of individuals (WHO, 2014). Concurrency of sexual partners and number of lifetime partners has decreased over time for sexually active individuals in Zimbabwe, yet in 2015 14% of men and 1% of women reported multiple partners in the last year (Zimbabwe National Statistics Agency & ICF International, 2016). Men also reported an average of 6.1 lifetime partners while women reported an average of 1.8. Likewise, while condom use has increased for non-regular as well as multiple partners (two or more partners in last year) it is still low overall, especially for regular partners (Zimbabwe National Statistics Agency & ICF International, 2016). Voluntary Male Medical Circumcision (VMMC) is another area of prevention programming where progress has been made with 14% of 15-49 year old men reporting being circumcised in 2015 (Zimbabwe National Statistics Agency & ICF International, 2016). This increase from 9% in 2011 has been associated with a corresponding decrease in HIV rates, particularly when performed by trained health professionals. However, Zimbabwe still has one of the lowest male circumcision rates in sub-Saharan Africa (UNAIDS, 2017).

HIV testing rates in Zimbabwe have continued to increase with approximately 75% of HIV positive individuals aware of their status in 2016 (UNAIDS, 2017). Testing rates are still lower for men than women but self–test kit (HIVST) trials have shown promising results for

increasing testing rates among men (UNAIDS, 2017). Testing is essential for the provision of antiretroviral therapy (ART). ART adherence by individuals living with HIV is critical for slowing the progress of the infection. ART adherence not only increases the life expectancy of those who test positive but it also reduces the risk of transmission to any uninfected partners by suppressing viral loads (Cohen & Gay, 2010). As of 2016, approximately 75% of people living with HIV in Zimbabwe were receiving ART and 64% had suppressed viral loads (UNAIDS, 2017). These rates are likely to continue increasing in Zimbabwe with ART now available (since 2016) at no cost to all individuals who test positive, regardless of CD4 count. Pre-exposure prophylaxis (PrEP) is also in the process of being scaled up in Zimbabwe with an estimated 400 current users in 2016 (UNAIDS, 2017).

The role of gender. While behavior changes have directly contributed to the overall HIV prevalence decline in Zimbabwe, current individual-level surveys demonstrate a large gender gap with men still more likely to report risk behaviors significantly associated with HIV. While men are more likely to report riskier sexual behaviors, they are also less likely to access testing and treatment services (81% of HIV positive women were on ART in 2016 compared to 65% of men) (UNAIDS, 2017; Staveteig et al., 2013). This gendered trend has been attributed in large part to hegemonic masculine ideals within Zimbabwean culture, which emphasize behaviors that demonstrate sexual prowess, control, strength, knowledge, and being "whole" (disease-free) (Skovdal et al., 2011; DiCarlo et al., 2014; Leichliter et al., 2011).

Although men report riskier sex and health behaviors, women continue to be identified as particularly vulnerable in the Zimbabwe HIV epidemic (UNAIDS, 2016). In terms of the HIV prevalence decline, the rate of change looks similar for men and women, however, women continue to have a higher HIV rate than men at every time point in the epidemic (Gonese et al.,

2015). Women's age at first sexual intercourse is associated with HIV in Zimbabwe. Women

reporting a lower age at first sex are more likely to be HIV positive whereas men reporting a

lower age at first sex are more likely to be HIV negative (Zimbabwe National Statistics Agency

& ICF International, 2016). This is likely a consequence of the different sexual mixing that is

taking place at these ages for men and women. Whereas young women are more likely to be

having sexual relationships with older men who are more likely to be HIV positive, young men

are more likely to be having sexual relationships with women similar in age and less likely to be

HIV positive (Gregson et al., 2002). Other factors associated with gender inequality and

hegemonic gender ideals within Zimbabwean culture contribute to women's higher level of HIV

risk relative to men, including domestic violence, transactional sexual relationships, widow

inheritance, gendered division of labor, and childbearing norms (Zimbabwe National Statistics

Agency & ICF International, 2016).

Marriage and HIV in Zimbabwe

　　　Individual-level data. While the bulk of HIV research and programming efforts

continue to focus on individuals, a majority of new HIV infections in sub-Saharan Africa now

occur among stable couples (Chemaitelly et al., 2014). As of 2015, 62% of women and 50% of

men (between the ages of 15-49) living in Zimbabwe were currently in a stable couple, the vast

majority of which were marriages (only 3% of women and 1% of men were cohabiting)

(Zimbabwe National Statistics Agency & ICF International, 2016). These rates have stayed

fairly constant since 2010 and represent multiple forms of marriage that are common in

Zimbabwe, including unregistered customary/traditional marriages, registered

customary/traditional marriages, and registered civil marriages (Dube, 2013). Arguably the

biggest division between marriage forms in Zimbabwe is between customary/traditional

marriages and civil marriages since civil marriages strictly prohibit polygamy and offer more legal protection for both spouses as opposed to only the husband (Dube, 2013). With a dual legal system in Zimbabwe, customary/traditional marriages can be registered and governed by customary law or be unregistered and unrecognized by any legal system. Without legal recognition, unregistered customary marriages are formalized through the payment of lobola or roora (bride wealth). In 2013 it was reported by the Deputy Registrar-General that approximately 84% of marriages in Zimbabwe were unregistered customary/traditional marriages (Staff reporter, 2013).

Polygamy in the form of polygyny (a man having more than one wife) is still a fairly common experience in Zimbabwe with 11% of married women and 5% of married men reporting more than one wife in 2015 (Zimbabwe National Statistics Agency & ICF International, 2016). This includes "small houses," a term used for when a man has one or more extramarital girlfriends. While polygamy tends to be openly acknowledged within the marriage and takes place within customary unions, a "small house" is often not open discussed within the marriage and takes place within civil unions in generally more urban areas. These numbers for polygamy rates in Zimbabwe have remained consistent for more than a decade (Zimbabwe National Statistics Agency & ICF International, 2016).

While marriage is a relationship form nearly all adults in Zimbabwe experience at least once, women continue to marry earlier than men (median age at first marriage in 2015 was 19.8 for women and 25.6 for men) despite increases in the age at first marriage for both men and women (Zimbabwe National Statistics Agency & ICF International, 2016). It has also been estimated, using the most recent data available, that approximately 30% of women in Zimbabwe first married before age 18 (Zimbabwe National Statistics Agency & ICF International, 2016).

This is likely to change, however, given a recent (2016) High Court ruling that marriage before age 18 is illegal for both boys and girls and applies to every form of marriage even unregistered customary marriages (Nemukuyu, 2016).

In terms of HIV rates, 15.8% of individuals who were currently married in 2015 were HIV positive compared to only 4.6% of individuals who had never been married (Zimbabwe National Statistics Agency & ICF International, 2016). Additionally, for those who were HIV positive and currently married, rates looked similar for men and women. Rates of HIV for men and women in 2015 were also similar for both polygynous and non-polygynous unions in Zimbabwe (16.9% and 15.6% respectively) (Zimbabwe National Statistics Agency & ICF International, 2016).

As a consequence of these marriage and HIV trends, widowhood is a common experience in Zimbabwe, especially for women. In 2015, 4% of all women reported being currently widowed (compared to less than 1% of men) and 22.6% of women age 45-49 reported being currently widowed (Zimbabwe National Statistics Agency & ICF International, 2016). However, this does not account for the women who had at one time been widowed but had subsequently remarried. Not only are women more likely to experience widowhood in Zimbabwe than men but the consequences are far more dire (Lopman et al., 2009). As one widow described it, "widowhood is not simply a change in marital status, but the end to economic, social, political, physical, and emotional security" (Mhaka, 2017). This is due in part to the fact that the majority of marriages in Zimbabwe are unregistered customary unions as opposed to civil unions, which tend to protect women more after a marriage has ended. This trend may change however given a recent (2017) High Court ruling that women in unregistered customary unions have a right, after

the union has ended, to receive part of the property accumulated during the union (Munyoro, 2017).

In addition, over half of the women and men who reported being currently widowed in 2015 were also HIV positive (Zimbabwe National Statistics Agency & ICF International, 2016). Similarly, 31.9% of women and 19% of men who were currently divorced or separated were living with HIV (Zimbabwe National Statistics Agency & ICF International, 2016). Higher rates among this population, especially for women, which is a trend across sub-Saharan Africa has been attributed in part to marriage dissolution from the knowledge of, or at least suspicion of, a positive HIV status on the part of partners, with male partners often having more cultural and financial leverage to end relationships. Remarriage is also not an uncommon experience in Zimbabwe and those who are divorced, separated, or widowed are likely to enter into another stable couple within their lifetime.

While this body of research explores the role of marital status and behaviors within couples in terms of HIV rates, it does so using individuals as the unit of analysis and therefore as the source for any partner information. This research cannot assess any rates or risk factors in terms of the HIV-status of the couples, only individuals.

Couple-level data. HIV research that treats couples as the unit of analysis through the collection of data (survey and biological samples) from both partners is imperative for accurately identifying not only the HIV status of couples but also the partner characteristics and sexual behaviors associated with each HIV status couple type.

In Zimbabwe, the prevalence of HIV-affected couples has continued to decline as the general prevalence rate has fallen across time, based on analyses from chapter 2 using DHS data from matched couples (28% of couples in 2005/6; 21.5% in 2010/1; 20% in 2015) (Table 3).

The percentage of HIV-positive concordant couples (both partners are HIV-positive) decreased from 14.7% in 2005/6 to 10.3% in 2010/1 and then increased slightly to 10.9% in 2015. The percentage of HIV-discordant couples decreased from 13.2% in 2005/6 to 11.2% in 2010/1 to 8.9% in 2015. Likewise the percentage of HIV negative concordant couples (both partners are HIV negative) has increased across time (72% in 2005/6; 78.5% in 2010/1; 80% in 2015). This data also reveals that the HIV rate is higher for couples than the general prevalence rate across time.

In terms of HIV, couples can be thought of as being the combination of two individuals' accumulated sexual behaviors as well as the current sexual behaviors within the couple. The accumulated sexual behaviors of individuals represent, at the very least, behaviors over time within the current couple. For individuals with more than one lifetime union and/or more than one lifetime partner, prior sexual behaviors represent behaviors within the current couple in addition to previous couples and/or non-regular partners. For individuals with more than one lifetime union and/or more than one lifetime partner, this sexual behavior history can serve as a marker for the level of risk for being HIV positive prior to the formation of the current couple. When taken together within a couple, accumulated sexual behaviors can also measure the level of difference between partners' accumulated sexual behaviors within the couple. They can therefore also serve as an indicator of any patterned sexual mixing taking place, meaning whether lower HIV-risk sexual partners are coupling with other lower HIV-risk partners or higher HIV-risk partners and if lower HIV-risk partners are in fact partnering with higher HIV-risk partners, whether this sexual mixing is gendered.

Sexual mixing is an important process to consider when studying couples' health since couples do not form at random, rather, they are formed through indirect or direct mutual

selection processes on the part of individuals. In terms of HIV, direct selection, also known as serosorting, refers to individuals forming couples, at least in part, on the basis of known or suspected HIV-status. Indirect selection, on the other hand, takes place when selection takes place based on other underlying/background factors (religion, education, wealth, location, etc.) that are also associated with HIV status (Pullum & Staveteig, 2013). Examining the role of sexual mixing is crucial, especially with cross-sectional data, for discerning the possible sources and timing of risk or positive HIV status within a couple.

Current sexual behaviors within a couple are also important to consider beyond the individuals' accumulated sexual behaviors as a measure for current HIV-risk level. This is especially important for HIV-discordant couples, since current sexual behaviors, like condom use, are an indicator of the risk for future seroconversion within the couple. It can also serve as a possible explanation for the presence of HIV-positive concordant couples, through previous seroconversion within the couple. Current sexual behaviors are also likely to be related to any direct selection processes in the sense that the sexual behaviors of couples that have formed on the basis of known or suspected HIV status could be shaped by that information with HIV-negative concordant couples potentially less likely to use condoms than other HIV status couple types.

The only research (two studies found during an extensive literature search) in the last two decades that has looked at HIV sexual risk behaviors associated with couples using this conceptual framework and through the collection of couple-level data in Zimbabwe also utilized the matched couple data from the Demographic and Health Surveys. One study looked at the prevalence rates and risk factors (primarily underlying factors) associated with different HIV statuses of couples in multiple countries, including Zimbabwe for the 2010/1 survey year, as well

as the relative risk for seroconversion due to HIV-discordant couples (Pullum & Staveteig, 2013). While men living in stable couples in Zimbabwe were found in this study to have a significantly higher risk for being HIV positive than women, women were found to have a higher risk for seroconversion within HIV-discordant couples. A second study examined the HIV status of couples in four countries, including Zimbabwe, in terms of partner faithfulness (concurrency) (Mishra & Bignami-Van Assche, 2009). This study found that couples with both partners reporting lifetime faithfulness (one lifetime partner) had a significantly reduced risk for being HIV positive. It was also found that men were significantly more likely to report concurrency and multiple partners than were women. Interestingly, this study found that the risk of being HIV positive for couples in Zimbabwe was highest for couples where both partners reported being recently faithful (two or more lifetime partners but only spousal partners in the last 12 months) (Mishra & Bignami-Van Assche, 2009).

Sources of proximate risk for serodiscordancy within couples include both the biological and behavioral individual-level risk factors for being HIV positive, such as, being a biological female, a higher number of lifetime partners, concurrent partners, testing positive for viral or bacterial STI infection, especially HSV-2, not using condoms consistently, presence of genital ulcers, biological males not being circumcised, paid/transactional sex (Kaiser et al., 2011; Chomba et al., 2008). Risk factors specific to couples also play a role in seroconversion risk. If a couple forms as HIV-negative concordant and becomes HIV discordant, it means that one partner became infected through a sexual relationship outside of the couple. Because of the high level of infectiousness during the acute phase of infection this source of infection from outside the couple increases the risk for subsequent seroconversion within the primary couple and therefore HIV-positive concordancy, ultimately. Other risk factors for seroconversion, and

therefore HIV status change from HIV discordant to HIV positive concordant, include being a biological female, testing positive for viral or bacterial STI infection, especially HSV-2, not using condoms consistently, biological males not being circumcised, presence of genital ulcers, longer duration of relationship, higher coital frequency, the positive partner not using ART and/or the negative partner not using PrEP (Freeman & Glynn, 2004; Hughes et al., 2011; Kaiser et al., 2011).

Very little research has used couple-level data to look at how sexual risk behaviors and sexual mixing patterns differ by couples' HIV status but it is needed in order to understand the current HIV epidemic in sub-Saharan Africa where the majority of all new infections occur among couples and particularly in the country of Zimbabwe where sexual behavior changes have been shown to play a primary role in the general HIV rate decline. A focus on identifying the risk factors associated with HIV-discordant couples is also needed for this research given their particularly high risk level and need for both prevention and treatment services. This study used 2015 DHS couple-level data for Zimbabwe to answer two questions left unanswered by current research:

Do individual accumulated sexual risk behaviors and sexual mixing patterns differ for HIV-discordant couples compared to HIV-concordant couples? Are there gendered differences?

Do current sexual risk behaviors differ for HIV-discordant couples compared to HIV-concordant couples? Are there gendered differences?

Methods

Data

This study used data collected from the 2015 Zimbabwe DHS surveys. DHS surveys are nationally representative, repeated cross-sectional household surveys, collected approximately

every five years in order to provide on-going data on population and health for more than 90
countries worldwide (ICF International, 2016). Each DHS survey collects data using multiple
methods including several questionnaires, biomarker measurement/testing, and global
positioning system (GPS) receivers. In terms of sampling, DHS surveys employ a stratified,
two-stage cluster design where the primary sampling unit is a geographical frame defined by a
recent census, electoral zone, satellite, or administrative list and the stratification involves the
separation of urban and rural by region. Survey samples are generally representative at the
national, residential (urban/rural), and regional (departments/states) levels.

The "couples" dataset was chosen for this study since these datasets pair the men and
women who participate in the individual questionnaire and name each other as "cohabitating
partners" (only heterosexual couples are included). According to the DHS questionnaire the
designation of "cohabitating partners" includes married couples as well as couples living as
though married. Agreement between the women's identification of a cohabitating partner and
men's identification of a cohabitating partner is necessary in order for inclusion in the couples
file. The "couples" datasets contain data collected from the individual men's and women's
questionnaires but the unit of analysis is the couple with the unit of observation the individual
men and women who make up the couples. It's important to note that men who name (and are
able to be matched to) multiple cohabitating partners are listed multiple times in the couples data
since the unit of analysis is the couple. However, the majority (95%) of the men included in this
study reported currently being married to only one partner and were represented in the study
within only one couple (99%). Polygynous couples were left in the study in order to maximize
the sample size and statistical power for the multinomial logistic regression models.

For the purposes of this study, HIV biomarker data was merged with the couples data following DHS methodology so that each individual within every couple had an HIV status. Complete/definitive HIV test results were required of both partners within a couple in order to be included in the analyses for this study. The DHS protocol for HIV biomarker data, which involves the informed, voluntary, and anonymous testing of blood spots from a finger prick, is ethically reviewed and must be approved by each host country. 15.23% of couples were left out of the study due to these criteria. The survey sample in this study reflects a complete case analysis approach.

Given the DHS data collection methodology for the couples and HIV datasets, the sample for this study was limited to heterosexual couples where both partners were physically present in the household at the time of data collection, were in the survey's country-and-gender-specific designated age range, successfully completed the individual questionnaire, named each other as a "cohabitating partner," were tested for HIV, had definitive HIV results, and were either HIV-1 positive or negative.

The 2015 DHS survey for Zimbabwe is the most current, nationally representative, HIV survey for couples available for the country making it well suited for this study. High response rates were also an important consideration when choosing this data. Men had relatively lower HIV testing (81%) and survey (92%) response rates than women (88% and 96% respectively) so complex survey weights based on men's HIV testing response rates were utilized. It is important to note that the survey weights used in this study were based on individual response rates and that the response rates for couples are likely to differ, and be lower, compared to individuals. Unfortunately, data on the response rates for the couples included in the DHS surveys was not available, only for the individual men and women who make up the couples. Becker and Sayer

(2009) have proposed a couple-based sampling weight for the DHS couples data in order to account for this difference between individual and couple response rates. Since this study used couples data as well as HIV data, DHS protocol was followed and the men's HIV sampling weight was utilized.

Measures

With the dependent variable the HIV-status of couples (HIV-negative concordant, HIV-positive concordant, or HIV-discordant), this study assessed HIV risk, in part through variables that captured accumulated sexual behaviors in terms of the individuals within couples. These included number of lifetime partners, number of lifetime unions, and age at first union. Number of lifetime partners was constructed as a categorical variable with different levels for men and women due to differences in frequency (women= one lifetime partner; two or more lifetime partners; men= one or two lifetime partners; three or more lifetime partners). For number of lifetime unions, the categories were the same for men and women (one lifetime union; more than one lifetime union). A combined measure for number of partners and number of unions was also created in order to capture the relationship between the two individual measures (women=one partner and one union; one partner and more than one union/more than one partner and one union; more than one partner and more than one union; men=one or two partners and one union; one or two partners and more than one union; three or more partners and one union; three or more partners and more than one union). Age at first union was the third key variable used to capture individual's accumulated sexual behaviors and this variable was also constructed around gendered frequencies (women= 8-14; 15-19; 20-24; 25 and older; men= 8-19; 20-24; 25 and older). It's important to note that for individuals reporting only one lifetime union, this variable

captured the current union. However, for individuals reporting more than one lifetime union, this variable captured their first union and not the current relationship.

In order to measure the risk associated with sexual mixing, these three variables were also constructed so as to measure the combination (amount of difference) of both individuals' accumulated behaviors within the couple. For both number of lifetime partners and unions, the categories consisted of: both partners reported one lifetime partner (union); one partner reported one lifetime partner (union) and the other reported more than one lifetime partner (union); both partners reported more than one lifetime union. This was also done for the combined measure of number of partners and number of unions. In order to capture gender differences in these combinations three separate dichotomous measures were created (first measure=the man reported three or more partners and more than one union and the woman reported one partner and/or one union; all other couple combinations; second measure= the man reported three or more partners and more than one union and the woman reported one partner and one union; all other couple combinations; third measure=the woman reported more than one partner and more than one union and the man reported one or two partners and/or one union; all other couple combinations). For the couple-level age at first union variable, the categories were: the man was 0-4 years older than the woman; the man was 5 or more years older than the women; the woman was older than the man.

HIV risk was also assessed through current sexual behaviors within the couple by using a measure to capture condom use at last sex (most recent sexual intercourse). This variable was also constructed on both the individual (yes; no) and couple-level (both partners reported using a condom; at least one partner reported not using a condom).

Control variables at the individual-level included age, education, religion, news/media access, and knowledge about HIV/AIDS. Control variables at the couple-level included location (urban/rural), wealth, age difference, religion difference, education difference, news/media access difference, knowledge about HIV/AIDS difference. These variables were chosen as control variables based on their demonstrated role in HIV research as important underlying factors that shape HIV infection through proximate determinants like sexual risk behaviors.

Analytic Strategy

Analyses consisted of multinomial logistic regression for both bivariate and multivariate models. The multivariate analyses were used to isolate key individual sexual behavior measures while controlling for underlying factors. Separate analyses were performed using HIV-negative concordant couples as the base category and HIV-positive concordant couples as the base category. All analyses were performed using STATA version 13 (StataCorp, College Station, TX, USA). The data and analyses for this study complied with the University of Colorado Institutional Review Board's classification of non-human subjects research and therefore no ethical approval was necessary, however, given the sensitive nature of biomarker data, the author accepted and signed a Terms of Use Statement with the DHS Program.

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Results

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Descriptive Statistics

Table 1 provides the weighted percentages of each of the sexual risk behavior measures and each of the control measures by HIV status couple type. Table 2 contains the weighted percentages of three sexual risk measures for each HIV status couple type and age grouping. Table 3 presents the weighted percentages of HIV status couple types for each sexual risk measure. Several key findings from the tables are discussed in this section.

Table 1
Descriptive statistics by HIV status of couples, Zimbabwe 2015

	% HIV-negative concordant couples			% HIV-positive concordant couples			% HIV-discordant couples			% Total couples		
	Women	Men	Couple	Women	Men	Couple	Women	Men	Couple	Women	Men	Couple
HIV prevalence rate			80.67			10.71	3.73	4.89	8.62			
Number of wives												
One wife/only wife	92.59	94.72		95.13	97.14		90.46	92.49		92.68	94.78	
More than one wife	7.41	5.28		4.87	2.86		9.54	7.51		7.32	5.22	
Number of wives (couple)												
Report same number of wives			96.44			97.99			95.11			96.49
Report different number of wives			3.56			2.01			4.89			3.51
Number of lifetime unions												
One	90.19	19.59		64.21	44.75		62.02	43.45		84.98	24.34	
More than one	9.81	80.41		35.79	55.25		37.98	56.55		15.02	75.66	
Number of lifetime unions (couple)												
Both partners report one lifetime union			15.06			24.30			17.56			16.26
One partner reports one lifetime union and other partner reports more than one lifetime union			79.66			60.36			70.35			76.79
Both partners report more than one lifetime union			5.28			15.34			12.09			6.95
Number of lifetime partners												
One	78.12	18.12		41.35	4.43		37.88	4.66		70.71	15.49	
Two (women=two or more)	21.88	18.78		58.65	12.17		62.12	16.00		29.29	17.84	
Three or more (men)		63.10			83.40			79.34			66.67	
Number of lifetime partners (couple)												
Both partners report one lifetime partner			16.48			3.50			1.51			13.80
One partner reports one lifetime partner and other partner reports more than one lifetime partner			63.29			38.78			39.51			58.61
Both partners report more than one lifetime partner			20.24			57.72			58.98			27.59
Combined number of lifetime unions and partners												
One lifetime partner (men=one or two) and one lifetime union	77.86	4.32		40.80	5.53		37.88	6.08		70.45	4.60	
More than one lifetime partner (men=three or more) and one lifetime union	12.32	15.27		23.42	39.22		24.14	37.37		14.53	19.74	
One lifetime partner (men=one or two) and more than one lifetime union	0.26	32.58		0.55	11.08		0.00	14.58		0.27	28.73	
More than one lifetime partner (men=three or more) and more than one lifetime union	9.56	47.83		35.24	44.18		37.98	41.96		14.76	46.93	
Combined number of lifetime unions and partners (couple)												
Both partners report one lifetime partner (men=one or two) and one lifetime union			2.73			2.28			2.73			2.68
Woman reports one lifetime partner and one lifetime union/man reports one or two lifetime partners and more than one lifetime union or three or more lifetime partners and one lifetime union			37.52			18.77			14.72			33.54
Man reports one or two lifetime partner and one lifetime union/woman reports one lifetime partner and more than one lifetime union or more than one lifetime partner and one lifetime union			0.51			0.13			0.23			0.45
Both partners report one (men=one or two) lifetime partners and more than one lifetime union or more than one (men=three or more) lifetime partners and one lifetime union			5.29			11.78			11.21			6.50
Woman reports more than one lifetime partner and more than one lifetime union/man reports one or two lifetime partner and one lifetime union			1.08			3.12			3.12			1.47
Woman reports more than one lifetime partner and more than one lifetime union/man reports one or two lifetime partners and more than one lifetime union or three or more lifetime partners and one lifetime union			5.04			19.75			26.03			8.42
Man reports three or more lifetime partners and more than one lifetime union/woman reports one lifetime partner and one lifetime union			37.61			19.75			20.43			34.22
Man reports three or more lifetime partners and more than one lifetime union/woman reports one lifetime partner and more than one lifetime union or more than one lifetime partner and one lifetime union			6.77			12.06			12.70			7.85
Woman reports more than one lifetime partner and more than one lifetime union/man reports three or more lifetime partners and more than one lifetime union			3.44			12.37			8.83			4.86
Age at first union												
8-14 (women)	4.82			7.27			7.12			5.28		
15-19 (men=8-19)	59.73	11.73		54.74	10.52		49.27	8.84		58.29	11.35	
20-24	29.59	47.68		20.53	36.33		25.94	35.08		28.30	45.38	
25-51	5.87	40.59		17.46	53.14		17.68	56.08		8.13	43.27	
Age at first union (couple)												
Man was 0-4 years older than woman at first union			39.49			27.35			35.79			37.87
Man was 5 or more years older at first union			53.64			60.92			53.39			54.40
Woman was older at first union			6.87			11.73			10.82			7.73
Used condom last intercourse												
Yes	3.88	4.86		39.97	42.95		9.64	30.39		9.64	11.14	
No	96.12	95.14		60.03	57.05		90.36	69.61		90.36	88.86	
Used condom last intercourse (couple)												
Both partners report using a condom (or did not have sex in the last year)			1.60			28.59			20.25			6.10
At least one partner reports not using a condom			98.40			71.41			79.75			93.90

Table 1 continued

	% HIV-negative concordant couples			% HIV-positive concordant couples			% HIV-discordant couples			% Total couples		
	Women	Men	Couple	Women	Men	Couple	Women	Men	Couple	Women	Men	Couple
Location (couple)												
Urban			33.54			33.02			35.26			33.63
Rural			66.46			66.98			64.74			66.37
Religion												
Traditional	0.82	3.79		0.61	3.95		1.27	4.23		0.84	3.85	
Roman Catholic	5.23	7.54		3.96	6.17		6.33	12.13		5.19	7.79	
Protestant	14.61	13.39		11.10	10.22		15.84	16.04		14.34	13.28	
Pentecostal	22.76	15.39		24.38	14.46		22.36	7.83		22.90	14.64	
Apostolic Sect	46.29	33.41		45.19	29.23		39.78	32.56		45.61	32.89	
Other Christian	3.90	5.02		4.90	4.40		5.74	4.74		4.16	4.93	
Muslim	0.23	0.51		1.70	2.51		0.45	0.94		0.41	0.76	
Other	0.08	0.14		0.20	0.00		0.00	1.00		0.09	0.20	
No Religion	6.07	20.80		7.96	29.07		8.23	20.52		6.46	21.66	
Religion (couple)												
Report same religion			55.01			43.13			43.95			52.78
Report different religion			44.99			56.87			56.05			47.22
Age												
15-19 (women)	8.02			2.27			6.28			7.25		
20-24 (men=15-24)	20.16	7.89		13.31	1.96		9.68	4.14		18.53	6.93	
25-29	23.7	18.48		17.34	9.2		20.75	12.03		22.76	16.93	
30-34	21.36	24.56		23.23	15.89		27.07	24.34		22.05	23.61	
35-39	13.17	18.54		23.83	21.3		19.78	20.01		14.88	18.96	
40-44	9.34	15.16		15.56	26.14		11.45	21.15		10.19	16.85	
45-49	4.25	9.87		4.45	13.65		4.98	12.67		4.34	10.51	
50-54 (men)		5.5			11.87			5.65			6.2	
Age (couple)												
Man is 0-4 years older than woman			42.11			32.67			42.04			41.09
Man is 5-9 years older than woman			39.31			34.95			27.1			37.79
Man is 10 or more years older than woman			14.47			24.76			17.96			15.87
Woman is older than man			4.12			7.62			12.89			5.25
Education												
None/incomplete primary	13.52	11.2		17.96	11.31		11.07	10.05		13.78	11.11	
Complete primary	17.13	12.93		17.90	15.43		21.33	16.43		17.57	13.5	
Incomplete secondary	61.06	59.99		61.15	64.38		61.10	58.01		61.08	60.29	
Complete secondary/post-secondary	8.29	15.87		2.99	8.88		6.5	15.5		7.57	15.09	
Education (couple)												
Man has a higher level of educational attainment			28.22			28.95			32.05			28.63
Same level of educational attainment			57.78			57.32			57.09			57.09
Woman has a higher level of educational attainment			13.99			13.72			14.28			14.28
Wealth (couple)												
Poorest			19.32			18.66			23.15			19.58
Poorer			19.75			20.72			16.91			19.61
Middle			16.91			19.69			18.07			17.31
Richer			21.99			25.93			23.13			22.51
Richest			22.03			15			18.73			20.99
News/media frequency												
At least once a week	59.77	72.42		58.43	68.1		53.82	69.83		59.12	71.73	
Less than once a week	17.8	16.28		18.71	16.48		18.5	14.43		17.96	16.15	
Not at all	22.42	11.3		22.85	15.42		27.68	15.74		22.92	12.12	
News/media frequency (couple)												
Man has greater level of access to news/media			27.39			23.8			29.03			27.14
Same level of access to news/media			61.62			64.61			60.8			61.87
Woman has greater level of access to news/media			10.99			11.59			10.17			10.98
AIDS knowledge												
Accurate knowledge	57.16	62.09		56.14	58.39		57.29	63.99		57.07	61.85	
Less accurate knowledge or has never heard of HIV/AIDS	42.84	37.91		43.86	41.61		42.71	36.01		42.93	38.15	
AIDS knowledge (couple)												
Man has more accurate knowledge of HIV/AIDS			24.54			24.29			24.53			24.51
Same level of accurate knowledge of HIV/AIDS			55.85			53.67			57.63			55.77
Woman has more accurate knowledge of HIV/AIDS			19.61			22.03			17.84			19.72

Source: Demographic and Health Surveys
Weighted sample size (N)= 3034

Table 2

Key descriptive statistics by HIV status of couples and age of partners, Zimbabwe 2015

	% HIV-negative concordant couples			% HIV-positive concordant couples			% HIV-discordant couples			% Total couples		
	Women	Men	Couple	Women	Men	Couple	Women	Men	Couple	Women	Men	Couple
Age 15-19 (women)												
One lifetime union	97.17			100.00			92.70			96.93		
More than one lifetime union	2.83			0.00			7.30			3.07		
Age 20-24 (men=15-24)												
One lifetime union	93.33	7.23		72.54	0.00		65.49	39.96		90.48	8.69	
More than one lifetime union	6.67	92.77		27.46	100.00		34.51	60.04		9.52	91.31	
Age 25-29												
One lifetime union	89.59	14.59		70.26	19.62		67.60	27.12		86.29	15.65	
More than one lifetime union	10.41	85.41		29.74	80.38		32.40	72.88		13.71	84.35	
Age 30-34												
One lifetime union	88.17	19.83		60.89	35.53		62.37	48.46		82.36	23.51	
More than one lifetime union	11.83	80.17		39.11	64.47		37.63	51.54		17.64	76.49	
Age 35-39												
One lifetime union	87.98	20.17		59.48	45.82		46.23	30.26		78.31	24.17	
More than one lifetime union	12.02	79.83		40.52	54.18		53.77	69.74		21.69	75.83	
Age 40-44												
One lifetime union	89.80	21.18		59.47	48.77		59.44	52.66		81.89	29.17	
More than one lifetime union	10.20	78.82		40.53	51.23		40.56	47.34		18.11	70.83	
Age 45-49 (men= 45-54)												
One lifetime union	83.21	29.29		56.78	57.95		60.02	52.10		78.01	36.14	
More than one lifetime union	16.79	70.71		43.22	42.05		39.98	47.90		21.99	63.86	
Age 15-19												
One lifetime partner (men=one or two)	90.51			57.68			67.25			87.67		
More than one (men=more than two) lifetime partner(s)	9.49			42.32			32.75			12.33		
Age 20-24 (men=15-24)												
One lifetime partner (men=one or two)	83.60	42.25		36.80	27.79		30.63	23.71		77.61	40.86	
More than one (men=more than two) lifetime partner(s)	16.40	57.75		63.20	72.21		69.37	76.29		22.39	59.14	
Age 25-29												
One lifetime partner (men=one or two)	73.47	42.72		43.05	28.75		34.51	12.87		67.93	40.08	
More than one (men=more than two) lifetime partner(s)	26.53	57.28		56.95	71.25		65.49	87.13		32.07	59.92	
Age 30-34												
One lifetime partner (men=one or two)	72.28	36.88		38.87	19.71		40.10	17.37		65.11	33.91	
More than one (men=more than two) lifetime partner(s)	27.72	63.12		61.13	80.29		59.90	82.63		34.89	66.09	
Age 35-39												
One lifetime partner (men=one or two)	80.83	34.79		35.68	14.14		34.89	26.27		67.82	31.53	
More than one (men=more than two) lifetime partner(s)	19.17	65.21		64.32	85.86		65.11	73.73		32.18	68.47	
Age 40-44												
One lifetime partner (men=one or two)	77.32	36.06		49.46	15.19		30.79	22.33		68.25	31.11	
More than one (men=more than two) lifetime partner(s)	22.68	63.94		50.54	84.81		69.21	77.67		31.75	68.89	
Age 45-49 (men=45-54)												
One lifetime partner (men=one or two)	77.34	30.59		54.89	12.94		45.09	21.41		71.68	26.84	
More than one (men=more than two) lifetime partner(s)	22.66	69.41		45.11	87.06		54.91	78.59		28.32	73.16	
Age 15-19												
Used condom last sex	7.78			19.46			12.58			8.53		
Did not use a condom last sex	92.22			80.54			87.42			91.47		
Age 20-24 (men=15-24)												
Used condom last sex	3.84	5.55		18.92	36.90		8.52	3.83		5.21	6.41	
Did not use a condom last sex	96.16	94.45		81.08	63.10		91.48	96.17		94.79	93.59	
Age 25-29												
Used condom last sex	2.26	5.39		42.41	18.51		29.38	18.47		7.67	6.96	
Did not use a condom last sex	97.74	94.61		57.59	81.49		70.62	81.53		92.33	93.04	
Age 30-34												
Used condom last sex	3.21	3.74		33.60	41.68		25.78	21.06		9.02	8.01	
Did not use a condom last sex	96.79	96.26		66.40	58.32		74.22	78.94		90.98	91.99	
Age 35-39												
Used condom last sex	3.94	3.16		46.59	30.31		29.13	35.80		14.14	9.39	
Did not use a condom last sex	96.06	96.84		53.41	69.69		70.87	64.20		85.86	90.61	
Age 40-44												
Used condom last sex	4.48	5.41		55.62	45.90		36.75	52.57		15.98	17.24	
Did not use a condom last sex	95.52	94.59		44.38	54.10		63.25	47.43		84.02	82.76	
Age 45-49 (men=45-54)												
Used condom last sex	7.69	7.18		46.98	60.53		22.58	25.08		13.49	17.60	
Did not use a condom last sex	92.31	92.82		53.02	39.47		77.42	74.92		86.51	82.40	

Source: Demographic and Health Surveys
Weighted sample size (N)= 3034

Table 3
Key descriptive statistics by sexual risk behavior, Zimbabwe 2015

	% HIV-negative concordant couples			% HIV-positive concordant couples			% HIV-discordant couples		
	Women	Men	Couple	Women	Men	Couple	Women	Men	Couple
HIV prevalence rate			80.67			10.71	3.73	4.89	8.62
Number of lifetime unions									
One	85.61	64.92		8.10	19.69		6.29	15.39	
More than one	52.69	85.73		25.52	7.82		21.79	6.44	
Number of lifetime unions (couple)									
Both partners report one lifetime union			74.69			16.01			9.31
One partner reports one lifetime union and other partner reports more than one lifetime union			83.68			8.42			7.90
Both partners report more than one lifetime union			61.34			23.66			15.00
Number of lifetime partners									
One	89.12	94.34		6.26	3.07		4.62	2.59	
Two (women=two or more)	60.27	84.96		21.45	7.31		18.28	7.73	
Three or more (men)	80.67	76.34		10.71	13.40		8.62	10.26	
Number of lifetime partners (couple)									
Both partners report one lifetime partner			96.34			2.72			0.94
One partner reports one lifetime partner and other partner reports more than one lifetime partner			87.10			7.09			5.81
Both partners report more than one lifetime partner			59.17			22.41			18.42
Combined number of lifetime unions and partners									
One lifetime partner (men=one or two) and one lifetime union	89.16	75.76		6.20	12.86		4.63	11.38	
More than one lifetime partner (men=three or more) and one lifetime union	68.42	62.39		17.26	21.29		14.32	16.32	
One lifetime partner (men=one or two) and more than one lifetime union	77.75	91.49		22.25	4.13		0.00	4.37	
More than one lifetime partner (men=three or more) and more than one lifetime union	52.24	82.21		25.58	10.08		22.18	7.71	
Combined number of lifetime unions and partners (couple)									
Both partners report one lifetime partner (men=one or two) and one lifetime union			82.12			9.11			8.77
Woman reports one lifetime partner and one lifetime union/man reports one or two lifetime partners and more than one lifetime union or three or more lifetime partners and one lifetime union			90.23			5.99			3.78
Man reports one or two lifetime partner and one lifetime union/woman reports one lifetime partner and more than one lifetime union or more than one lifetime partner and one lifetime union			92.57			3.06			4.38
Both partners report one (men=one or two) lifetime partners and more than one lifetime union or more than one (men=three or more) lifetime partners and one lifetime union			65.71			19.42			14.87
Woman reports more than one lifetime partner and more than one lifetime union/man reports one or two lifetime partner and one lifetime union			59.07			22.67			18.26
Woman reports more than one lifetime partner and more than one lifetime union/man reports one or two lifetime partners and more than one lifetime union or three or more lifetime partners and one lifetime union			48.24			25.12			26.63
Man reports three or more lifetime partners and more than one lifetime union/woman reports one lifetime partner and one lifetime union			88.67			6.18			5.15
Man reports three or more lifetime partners and more than one lifetime union/woman reports one lifetime partner and more than one lifetime union or more than one lifetime partner and one lifetime union			69.60			16.46			13.95
Woman reports more than one lifetime partner and more than one lifetime union/man reports three or more lifetime partners and more than one lifetime union			57.11			27.25			15.65
Age at first union									
8-14 (women)	73.62			14.76			11.62		
15-19 (men=8-19)	82.66	83.36		10.06	9.93		7.28	6.71	
20-24	84.33	84.76		7.77	8.58		7.90	6.66	
25-51	58.24	75.67		23.01	13.16		18.75	11.17	
Age at first union (couple)									
Man was 0-4 years older than woman at first union			84.12			7.74			8.14
Man was 5 or more years older at first union			79.55			12.00			8.46
Woman was older at first union			71.67			16.26			12.07
Used condom last intercourse									
Yes	32.50	35.20		44.43	41.29		23.06	23.51	
No	85.81	86.37		7.12	6.88		7.08	6.75	
Used condom last intercourse (couple)									
Both partners report using a condom (or did not have sex in the last year)			21.15			50.23			28.62
At least one partner reports not using a condom			84.53			8.15			7.32

Source: Demographic and Health Surveys
Weighted sample size (N)= 3034

Looking at Table 1, 80.67% of all couples were HIV-negative concordant, 10.71% of couples were HIV-positive concordant, and 8.62% of couples were HIV-discordant (3.73% female-positive discordant and 4.89% male-positive discordant). The majority of all women in the sample reported one lifetime union (84.98%). Yet a greater proportion of women in HIV-negative concordant couples (90.19%) reported one lifetime union compared to HIV-positive concordant (64.21%) and HIV-discordant couples (62.02%). In terms of number of lifetime partners, the majority of all women in the sample also reported one lifetime partner (70.71%) yet when looking at this percentage by HIV status couple type only the majority of women in HIV-negative concordant couples reported one lifetime partner (78.12%). The majority of HIV-positive concordant couples (58.65%) and HIV-discordant couples (62.12%) reported more than one lifetime partner. When looking at these measures by age groupings (Table 2), the percentage of women who reported one lifetime partner and the percentage of women who reported one lifetime union generally tended to decrease with increasing age regardless of HIV status couple type. For the combined measure of number of partners and number of unions, the majority of women in HIV-negative concordant couples (77.86%) reported one partner and one union while the greatest proportion (but not the majority) of women in HIV-positive concordant couples (40.80%) reported one partner and one union. However, the most frequent response for women in HIV-discordant couples was roughly split between one partner and one union and more than one partner and more than one union.

Descriptive trends for these measures look quite different for the men in the sample. The majority of all men (75.66%) reported more than one lifetime union. This trend held for each HIV status couple type as well but a greater percentage of men in HIV-negative concordant couples (80.41%) reported more than one lifetime union compared to HIV-positive concordant

couples (55.25%) and HIV-discordant couples (56.55%). The majority of all men (66.67%) reported three or more lifetime partners as well. This trend held for each HIV status couple type as well except that a smaller percentage of men in HIV-negative concordant couples (63.10%) reported three or more partners compared to men in HIV-positive concordant couples (83.40%) and HIV-discordant couples (79.34%). Looking at these measures by age groupings (Table 2), a greater percentage of men in each HIV status couple type reported more than one lifetime union at younger ages than at older ages while the percentage of men reporting three or more partners tended to increase with increasing age. For the combined measure of partners and unions, the most frequent response for men in each HIV status couple type was three or more lifetime partners and more than one lifetime union although the percentage was highest for men in HIV-negative concordant couples (47.83%). Interestingly, the percentage of men in HIV-positive concordant couples and HIV-discordant couples who reported three or more lifetime partners and only one lifetime union was more than twice that of men in HIV-negative concordant couples.

Looking at the measure capturing both partners reported combined number of partners and unions, the most frequent category for HIV-negative concordant couples was for men reporting three or more lifetime partners and more than one lifetime union paired with women reporting one lifetime partner and one lifetime union (37.61%). The second most frequent category was for women reporting one lifetime partner and one lifetime union paired with men reporting one or two lifetime partners and more than one lifetime union or three or more lifetime partners and one lifetime union (37.52%). In contrast the two most frequent categories for HIV-positive concordant couples and HIV-discordant couples were for women reporting more than one lifetime partner and more than one lifetime union paired with men reporting more than one lifetime union and one or two lifetime partners or one lifetime union and three or more lifetime

partners (19.75% and 26.03% respectively) and men reporting three or more lifetime partners and more than one lifetime union paired with women reporting one lifetime partner and more than one lifetime union or more than one lifetime partner and one lifetime union (19.75% and 20.43% respectively).

For measures of age at first union, the majority of women for each HIV status couple type reported first marrying between the ages of 15-19. For men, the majority of men in HIV-positive concordant couples and HIV-discordant couples reported first marrying between the ages of 25 and 51 while the most frequent response for men in HIV-negative concordant couples was the age category of 20-24. In terms of the measure capturing both partners, the majority of couples reported that the man was five or more years older than the woman at the time of first marriage regardless of HIV status.

In terms of condom use, the majority of all partners and couples reported not using a condom during last intercourse but a much higher percentage of HIV-positive concordant couples and HIV-discordant couples reported condom use and a greater percentage of men reported condom use than women for each HIV status.

Lifetime Number of Partners

Individual partners. Having more than one lifetime partner (more than two for men) was a risk factor for being in an HIV-discordant couple as opposed to an HIV-negative concordant couple for both men and women in stable couples but it was a greater risk factor for women. Looking at Table 4, women with more than one lifetime partner were almost 6 times as likely (rrr=5.76, p<.001) to be in an HIV-discordant relationship (than an HIV-negative concordant relationship) compared to women with one lifetime partner, controlling for underlying factors.

Table 4

Women's relative risk for being in an HIV-discordant couple (compared to an HIV-negative concordant couple), Zimbabwe 2015

	Bivariate	Adjusted						
Number of other wives (none)								
At least one other wife	1.32	1.18						
	(0.36)	(0.31)						
Number of lifetime partners (one)								
Two or more	5.85***		5.76***					
	(0.96)		(0.97)					
Number of lifetime unions (one)								
More than one	5.63***			5.50***				
	(0.86)			(0.87)				
Combined number of lifetime partners and unions (one partner and one union)								
One partner and more than one union/more than one partner and one union	3.94***				3.96***			
	(0.82)				(0.85)			
More than one partner and more than one union	8.17***				8.04***			
	(1.46)				(1.46)			
Age at first union (15-19)								
8-14	1.79+					1.84*		
	(0.54)					(0.56)		
20-24	1.06					1.01		
	(0.18)					(0.18)		
25-51	3.65***					3.12***		
	(0.76)					(0.74)		
Used condom last intercourse (yes)								
No	0.12***						0.12***	
	(0.02)						(0.02)	
HIV testing (tested and received result)								
Never tested or did not receive result	1.27							1.30
	(0.34)							(0.34)
Age (25-29)								
15-19	0.89	0.87	1.38	1.19	1.44	0.87	0.80	0.84
	(0.32)	(0.31)	(0.52)	(0.44)	(0.54)	(0.31)	(0.31)	(0.30)
20-24	0.55*	0.53*	0.66	0.59+	0.65	0.56*	0.57*	0.54*
	(0.15)	(0.14)	(0.18)	(0.16)	(0.18)	(0.15)	(0.15)	(0.14)
30-34	1.45	1.50	1.47	1.40	1.42	1.35	1.51+	1.51+
	(0.35)	(0.37)	(0.38)	(0.35)	(0.36)	(0.34)	(0.37)	(0.37)
35-39	1.72*	1.77*	1.92*	1.56+	1.76*	1.57+	1.67+	1.78*
	(0.45)	(0.46)	(0.52)	(0.42)	(0.48)	(0.42)	(0.44)	(0.47)
40-44	1.40	1.40	1.55	1.38	1.49	1.27	1.25	1.42
	(0.37)	(0.36)	(0.44)	(0.38)	(0.42)	(0.33)	(0.34)	(0.37)
45-49	1.34	1.43	1.61	1.22	1.43	1.26	1.27	1.39
	(0.49)	(0.53)	(0.63)	(0.48)	(0.57)	(0.49)	(0.51)	(0.52)
Education (incomplete secondary)								
None/incomplete primary	0.82	0.71	0.66	0.59+	0.61+	0.69	0.69	0.70
	(0.21)	(0.19)	(0.18)	(0.17)	(0.17)	(0.19)	(0.19)	(0.19)
Complete primary	1.24	1.14	1.10	1.09	1.08	1.17	1.14	1.14
	(0.22)	(0.20)	(0.20)	(0.20)	(0.20)	(0.21)	(0.21)	(0.20)
Complete secondary/post-secondary	0.78	0.66	0.78	0.85	0.86	0.55+	0.62	0.65
	(0.23)	(0.21)	(0.27)	(0.27)	(0.29)	(0.18)	(0.19)	(0.21)
Religion (Christian religions)								
Apostolic sect	0.79	0.74+	0.72+	0.69*	0.70*	0.76+	0.74+	0.74+
	(0.13)	(0.12)	(0.12)	(0.11)	(0.12)	(0.12)	(0.13)	(0.12)
All others/no religion	1.28	1.30	1.09	1.12	1.06	1.26	1.23	1.29
	(0.34)	(0.35)	(0.30)	(0.30)	(0.29)	(0.35)	(0.36)	(0.35)
News/media frequency (at least once a week)								
Less than once a week	1.15	1.17	1.21	1.12	1.17	1.17	1.09	1.17
	(0.25)	(0.27)	(0.28)	(0.26)	(0.28)	(0.26)	(0.26)	(0.27)
Not at all	1.37+	1.45+	1.34	1.40	1.35	1.45+	1.49+	1.45+
	(0.25)	(0.29)	(0.27)	(0.29)	(0.27)	(0.29)	(0.31)	(0.29)
AIDS knowledge (accurate knowledge)								
Less accurate knowledge or has never heard of HIV/AIDS	0.99	1.05	1.00	1.00	0.98	1.03	1.07	1.04
	(0.15)	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)	(0.17)	(0.16)

Source: Demographic and Health Surveys
†p<.1, *p<.05, **p<.01, ***p<.001

Notes: Results are presented as relative risk ratios (standard errors). Reference category for outcome variable is women in HIV-negative concordant couples. Reference categories for all other variables are listed in parentheses.

Men with more than two lifetime partners were more than twice as likely (rrr=2.20, p<.001) to be in a discordant relationship as opposed to an HIV-negative concordant couple than men with one or two lifetime partner(s), controlling for underlying factors (Table 5).

Table 5

Men's relative risk for being in an HIV-discordant couple (compared to an HIV-negative concordant couple), Zimbabwe 2015

	Bivariate	Adjusted						
Number of wives (one)								
More than one	1.46	1.27						
	(0.39)	(0.35)						
Number of lifetime partners (one or two)								
Three or more	2.25***		2.20***					
	(0.47)		(0.47)					
Number of lifetime unions (one)								
More than one	0.32***			0.33***				
	(0.05)			(0.06)				
Combined number of lifetime partners and unions (three or more partners and more than one union)								
One or two partners and one union	1.60				1.48			
	(0.70)				(0.67)			
Three or more partners and one union	2.79***				2.69***			
	(0.56)				(0.55)			
One or two partners and more than one union	0.51**				0.52**			
	(0.12)				(0.12)			
Age at first union (25-51)								
8-19	0.55*					0.62		
	(0.16)					(0.19)		
20-24	0.53***					0.59**		
	(0.09)					(0.10)		
Used condom last intercourse (yes)								
No	0.12***						0.12***	
	(0.02)						(0.02)	
HIV testing (tested and received result)								
Never tested or did not receive result	0.96							0.92
	(0.18)							(0.18)
Age (30-34)								
15-24	0.53	0.54	0.55	0.66	0.66	0.67	0.53	0.54
	(0.21)	(0.22)	(0.23)	(0.27)	(0.27)	(0.28)	(0.22)	(0.22)
25-29	0.66+	0.66+	0.67	0.72	0.74	0.70	0.66	0.65+
	(0.16)	(0.16)	(0.16)	(0.18)	(0.18)	(0.18)	(0.17)	(0.16)
35-39	1.09	1.09	1.08	1.10	1.08	1.04	1.11	1.10
	(0.25)	(0.25)	(0.26)	(0.26)	(0.26)	(0.24)	(0.26)	(0.26)
40-44	1.41	1.43	1.44	1.38	1.39	1.40	1.24	1.45
	(0.33)	(0.34)	(0.34)	(0.33)	(0.33)	(0.34)	(0.30)	(0.35)
45-54	1.20	1.20	1.17	1.07	1.04	1.11	1.03	1.23
	(0.27)	(0.28)	(0.27)	(0.24)	(0.24)	(0.25)	(0.25)	(0.28)
Education (incomplete secondary)								
None/incomplete primary	0.93	0.87	0.90	0.81	0.82	0.89	0.84	0.89
	(0.22)	(0.23)	(0.24)	(0.20)	(0.20)	(0.24)	(0.24)	(0.24)
Complete primary	1.31	1.30	1.35	1.24	1.26	1.33	1.37	1.31
	(0.27)	(0.28)	(0.30)	(0.27)	(0.28)	(0.28)	(0.30)	(0.29)
Complete secondary/post-secondary	1.01	0.91	0.94	0.92	1.02	0.85	0.87	0.89
	(0.23)	(0.23)	(0.23)	(0.22)	(0.24)	(0.21)	(0.22)	(0.22)
Religion (Christian religions)								
Apostolic sect	0.99	0.77	0.79	0.72+	1.02	0.80	0.79	0.78
	(0.18)	(0.13)	(0.13)	(0.12)	(0.20)	(0.14)	(0.14)	(0.13)
All others/no religion	1.07	1.22	1.28	1.15	1.00	1.24	1.23	1.23
	(0.19)	(0.35)	(0.37)	(0.34)	(0.19)	(0.35)	(0.39)	(0.35)
News/media frequency (at least once a week)								
Less than once a week	0.92	0.97	0.95	0.95	0.91	0.98	0.94	0.97
	(0.18)	(0.19)	(0.19)	(0.19)	(0.18)	(0.20)	(0.20)	(0.19)
Not at all	1.45+	1.51+	1.53+	1.53+	1.54+	1.49+	1.46	1.52+
	(0.31)	(0.35)	(0.36)	(0.36)	(0.36)	(0.35)	(0.36)	(0.36)
AIDS knowledge (accurate knowledge)								
Less accurate knowledge or has never heard of HIV/AIDS	0.92	0.95	0.97	0.93	0.94	0.96	0.92	0.95
	(0.14)	(0.16)	(0.17)	(0.16)	(0.17)	(0.16)	(0.17)	(0.16)

Source: Demographic and Health Surveys

†p<.1, *p<.05, **p<.01, ***p<.001

Notes: Results are presented as relative risk ratios (standard errors). Reference category for outcome variable is men in HIV-negative concordant couples. Reference categories for all other variables are listed in parentheses.

Sexual mixing. The number of lifetime partners was as an additive risk for couples. As shown in Table 6, couples with both partners reporting one lifetime partner had the lowest risk for being HIV-discordant, couples with one partner reporting more than one lifetime partner and the other partner reporting only one lifetime partner had the next highest risk for being discordant, and couples with both partners reporting more than one lifetime partner had the highest risk for being HIV-discordant as opposed to HIV-negative concordant.

Table 6

Couples' relative risk for being HIV-discordant (compared to HIV-negative concordant), Zimbabwe 2015

	Bivariate	Adjusted								
Number of wives (same number reported by man and woman)										
Different number of wives reported	1.39 (0.59)	1.14 (0.51)								
Number of lifetime partners (one partner reports one lifetime partner and other partner reports more than one lifetime partner)										
Both partners report one lifetime partner	0.15*** (0.07)		0.16*** (0.08)							
Both partners report more than one lifetime partner	4.67*** (0.77)		4.24*** (0.72)							
Number of lifetime unions (one partner reports one lifetime union and other partner reports more than one lifetime union)										
Both partners report one lifetime union	1.32 (0.27)			1.16 (0.26)						
Both partners report more than one lifetime union	2.59*** (0.59)			2.02** (0.49)						
Combined number of lifetime partners and unions Man reports three or more partners and more than one union and woman reports one partner and/or one union	0.62** (0.11)				0.66* (0.12)					
Combined number of lifetime partners and unions Man reports three or more partners and more than one union and woman reports one partner and one union	0.43*** (0.09)					0.46*** (0.10)				
Combined number of lifetime partners and unions Woman reports more than one partner and more than one union and man reports one or two partners and/or one union	6.32*** (1.22)						5.50*** (1.13)			
Age at first union (man was 5 or more years older at first union)										
Woman was older at first union	2.57*** (0.71)							1.08 (0.43)		
Man was 0-4 years older than woman at first union	1.37+ (0.25)							1.01 (0.25)		
Age at first union-men (20-24)										
8-19	0.36** (0.12)							0.79 (0.28)		
25-51	0.45*** (0.08)							2.12*** (0.43)		
Used condom last intercourse (both partners report using a condom or did not have sex in the last year)										
At least one partner reports not using a condom	0.06*** (0.02)								0.06*** (0.02)	
HIV Testing (both partners have tested and received result)										
At least one partner has not tested or received result	1.01 (0.17)									0.96 (0.18)
Age-men (30-34)										
15-24	0.48+ (0.19)	0.47+ (0.19)	0.67 (0.27)	0.48+ (0.19)	0.48+ (0.19)	0.50+ (0.23)	0.57 (0.26)	0.64 (0.18)	0.46+ (0.19)	0.47+ (0.19)
25-29	0.61* (0.15)	0.60* (0.15)	0.72 (0.19)	0.60* (0.15)	0.60* (0.15)	0.60* (0.15)	0.62+ (0.16)	0.65+ (0.16)	0.63+ (0.16)	0.60* (0.15)
35-39	1.11 (0.25)	1.09 (0.26)	1.23 (0.31)	1.07 (0.26)	1.09 (0.26)	1.11 (0.27)	0.99 (0.25)	1.03 (0.26)	1.11 (0.26)	1.10 (0.26)
40-44	1.39 (0.32)	1.46 (0.34)	1.65* (0.41)	1.48+ (0.35)	1.46 (0.34)	1.49+ (0.36)	1.38 (0.32)	1.43 (0.34)	1.25 (0.30)	1.47 (0.34)
45-54	1.27 (0.29)	1.41 (0.33)	1.53+ (0.38)	1.42 (0.34)	1.40 (0.33)	1.45 (0.35)	1.20 (0.29)	1.30 (0.31)	1.15 (0.29)	1.42 (0.34)
Age (man is 0-4 years older than woman)										
Woman is older than man	3.31*** (0.86)	3.24*** (0.85)	1.91* (0.56)	2.97*** (0.80)	3.05*** (0.80)	2.85*** (0.75)	2.46** (0.70)	3.16*** (1.06)	3.41*** (0.95)	3.24*** (0.86)
Man is 5-9 years older than woman	0.65* (0.11)	0.62** (0.11)	0.66* (0.12)	0.63** (0.11)	0.61** (0.11)	0.61** (0.11)	0.61** (0.11)	0.51** (0.13)	0.63** (0.11)	0.62** (0.11)
Man is 10 or more years older than woman	1.00 (0.22)	0.93 (0.21)	0.84 (0.19)	0.93 (0.21)	0.88 (0.20)	0.85 (0.19)	0.87 (0.20)	0.63 (0.18)	0.94 (0.21)	0.93 (0.21)
Education-men (incomplete secondary)										
None/incomplete primary	0.76 (0.19)	0.66 (0.19)	0.57+ (0.17)	0.65 (0.18)	0.64 (0.18)	0.63 (0.18)	0.55* (0.16)	0.76 (0.22)	0.64 (0.19)	0.67 (0.20)
Complete primary	1.10 (0.27)	1.02 (0.28)	0.89 (0.26)	1.02 (0.28)	1.00 (0.28)	0.97 (0.27)	0.93 (0.26)	1.10 (0.29)	0.99 (0.27)	1.03 (0.29)
Complete secondary/post-secondary	0.91 (0.22)	1.08 (0.27)	1.40 (0.37)	1.12 (0.29)	1.07 (0.28)	1.09 (0.29)	1.16 (0.29)	0.94 (0.24)	0.88 (0.23)	1.07 (0.27)
Education (same level of educational attainment)										
Woman has a higher level of educational attainment	1.55+ (0.37)	1.53+ (0.38)	1.39 (0.37)	1.53+ (0.37)	1.52+ (0.38)	1.54+ (0.39)	1.51 (0.39)	1.40 (0.35)	1.71* (0.43)	1.52+ (0.38)
Man has a higher level of educational attainment	1.31 (0.23)	1.19 (0.22)	1.08 (0.22)	1.18 (0.22)	1.17 (0.22)	1.14 (0.22)	1.12 (0.22)	1.33 (0.25)	1.26 (0.24)	1.20 (0.23)
Religion (report same religion)										
Report different religion	1.56** (0.23)	1.58** (0.24)	1.33+ (0.22)	1.54** (0.24)	1.60** (0.25)	1.60** (0.25)	1.53** (0.24)	1.58** (0.25)	1.52* (0.24)	1.57** (0.25)
Location (urban)										
Rural	0.93 (0.14)	0.52* (0.17)	0.50* (0.17)	0.53* (0.17)	0.54+ (0.18)	0.56+ (0.18)	0.51* (0.17)	0.54+ (0.18)	0.56+ (0.18)	0.52* (0.17)
Wealth (richer)										
Poorest	1.14 (0.24)	1.89+ (0.65)	2.19* (0.81)	1.83+ (0.63)	1.77+ (0.61)	1.72 (0.60)	1.83+ (0.66)	1.79+ (0.63)	1.66 (0.56)	1.87+ (0.64)
Poorer	0.81 (0.19)	1.36 (0.47)	1.57 (0.59)	1.32 (0.46)	1.28 (0.45)	1.24 (0.44)	1.34 (0.49)	1.32 (0.46)	1.28 (0.46)	1.35 (0.47)
Middle	1.02 (0.26)	1.67 (0.62)	1.94+ (0.77)	1.63 (0.60)	1.62 (0.60)	1.62 (0.61)	1.67 (0.63)	1.61 (0.61)	1.65 (0.61)	1.66 (0.61)
Richest	0.81 (0.18)	0.63* (0.14)	0.64+ (0.15)	0.64* (0.14)	0.65* (0.14)	0.64* (0.14)	0.69 (0.16)	0.60* (0.14)	0.70 (0.16)	0.62* (0.14)
News/media frequency (same level of access to news/media)										
Woman has greater level of access to news/media	0.94 (0.23)	0.98 (0.25)	1.01 (0.26)	1.02 (0.26)	1.00 (0.26)	1.00 (0.26)	0.98 (0.25)	0.98 (0.25)	0.95 (0.25)	0.99 (0.25)
Man has greater level of access to news/media	1.07 (0.19)	1.00 (0.20)	0.98 (0.20)	1.02 (0.20)	0.99 (0.20)	0.98 (0.19)	0.98 (0.20)	1.00 (0.20)	0.98 (0.19)	1.01 (0.20)
AIDS knowledge (same level of accurate knowledge of HIV/AIDS)										
Woman has more accurate knowledge of HIV/AIDS	0.88 (0.17)	0.87 (0.18)	0.81 (0.17)	0.87 (0.18)	0.85 (0.17)	0.84 (0.17)	0.79 (0.17)	0.87 (0.18)	0.85 (0.18)	0.87 (0.17)
Man has more accurate knowledge of HIV/AIDS	0.97 (0.18)	0.92 (0.17)	0.91 (0.19)	0.93 (0.18)	0.93 (0.18)	0.93 (0.18)	0.91 (0.18)	0.92 (0.19)	0.91 (0.19)	0.93 (0.18)

Source: Demographic and Health Surveys

†p<.1, *p<.05, **p<.01, ***p<.001

Notes: Results are presented as relative risk ratios (standard errors). Reference category for outcome variable is HIV-negative concordant couples. Reference categories for all other variables are listed in parentheses.

Both partners reporting more than one lifetime partner within a couple were more than 4 times as likely (rrr=4.23, p<.001) to be discordant as opposed to negative concordant than couples where one partner reported more than one lifetime partner and the other partner reported only one, controlling for underlying factors. However, for couples where both partners reported only one lifetime partner, they were about 85% less likely (rrr=0.16, p<.001) to be discordant than couples where one partner reported more than one lifetime partner and the other partner reported only one.

HIV-positive concordant couples as comparison base. No significant differences were found for number of lifetime partners when comparing HIV-discordant couples to HIV-positive concordant couples (Tables 7, 8, 9). This suggests that the risk being captured here is the risk for being in a positive couple, whether discordant or positive concordant.

Table 7

Women's relative risk for being in an HIV-discordant couple (compared to an HIV-positive concordant couple), Zimbabwe 2015

	Bivariate	Adjusted						
Number of other wives (none)								
At least one other wife	2.06*	2.33*						
	(0.73)	(0.85)						
Number of lifetime partners (one)								
Two or more	1.16		1.22					
	(0.24)		(0.25)					
Number of lifetime unions (one)								
More than one	1.10			1.27				
	(0.20)			(0.24)				
Combined number of lifetime partners and unions (one partner and one union)								
One partner and more than one union/more than one partner and one union	1.08				1.06			
	(0.30)				(0.29)			
More than one partner and more than one union	1.16				1.35			
	(0.25)				(0.29)			
Age at first union (15-19)								
8-14	1.09					1.12		
	(0.40)					(0.43)		
20-24	1.40					1.34		
	(0.36)					(0.36)		
25-51	1.13					1.09		
	(0.28)					(0.30)		
Used condom last intercourse (yes)								
No	1.92**						1.95**	
	(0.38)						(0.40)	
HIV testing (tested and received result)								
Never tested or did not receive result	2.05+							2.07+
	(0.79)							(0.82)
Age (25-29)								
15-19	2.31	2.52	2.55	2.57	2.59	2.64	2.72	2.27
	(1.36)	(1.53)	(1.56)	(1.56)	(1.58)	(1.61)	(1.73)	(1.37)
20-24	0.61	0.61	0.64	0.63	0.64	0.63	0.59	0.62
	(0.23)	(0.23)	(0.24)	(0.24)	(0.24)	(0.24)	(0.23)	(0.23)
30-34	0.97	0.95	0.96	0.96	0.95	0.96	0.93	0.98
	(0.28)	(0.27)	(0.28)	(0.28)	(0.28)	(0.28)	(0.28)	(0.28)
35-39	0.69	0.67	0.69	0.66	0.66	0.68	0.71	0.69
	(0.23)	(0.23)	(0.23)	(0.22)	(0.23)	(0.23)	(0.24)	(0.23)
40-44	0.61	0.57+	0.62	0.61	0.61	0.60	0.65	0.60
	(0.19)	(0.18)	(0.20)	(0.19)	(0.20)	(0.19)	(0.21)	(0.19)
45-49	0.93	1.00	1.02	0.97	0.97	0.99	1.12	0.93
	(0.43)	(0.47)	(0.48)	(0.46)	(0.46)	(0.47)	(0.53)	(0.44)
Education (incomplete secondary)								
None/incomplete primary	0.62+	0.55*	0.57+	0.55*	0.55+	0.58+	0.55+	0.55*
	(0.18)	(0.17)	(0.17)	(0.17)	(0.17)	(0.18)	(0.17)	(0.17)
Complete primary	1.19	1.14	1.15	1.15	1.14	1.20	1.17	1.14
	(0.27)	(0.26)	(0.26)	(0.26)	(0.26)	(0.28)	(0.27)	(0.26)
Complete secondary/post-secondary	2.18	2.39	2.33	2.46	2.44	2.20	2.43	2.32
	(1.18)	(1.33)	(1.30)	(1.38)	(1.37)	(1.24)	(1.32)	(1.29)
Religion (Christian religions)								
Apostolic sect	0.78	0.80	0.81	0.80	0.80	0.81	0.79	0.80
	(0.15)	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)	(0.16)
All others/no religion	0.84	0.91	0.91	0.90	0.90	0.91	0.98	0.91
	(0.30)	(0.33)	(0.33)	(0.33)	(0.33)	(0.33)	(0.35)	(0.34)
News/media frequency (at least once a week)								
Less than once a week	1.07	1.18	1.20	1.17	1.18	1.20	1.29	1.20
	(0.28)	(0.32)	(0.32)	(0.32)	(0.32)	(0.32)	(0.36)	(0.32)
Not at all	1.31	1.50+	1.46+	1.50+	1.46+	1.54+	1.54+	1.52+
	(0.29)	(0.34)	(0.33)	(0.34)	(0.33)	(0.36)	(0.36)	(0.35)
AIDS knowledge (accurate knowledge)								
Less accurate knowledge or has never heard of HIV/AIDS	0.95	1.00	1.00	0.99	0.99	0.99	0.98	0.99
	(0.17)	(0.19)	(0.18)	(0.18)	(0.18)	(0.18)	(0.19)	(0.18)

Source: Demographic and Health Surveys

†p<.1, *p<.05, **p<.01, ***p<.001

Notes: Results are presented as relative risk ratios (standard errors). Reference category for outcome variable is women in HIV-positive concordant couples. Reference categories for all other variables are listed in parentheses.

Table 8

Men's relative risk for being in an HIV-discordant couple (compared to an
HIV-positive concordant couple), Zimbabwe 2015

	Bivariate	Adjusted						
Number of wives (one)								
More than one	2.76*	3.45**						
	(1.13)	(1.47)						
Number of lifetime partners (one or two)								
Three or more	0.76		0.79					
	(0.20)		(0.21)					
Number of lifetime unions (one)								
More than one	1.05			0.94				
	(0.20)			(0.18)				
Combined number of lifetime partners and unions (three or more partners and more than one union)								
One or two partners and one union	1.16				1.22			
	(0.58)				(0.64)			
Three or more partners and one union	1.00				1.10			
	(0.20)				(0.23)			
One or two partners and more than one union	1.39				1.29			
	(0.42)				(0.39)			
Age at first union (20-24)								
8-19	0.80					0.70		
	(0.27)					(0.25)		
25-51	0.91					0.84		
	(0.19)					(0.18)		
Used condom last intercourse (yes)								
No	1.72**						1.61*	
	(0.35)						(0.33)	
HIV testing (tested and received result)								
Never tested or did not receive result	1.99**							2.22**
	-0.51							(0.57)
Age (30-34)								
15-24	1.38	1.58	1.48	1.53	1.45	1.73	1.52	1.45
	(0.83)	(0.95)	(0.88)	(0.92)	(0.87)	(1.05)	(0.91)	(0.87)
25-29	0.85	0.90	0.86	0.87	0.85	0.90	0.86	0.89
	(0.30)	(0.32)	(0.31)	(0.31)	(0.33)	(0.31)	(0.31)	(0.32)
35-39	0.61+	0.58+	0.59+	0.58+	0.58+	0.58+	0.60+	0.58+
	(0.18)	(0.17)	(0.17)	(0.17)	(0.17)	(0.17)	(0.18)	(0.17)
40-44	0.53*	0.50*	0.52*	0.51*	0.50*	0.51*	0.56*	0.51*
	(0.15)	(0.14)	(0.15)	(0.15)	(0.14)	(0.15)	(0.16)	(0.15)
45-54	0.47**	0.43**	0.45**	0.45**	0.44**	0.43**	0.49**	0.42**
	(0.13)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.13)	(0.11)
Education (incomplete secondary)								
None/incomplete primary	0.99	1.08	1.11	1.12	1.21	1.15	1.13	1.03
	(0.30)	(0.37)	(0.37)	(0.37)	(0.40)	(0.39)	(0.38)	(0.35)
Complete primary	1.18	1.28	1.26	1.27	1.33	1.30	1.22	1.22
	(0.32)	(0.35)	(0.35)	(0.35)	(0.37)	(0.34)	(0.34)	(0.34)
Complete secondary/post-secondary	1.94+	1.99*	1.92+	1.93+	1.94+	1.87+	1.91+	1.99*
	(0.65)	(0.70)	(0.67)	(0.67)	(0.68)	(0.65)	(0.64)	(0.68)
Religion (Christian religions)								
Apostolic sect	0.78	0.81	0.83	0.82	0.99	0.85	0.82	0.81
	(0.15)	(0.16)	(0.16)	(0.16)	(0.24)	(0.17)	(0.16)	(0.16)
All others/no religion	0.84	0.79	0.83	0.83	0.66+	0.84	0.83	0.85
	(0.30)	(0.28)	(0.30)	(0.29)	(0.16)	(0.30)	(0.29)	(0.31)
News/media frequency (at least once a week)								
Less than once a week	0.85	0.98	0.99	0.97	0.97	0.98	0.97	0.97
	(0.21)	(0.25)	(0.25)	(0.24)	(0.24)	(0.25)	(0.24)	(0.25)
Not at all	1.00	1.07	1.10	1.10	1.09	1.08	1.11	1.06
	(0.29)	(0.33)	(0.33)	(0.33)	(0.33)	(0.33)	(0.33)	(0.32)
AIDS knowledge (accurate knowledge)								
Less accurate knowledge or has never heard of HIV/AIDS	0.79	0.81	0.80	0.80	0.81	0.81	0.84	0.80
	(0.15)	(0.17)	(0.17)	(0.17)	(0.17)	(0.17)	(0.18)	(0.17)

Source: Demographic and Health Surveys

†p<.1, *p<.05, **p<.01, ***p<.001

Notes: Results are presented as relative risk ratios (standard errors). Reference category for outcome variable is men in HIV-positive concordant couples. Reference categories for all other variables are listed in parentheses.

Table 9

Couples' relative risk for being HIV-discordant (compared to HIV-positive concordant), Zimbabwe 2015

	Bivariate	Adjusted								
Number of wives (same number reported by man and woman)										
Different number of wives reported	2.51	2.58								
	(1.50)	(1.55)								
Number of lifetime partners (one partner reports one lifetime partner and other partner reports more than one lifetime partner)										
Both partners report one lifetime partner	0.42		0.39							
	(0.28)		(0.26)							
Both partners report more than one lifetime partner	1.00		0.97							
	(0.21)		(0.21)							
Number of lifetime unions (one partner reports one lifetime union and other partner reports more than one lifetime union)										
Both partners report one lifetime union	0.62*			0.64+						
	(0.15)			(0.16)						
Both partners report more than one lifetime union	0.68			0.62+						
	(0.17)			(0.17)						
Combined number of lifetime partners and unions Man reports three or more partners and more than one union and woman reports one partner and/or one union	1.06				1.04					
	(0.22)				(0.22)					
Combined number of lifetime partners and unions Man reports three or more partners and more than one union and woman reports one partner and one union	1.04					1.07				
	(0.29)					(0.30)				
Combined number of lifetime partners and unions Woman reports more than one partner and more than one union and man reports one or two partners and/or one union	1.39						1.62*			
	(0.28)						(0.35)			
Age at first union (man was 5 or more years older at first union)										
Woman was older at first union	1.34							0.69		
	(0.50)							(0.36)		
Man was 0-4 years older than woman at first union	1.79*							1.24		
	(0.42)							(0.40)		
Age at first union-men (20-24)										
8-19	0.58							0.80		
	(0.23)							(0.34)		
25-51	0.74							1.51		
	(0.16)							(0.38)		
Used condom last intercourse (both partners report using a condom (or did not have sex in the last year)										
At least one partner reports not using a condom	1.58*								1.48+	
	(0.36)								(0.34)	
HIV Testing (both partners have tested and received result)										
At least one partner has not tested or received result	1.93**									2.20**
	(0.45)									(0.53)
Age-men (30-34)										
15-24	1.22	1.23	1.29	1.19	1.24	1.25	1.35	1.44	1.29	1.13
	(0.74)	(0.74)	(0.76)	(0.72)	(0.74)	(0.75)	(0.80)	(0.87)	(0.76)	(0.68)
25-29	0.81	0.83	0.81	0.80	0.82	0.81	0.83	0.85	0.80	0.82
	(0.29)	(0.30)	(0.29)	(0.29)	(0.29)	(0.29)	(0.30)	(0.31)	(0.29)	(0.29)
35-39	0.63	0.59+	0.60+	0.60+	0.60+	0.59+	0.58+	0.57+	0.61+	0.58+
	(0.18)	(0.17)	(0.18)	(0.18)	(0.18)	(0.17)	(0.17)	(0.17)	(0.18)	(0.17)
40-44	0.55*	0.52*	0.53*	0.51*	0.52*	0.52*	0.52*	0.51*	0.56+	0.50*
	(0.16)	(0.15)	(0.16)	(0.15)	(0.15)	(0.15)	(0.15)	(0.17)	(0.17)	(0.15)
45-54	0.53*	0.52*	0.54*	0.51*	0.52*	0.52*	0.50*	0.50*	0.56+	0.47**
	(0.14)	(0.15)	(0.16)	(0.15)	(0.15)	(0.15)	(0.14)	(0.14)	(0.17)	(0.13)
Age (man is 0-4 years older than woman)										
Woman is older than man	1.28	1.27	1.29	1.41	1.30	1.30	1.17	1.74	1.28	1.28
	(0.44)	(0.45)	(0.47)	(0.50)	(0.46)	(0.46)	(0.42)	(0.73)	(0.45)	(0.46)
Man is 5-9 years older than woman	0.63+	0.64+	0.67	0.65+	0.64+	0.64+	0.64+	0.63	0.62+	0.64+
	(0.16)	(0.16)	(0.17)	(0.16)	(0.16)	(0.17)	(0.17)	(0.22)	(0.16)	(0.17)
Man is 10 or more years older than woman	0.67	0.64	0.64	0.69	0.65	0.65	0.64	0.58	0.64	0.67
	(0.19)	(0.19)	(0.19)	(0.20)	(0.19)	(0.19)	(0.19)	(0.22)	(0.19)	(0.20)
Education-men (incomplete secondary)										
None/incomplete primary	0.73	0.68	0.69	0.69	0.69	0.69	0.65	0.75	0.66	0.61
	(0.24)	(0.25)	(0.26)	(0.25)	(0.25)	(0.25)	(0.24)	(0.28)	(0.25)	(0.23)
Complete primary	0.96	0.87	0.87	0.89	0.88	0.88	0.86	0.95	0.90	0.84
	(0.29)	(0.30)	(0.31)	(0.30)	(0.31)	(0.30)	(0.30)	(0.33)	(0.31)	(0.29)
Complete secondary/post-secondary	1.88+	1.95	1.99+	1.90	1.98+	1.98+	2.03+	1.82	2.16*	2.09+
	(0.66)	(0.80)	(0.82)	(0.79)	(0.81)	(0.81)	(0.83)	(0.74)	(0.84)	(0.85)
Education (same level of educational attainment)										
Woman has a higher level of educational attainment	1.73+	1.91*	1.95*	1.95*	1.90*	1.91*	1.90*	1.79+	1.82*	1.97*
	(0.50)	(0.58)	(0.62)	(0.60)	(0.59)	(0.59)	(0.59)	(0.57)	(0.56)	(0.60)
Man has a higher level of educational attainment	1.10	1.13	1.16	1.19	1.15	1.15	1.12	1.21	1.12	1.13
	(0.25)	(0.26)	(0.27)	(0.28)	(0.27)	(0.27)	(0.26)	(0.28)	(0.26)	(0.26)
Religion (report same religion)										
Report different religion	0.97	0.99	0.96	0.99	0.97	0.97	0.97	0.99	0.98	0.96
	(0.21)	(0.22)	(0.22)	(0.22)	(0.22)	(0.22)	(0.21)	(0.22)	(0.22)	(0.21)
Location (urban)										
Rural	0.91	0.94	0.86	0.87	0.89	0.88	0.86	0.92	0.87	0.91
	(0.20)	(0.47)	(0.44)	(0.45)	(0.45)	(0.44)	(0.43)	(0.46)	(0.45)	(0.46)
Wealth (richer)										
Poorest	1.39	1.64	1.68	1.66	1.64	1.66	1.62	1.63	1.63	1.62
	(0.43)	(0.88)	(0.91)	(0.89)	(0.88)	(0.90)	(0.87)	(0.87)	(0.88)	(0.86)
Poorer	0.91	1.13	1.15	1.12	1.12	1.13	1.12	1.11	1.15	1.16
	(0.29)	(0.59)	(0.62)	(0.59)	(0.60)	(0.60)	(0.60)	(0.57)	(0.61)	(0.60)
Middle	1.03	1.28	1.30	1.28	1.28	1.30	1.29	1.27	1.28	1.32
	(0.34)	(0.70)	(0.72)	(0.70)	(0.71)	(0.72)	(0.71)	(0.69)	(0.71)	(0.71)
Richest	1.40	1.34	1.29	1.26	1.30	1.30	1.34	1.29	1.23	1.38
	(0.47)	(0.51)	(0.49)	(0.49)	(0.49)	(0.49)	(0.50)	(0.50)	(0.46)	(0.52)
News/media frequency (same level of access to news/media)										
Woman has greater level of access to news/media	0.93	1.02	1.05	0.97	1.01	1.02	1.01	1.03	1.01	0.98
	(0.26)	(0.30)	(0.31)	(0.29)	(0.30)	(0.30)	(0.30)	(0.30)	(0.30)	(0.28)
Man has greater level of access to news/media	1.30	1.40	1.42	1.43	1.42	1.41	1.40	1.42	1.44	1.41
	(0.28)	(0.32)	(0.32)	(0.32)	(0.32)	(0.32)	(0.32)	(0.33)	(0.34)	(0.33)
AIDS knowledge (same level of accurate knowledge of HIV/AIDS)										
Woman has more accurate knowledge of HIV/AIDS	0.75	0.76	0.75	0.75	0.75	0.75	0.73	0.75	0.75	0.75
	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)
Man has more accurate knowledge of HIV/AIDS	0.94	0.88	0.90	0.89	0.90	0.91	0.91	0.91	0.87	0.88
	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)	(0.20)

Source: Demographic and Health Surveys

†p<.1, *p<.05, **p<.01, ***p<.001

Notes: Results are presented as relative risk ratios (standard errors). Reference category for outcome variable is HIV-positive concordant couples. Reference categories for all other variables are listed in parentheses.

Lifetime Number of Unions.

  Individual partners. Being in more than one stable couple over the life-course, as opposed to only the current relationship, was protective for men but a risk factor for women in terms of being in a discordant couple rather than an HIV-negative concordant couple. Women with more than one lifetime union were 5.5 times as likely (p<.001) to currently be in a discordant relationship, as opposed to an HIV-negative concordant couple, as women with one lifetime union, controlling for underlying factors (Table 4). But men with more than one lifetime union were about 70% less likely (rrr=0.33, p<.001) to be in a discordant couple than men with only one lifetime union (Table 5). This is an interesting finding given the degree to which the risk associated with this behavior differed for men and women. Looking at the descriptive analyses in Table 1, the majority of men in both HIV-discordant and HIV-negative concordant couples reported three or more lifetime partners. However, a higher percentage of men reporting three or more lifetime partners in HIV-discordant couples reported only one lifetime union than men reporting three or more lifetime partners in HIV-negative concordant couples (47% vs. 24%). Being in a stable couple may be protective for men in terms of the types of sexual behaviors associated with regular partners as opposed to non-regular partners. Additionally, a higher percentage of men reporting more than one lifetime union in discordant couples were coupled with a partner reporting more than one lifetime partner (50% vs. 18%) and more than one lifetime union (21% vs. 6%) than men with more than one lifetime union in negative concordant couples. This suggests that men in HIV-negative concordant couples may have managed their own higher sexual risk behavior profiles by forming relationships with lower risk women.

Sexual mixing. As shown in Table 6, both partners reporting more than one lifetime union were twice as likely (rrr=2.02, p<.01) to be HIV-discordant (as opposed to HIV-negative concordant) as couples with one partner reporting one lifetime union and the other partner reporting more than one lifetime union. This suggests that the protective effect of more lifetime unions for men is only when men form couples with women who had not been in a stable couple before entering the current relationship.

HIV-positive concordant couples as comparison base. However, when comparing HIV-discordant couples to HIV-positive concordant couples in Table 9, couples with both partners reporting more than one lifetime union were about 40% less likely (rrr=0.62, p<.1) to be discordant than couples with one partner reporting one lifetime union and the other partner reporting more than one lifetime union. Interestingly, this was also true for couples with both partners reporting one lifetime union (rrr=0.64, p<.1). This finding indicates a possible relationship between discordancy in partners' combined number of lifetime unions and HIV-discordant status compared to HIV-positive concordant couples.

Combined Lifetime Number of Partners and Unions

Individual partners. Results for the analyses using the measures combining number of partners and number of unions support the previous findings for men and women. Looking at Table 4, women reporting one partner and more than one union or more than one partner and one union were approximately 4 times as likely (rrr=3.96, p<.001) as women reporting one partner and one union to be in an HIV-discordant couple as opposed to an HIV-negative concordant couple. Women reporting more than one partner and more than one union were 8 times as likely (rrr=8.04, p<.001) as women reporting one partner and one union to be in an HIV-discordant couple as opposed to an HIV-negative concordant couple.

As shown in Table 5, men reporting three or more partners and one union were more than 2.5 times as likely (rrr=2.69, p<.001) as men reporting three or more partners and more than one union to be in an HIV-discordant couple as opposed to an HIV-negative concordant couple. However, men reporting one or two partners and more than one union were approximately half as likely (rrr=0.52, p<.01) as men reporting three or more partners and more than one union to be HIV-discordant as opposed to HIV-negative concordant.

Sexual mixing. Looking at the combined partner and union measures for both partners in Table 6, gendered trends were apparent. Couples with men reporting three or more partners and more than one union and women reporting one partner and one union or one partner and more than one union were roughly 35% less likely (rrr=0.66, p< .05) to be HIV-discordant than HIV-negative concordant compared to all other partner combinations of number of partners and unions. However, limiting these couples to only those with men reporting three or more partners and more than one union and women reporting one partner and one union shows a further reduction of risk for being HIV-discordant (rrr=0.46, p<.001). In contrast, couples with women reporting more than one partner and more than one union and men reporting one or two partners and one union or one or two partners and more than one union were 5.5 times as likely (rrr=5.50, p<.001) as couples with all other partner combinations of number of partners and unions to be HIV-discordant as opposed to HIV-negative concordant.

HIV-positive concordant couples as comparison base. Comparing HIV-discordant couples to HIV-positive concordant couples the only significant difference was for one of the couples measure. Couples with women reporting more than one partner and more than one union and men reporting one or two partners and one union or one or two partners and more than

one union were 1.62 times as likely (rrr=1.62, p<.5) to be HIV-discordant as opposed to HIV-positive concordant compared to couples with other combinations of partners and unions.

Age at First Union

 Individual partners. Marriage at younger ages may be generally protective for both men and women in terms of the risk for being in an HIV-discordant couple. Looking at Table 4, the age range for entering into a first marital/cohabitating union with the lowest risk for women was 15-19. Women who were age 25 or older when they entered into their first marriage/cohabitation were 3 times as likely (rrr=3.12, p<.001) to be in an HIV-discordant couple as opposed to an HIV-negative concordant relationship compared to women who were between the ages of 15-19. Additionally, women who were in the youngest age group of 8-14 when they entered into their first union were almost twice as likely (rrr=1.84, p<.05) to be in an HIV-discordant couple than women who were 15-19, controlling for underlying factors. For men, the age range for first union with the lowest risk for being in an HIV-discordant couple was 20-24 (Table 5). Men who were 20-24 when they entered into their first union were about 40% less likely (p<.01) as men age 25-51 to be in a discordant couple as opposed to a negative concordant couple.

 Marriage at younger ages may be generally protective of risk for individuals due to a quantitative and qualitative difference in non-regular partners as opposed to marriage/stable couple partners or due to a difference in the types of sexual behaviors engaged in with non-regular partners as opposed to marriage/stable couple partners.

 Sexual mixing. No significant relationships were found when accounting for the combined effect of both partners reported age at first union and controlling for underlying factors (Table 6).

HIV-positive concordant couples as comparison base. No significant differences were found for age at first union when comparing HIV-discordant couples to HIV-positive concordant couples (Tables 7, 8, 9).

Condom Use

Individual partners. The results demonstrated condom use to be a risk factor for being in an HIV-discordant couple as opposed to an HIV-negative concordant couple for both men and women. Women and men who had sex within the last year and reported no condom use during their most recent sexual intercourse were each almost 90% less likely (rrr=0.12, p<.001) to be in an HIV-discordant relationship (as opposed to an HIV-negative concordant relationship) compared to the women and men who reported using a condom or not having sex in the last year (Tables 4 and 5) . While this finding may seem counterintuitive given the importance of and programming focus on condoms as a preventative behavior, there are two plausible explanations for this finding. The first is that condom use rates were low for regular partners and that the condom use on the part of the men and women in HIV-discordant couples was due to their engagement in sexual relationships (concurrent) outside of the couple and that this engagement in riskier sex explains both their HIV-status and their reported condom use. This seems unlikely, however, since the majority of men and women reported their partner as the last person they had sex with. The second, more likely explanation is that with HIV testing rates at 75% coverage for HIV-positive individuals in Zimbabwe, it's likely that a substantial portion of the men and women in couples were aware of their status, at least at the time of their last test and were using a condom to protect their partner (UNAIDS, 2017).

Sexual mixing. Couples where at least one partner reported no condom use at last sex were 95% less likely (rrr=0.06, p<.001) to be discordant (Table 6). However, for the majority of couples, partners were not using a condom, regardless of status (Table 1).

HIV-positive concordant couples as comparison base. When looking at the relationship between HIV-discordant and HIV-positive concordant couples, interesting trends emerge for the men and women. Women reporting no condom at most recent sex were almost twice as likely (rrr=1.95, p<.01) as women reporting the use of a condom to be in an HIV-discordant couple as opposed to an HIV-positive concordant couple (Table 7). Similarly, men reporting no condom were 1.6 times as likely (p<.05) to be in a discordant couple (Table 8). This suggests that while condom usage rates were significantly higher for HIV-discordant couples than HIV-negative concordant couples, they were still significantly lower than HIV-positive concordant couples. Based on the descriptives for HIV testing rates, both men and women partners in HIV-positive concordant couples and as couples, had higher testing rates than HIV-discordant couples, meaning that HIV-positive concordant couples were potentially more likely to know their HIV positive status than HIV-discordant couples. It's also likely that a portion of the HIV-positive concordant couples believed themselves to be an HIV-discordant couple.

Discussion

The findings from this study demonstrate that individual-level and couple-level data together tell a more complete story about HIV risk factors for couples in Zimbabwe. Assessing sexual risk factors for being in an HIV-discordant couple allows for the determination of individual-level risk factors for being HIV-positive and at risk for infecting the other partner or

HIV-negative and at a high risk for becoming HIV-positive from the other partner and allows for the determination of risk for seroconversion within the couple.

In terms of risk factors for being in an HIV-discordant couple (as opposed to an HIV-negative concordant couple) based on individuals' accumulated sexual behaviors, a younger age at first marriage was shown to be generally protective for both men and women. Although a first union at ages 8-15 (the youngest ages) for women was a risk factor, the risk was still not as high as it was for first unions at the oldest ages. This finding is somewhat surprising given that HIV research and programing in sub-Saharan Africa has focused on younger ages at first sexual intercourse and marriage as risk factors for HIV, particularly for women. Having more than one (or two for men) lifetime partners was also a risk factor for both men and women. The risk associated with both of these behaviors was greater for women than men. The risk associated with number of lifetime unions had a more pronounced gendered effect with more than one lifetime union being a risk factor for women but a protective factor for men. This finding likely demonstrates sexual mixing with men who in terms of their average number of lifetime partners would be considered higher risk, partnering with women who would be considered low risk. This could be the result of more indirect selection processes but given that this sexual mixing is discordant (high risk with low risk) men may be using direct partner selection as a form of protection or risk management. Men are also better positioned than women in Zimbabwe, both socially and financially, to use serosorting as a prevention strategy.

Given the amount of emphasis placed on eliminating concurrent partnerships by HIV prevention programs in Zimbabwe, it could be that men have "replaced" concurrent relationships with serial monogamy in order to reduce their risk for HIV. Based on weighted analyses using Zimbabwe DHS data for 2010/1, the vast majority of men in stable couples reported only one

lifetime union, whereas in 2015 the vast majority of men reported more than one lifetime union (supplemental analyses not shown here). That is a striking change within a short period of time.

In terms of other sexual mixing findings, there was an additive risk for being in an HIV-discordant couple as opposed to an HIV-negative concordant couple for combined numbers of lifetime partners. More than one lifetime union for both partners also increased the risk of being in an HIV-discordant couple compared to HIV-negative concordant couples. Given the gendered findings from each partner's number of lifetime partners and unions it is likely that HIV-discordant couples are more likely to form when a high risk individual partners with another high risk individual.

For current sexual behaviors, condom use at the individual and couple level was a significant risk factor for being in an HIV-discordant couple. This finding suggests that HIV-discordant couples are more likely to accurately know at least one partner's HIV status due to the high rates of testing for the country.

While these risk factors were significant when comparing HIV-discordant couples to HIV-negative concordant couples, some of these risk factors were not unique to HIV-discordant couples but were unique to couples with at least one partner who is HIV positive. This makes sense given that individual-level risk factors carry over between HIV-status couple types. What was unique to HIV-discordant couples was condom use. Men and women who reported no condom use at last sex were significantly less likely to be in an HIV-discordant couple than an HIV-negative concordant couple but significantly more likely to be in an HIV-discordant couple than an HIV-positive concordant couple. Discordance in terms of number of lifetime unions between the two partners at the couple-level was also a unique risk factor for being in an HIV-discordant couple.

Emphasis of prevention strategies in Zimbabwe thus far have focused on individual sexual behaviors outside of stable couples and known behavior changes (reduction in concurrent partners, decrease in number of lifetime partners, increase in condom use for non-regular partners) reflect this programming effort. However, given the findings from this study, prevention strategies need to address couples in addition to individuals (who will most likely participate as a partner in at least one stable couple over their lifetime in Zimbabwe). Focus on stable couples, and the women in stable couples in particular, for prevention and treatment services could help continue, or even accelerate, the HIV prevalence decline that has prevailed over the past two decades in Zimbabwe. More specifically, HIV prevention programs should tailor condom messaging to include sex within stable couples, especially couples with at least one HIV-positive partner, so as to prevent seroconversion within HIV-discordant couples (and "super infection" within HIV-positive concordant couples). More research is needed in order to determine whether men are in fact using direct selection to choose lower risk stable couple partners in order to manage their own higher risk behaviors. Research looking at these measures across multiple time-points for Zimbabwe is also needed in order to understand how these behaviors have changed across time for couples and whether there is a relationship to non-coupled individuals' sexual behaviors and the decline in HIV general prevalence.

Limitations

There are significant limitations to this study. First, the data are cross-sectional as opposed to longitudinal. Timing of infection, therefore, cannot be known in relation to current couple formation. It is also unknown how any previous unions ended (death or divorce). It can also only be assumed that the majority of individuals knew their current HIV status given the estimated rate of testing for the country and it cannot be known whether individuals discussed

their status with their partners. It is also unknown whether HIV-positive partners were receiving ART (likely) or whether HIV-negative partners in discordant couples were receiving PrEP (highly unlikely). Due to sample size, it was also not possible to explore the possible differences that exist within HIV-discordant couples due to the gender of the positive partner.

Two other considerations are also important. The first is that condom usage reporting should be treated with caution. Research has demonstrated over-reporting of condom use for individuals and couples who have previously gone through voluntary counseling and testing (VCT). The second is that 15% of the men and 0.3% of the women in the full sample of couples for this study who reported more than one lifetime union also reported only one lifetime partner. After careful examination of the data, it is still unclear why this was the case but caution should be taken when drawing conclusions from the lifetime partner measures, especially for HIV-negative concordant couples where 18% of the men have this discrepancy. These limitations limit the conclusions that can be made from this study as to explanations for the trends identified. Future research using qualitative methods should explore this within the context of Zimbabwe in order to better understand the risks for and needs of HIV-discordant couples.

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