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Use of "Strengthening Our Vows" Video Intervention to Encourage Negotiated Explicit Sexual Agreements in Zambian Heterosexual HIV Seroconcordant Negative Couples

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Abstract

Negotiating sexual agreements in combination with couples' voluntary HIV counseling and testing (CVCT) may help further reduce HIV transmission in Zambian Concordant HIV negative couples (CNC). Though CVCT has been shown to reduce HIV transmission in CNC by 47%, approximately half of residual infections occur in this group. We developed a "Strengthening Our Vows" video session to foster communication and negotiation of explicit sexual agreements to reduce concurrent sexual exposures and prevent HIV transmission to the spouse due to unprotected, extramarital sex. CNC were recruited through CVCT services at five clinics in

Lusaka and Ndola in 2016. Enrolled CNC attending the facilitated group video sessions were encouraged to discuss sexual agreements at home and return 1-2 weeks later for follow-up assessment. One fourth of the 580 CNC returning reported a history of extra-marital partners and/or a sexually transmitted infection (STI) prior to enrollment. More than 95% reported a friendly, supportive 15-60 min negotiation culminating in an agreement to remain monogamous or disclose sexual contacts and use condoms together until a repeat HIV test 30 days after an outside sexual exposure. Two thirds of participants identified at least one threat to adherence of their agreements including alcohol use, financial pressures, travel, discord in the home, and post-partum or menstrual abstinence. CNC negotiated explicit sexual agreements to avoid exposure to HIV through concurrent partnerships and protect the spouse in the event of an outside sexual contact. Open communication was a consistent theme to facilitate mutual protective efforts. Long-term follow-up of HIV/STI incidence is ongoing to assess the impact of these agreements.

This sub-study is part of a trial retrospectively registered on ClinicalTrials.gov (Identifier: NCT02744586) on 20 April 2016.

Keywords

HIV prevention; dyadic interventions; sexual behavior; concurrent partners; couples HIV testing

Introduction

Most incident HIV infections in sub-Saharan Africa (SSA) occur in steady heterosexual couples (K.L Dunkle et al., 2008; Kumwenda et al., 2014), of which approximately half are concordant HIV-negative couples (CNC) (Chemaitelly et al., 2014; Wall et al., 2019). In addition, a 2017 modeling exercise indicated that "As the HIV/AIDS epidemic has matured in many countries, it is believed that the proportion of new infections occurring within couples has risen." (Juga et al., 2017).

Having unprotected sex with multiple partners increases opportunities for HIV transmission (Joint United Nations Programme on HIV/AIDS (UNAIDS), 2007; Kharsany & Karim, 2016). Multiple, concurrent partnerships are one of the drivers of the Zambian HIV epidemic (Zambia National AIDS Council, 2009). In Zambia's Demographic Health Survey, approximately 20% of men and 1% of women who are married/cohabiting report having two or more partners in the past 12 months (Zambia Central Statistical Office, 2018). This is similar to other countries with men reporting more multiple and concurrent partners than women (Halperin & Epstein, 2004; International Organization for Migration, 2010). Baseline data from a cluster-randomized trial (CRT) in Zambia, of which this is a sub-study, further supports CNC being an at-risk population as approximately 24% of CNC have at least one HIV risk factor (Sharkey et al., 2021).

One cost-effective HIV prevention strategy with substantial impact for heterosexual couples is Couples' Voluntary HIV Counseling and Testing (CVCT) (Center for Disease Control and Prevention (*Couples HIV Counseling and Testing Intervention and Training Curriculum* 2007) endorsed by WHO (World Health Organization, 2012, 2021). In Rwanda, where CVCT has been nationalized in antenatal clinics since 2013, more than 80% of couples have

received joint testing (Karita et al., 2016) and have prevented an estimated 70% of new infections (K.L Dunkle et al., 2008; K. L. Dunkle et al., 2008). In > 200,000 Zambian couples offered joint testing in > 70 government health centers, CVCT reduced HIV transmission between 47% –79% in CNC and discordant couples (DC) on anti-retroviral therapy (ART) respectively (Wall et al., 2019). CVCT could avert half of new HIV infection in Zambia for 5% of the annual President's Emergency Plan for AIDS Relief budget (Wall et al., 2019). A modeling study has shown similar results for East-Central, Southern and West Africa (Wall et al., 2020). Though HIV incidence in CNC is low relative to DC, CNC make up 79% of all couples and thus contribute to approximately half of new infections even after CVCT (Wall et al., 2019).

Where African couples have been tested jointly, the focus in the literature has been on couples with HIV and on discordant couples in particular with emphasis on disclosure of test results to partners (Audet et al., 2018; Batte et al., 2015; Damian et al., 2019; Juga et al., 2017; Kababu et al., 2018; Kouanda et al., 2012; Mlay et al., 2008). More couples-based HIV interventions tailored for CNC are needed to enhance the impact of CVCT and further reduce HIV risk in this large group. One strategy as an added component to CVCT in targeting Western CNC male couples is negotiated sexual agreements within the relationship (Stephenson et al., 2015). These agreements may include either mutual monogamy not requiring condoms, condom use with all outside partners and no condom use within the couple, or condom use both within and outside the couple (Leblanc et al., 2017). Though sexual agreements within male couples have been extensively explored (Beougher et al., 2012; Darbes et al., 2014; Essack et al., 2019; Gass et al., 2012; Hoff & Beougher, 2010; Hoff et al., 2009b; Mitchell et al., 2016; Perry et al., 2016; Stephenson, White, et al., 2015), little is known about the use of negotiated sexual agreements as an HIV prevention strategy in heterosexual African HIV negative couples. In addition, studies on sexual agreements in heterosexual relationships highlight false perceptions about sexual exclusivity (Drumright et al., 2004; Hageman et al., 2010; Lenoir et al., 2006), lack of explicit monogamy agreements (Jones et al., 2015; Rios-Spicer et al., 2019), difficulties in communicating sexual concurrency (Rios-Spicer et al., 2019), and ambiguity in definitions of 'monogamy' amongst clients and researchers (Conley et al., 2015). All of these issues may increase risk of STIs and HIV within the relationship, especially for countries with high HIV prevalence and a generalized HIV epidemic, such as Zambia. Thus, understanding how couples communicate and negotiate explicit sexual agreements may lead to additional consideration of this couple-based behavioral strategy to prevent HIV.

The aim of this study was to conduct a post-assessment following the "Strengthening Our Vows" video-based intervention targeting heterosexual HIV negative couples in Zambia. The preliminary outcome was communicating and negotiating sexual agreements and identifying threats to maintaining them.

Methods

Study site

This study was conducted at five government health centers in two urban cities Ndola ($n =$ 4) and Lusaka ($n = 1$), Zambia, where CVCT services are offered. Coordination for the study

was overseen by Center for Family Health Research in Zambia also located in these cities. Both cities were located in provinces where HIV prevalence is highest at ~15% (Zambia Central Statistical Office, 2018).

Study design

This study was designed as a single-arm study. The aim of this study was to test the impact of a video-based intervention "Strengthening Our Vows" (SOV) on negotiated sexual agreements among heterosexual HIV seroconcordant negative couples (CNC) to prevent HIV acquisition through unprotected, extramarital sex and to identify potential threats to keeping their agreements. In addition, participants were asked to recall HIV prevention strategies from the intervention visit. Couples returned one to two weeks after participating in the intervention. Baseline sociodemographic, reproductive, and sexual behavioral characteristics were compared for couples returning for post-assessment (follow-up) versus not to assess predictors of the post-assessment attendance.

This study was part of a cluster-randomized trial (CRT) in Zambia. The CRT design consisted of a similarly structured intervention arm SOV and comparator arm "Good Health Package"(GHP). The overall aim of SOV is to assess the impact of the intervention on reducing HIV risk factors, a composite of incident HIV/STI; self-reported number of outside sexual partners, alcohol and condom use with outside sexual partners, STI treatment, and joint HIV testing with outside partner; and knowledge of outside partner HIV status compared to GHP. GHP's aim assessed the impact of a video on knowledge uptake, recommendations, and adoption of strategies to prevent diarrheal diseases, including cholera, respiratory diseases, schistosomiasis, soil-transmitted helminthiasis, hypertension, and diabetes in heterosexual CNC.

Participants and Procedures

Prescreening for the study—The pre-screening for this study occurred over a six-month period in 2016 at five governmental health centers offering CVCT services in Ndola and Lusaka. Couples receiving these CVCT services were potential participants for this study. Trained CVCT counselors provided these CVCT services. CVCT included joint pre-test counseling, HIV rapid testing per national guidelines adapted for couples (Boeras et al., 2011), mutual disclosure, and post-test counseling together per their couple HIV status according to Center for Disease Control and Prevention and WHO guidelines (Couples HIV Counseling and Testing Intervention and Training Curriculum 2007; World Health Organization, 2012). Initial eligible and interested HIV negative couples were invited to return for additional screening where eligibility criteria was assessed.

Eligibility criteria—In addition to both spouses being HIV negative, women were age range of 18 to 45 years old, and men were age range 18 to 65 years old. The couple had to be cohabiting for at least three months. Both partners had to be interested, able and willing to provide informed consent, answer questions on risk factors, provide contact information, and be available for follow-up. Eligible couples were invited to return for consenting.

Informed consent—Potential couples were provided with study information by viewing a verbatim reading of the informed consent on a video. The couple met with a counselor to discuss any questions or clarifications on study participation and procedures, and jointly signed consent (Chomba et al., 2008; McKenna et al., 1997; Wall et al., 2019). Couples were also asked if they understood study participation was voluntary.

Baseline questionnaire at enrollment visit—Baseline questionnaires were administered to 813 eligible CNC. CNC were separated by spouse and administered a baseline questionnaire by a gender-matched research counselor. Each spouse was asked questions related to socio-demographic characteristics (income, number of persons and children under 16 in the household, and literacy) and reproductive health (self-reported pregnancy and current family planning). In addition, each spouse was asked about past and recent sexual history related to HIV risk behaviors (lifetime sexual partners, age at first sexual intercourse, and since married frequency of sex with spouse in the last month, outside partners, alcohol and condom use with outside partners and STI treatment).

Invitation to the intervention visit—Couples completed interviewer-administered baseline questionnaire. At the end of the visit, couples were provided study reimbursement. In addition, couples were given an appointment to return to the health center for the intervention visit. The intervention visit was approximately one to two weeks after the enrollment visit.

Incentives—Couples received approximately US $3 per person-visit as study reimbursement to cover time at clinic and transport, as described in the informed consent. An additional US $2 per person was given as a lunch allowance if the visit exceeded 3 hr.

Ethics—University of Zambia Biomedical Regulatory Ethics Committee (Protocol 021-07-15) and Emory University Institutional Review Board (Protocol IRB00083001) in Atlanta, Georgia USA, reviewed and approved the study. Permission to conduct this study in the clinics was granted by the Lusaka and Ndola District Health Offices. The CRT to which this study belongs was retrospectively registered on ClinicalTrials.gov.

The intervention

Development of the SOV intervention video—Similar to heterosexual couples, the majority of HIV transmission in men who have sex with men (MSM) couples have occurred within the primary relationship (Davidovich et al., 2001; Davidovich et al., 2000; Sullivan et al., 2009) where sex is more likely to be unprotected (Gass et al., 2012). With safer sex communication for HIV prevention historically targeting casual partners (Miller et al., 2009), married heterosexual couples and steady MSM couples may falsely perceive their relationships to be more protected (Bunnell et al., 2005; Stephenson, White, et al., 2015).

Our rationale for exploring negotiated sexual agreements in heterosexual couples came from various studies showing that MSM relationships with negotiated sexual agreements usually were less likely to practice unsafe sex (Crawford et al., 1999; Crawford et al., 2001; Darbes et al., 2014; Hoff et al., 2012; Kippax et al., 1993; Kippax et al., 1997). In addition, these agreements were noted to be common and mostly kept (Crawford et al., 2001). Other studies

showed that a higher level of investment in sexual agreement (Darbes et al., 2014; Hoff et al., 2012) and communication (Darbes et al., 2014) in addition to other factors significantly predicted less condomless anal sex (CAS) in CNC MSM couples (Darbes et al., 2014) or decreased likelihood of CAS with outside partners (Hoff et al., 2012). One study found that HIV and STI prevention was a main motivator for making sexual agreements in CNC MSM (Hoff et al., 2010). Other studies highlighted important considerations for sexual agreements, such as broken agreements and lack of their disclosure (Hoff et al., 2012) (Hoff et al., 2009a), perception of low HIV risk in CNC MSM, and lower HIV testing behaviors (Stephenson, White, et al., 2015). Another study explored reported substance or alcohol abuse and recent broken agreements in MSM couples (Mitchell et al., 2014). These studies highlight the importance of sexual agreements to keep steady relationships HIV free, to be pragmatic and flexible, to allow a means to disclose broken agreements, to understand threats to sexual agreements, and to encourage re-testing to reconfirm serostatus.

Various literature reviews have also summarized negotiated safety through agreements in CNC MSM couples (Leblanc et al., 2017) and reported a wide range of agreements, ways of characterizing them and relationships to health outcomes in MSM couples (Rios-Spicer et al., 2019). Authors concluded more research was needed to better understand agreement breaches and communication of them, and the potential expansion of sexual agreements beyond MSM (Rios-Spicer et al., 2019).

Our formative work showed Zambian CNC and CVCT counselors being receptive to using relationship agreements as an HIV prevention strategy (Sharkey et al., 2021). Our observations were similar to a qualitative study in US heterosexual couples who were willing to undergo couples counseling and testing and discuss sexual agreements (Stephenson, Finneran, et al., 2015). These factors led to the creation of a locally adapted video intervention arm "Strengthening Our Vows."

Description of the Intervention—A standardized SOV video intervention was administered to couples over a six-month period in 2016. The SOV video, based on the harm reduction approach, offered a traditional choice of 'monogamy agreement' in addition to other HIV prevention strategies. The video was presented in Bemba and Nyanja and equivalent to or below 8th grade level. The video consisted of two parts, delivered on the same day and within approximately 1 hr run-time. Pauses were incorporated for counselors to facilitate discussion using structured flip chart guides. The SOV video content has been described fully elsewhere (Sharkey et al., 2021).

The first part of the video (approximately 20 min) was presented to men and women in participating couples in separate gender-specific groups and included two themes. The first theme focused on keeping HIV from entering the marriage by (a) practicing monogamy, i.e., having sex with your spouse only, (b) testing jointly with outside partners, and only having sex with those who are also HIV-negative and/or (c) using condoms every time with an outside partner. The second theme explored ways to avoid passing the virus on in the event of an unprotected sexual exposure to an outside partner with HIV-positive or unknown HIV status and included an alternative/interim plan of abstaining from sex with the spouse or using condoms consistently with the spouse until HIV retest after the "window period"

of 30 days. The "window period" was emphasized in the video as a particularly infectious period prior to development of anti-HIV antibodies. The average group size was five couples (median 11, range 1-16).

Subsequently, husbands and wives were brought together into one group to view the second part of the video (approximately 40 min) which presented scenarios highlighting potential threats such as longstanding outside partners; traveling away from home; alcohol use; receipt of attention, money, and gifts; discord in the union; and sexual inactivity due to wife's postpartum abstinence or menstruation. A guided discussion focused on the HIV risk the couples in each scenario faced; what actions could reduce risk of HIV; and what couples could agree to do to prevent HIV. The video also featured examples of communicating about extramarital partners and included guidance on how to deal with difficult communication and disclosure. A unique concept for communicating an unprotected outside sexual exposure was the yellow card, a visual symbol derived from soccer, to use as a non-verbal notification to the spouse. The final part of the video advised couples to discuss risk reduction plans together and finalize their agreement.

The intervention visit lasted approximately 3-4 hr. At the end of the visit, each spouse was given yellow cards to use in the event of outside sexual exposures and provided with condoms. Couples were encouraged to discuss topics from the video at home and return one to two weekends later for post-intervention assessment.

Training of the counselors—Trained research counselors conducted study visits. Selection of counselors was based on their previous experience and performance during the CVCT program. Research counselors received training by the main coordinating research study teams in Lusaka and Ndola on all study procedures including the intervention. Research counselors were not assigned specific couples. Further details regarding counselor training for this study can be found elsewhere (Sharkey et al., 2021).

Post-assessment questionnaire at follow-up

Of the 613 CNC, who received the intervention, 580 CNC returned to be administered the post-assessment questionnaire. CNC were separated by spouse and asked questions from a structured questionnaire by gender-matched research counselor. Spouses were asked about knowledge and recall of HIV prevention strategies (window period for retesting for HIV, monogamy/ faithfulness, condom use and HIV testing with outside partners, having sex with only HIV-negative partners, non-verbal communication (yellow card) of potential HIV exposure, and abstaining or using condom with spouse until retested for HIV) covered during the SOV intervention visit and subsequent discussion at home. Each spouse was asked about their discussions at home in regards to timing (length) and context/nature (tone, agreement of a strategy, discussion initiator, and comfort level). In addition, each spouse answered questions about their understanding of the agreements they had negotiated including strategies and potential challenges to using the agreements. Each spouse was also asked to identify any threats that would prevent him/her or their spouse from adhering to their sexual agreement. Each partner was asked if they were willing to discuss agreements, strategies, and challenges with their spouse and the counselor. Finally, each partner was

asked whether there was any information they WOULD or WOULD NOT want discussed when brought together as a couple. This visit provided an opportunity for the research counselors for the two partners to meet and compare notes, to bring the couple together, and to reinforce and to congratulate couples on successful negotiations while maintaining confidentiality. Spouses then recited standardized SOV vows to each other, which included not exposing themselves to HIV outside the marriage and, if exposed, keeping the spouse safe during the window period until a repeat negative test.

Data collection/Measures

Predictors of post-assessment—Predictors of post-assessment were measured using baseline questionnaire. Each spouse self-reported information related to socio-demographics, reproductive health, and past and recent sexual history related to HIV risk behaviors. A couple HIV risk composite (Yes or No) was created to assess whether couples had any pre-existing HIV risk behaviors in their marriage. The couple HIV risk composite included self-reported outside partners since married, alcohol use or condomless sex with these outside partners, and being treated for an STI.

Post-assessment at follow-up—Knowledge was measured based on man and woman's responses to open-ended questions on the window period for retesting for HIV and HIV prevention topics covered during SOV intervention visit. Men and women selected best descriptors of discussions at home based on options read by the counselor. All sexual agreements (primary and contingent) were read to spouses prior to choosing. Questions related to barriers, challenges, and concerns using sexual agreements were open-ended. Questions related to individual and perceived spouse's threats to adhering to their sexual agreements were open-ended. Information each spouse WOULD or WOULD NOT want discussed when the couple was brought together was marked. All open-ended questions had pre-coded response options based on SOV content and piloting of the questionnaire during the formative phase of main CRT. Pre-coded options were used due to the number of participants and to facilitate quantification of findings.

Statistical analyses—Statistical analyses were carried out using SAS 9.4 (SAS Institute, Cary, N.C.). Baseline characteristics of couples in SOV clinics who watched the video and returned for follow-up ($n = 580$) were compared to those who did not return ($n = 233$) to assess retention (attrition) bias. Baseline socio-demographics and past and current sexual history, reproductive health and sexual behavioral characteristics were compared by follow-up (post-assessment) attendance using logistic regression and crude prevalence odds ratios (cPORs) and 95% confidence intervals (95% CIs) were calculated. Covariates with statistically significant differences ($p < .05$) were included in the multivariate analysis, and adjusted PORs (aPORs) and 95% CIs were reported.

Responses to the questionnaires administered at follow-up 1-2 weeks after watching the SOV video were presented as frequencies separately for men and women. Statistical differences in responses between men and women were assessed with chi-square tests. Because the number of participants was large, some statistically significant differences

were not meaningful, and thus we have highlighted in the results section only significant differences (p .05) with a > 5% difference between male and female responses.

Results

Recruitment and follow-up attendance

We compared characteristics of couples with and without a follow-up visit in Table 1. Of the 813 enrolled couples in the SOV arm, 580 couples (approximately 71%) completed baseline questionnaire, the intervention visit, and the post-assessment questionnaire 1-2 weeks after receiving intervention. These 580 couples were older, had more children living in the home and had cohabited for longer while couples who did not return had higher incomes and women's comprehension and literacy in English. Sexual histories and risk behaviors showed no significant differences between the two groups with respect to lifetime sexual partners, age at first intercourse, frequency of sex within the union, reporting outside partners since entering the union, ongoing outside partnerships, outside sexual contact under the influence of alcohol, and condom use with outside partners (the latter not shown for women due to small sample sizes). Men's history of treatment for sexually transmitted infection (STI) since the union was also not significantly different between the two groups while women who returned were more likely to report treatment for STI. Because age of man, age of woman, number of children and duration of cohabitation were collinear, only years cohabiting was included in the multivariate model. Of the differences listed above only years cohabiting remained an independent predictor of returning (aPOR 1.05 per year increase, 95% CI [1.02, 1.08], p = .002, not shown). Among CNC who returned, a higher percentage had at least one partner reporting an HIV risk factor compared with CNC who did not return, though this was not significant.

Recall of HIV prevention strategies

Table 2 presents responses of men and women about their recall of strategies and threats covered during the SOV video. Questions were asked in an open-ended fashion and responses in Table 2 are ordered by frequency of mentions. The most common topic recalled by both men and women was the yellow card, followed by keeping the marriage HIV negative and monogamy/faithfulness. Women were more likely than men (> 5% difference) to mention using condoms with other partners, abstaining or using condoms with spouse for 30 days after an outside sexual exposure, things that might be threats to remaining HIV-free, and what to do in the event of condomless sex with a partner whose HIV serostatus is unknown. Few couples mentioned testing with outside partners and only having sex with HIV-negative people. Most respondents correctly cited the 30-day window between sexual exposure and a positive HIV test.

Discussion and communication at home

Table 2 also describes men and women's reported communication at home during follow-up assessment. Only 3% of couples reported not discussing covered topics after the SOV video and half of those cited lack of time or opportunity as the reason. Four in five men and women reported discussing strategies to avoid sexual exposure and a quarter reported discussing threats to remaining HIV-free and what actions to take in the event of an sexual

exposure. Both men and women said that the man was more likely to initiate discussion though to different degrees. Almost all couples reported the discussion as friendly and supportive, most said it lasted between 15-60 min and 85% reported agreeing on everything related to their plan with another 15% reporting agreeing on some things (not shown). Men and women were equally likely (98%) to report being very comfortable with the discussion (not shown).

Almost one third of respondents said they would not face any challenges to realistically and effectively using their agreement. Women were more likely to say that they could not tell their spouse if they were exposed while men were more likely to report that they cannot use condoms with their spouse. Twelve percent of respondents said they could not test with other partners and 11% that they could not avoid risks and challenges. Few (5%) mentioned that they could not trust their spouse to keep the agreements or that they could not use condoms with outside partners.

When asked whether they had any concerns about remaining HIV-free, 13% of men and 9% of women said yes. Reasons differed between men and women with men being more likely to say that they could not test with other partners in their area and women reporting that they suspected or knew that their spouse had another partner.

Negotiated sexual agreements

Negotiated agreements reported at follow-up are summarized in Table 3. Most men and women chose to remain monogamous and a majority reported telling their spouse of this plan. Most remaining couples who reported not telling their spouse wished to share their plan though half had not yet done so due to lack of time or opportunity (not shown). Most respondents said their spouse communicated a plan of monogamy with remaining respondents indicating they would like their spouse to share their plan.

Men and women differed on the most common responses about perceived threats to remaining HIV-free both for themselves and for their spouses. Women were more likely than men to report facing no threats. Men felt that the most important threats they would face were alcohol use/abuse, being away from their spouse, and tension or disagreements at home. In contrast, financial pressure related to insufficient income was the most often cited threat reported by women. Less common threats reported with similar frequency by both genders included abstinence due to post-partum, menstruation or illness, lack of sexual satisfaction, and peer pressure to have other partners. Men responded similarly to women that the biggest threat women would face was financial pressure with being away from their spouse and tension or disagreement in the home also common. The most common threats women thought their spouses would face were alcohol use/abuse and being away from each other.

Both men and women were overwhelmingly inclined to share their plan of remaining monogamous. In the event of an outside sexual exposure, 58% of men and women preferred to use the yellow card and another 38% wanted to tell their spouse in another way. Only 4% indicated that they did not want to let their spouse know about the sexual exposure. The most common plan chosen by both genders was to use condoms in the marriage until after

a repeat test result in 30 days with 27% preferring to abstain during that time. A majority of men and women wanted their spouse to notify them in the event of an outside sexual exposure.

Discussion

An overwhelming majority of Zambian CNC negotiated explicit sexual agreements of monogamy to prevent HIV from entering the union. Almost all couples described discussions at home as friendly, supportive, and comfortable. Interestingly, though nearly all men and women chose monogamy, two thirds of women and three quarters of men identified at least one threat to their ability to adhere to their agreement. In addition, couples' choice to remain monogamous may not accurately reflect one quarter of couples reporting some baseline HIV risk. We think there could be many reasons for the latter observation including historical risk due to length of cohabitation (6.7 years), recent CVCT and low perceived risk, and societal expectations for married, heterosexual couples. SOV strongly defines monogamy in the context of an HIV prevention strategy while recognizing total monogamy may not be realistic. In addition to monogamy, almost all spouses chose an alternative/interim sexual agreement to use condoms together rather than abstain to protect their spouses from outside-unprotected sexual exposure. These sexual agreements were communicated explicitly during SOV vows, which was often observed as a powerful and emotional moment.

Knowledge of the 30-day window period between sexual exposure and the need to repeat the HIV test was good. Notably, wanting to be honest and wanting the spouse to be honest in the event of an outside sexual exposure was almost universal with the yellow card being the preferred way of communicating this for over half of both men and women.

Threats to Maintaining Monogamy Agreements

Our participants identified familiar threats to monogamy including physical separation due to travel or illness, alcohol use, financial pressure, discord in the home and lack of sexual satisfaction. Physical separation from the spouse was cited as a threat by one third of men and women in our study. This is not uncommon for African couples and has been reported in Malawi (Rosenberg et al., 2018); in fishing communities in Kenya (Kwena et al., 2013; Kwena et al., 2019) and Uganda (Nakiire et al., 2020), where both men and women are at risk; and among male truck drivers (Deane et al., 2018; Lalla-Edward et al., 2019) and miners (Martins-Fonteyn et al., 2017), the latter occupations often requiring long stays away from home. Additionally, physical separation for prolonged periods may be challenging for couples who have frequent intra-marital sex (Kwena et al., 2017).

Alcohol use was the most common threat to remaining HIV-free cited by men, and by women about men in our study. This has been a common theme in several studies in couples in South Africa (Belus et al., 2019; Wechsberg et al., 2015; Wechsberg et al., 2016; Woolf-King et al., 2019), Malawi (Conroy et al., 2020), Rwanda and Uganda (Coldiron et al., 2008; Matovu, 2010). Our intervention did not include an alcohol reduction component. With only a few HIV-alcohol reductions efficacy interventions being done with mixed findings (Carrasco et al., 2016), more research is needed.

Both women and men identified financial pressures 'financial insecurity' as the most common threat to monogamy for women. Financial insecurities, including food insecurity, are known drivers of HIV in SSA particularly among women (Bajunirwe et al., 2020; Dellar et al., 2015; Harrison et al., 2015). Women may engage in extramarital sex for financial reasons and food to support their family. In a study of Kenyan couples in fishing communities, men and women noted that women may engage in extramarital sex to support their children and provide food as husbands may traveling for work without leaving money or spend it on alcohol (Kwena et al., 2017). Women are often vulnerable due to their financial dependence on their spouses putting them at increased risk for HIV. This vulnerability may reduce their ability to negotiate safer sex. This interconnected cycle of financial pressure, alcohol use, and physical separation places both men and women at increased risk for HIV.

Honest disclosure of sex with another partner is a daunting prospect for anyone in a cohabiting partnership and requires trust and open communication (Gamarel et al., 2020; Gusakova et al., 2020). Reporting a sexual exposure that will lead to marital condom use or abstinence for a month is especially difficult if pre-existing tensions are present, including relationship dissatisfaction and disagreements which were cited by men and women in our study and have also been reported in South African couple studies (Belus, Baucom, et al., 2020; Belus, Kline, et al., 2020).

Gender Differences

Differences were noted between men and women as it pertains to recall of HIV prevention topics from the intervention and reported challenges of effectively and realistically using sexual agreements.

Recall of Video Content—Though not significant, men recalled monogamy/faithfulness more than women. However, women had better recall on topics such as, protecting their spouses from HIV, threats to the marriage and dealing with partners with unknown HIV status. In SSA, women's comprehensive knowledge on HIV is generally lower than men (Chan & Tsai, 2018). A similar trend was also seen in Zambia's Demographic Health Survey as it relates to knowledge of HIV prevention (Zambia Statistics Agency - ZSA et al., 2020). Our observation of women's better recall of HIV prevention content may reflect their interest (Ek, 2015) due to their own or perceived spouses' HIV risk or women's health seeking behaviors.

Challenges to Using Sexual Agreements—Men and women highlighted different potential challenges to using their sexual agreements. More men than women reported not being able to use condoms with their spouse to protect her from unprotected, extramarital sex. Men's concerns regarding condom use with spouse may reflect resistance/reluctance (De Visser, 2004; Maharaj & Cleland, 2005); cultural norms (Maharaj & Cleland, 2005) and practices (Madiba & Ngwenya, 2017); reduced sexual pleasure (Browne & Minichiello, 1994; Laher et al., 2020; Madiba & Ngwenya, 2017); loss of intimacy (Analogbei et al., 2020; Laher et al., 2020); and being suspected of infidelity/unfaithfulness (Conley et al., 2015; Laher et al., 2020; Stephenson, Finneran, et al., 2015). Women, however, reported

more than men on potentially having challenges communicating extramarital partners to their spouse. Challenges for women communicating and negotiating sexually protective behaviors like condom use and disclosing HIV status are well studied in SSA. Women's concern to communicate extramarital partners could be due to fear of separation (Madiba & Ngwenya, 2017), loss of financial security (Madiba & Ngwenya, 2017), increased tensions in home or partner violence, and labelling and stigmatization (Madiba & Ngwenya, 2017) which may represent broader issues of power imbalance and gender inequalities found in more patriarchal cultures (Madiba & Ngwenya, 2017). These challenges further highlight the importance of facilitated discussions with counselors (Stephenson, Finneran, et al., 2015) to review and discuss concerns, barriers and solutions, to compare notes with other counselors, and to discuss issues face to face with couples in a neutral environment.

Mitigating Social Desirability Bias

In sexual behavioral studies, such as ours, a common concern is participants reporting behaviors that may be seen as being more socially acceptable. Though no standardized tools or computer/mobile technologies were used, we believe social desirability bias was mitigated by administering the same questionnaires to each spouse separately in private with a gender-matched research counselor. Additionally, couples had time to establish rapport with the research counselors during previous study visits, including consenting, where study procedures were reviewed. A study by Bergen and Labonte highlighted practical strategies similar to ours that can be used to minimize social desirability bias, such as gender matching, privacy, review of study procedures, and rapport (Bergen & Labonte, 2020; Chiumento et al., 2017). In addition, some questions were asked differently but with similar meaning.

Strengths

We note several strengths in our study. A main strength of our study was recruiting CNC who had undergone CVCT, an effective HIV prevention strategy with substantial impact. HIV testing and joint disclosure of HIV results are key components in establishing explicit negotiated sexual agreements (Leblanc et al., 2017). Thus, established, standardized indicators that measure HIV testing and joint disclosure of results in couples are needed. Outside of research programs and demonstration projects (Desgrees-du-Lou & Orne-Gliemann, 2008) and in the absence of demand creation efforts (Byamugisha et al., 2011; Jefferys et al., 2015; Kelley et al., 2016; Lambdin et al., 2011; Matovu et al., 2016; Mohlala et al., 2011; Wall et al., 2012), most adults in SSA continue to be tested as individuals often leading to inaccurate or untruthful disclosures (Conroy & Wong, 2015; Mendelsohn et al., 2015). A study in Cape Town showed mutually correct knowledge of partner's HIV status in 38% of women, 28% of men and only 17% of couples (Doherty et al., 2016). To date, studies in SSA with jointly tested couples have focused mostly on discordancy and disclosures. Our study targets heterosexual CNC in SSA where approximately half of new HIV infections in stable unions occur (Chemaitelly et al., 2014; Wall et al., 2019). After CVCT, Zambian CNC are at relatively low risk though they contribute to approximately half of residual new infections due to their large numbers (Wall et al., 2019). Our study highlights the ability of CNC who underwent CVCT to negotiate explicit sexual agreements as an HIV prevention strategy.

In addition, the couple-based nature of this intervention means we have both spouses' responses, which allows for better comparisons and strengthening of our findings. For SOV, we clearly define 'monogamy 'in the context of an HIV prevention strategy as its definition has often been ambiguous (Conley et al., 2015) with different interpretations (Conley et al., 2015; Family Health International, 2010) historically leading to challenges in its effectiveness as an STI prevention strategy (Conley et al., 2015; Family Health International, 2010). Another strength of this study is showing that CNC can communicate and negotiate explicit sexual agreements to prevent and protect their marriages from HIV from unprotected, extramarital sex. These agreements were discussed and mostly established at home with little to no reported challenges. The findings here support our formative work (Sharkey et al., 2021) and others authors (Lee & Mitchell, 2018; Stephenson, Finneran, et al., 2015) that highlight the feasibility, interest and willingness of heterosexual couples to discuss sexual agreements. In addition, SOV targets safer sex communication for HIV prevention in committed couples which historically mostly focused on casual relationships (Miller et al., 2009). We found almost all couples had explicitly communicated their agreement to be monogamous with their spouses. Our finding is promising as several studies found many monogamy agreements in heterosexual relationships to be understood and expected but often not communicated (Corbett et al., 2009; Richters et al., 2014), resulting in them being poorly adhered to (Corbett et al., 2009). SOV equips couples to state explicitly their sexual agreements with their spouses, as false perceptions about sexual exclusivity within heterosexual relationships (Richters et al., 2014; Stephenson, Finneran, et al., 2015) puts the couple at risk for HIV and other STIs. In addition, the option to initiate a discussion about an HIV sexual exposure, verbally and non-verbally (yellow card) in SOV, may help couples "break the ice" on communicating difficult subject matters like extramarital sex (Hotton et al., 2015). SOV offers a more structured and pragmatic approach to disclose a breach in agreement and take action to protect their spouse through condom use or abstinence until HIV retest within 30 days, which almost all couples adopted.

Limitations

Our study is not without limitations. We acknowledge that baseline knowledge of, presence of and motivations for sexual agreements in CNC was not assessed. Anecdotally, discussions with CNC during the formative phase of the main CRT highlighted they did not discuss extramarital sex and relationship agreements were not common. Additionally, our formative work found though awareness of sexual concurrency exists, it was not a social norm in Zambia (Sharkey et al., 2021). This supports that pre-existing communication of an explicit sexual agreement may not be likely. In addition, a study by Stephenson and authors found inclusion of intervention concepts in the pre-intervention phase reduces the ability to quantify its impact (Stephenson et al., 2010). Though couples explicitly communicated their sexual agreements, SOV did not include practical skills building on couple communication, which may be beneficial to couples encountering communication that is more difficult. This study did not specifically include or measure gender-based violence (GBV) though this has been explored in other studies (Malama et al., 2019; van der Straten et al., 1995). However, our study did include handling difficult communication. Leddy and colleagues measured sexual communication self-efficacy (i.e., a couple's confidence in their ability to communicate about HIV prevention) and found an association with better condom

use in South African couples (Leddy et al., 2016). While we did not measure sexual communication self-efficacy directly, responses from both men and women in our study indicated a universal desire to disclose and to be disclosed to in the event of outside sexual contacts. Long-term follow-up will tell whether the focus on HIV prevention rather than adultery per se, and the interdependence of the two partners in maintaining the household (Rogers et al., 2016), reduces the barriers to disclosure and adoption of protective behaviors.

Another potential limitation was our study's focus on sexual agreements for HIV prevention. We acknowledge there may be other factors, such as relationship quality, relationship dynamics, gender roles and norms, which affect and influence sexual agreements. In addition, couples may view these factors as more important than HIV prevention and may prefer a more relationship-centered agreement that focuses on non-HIV and non-health topics (Stephenson, Finneran, et al., 2015). Recent findings by LeBlanc and colleagues further suggest that heterosexual couples may prefer couple-tailored sexual agreements, re-framed in the context of building relationships and including sexual health (Leblanc et al., 2022).

Conclusion

Our study highlights Zambian CNC's ability to negotiate and explicitly communicate their sexual agreement of monogamy. Our study also confirms Zambian CNCs' ability to recall key elements from the "Strengthening Our Vows," video-based intervention using consistent messaging-that encourages negotiated sexual agreements with their spouses. Men and women cited similar threats to engaging in unprotected, extramarital sex, such as alcohol use in men, financial pressures in women, physical separation and tension in the home. Our findings are more generalizable to jointly counseled CNC. These findings are important, as CNC are an understudied and comparatively low-risk group who contribute to a substantial number of new HIV infections in SSA. In addition, our study was conducted in a resource-limited setting, which highlights the potential applicability of video-based interventions. Future studies on negotiating sexual agreements as an HIV prevention strategy in CNC should explore barriers to follow-up attendance in CNC who have not been cohabiting as long and may be younger.

Studies on explicit sexual agreements in heterosexual couples remain understudied. Most research to date have been in high income countries. Our study shows the possibility of including a negotiated sexual agreement component with CVCT to reach many CNC in Africa who have not yet been jointly tested and counseled given the high percentage of couples that negotiated sexual agreements in a friendly, supportive and comfortable environment. Additional studies on the feasibility and willingness of heterosexual couples to negotiate and communicate explicit sexual agreements are needed, particularly in SSA, where HIV disease burden is highest.

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Availability of data and materials:

Datasets are maintained by the co-authors and are available for analysis in collaborative publications on request.

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Table 1

Baseline Socio-Demographic, Past and Current Sexual History, Reproductive Health and Sexual Behavioral Characteristics of Couples at SOV Clinics by Follow-Up Attendance

	Watched SOV Video and Attended Follow-up (N = 580)		No Follow-up (*n* = 233)		
	n/mean	%/SD	n/mean	%/SD	*p* [a]
Sociodemographics					
Male age (mean, years)	32.5	7.8	30.9	7.7	0.010
Female age (mean, years)	26.8	7.0	25.4	6.4	0.006
If income yes, man's income (mean, ZMW)	998	1242	1204	1364	0.041
Number of people in household	4.9	2.1	4.5	2.1	0.035
Number of children under 16 in household	2.4	1.6	2.0	1.6	0.001
Woman reads or understands English					
Easily	182	32%	93	40%	0.028
With Difficulty/Not at all	395	68%	142	60%	
Couple characteristics					
Years Cohabiting	6.7	6.0	5.2	5.4	0.001
Past sexual history and behavior					
Man lifetime sex partners (mean)	5.1	5.2	5.4	6.7	0.449
Woman lifetime sex partners (mean)	2.0	1.5	1.9	1.3	0.533
Man age at first sexual intercourse (mean, years)	18.5	3.8	18.9	4.3	0.214
Woman age at first sexual intercourse (mean, years)	17.2	2.5	17.5	2.6	0.091
Man: Number of times had sex with spouse in last month (mean)	10.1	8.9	11.3	13.2	0.204
Woman: Number of times had sex with spouse in last month (mean)	10.4	9.8	10.6	8.6	0.787
Man reports ever having outside partners since union					
Yes	68	12%	31	13%	0.530
No	512	88%	202	87%	
If yes, man's number of outside partners (mean)	2.1	2.3	2.6	3.7	0.539
Man: Condom use with outside partners					
Never (0%)	26	38%	10	32%	
Rarely (20%)	11	16%	2	6%	

	Watched SOV Video and Attended Follow-up (N = 580)		No Follow-up (*n* = 233)		
	n/mean	%/SD	n/mean	%/SD	*p* [a]
Sometimes (50%)	13	19%	8	26%	0.590
Often (75%)	4	6%	2	6%	
Always (100%)	14	21%	9	29%	
Man reports sex with outside partners under influence of alcohol					
Yes	28	41%	10	32%	0.400
No	40	59%	21	68%	
Man reports ongoing outside partner(s)					
Yes	11	16%	4	13%	0.768
No	57	84%	27	87%	
Woman reports ever having outside partners since union					
Yes	6	1%	1	0%	0.680
No	573	99%	232	100%	
Man ever treated for STI					
Yes	76	13%	22	9%	0.150
No	504	87%	211	91%	
Woman ever treated for STI					
Yes	27	5%	4	2%	0.048
No	552	95%	229	98%	
Man: At least one risk factor (ever treated for STI or having outside partners)					
Yes	130	22%	44	19%	0.267
No	450	78%	189	81%	
Woman: At least one risk factor (ever treated for STI or having outside partners)					
Yes	31	5%	5	2%	0.045
No	548	95%	228	98%	
Couple: At least one risk factor (either partner treated for STI or having outside partners)					
Yes	145	25%	45	19%	0.081
No	434	75%	188	81%	

[a]Two-tailed t-test for continuous variables, chi-square test for categorical variables with expected cell counts greater than or equal to 5, Fisher's exact test for categorical variables expected cell counts less than 5

[b]Acronyms: sexually transmitted infection (STI); strengthening our vows (SOV); Zambian kwacha (ZMW)

Table 2

Knowledge and Communication After SOV Video Intervention: Questionnaire Responses

	Men (N = 580)		Women (N = 580)	
	N	%	N	%
Knowledge of strategies				
Can you describe for me the topics discussed during the video and group discussions at your last visit? (open-ended)				
The yellow card	412	71%	421	73%
How to keep our marriage HIV negative	376	65%	392	68%
Monogamy/faithfulness	355	61%	324	56%
Using condoms with other partners	199	34%	232	40%
How to protect the spouse in the event of an outside exposure (sexual) to HIV	207	36%	198	34%
Abstaining or using condoms with spouse for 30 days after outside exposure (sexual) and re-testing	121	21%	183	32%
The things that might be threats to remaining HIV free in our marriage	86	15%	122	21%
What to do if you have sex without a condom with someone whose HIV status you do not know	67	12%	111	19%
Testing together with other partners and only having HIV-negative partners	43	7%	57	10%
Other	39	7%	15	3%
When a person is exposed to HIV, it can take some time before it shows up in their blood and they test positive for HIV. How long does it usually take before a person will test positive after an exposure (sexual)?				
30 days/1 month	495	85%	513	88%
Other	69	12%	39	7%
Don't know	16	3%	28	5%
Communicating with the spouse about keeping HIV out of the union				
Since you had your videos and group discussion, did you and your spouse discuss how to keep HIV out of your marriage?				
Yes	569	98%	554	96%
No	11	2%	26	4%
If not, what is the main reason you did not discuss how to keep HIV out of your marriage?				
No time/opportunity	6	1%	10	2%
No need for us to further discuss	1	0%	3	1%
Not comfortable	1	0%	1	0%
My spouse refused to discuss	0	0%	1	0%
Other	3	1%	11	2%
In terms of keeping HIV out of your marriage, what did you discuss?				
Strategies we will use to avoid exposure (sexual)	448	79%	454	82%
Threats we face to remain HIV free	151	27%	151	27%
What we will do if one of us is exposed	130	23%	151	27%

	Men (N = 580)		Women (N = 580)	
	N	**%**	**N**	**%**
An exposure (sexual) that has occurred	24	4%	21	4%
Other	59	10%	24	4%
Would you describe the discussion as:				
Friendly and supportive	563	99%	549	99%
Tense and uncomfortable	5	1%	2	0%
Hostile/Angry	0	0%	3	1%
Who initiated the discussion?				
You initiated	380	67%	250	45%
Your spouse initiated	147	26%	278	50%
You both initiated	41	7%	26	5%
What do you think are the most difficult challenges for you?				
No challenges	169	29%	191	33%
I cannot tell my spouse if I am exposed	69	12%	104	18%
I cannot test with a partner who is not my spouse	82	14%	59	10%
I cannot use condoms with my spouse	90	16%	47	8%
I cannot avoid the risks/challenges	78	13%	51	9%
I do not trust my spouse to keep the agreements	35	6%	23	4%
I cannot use condoms with a boyfriend/girlfriend	38	7%	12	2%
Other	77	13%	115	20%
Do you have any concerns about your ability to remain HIV- in your marriage?				
Yes	75	13%	50	9%
No	505	87%	530	91%
What are your concerns?				
I can't test with another partner around here	28	5%	6	1%
We don't have enough money	18	3%	9	2%
I suspect my spouse has another partner	11	2%	15	3%
My spouse has another partner	12	2%	11	2%
My spouse won't use condoms	8	1%	6	1%
Other	10	2%	8	1%

Table 3

Negotiated Agreements After SOV Video: Questionnaire Responses

	Men (N = 580)		Women (N = 580)	
	N	%	N	%
The plan to keep the union HIV-free				
Which of the following best describes the plan that you have chosen for yourself?				
You will be monogamous and only have sex with your spouse	560	97%	570	98%
You may have other partners but you will always use a condom with them	14	2%	4	1%
You may have other partners but only if you have tested with those partners and you know they are HIV-or you will always use a condom	6	1%	3	1%
Have you told your spouse your plan to avoid HIV exposure (sexual)?				
Yes	555	96%	556	96%
No	25	4%	24	4%
If not, would you like to tell your spouse what your plan is?				
Yes	22	4%	23	4%
No	3	1%	1	0%
Has your spouse told you how they plan to avoid exposure (sexual) to HIV outside marriage?				
Yes	551	95%	560	97%
No	29	5%	20	3%
If not, would you like your spouse to tell you how they plan to avoid exposures (sexual) to HIV?				
Yes	28	5%	19	3%
No	1	0%	1	0%
Which of the following best describes the plan that your spouse has chosen?				
He/she will be monogamous and only have sex with you	549	100%	550	98%
He/she may have other partners but he/she will always use a condom with them	1	0%	8	1%
He/she may have other partners but either he/she has tested with those partners and will know they are HIV-or he/she will always use a condom	1	0%	1	0%
Threats and challenges				
Thinking about the plan you have chosen to stay HIV negative in your marriage, what do you think are the things that make it difficult for you to stick to your plan?				
Alcohol use/abuse	256	44%	102	18%
Financial Pressures	118	20%	202	35%
We are away from each other a lot	204	35%	110	19%
Tension or disagreements at home	189	33%	113	19%
Post-partum abstinence	125	22%	101	17%
Abstinence due to menstruation	89	15%	86	15%
Lack of sexual satisfaction	96	17%	71	12%
Peer pressure to have other partners	60	10%	34	6%
Abstinence due to sickness	29	5%	38	7%

	Men (N = 580)		Women (N = 580)	
	N	%	N	%
Want nice things like others have	24	4%	46	8%
A girl/boyfriend whose HIV status is unknown	24	4%	29	5%
No risk	142	24%	184	32%
Thinking about the plan your spouse has chosen, what do you think are the things that make it difficult for your spouse to stick to his/her plan?				
Financial Pressures	279	48%	109	19%
We are away from each other a lot	197	34%	158	27%
Tension or disagreements at home	161	28%	126	22%
Alcohol use/abuse	98	17%	156	27%
Lack of sexual satisfaction	86	15%	91	16%
Peer pressure to have other partners	67	12%	44	8%
Want nice things like others have	79	14%	27	5%
Post-partum abstinence	33	6%	64	11%
Abstinence due to menstruation	25	4%	51	9%
No risk	164	28%	144	25%
Topics to discuss when brought back together with spouse				
Discuss plan with spouse:				
I would like to say openly what my plan is	572	99%	577	99%
I would not like to say openly what my plan is	7	1%	3	1%
I want to tell my spouse that my choice is:				
Faithfulness, be monogamous and only have sex with each other	564	97%	570	98%
Using condoms with outside partners	30	5%	11	2%
Testing with outside partners and only having sex with HIV–	4	1%	3	1%
If I have an outside exposure (sexual), I would:				
Like to show the yellow card so we can discuss how to prevent transmission to my spouse	339	58%	333	58%
Like to tell my spouse so we can discuss how to prevent transmission	215	37%	227	39%
Prefer not to share this information with my spouse, but I promise to wait 30 days and get retested before having sex without a condom with my spouse	26	4%	19	3%
In that situation, if I had a possible exposure (sexual) to HIV, I would:				
Use condoms with my spouse for 1 month until the retest	421	73%	399	69%
Abstain from sex with my spouse for 1 month until the retest	151	26%	164	28%
Not do anything different in my marriage, just continue as usual	5	1%	15	3%
Other	3	1%	2	0%
If my spouse had a possible exposure (sexual) to HIV, I would like my spouse to:				
Tell me, so we can abstain or use condoms for 1 month until the retest	555	96%	572	99%

	Men (N = 580)		Women (N = 580)	
	N	%	N	%
Don't tell me, just abstain or use condoms with me for one month until the retest	11	2%	6	1%
Not do anything different, just continue as usual	11	2%	1	0%
Something else	3	1%	1	0%