Published in final edited form as:

J Acquir Immune Defic Syndr. 2014 May 1; 66(1): e1–e7. doi:10.1097/QAI.0000000000000076.

Predictors of First Follow-Up HIV Testing for Couples' Voluntary HIV Counseling and Testing in Ndola, Zambia

Nancy L Czaicki, MSPH, Jonathan Davitte, MPH, Bella Siangonya, MPH, Randee Kastner, MPH, Nurilign Ahmed, MPH, Naw Htee Khu, MPH, Wan Hsuan Kuo, MPH, Joseph Abdallah, MPH, Kristin M Wall, MS PhD*, Amanda Tichacek, MPH, Mubiana Inambao, MD MPH, Kakungu Simpungwe, MD MPH, Ibou Thior, MD MS**, and Susan Allen, MD MPH

Nancy L Czaicki: nczaicki@rzhrg-mail.org; Jonathan Davitte: jdavitte@gmail.com; Bella Siangonya: bsiangonya@gmail.com; Randee Kastner: randee.kastner@unibas.ch; Nurilign Ahmed: NAhmed@rzhrg-mail.org; Naw Htee Khu: nkhu@emory.edu; Wan Hsuan Kuo: wan-hsuan.kuo@emory.edu; Joseph Abdallah: joseph.farahat.abdallah@emory.edu; Kristin M Wall: kmwall@emory.edu; Amanda Tichacek: amanda.tichacek@emory.edu; Mubiana Inambao: MInambao@rzhrg-mail.org; Kakungu Simpungwe: mkakungusimpungwe@yahoo.co.uk; Ibou Thior: ithior@path.org; Susan Allen: sallen5@emory.edu

Rwanda Zambia HIV Research Group, Department of Pathology and Laboratory Medicine, School of Medicine, Emory University, Atlanta, GA, USA

*Department of Epidemiology, Rollins School of Public Health, Emory University, Atlanta, Georgia, USA

**Program for Appropriate Technology in Health (PATH), Washington, DC, USA

Abstract

Introduction—We describe predictors of first follow-up testing for concordant negative and discordant couples seeking joint voluntary HIV counseling and testing in Ndola, Zambia, where cohabiting couples account for an estimated two-thirds of incident HIV infections.

Methods—Demographic and serostatus data were collected from couples' voluntary HIV testing and counseling (CVCT) and follow-up testing services implemented in government clinics. We calculated follow-up testing rates by serostatus and compared rates before and after the introduction of a Good Health Package (GHP).

Results—The follow-up testing rate from May 2011 to December 2012 was 12.2% for concordant negative (M–F–) couples and 24.5% for discordant (M+F– or M–F+) couples. Significant predictors of follow-up testing in multivariate analyses included increasing man's (aOR=1.02 per year) and woman's (aOR=1.02) age, the man being HIV+ (aOR=2.57), and the woman being HIV+ (aOR=1.89). The man (aOR=1.29) and the couple (aOR=1.22) having been previously tested for HIV were predictive of follow-up testing among concordant negative couples. Introduction of a GHP increased follow-up testing among discordant (aOR=2.93) and concordant negative (aOR=2.06) couples.

Conclusion—A low-cost GHP including prevention, screening, and treatment for common causes of morbidity and mortality resulted in increased follow-up testing rates among HIV discordant and concordant negative couples. Overall follow-up testing rates remain low and efforts to increase these rates are necessary in order to ensure linkage to combination prevention, reduce HIV transmission within couples and identify seroconversions promptly. Further investigation of

Corresponding author: Nancy Czaicki, MSPH, PhD (candidate), nczaicki@rzhrg-mail.org, Phone: 314-578-1024, Fax: 404-727-5764.

Conflicts of Interest: The authors declare no conflicts of interest.

low-cost sustainable incentives and other factors influencing follow-up HIV testing for couples is needed.

Keywords

HIV; CVCT; Follow-Up; HIV Testing; Concordant negative and Discordant couples; Zambia

Introduction

The 22.5 million people living with HIV in Sub-Saharan Africa account for 68% of the global HIV prevalence¹. Within this region, Zambia has one of the most concentrated epidemics¹. Specifically, Zambia's Copperbelt Province has an adult HIV prevalence of 17% while the national adult HIV prevalence stands at 14%². Cohabiting couples in Sub-Saharan Africa currently represent the world's largest HIV risk group³. The majority of HIV transmission in this region occurs through heterosexual transmission with 60–95% of incident heterosexually transmitted cases occurring in cohabiting couples^{1,5}. This high rate of transmission is especially prominent in discordant couples who are unaware that only one partner is HIV positive (HIV+) ^{4,5}. The rates of discordance within couples vary across African countries from 23–54%⁶. In Lusaka, the capital of Zambia, the proportion of couples with discordant results was found to be 23%⁷, which is similar to that found in couples' voluntary HIV counseling and testing (CVCT) centers in the past^{8–10}. In Ndola, a city in the industrialized Copperbelt region of northern Zambia, 12% of couples are HIV serodiscordant¹¹.

CVCT has been shown to be a cost-effective intervention to reduce the transmission of HIV in this large risk group^{12–14} with evidence showing a two-thirds reduction in HIV transmission⁴. Additional studies have demonstrated that CVCT leads to an increase in preventative sexual behaviors^{10,15–17} and the World Health Organization advocates CVCT due to its effectiveness in reducing HIV transmission^{7,9,18–22}. Furthermore, a cross-sectional household survey in Lusaka, Zambia showed a majority of adults sampled (72%) believed CVCT is “good”, and nearly half of them (47%) were willing to test jointly with their spouses, though very few couples have been tested together²⁰. In addition, there has been demand for more support for those individuals testing HIV negative (HIV-) in the form of education and empowerment to remain negative²³.

Outside of the research setting, little focus has been placed on follow-up testing of HIV negative persons. In context, this includes the negative partner in a discordant couple or both partners in a concordant negative couple. As part of an expansion of CVCT services throughout government clinics in the Copperbelt province, follow-up of discordant and concordant negative couples for further counseling and repeat HIV testing was established.

We were unable to find literature on follow-up testing for discordant or concordant negative couples identified during routine services in government clinics in high prevalence areas. Previously, we observed a follow-up HIV testing rate of 65% for couples with indeterminate results in government clinics²⁴ and a rate of 72% for Zambian discordant couples who completed enrollment in a research study²⁵. The results of multiple studies suggest that retention in care after testing HIV+ and not being initially eligible for ARV is less than 33%²⁶, suggesting that follow-up rates of individuals of known serostatus outside of a research setting may be low and warrant further investigation and intervention.

We present here the progress of initiating a follow-up CVCT regimen for discordant and concordant negative couples identified through CVCT services at government clinics. Follow-up testing rates of discordant and concordant negative couples are presented with an

analysis of first follow-up predictors to inform future efforts to promote and increase retention among heterosexual couples.

Methods

Initial CVCT Visit

CVCT services staffed by government clinic nurses and counselors are currently provided in 15 government clinics in Ndola and one mobile testing unit. Training, quality control, monitoring and evaluation, and data reporting and analysis are provided by the Zambia Emory HIV Research Project (ZEHRP). Couples completing CVCT procedures as described elsewhere^{7,9,27,28} receive an incentive, as CVCT is not yet a routine integrated health service in government clinics. In other areas of Zambia, transportation cost is given as an incentive. Couples in Ndola receive chitenge, a traditional cotton wrap costing less than 5 USD as an incentive for completing their initial visit.

Follow-up procedure

Participating clinics offered CVCT every weekend and follow-up testing one weekend per month. Following the initial CVCT visit, concordant negative and discordant couples were referred for their first follow-up appointments 3–8 weekends after CVCT, depending on the follow-up testing schedule at their clinic. This timing was chosen to identify individuals in the window period, those who may be infected with HIV but not have detectable antibodies at the time of the initial visit. A subset of discordant couples who were eligible for research were referred to the ZEHRP site for an enrollment visit through August 31, 2011; this counted as their first follow-up visit. To ensure that couples were afforded ample flexibility for attendance, they were offered follow-up appointments between 8am–3pm on either Saturday or Sunday. Couples were informed that the first follow-up visit would be much shorter than the initial CVCT visit, consisting of an HIV rapid test for the HIV– partner(s) and post-test counseling based on the follow-up results. This follow-up counseling is similar to the first visit CVCT counseling described elsewhere^{7,9,27,28} and covers the issues of monogamy, condom use, and serostatus-related health issues. Discordant couples were encouraged to attend together, though only the HIV– partner was retested. Data used for this analysis included three distinct programmatic time periods: (1) May 1, 2011–Aug 31, 2011, when eligible discordant couples were also referred for ZEHRP research; (2) Sept 1 2011 – prior to a Good Health Package (GHP) start date (which differed by clinic); and (3) after the GHP start date through December 2012. During the first two time periods, couples did not receive any incentive for attending follow-up visits at the government clinics. In time period (1) eligible discordant couples attending a research enrollment visit as their follow-up did receive an incentive according to the study protocol in which they were enrolled. The GHP was implemented during the third time period and allowed couples to choose one item from a package which included soap, chlorine, deworming medication, screening and treatment for urinary schistosomiasis, and blood pressure and diabetes screening. This served as the follow-up incentive during this last time period.

Data Collection and Analysis

Data on age, cohabitation length, prior testing for HIV individually or together, and current antiretroviral (ARV) use were collected on each couple during the initial CVCT visit. Identifiers were not collected. A unique couple identification number linked the initial visit data to the follow-up visit and paper-ink fingerprints were used to confirm that the correct individuals were followed over time. Data for analysis was limited to couples attending their first CVCT visit from May 2011 through October 2012, and follow-up data were used through December 2012 in order to capture all of those who attended their first follow-up visit. Analysis was completed with SAS 9.2 (Cary, NC).

Attending follow-up was defined as a dichotomous variable with “yes” encompassing a government clinic follow-up or research referral attendance. Descriptive analyses of predictors of interest (Table 1) and the proportion of couples completing follow-up by time interval (Table 2) were evaluated, both stratified by couple serostatus. The association between predictors of interest and CVCT follow-up were also examined in bivariate analysis with crude odds ratios and p-values (Table 3).

Four clinics (Dola Hill, Kavuu, Kaniki, Ndola Mobile) were defined as rural with all other clinics being urban. The proportion of couples completing their first CVCT follow-up by clinic and catchment area was calculated (Table 4). Prior to model development, clinic catchment size was divided into quartiles. A backwards elimination strategy was used to create a multivariate logistic regression model since all predictors of interest could be considered exposures. Variables showing significance levels of $p < 0.05$ in bivariate analyses were retained in the model. For these models, time period, clinic catchment size quartiles, and month were all used as class variables. Multi-collinearity between final model variables was assessed. Final models including all couples and stratified by concordant HIV negative and discordant couples were used to calculate adjusted odds ratios (aORs) to identify predictors of follow-up (Table 5).

Results

Demographic Data and Follow-up Rates

Table 1 presents the demographic characteristics of couples by serostatus. Concordant negative couples make up 88% of the analysis cohort with the remaining 12% representing discordant couples. During this same period, an additional 1,511 concordant positive couples were screened and referred to care and treatment. Among discordant couples, 47% had an HIV+ man and 53% had an HIV+ woman. Though a majority of the women (70%) had been previously tested for HIV, the rate was lower for men (48%), and few couples had been previously tested together (12%). Interestingly, a higher percentage of concordant negative couples (12%) had been previously tested together than discordant couples (8%). The age distribution and mean cohabitation duration in this cohort align with previously reported demographic data on larger CVCT cohorts ⁷ and were similar across serostatus.

As shown in Table 2, 10,806 couples with at least one HIV– partner received CVCT services at government clinics in Ndola from May 2011 to December 2012. Overall, 13.6% of these couples returned to the clinic or their research referral for a first follow-up appointment. Discordant couples had a follow-up rate (24.5%) twice that of concordant negative couples (12.2%). The overall follow-up rate fluctuated slightly over time, but remained in the 12–15% range (Table 2). Prior to the introduction of the GHP, follow-up rates were higher in M+F– couples (27.1% and 28.8%) compared with M–F+ couples (22.2% and 20.6%). After the introduction of the GHP, M+F– and M–F+ had similar follow-up rates (24.9% and 24.4% respectively) though this difference was not statistically significant (Breslow-Day $p=0.17$).

Significant ($p < 0.05$) predictors of follow-up in bivariate analyses included urban clinic location, larger clinic catchment size, time period, either or both partners previously tested for HIV, older age, and more years cohabiting (Table 3). Additionally, either partner being HIV+ and using ARV were significant ($p < 0.05$) predictors of follow-up representing exclusive characteristics of discordant couples.

Variations across individual test sites were examined (Table 4). The three test sites with the most CVCT couples, Chipulukusu, Kaloko, and Mushili, did not have the highest rates of follow-up. Lubuto and Chipokota Mayamba made up a small percentage of the total couples

tested, but had the highest rates of follow-up (27% and 28%). Kawama, Kansenshi Prisons, Kabushi, and New Masala all had follow-up rates in the 20% range, with contributions to total couples tested all less than 10%.

In the final multivariate models, multi-collinearity was observed between man's age, woman's age, and age difference and the latter variable was thus excluded. In the model including all couples, age (men: aOR = 1.02, 95% CI 1.01–1.03 and women: aOR = 1.02, 95% CI 1.00–1.03); GHP (aOR = 2.16, 95% CI 1.65–2.83); the man being HIV+ (aOR = 2.57, 95% CI 2.11–3.12) or the woman being HIV+ (aOR = 1.89, 95% CI 1.55–2.31); and man's (aOR = 1.27, 95% CI 1.13–1.43) or couples' (aOR = 1.21, 95% CI 1.02–1.45) prior testing for HIV were significant predictors of follow-up testing controlling for clinic catchment size and month (Table 5).

The same analysis stratified by serostatus in Table 5 shows several differences in the relationships between covariates and follow-up. Man's increasing age remained predictive in both discordant and concordant negative couples while woman's age was predictive only in the latter group. Discordant couples had a greater increase in odds ratios after the introduction of the GHP (aOR 2.93 compared with aOR 2.06 among concordant HIV negative couples), though this interaction was not significant in the model containing all couples. Prior testing remained predictive only among concordant HIV negative couples. Among discordant couples, those with HIV+ men were more likely to have follow-up testing than those with HIV+ women, and the HIV+ partner being on ARV was associated with a borderline significant increase in follow-up testing (aOR 1.37, $p=0.07$).

Discussion

The majority of new HIV infections occur in cohabiting heterosexual couples^{3,29,30}, the world's largest risk group for incident HIV infection⁴. While initial HIV testing and counseling for couples has received increased attention since the publication of WHO guidelines in April 2012, little consideration has been given to follow-up testing and counseling. Our study confirmed that the addition of a Good Health Package of low-cost prevention, screening and treatment services for common causes of morbidity and mortality increased follow-up testing rates and identified several predictors that help inform strategies for improvement in Zambia and other settings.

Follow-up counseling and repeat testing is critical for discordant couples since the negative partner has a known, constant infection risk from the HIV+ partner. Though individual risk is comparatively lower among concordant HIV– couples, they are the largest group of couples and thus contribute to a substantial number of new and preventable infections. The proportion of discordant couples and the distribution of gender of the HIV+ partners in this cohort is consistent with previously published literature^{7,11,31} and increases the generalizability of these findings.

We have previously published our experience with CVCT in a research setting in Ndola³² and here we present transfer of these procedures from a research setting to an implementation setting in government clinics in the same city. We examined initial CVCT follow-up rates and predictors of follow-up in government clinics for both concordant negative and discordant couples for the 18-month period following full implementation of follow-up procedures. Since CVCT is not yet an institutionalized service, promotion and incentives are necessary to increase the number of those attending the first CVCT visit⁷. Unlike participants in research projects, couples attending follow-up at the government clinics were not given incentives prior to the introduction of the GHP. It is thus not surprising that follow-up numbers were comparatively low.

This study confirmed that follow-up testing rates in government clinic settings were lower than those reported by research projects. After implementing the GHP program which included modest public health related incentives that could be sustainable in government clinics, follow-up was higher relative to a pre-GHP time period suggesting that this particular incentive package had a positive effect, but longer-term research is needed and a greater impact is desired.

Older age, the GHP, and having an HIV+ man or (to a lesser extent) an HIV+ woman partner remained predictive of follow-up testing in multivariate and stratified analyses, while the man or couple having been previously tested were associated with higher follow-up rates only among concordant HIV negative couples.

Follow-up rates may increase with older age due to social or cultural constructs, maturity, health seeking behaviors, or more stable relationship status. However, years of cohabitation was only significantly associated with follow-up in the bivariate analysis. We are unable to give a definitive explanation for this relationship.

Several couple-level predictors significantly influenced the rate of follow-up among this cohort. Though follow-up rates overall were low, discordant couples had a follow-up rate twice that of concordant negative couples. This result is not surprising, since discordant couples likely perceive themselves at higher risk than concordant negative couples, and higher perceived risk is associated with seeking testing³⁵. It is possible that many concordant negative couples perceive themselves at minimal to no risk of HIV acquisition and thus do not pursue the follow-up appointment. The differences observed between M+F- and M-F+ couples may be due to gender-power relations where the man may have a greater say in health care decisions or HIV+ women may instead be receiving services through PMTCT or ANC, and not use CVCT as a main source of care. There may also be differences in perceived risks of male to female versus female to male transmission of HIV.

Follow-up was also higher among couples that had previously been tested together, though stratified analyses showed this association was limited to concordant HIV negative couples. The first CVCT visit was in itself a form of self-imposed follow-up, so it follows that they would have higher follow-up rates. Since nearly twice as many concordant negative couples had previously tested together compared to discordant couples, the first follow-up testing could have been motivated by knowledge of risky behavior for at least one partner, and thus motivation for additional follow-up confirmatory testing may have been more desirable. Such behavior may also indicate a higher level of comfort with the health care system or lower levels of fear of stigma or other social barriers to seeking care.

Limitations

In addition to the predictors explored here, couples' attitudes and perceptions such as fear, gender differences in motivation and power, stigma, perceptions of the health care system, relationship dynamics, and incongruity between perceived and actual risks may have also played a role in attending follow-up³³. We were unable to incorporate additional demographic and structural characteristics such as education, literacy, income, and distance to the health facility. Notably, stigma, fear of partner reaction, distance to clinic, cost, and other logistical issues have previously been cited as barriers to CVCT, and are also likely barriers to follow-up testing²⁰. In a research setting in Zambia, we found several context-level characteristics which address barriers to stigma (including delivering CVCT invitations to couples versus individuals, the couple being acquainted with the community worker delivering the CVCT invitation, and home invitation delivery versus delivery in other settings) were significantly predictive of CVCT uptake in multivariate models³⁴. Though

these attributes were not measured in this study, interpretations of our findings incorporate them.

The variation in follow-up rates observed between clinics suggests that the social and structural factors discussed above along with other facility or community-level characteristics likely play an important role beyond couple-level characteristics. Similar to our findings in Zambia³⁴, previous research in Rwanda found that CVCT uptake was significantly associated with factors that reduced stigma (including the couple being acquainted with the community worker delivering the CVCT invitation and delivering invitations after public endorsement of CVCT) and logistical barriers (including the presence of mobile testing units)³⁶. These factors associated with uptake of CVCT are likely also associated with CVCT follow-up rates.

In this study, follow-up in the first time interval was inclusive of a subset of discordant couples referred to research and couples referred to basic clinic follow-up, thus some couples received research-related incentives while others did not receive incentives at their follow-up appointment. We attempted to control for this natural programmatic variation by including indicators of these time periods in the analysis as well as significant interactions of clinic-level variables with these periods in the final model.

The distinction between rural and urban clinics was based on geographic location of the clinics and knowledge of clinic accessibility based on experience working in this area, and catchment populations were divided into quartiles for ease of modeling interactions. Potential misclassification among these variables is a limitation of the predictive ability of these covariates. Lastly, this study only concerns data collected in the first eighteen months after full implementation of follow-up procedures, and further analysis will be done as evidence-based improvements are made to this protocol.

Conclusions

Follow-up testing and counseling of discordant and concordant negative couples is an important initiative to ensure reduced transmission of HIV between partners and to facilitate linkage to combination prevention and care. Our aim is to inform other CVCT implementers about the importance of CVCT follow-up, specifically for discordant and concordant negative couples, and to provide insight into what factors significantly influence follow-up rates. The Good Health Package is an innovative strategy that integrates HIV prevention through CVCT with other affordable public health interventions. We believe that these findings are generalizable to couples in similar areas seeking CVCT services from public clinics. The GHP, discordancy, and previous HIV testing were significantly associated with attending follow-up. Leveraging these predictors, future investigation should be directed towards low-cost sustainable incentives, methods of increasing acceptability of HIV testing, streamlining clinic logistics, and targeting discordant and concordant negative couples to increase follow-up rates.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

The authors are grateful to all of the couples who participated in CVCT, the ZEHRP and government clinic staff, nurses, and counselors, and the Ndola District Health Management Team for making this service possible and accessible.

Source of Funding: Support for this project was provided by PATH Arise Program through funding from the Canadian International Development Agency (CIDA). The views expressed by the authors do not necessarily reflect the views of PATH, the Canadian Government, or CIDA. Additional funding was provided by the US National Institute of Mental Health [R01 MH095503-01]; the AIDS International Training and Research Program Fogarty International Center [3D43TW001042411]; the Emory Center for AIDS Research [P30 AI050409]; The Rollins School of Public Health Global Field Experience program at Emory University; and the International AIDS Vaccine Initiative [EA040113].

References

1. UNAIDS. Global Report: UNAIDS Report on the Global AIDS Epidemic. 2010.
2. Republic of Zambia MoH, and National AIDS Council. Zambia Country Report: Monitoring the Declaration of Commitment on HIV and AIDS and the Universal Access Biennial Report (2008–2009). 2010.
3. Painter TM. Voluntary counseling and testing for couples: a high-leverage intervention for HIV/AIDS prevention in sub-Saharan Africa. *Soc Sci Med*. 2001; 53(11):1397–1411. [PubMed: 11710416]
4. Dunkle KL, Stephenson R, Karita E, et al. New heterosexually transmitted HIV infections in married or cohabiting couples in urban Zambia and Rwanda: an analysis of survey and clinical data. *Lancet*. 2008 Jun 28; 371(9631):2183–2191. [PubMed: 18586173]
5. Dunkle KL, Greenberg L, Lanterman A, Stephenson R, Allen S. Source of new infections in generalised HIV epidemics — Authors' reply. *Lancet*. 2008; 372(9646):1300–1301.
6. De Walque D. Sero-discordant couples in five African countries: Implications for prevention strategies. *Population and Development Review*. 2007 Sep; 33(3):501–523. 2007.
7. Chomba E, Allen S, Kanweka W, et al. Evolution of couples' voluntary counseling and testing for HIV in Lusaka, Zambia. *J Acquir Immune Defic Syndr*. 2008 Jan 1; 47(1):108–115. [PubMed: 17984761]
8. Allen S, Serufilira A, Bogaerts J, et al. Confidential HIV testing and condom promotion in Africa. Impact on HIV and gonorrhea rates. *JAMA*. 1992; 268(23):3338–3343. [PubMed: 1453526]
9. McKenna SL, Muyinda GK, Roth D, et al. Rapid HIV testing and counseling for voluntary testing centers in Africa. *AIDS*. 1997; 11(Suppl 1):S103–S110. [PubMed: 9376093]
10. Roth DL, Stewart KE, Clay OJ, van Der Straten A, Karita E, Allen S. Sexual practices of HIV discordant and concordant couples in Rwanda: effects of a testing and counselling programme for men. *Int J STD AIDS*. 2001 Mar; 12(3):181–188. [PubMed: 11231872]
11. Lingappa JR, Lambdin B, Bukusi EA, et al. Regional differences in prevalence of HIV-1 discordance in Africa and enrollment of HIV-1 discordant couples into an HIV-1 prevention trial. *PloS one*. 2008; 3(1):e1411. [PubMed: 18183292]
12. Sweat M, Gregorich S, Sangiwa G, et al. Cost-effectiveness of voluntary HIV-1 counselling and testing in reducing sexual transmission of HIV-1 in Kenya and Tanzania.[see comment]. *Lancet*. 2000 Jul 8; 356(9224):113–121. [PubMed: 10963247]
13. Colebunders R, Ndumbe P. Priorities for HIV testing in developing countries? *Lancet*. 1993 Sep 4; 342(8871):601–602. [PubMed: 8102727]
14. Brent RJ. A social cost-benefit criterion for evaluating Voluntary Counseling and Testing with an application to Tanzania. *Health Econ*. 2010 Feb; 19(2):154–172. [PubMed: 19266590]
15. Allen S, Tice J, Van de Perre P, et al. Effect of serotesting with counselling on condom use and seroconversion among HIV discordant couples in Africa. *BMJ*. 1992; 304(6842):1605–1609. [PubMed: 1628088]
16. Allen S, Meinzen-Derr J, Kautzman M, et al. Sexual behavior of HIV discordant couples after HIV counseling and testing. *AIDS*. 2003 Mar 28; 17(5):733–740. [PubMed: 12646797]
17. Kamenga M, Ryder RW, Jingu M, et al. Evidence of marked sexual behavior change associated with low HIV-1 seroconversion in 149 married couples with discordant HIV-1 serostatus: experience at an HIV counselling center in Zaire. *AIDS*. 1991; 5(1):61–67. [PubMed: 2059362]
18. Becker S, Mlay R, Schwandt HM, Lyamuya E. Comparing couples' and individual voluntary counseling and testing for HIV at antenatal clinics in Tanzania: a randomized trial. *AIDS Behav*. 2010 Jun; 14(3):558–566. [PubMed: 19763813]

19. Kebaabetswe P, Ndase P, Mujugira A, et al. Perceptions of couple HIV counseling and testing in Botswana: a stakeholder analysis. *Patient Educ Couns*. 2010 Apr; 79(1):120–123. [PubMed: 19682831]
20. Kelley AL, Karita E, Sullivan PS, et al. Knowledge and perceptions of couples' voluntary counseling and testing in urban Rwanda and Zambia: a cross-sectional household survey. *PLoS One*. 2011; 6(5):e19573. [PubMed: 21573068]
21. Kennedy CE, Medley AM, Sweat MD, O'Reilly KR. Behavioural interventions for HIV positive prevention in developing countries: a systematic review and meta-analysis. *Bull World Health Organ*. 2010 Aug 1; 88(8):615–623. [PubMed: 20680127]
22. Maleta K, Bowie C. Selecting HIV infection prevention interventions in the mature HIV epidemic in Malawi using the mode of transmission model. *BMC Health Serv Res*. 2010; 10:243. [PubMed: 20723240]
23. Sikasote J, Grant L, Chinn DJ, Macwang' i M, Murray SA. Voluntary counselling and testing for HIV in a Zambian mining community: serial interviews with people testing negative. *Sex Transm Infect*. 2011 Aug; 87(5):433–438. [PubMed: 21429898]
24. Boeras DI, Luisi N, Karita E, et al. Indeterminate and discrepant rapid HIV test results in couples' HIV testing and counselling centres in Africa. *J Int AIDS Soc*. 2011 Apr 8; 14(1):18. [PubMed: 21477317]
25. Kempf MC, Allen S, Zulu I, et al. Enrollment and retention of HIV discordant couples in Lusaka, Zambia. *J Acquir Immune Defic Syndr*. 2008 Jan 1; 47(1):116–125. [PubMed: 18030162]
26. Rosen S, Fox MP. Retention in HIV care between testing and treatment in sub-Saharan Africa: a systematic review. *PLoS Med*. 2011 Jul 8; 7(7):e1001056. [PubMed: 21811403]
27. Allen S, Karita E, Chomba E, et al. Promotion of couples' voluntary counselling and testing for HIV through influential networks in two African capital cities. *BMC Public Health*. 2007; 7:349. [PubMed: 18072974]
28. Allen S. Couples HIV Counselling and Testing in two African Capitals: a Unpublished Manuscript. 2003:96.
29. Trask SA, Derdeyn CA, Fideli U, et al. Molecular epidemiology of human immunodeficiency virus type 1 transmission in a heterosexual cohort of discordant couples in Zambia. *J Virol*. 2002 Jan; 76(1):397–405. [PubMed: 11739704]
30. Hudson CP. The importance of transmission of HIV-1 in discordant couples in the population dynamics of HIV-1 infection in rural Africa. *Int J STD AIDS*. 1996; 7(4):302–304. [PubMed: 8876369]
31. Eyawo O, de Walque D, Ford N, Gakii G, Lester RT, Mills EJ. HIV status in discordant couples in sub-Saharan Africa: a systematic review and meta-analysis. *Lancet Infect Dis*. 2010 Nov; 10(11):770–777. [PubMed: 20926347]
32. Lambdin BH, Kanweka W, Inambao M, et al. Local Residents Trained As ' Influence Agents' Most Effective In Persuading African Couples On HIV Counseling And Testing. *Health Aff (Millwood)*. 2011 Aug; 30(8):1488–1497. [PubMed: 21821565]
33. Obermeyer CM, Osborn M. The utilization of testing and counseling for HIV: a review of the social and behavioral evidence. *Am J Public Health*. 2007 Oct; 97(10):1762–1774. [PubMed: 17761565]
34. Wall KM, Kilembe W, Nizam A, et al. Promotion of couples' voluntary HIV counselling and testing in Lusaka, Zambia by influence network leaders and agents. *BMJ open*. 2012; 2(5)
35. Morin SF, Khumalo-Sakutukwa G, Charlebois ED, et al. Removing barriers to knowing HIV status: same-day mobile HIV testing in Zimbabwe. *J Acquir Immune Defic Syndr*. 2006 Feb 1; 41(2):218–224. [PubMed: 16394855]
36. Wall K, Karita E, Nizam A, et al. Influence network effectiveness in promoting couples' HIV voluntary counseling and testing in Kigali, Rwanda. *AIDS*. 2012 Jan 14; 26(2):217–227. [PubMed: 22008653]