

Optimizing Prevention of HIV and Unplanned Pregnancy in Discordant African Couples

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Abstract

Background: Dual method use, which combines condoms with a more effective modern contraceptive to optimize prevention of HIV and unplanned pregnancy, is underutilized in high-risk heterosexual couples.

Materials and Methods: Heterosexual HIV-discordant Zambian couples were enrolled from couples' voluntary HIV counseling and testing services into an open cohort with 3-monthly follow-up (1994–2012). Relative to dual method use, defined as consistent condom use plus modern contraception, we examine predictors of (1) condom-only use (suboptimal pregnancy prevention) or (2) modern contraceptive use with inconsistent condom use (effective pregnancy prevention and suboptimal HIV prevention).

Results: Among 3,049 couples, dual method use occurred in 28% of intervals in M+F– and 23% in M–F+, $p < 0.01$; condom-only use in 56% in M+F– and 61% in M–F+, $p < 0.01$; and modern contraceptive use with inconsistent condom use in 16% regardless of serostatus. Predictors ($p < 0.05$) of condom-only use included the man being HIV+ (adjusted hazard ratio, aHR = 1.15); baseline oral contraceptive pill (aHR = 0.76), injectable (aHR = 0.48), or implant (aHR = 0.60) use; woman's age (aHR = 1.04 per 5 years) and lifetime number of sex partners (aHR = 1.01); postpartum periods (aHR = 1.25); and HIV stage of the index partner III/IV versus I (aHR = 1.10). Predictors ($p < 0.05$) of modern contraceptive use with inconsistent condom use included woman's age (aHR = 0.94 per 5 years) and HIV+ male circumcision (aHR = 1.51), while time-varying implant use was associated with more consistent condom use (aHR = 0.80).

Conclusions: Three-quarters of follow-up intervals did not include dual method use. This highlights the need for counseling to reduce unintended pregnancy and HIV transmission and enable safer conception.

Keywords: dual contraceptive method use, unintended pregnancy risk, HIV transmission risk, serodiscordant couples, Zambia

Introduction

DUAL METHOD USE is defined as the use of condoms for HIV/sexually transmitted infection (STI) prevention plus use of an effective modern contraceptive method for unintended pregnancy prevention. A public health priority, dual method use increases prevention of (1) HIV/STI; (2)

unintended pregnancy; and (3) mother-to-child transmission (PMTCT) when seroconversion is prevented in pregnant and breastfeeding women (Prong 1 of PMTCT) and pregnancies are prevented in HIV-positive women (Prong 2 of PMTCT).¹⁻⁴ Condoms are the front-line prevention tool for HIV/STIs. However, condom use alone is not as effective as other modern contraceptive options in preventing unintended pregnancy.^{5,6}

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We previously published that the pregnancy rate among HIV-discordant couples using condoms alone in our cohort was 26.4/100 couple-years.⁷ This reinforces the benefits of dual method use for added protection against unplanned pregnancy. Additionally, given that HIV-discordant couples seeking to conceive are at increased risk of HIV transmission,⁸⁻¹⁰ safer conception options are needed for discordant couples who wish to conceive.

Despite the knowledge that dual method use benefits women and couples, and despite World Health Organization (WHO) guidelines recommending dual contraceptive method use,¹¹ little is known about the factors associated with dual method use. More literature focusing on independent barriers to consistent condom or contraceptive use is needed to develop and target uptake and adherence strategies in high-risk couples. We have previously described factors associated with unprotected sex¹² and contraceptive method uptake/continuation¹³ in such couples. The current analysis adds to a larger picture of dual prevention to optimize HIV and unintended pregnancy prevention.

We explore predictors of condom-only use (to explore unintended pregnancy-related risk factors) and modern contraceptive use with inconsistent condom use (to explore HIV transmission-related risk factors).

Materials and Methods

Ethics

This study was approved by the Office for Human Research Protections-registered Institutional Review Boards (IRBs) at Emory University and in Zambia. The University of Zambia Biomedical Research Ethics Committee (IORG0000774) has US Office of Human Research Protection registration and one IRB committee (IRB00001131) that reviews research protocols. Written informed consent was obtained jointly from participating couples.

Participants

Married/cohabiting HIV serodiscordant heterosexual couples living in Lusaka, Zambia, were identified between 1994 and 2012 and enrolled in an open cohort with 3-monthly longitudinal follow-up and free outpatient healthcare, including family planning at the research clinic. Couples were identified from couples' voluntary HIV counseling and testing (CVCT) services established by the Rwanda Zambia HIV Research Group (RZHRG). CVCT services include a group educational counseling session, on-site rapid HIV antibody testing, and joint post-HIV test counseling of the couple. CVCT promotional and recruitment strategies,^{14,15} enrollment procedures,

retention and attrition,¹⁶ HIV testing and counseling procedures,^{16,17} and cohort demographics^{16,18} have been previously published.

Data collection

Demographic (including baseline age, years cohabiting, monthly income, literacy in Nyanja, religion, maternal language, and alcohol use), family planning and sexual history (including lifetime number of sexual partners, number of previous pregnancies, and fertility intentions), and clinical (including baseline HIV stage and viral load of the HIV-positive partners and male partner circumcision status) measures were collected at baseline. Fertility intentions were collected at enrollment from 2002 to 2011. Knowledge about and concerns with modern contraceptives were collected at baseline from 2002 to 2007.¹⁹ Condom use, contraceptive method use, and postpartum status were recorded during follow-up. Postpartum status was dichotomized in this analysis as being up to 6 months postpartum versus not pregnant/not postpartum.

Outcomes of interest

The first outcome of interest was time-varying condom-only use (consistent or inconsistent) without concurrent use of a modern contraceptive method (implant, injectables, copper intrauterine device [IUD], oral contraceptive pills [OCPs]) (Table 1). Indicators of unprotected sex with the study partner include self-reported condomless sex, sperm on a vaginal swab wet mount, incident pregnancy, or incident HIV seroconversion. This outcome was modeled to explore unintended pregnancy-related risk factors.

The second outcome of interest was time-varying modern contraceptive use with inconsistent condom use, defined as intervals in which a modern contraceptive method (including surgical sterilization) was used, but condom use (defined using the above indicators of unprotected sex) was inconsistent. This outcome was modeled to explore HIV transmission-related risk factors.

Referent group

The time-varying dual method use was defined as having no indicator of unprotected sex with the study partner plus the use of a modern contraceptive method (implant, injectables, IUD, OCPs, and surgical sterilization) (Table 1).

Analysis methods

Couples were censored if the partner who was HIV negative (HIV-) at enrollment seroconverted; if the partner who

TABLE 1. STUDY OUTCOME AND REFERENT GROUP DEFINITIONS

	<i>Nondual method use risk groups</i>	<i>Referent group</i>
<i>Outcome 1</i>	Condom-only use: time-varying condom-only use (consistent or inconsistent) without modern contraceptive method use in the previous study interval	Consistent dual method use: time-varying modern contraceptive method use, with no indication of unprotected sex with the study partner in the previous study interval
<i>Outcome 2</i>	Modern contraceptive use with inconsistent condom use: time-varying modern contraceptive method use, with indication of condomless sex in the previous study interval	

was HIV positive (HIV+) at enrollment initiated antiretroviral treatment (ART, which became available in government clinics in 2007); and if either partner died or if the couple separated, relocated, or were otherwise lost to follow-up. Additionally, we exclude 8% of study intervals during which couples are not at risk for dual method use due to pregnancy or lack of sexual activity. In the model of condom use only, couples who are sterilized ($n=40$ couples) were excluded from the analysis as they were not at risk for method uptake.

The distributions of dual method use, condom-only use, and modern contraceptive use with inconsistent condom use were calculated over all study intervals. Differences between M+F- and M-F+ couples were quantified using p -values from McNemar's tests for correlated proportions. The distributions of exposure covariates were calculated (means and standard deviations [SDs] for normal continuous variables; medians and interquartile ranges for non-normal continuous variables; and counts and percentages for categorical variables) stratified by the outcomes of interest. We present baseline (cross-sectional) cohort demographics in the text; longitudinal (time on study weighted-average) measures of frequency are given in the tables.

In univariable and multivariable analyses, repeated outcomes survival analysis models (Andersen-Gill models) explored factors associated with the two outcomes of interest. Andersen-Gill models are a counting process extension of Cox survival models that accommodate longitudinal data with nonindependent repeated outcomes. As we had no primary exposure of interest, multivariable models comprised all covariates that were significantly ($p < 0.05$) associated with the outcome of interest in univariable analyses in our primary analysis models. Subanalysis models were run, including variables associated with the outcome of interest in univariable models that were not collected over all study follow-up intervals (*e.g.*, fertility intentions, collected from 2002 to 2011; and contraceptive method knowledge and concerns, collected from 2002 to 2007). We explored the potential for interaction by the gender of the HIV-positive partner, but did not find major differences—

thus, couple serostatus is considered as a covariate in the models.

Data analysis was conducted with SAS, v9.4 (Cary, NC).

Results

Distribution of outcomes and cohort demographics

Among 3,049 discordant couples ($N=1,393$ M+F-, $N=1,656$ M-F+) followed for an average of roughly 2 years, dual method use was recorded in 26% of intervals (28% in M+F- and 23% in M-F+, $p < 0.01$), condom-only use in 59% of intervals (56% in M+F- and 61% in M-F+, $p < 0.01$), and modern contraceptive use with inconsistent condom use (16% regardless of couple serostatus) (Table 2). M+F- couples were more likely ($p < 0.01$) to have any intervals, including IUD and implant use (12% of overall study intervals), compared with M-F+ couples (8% of overall study intervals). Of intervals reporting condom-only (consistent or inconsistent) use without modern contraception, 37% (32% in M+F- and 40% in M-F+, $p < 0.01$) had an indication of unprotected sex.

At baseline, the average age of men in the cohort was 35.3 (SD=8.0) years, the average age of women was 28.6 (SD=6.7) years, the average time cohabiting was 7.2 (SD=6.2) years, the average number of couples' previous pregnancies was 3.6 (SD=2.4), and 49.6% of men and 57.6% of women stated they did not want more children.

Condom-only use

Univariable analysis results are presented for condom-only versus dual method use (Tables 3 and 4). Condom-only use was more likely among M+F- compared with M-F+ couples and older women. There were no differences by years cohabiting, literacy, religious affiliation, or maternal language/tribal group. Not surprisingly, baseline OCP and injectable contraceptive use were associated with less condom-only use during follow-up, as were baseline implant ($p=0.065$) and IUD use ($p=0.098$), although the hazard ratios (HRs) were

TABLE 2. DUAL METHOD USE AMONG HETEROSEXUAL HIV-DISCORDANT SEXUALLY ACTIVE COUPLES WHO ARE NOT CURRENTLY PREGNANT

	<i>All couples</i>		<i>M+F-</i>		<i>M-F+</i>		<i>p</i>
	<i>N intervals</i>	<i>%</i>	<i>N intervals</i>	<i>%</i>	<i>N intervals</i>	<i>%</i>	
Dual method use	6,096	26	3,343	28	2,753	23	*
Condoms only	14,015	59	6,675	56	7,340	61	*
Modern contraceptive use with inconsistent condom use	3,723	16	1,854	16	1,869	16	
Contraceptive method use							
Implant	1,684	7	968	8	716	6	*
Injectables	3,601	15	1,815	15	1,786	15	
IUD	630	3	432	4	198	2	*
OCP	3,557	15	1,798	15	1,759	15	
Permanent method	347	1	184	2	163	1	
Unprotected sex							
Yes	8,848	37	4,022	34	4,826	40	*
No	14,986	63	7,850	66	7,136	60	

Distributions are calculated across all study intervals.

* p (two-tailed) < 0.001 .

IUD, intrauterine device; OCP, oral contraceptive pill.

TABLE 3. UNADJUSTED ASSOCIATIONS BETWEEN COVARIATES AND TIME-VARYING CONDOM-ONLY USERS (VS. DUAL METHOD USERS) AMONG SEXUALLY ACTIVE HIV-DISCORDANT COUPLES WHO ARE NOT CURRENTLY PREGNANT AND NOT STERILIZED

	<i>Condom-only using intervals</i>		<i>Dual method using intervals</i>		HR	95% CI	p-Value (two-tail)
	N intervals/means	%/SD	N intervals/means	%/SD			
Couple serostatus							
M+F- (N=1,393)	6,675	48%	3,316	55%	1.13	1.07 1.20	<0.0001
M-F+ (N=1,656)	7,340	52%	2,740	45%	Ref.		
Man's age in years (mean, SD) (HR per 5-year increase)	35.69	8.34	35.24	7.46	1.01	0.995 1.03	0.189
Woman's age in years (mean, SD) (HR per 5-year increase)	29.03	7.01	28.42	6.24	1.02	1.01 1.04	0.014
Household Income in USD (median, IQR) (HR per 20 USD increase)	57.50	71.80	55.20	71.70	1.00	0.99 1.01	0.857
Years cohabiting (mean, SD) (HR per 5-year increase)	7.09	6.58	7.60	5.80	0.99	0.97 1.02	0.552
Woman reads Nyanja							
Yes, easily	3,312	24%	1,389	24%	Ref.		
With difficulty/not at all	10,647	76%	4,453	76%	1.02	0.96 1.08	0.586
Man reads Nyanja							
Yes, easily	4,647	43%	2,042	45%	Ref.		
With difficulty/not at all	6,235	57%	2,496	55%	1.02	0.95 1.09	0.612
Man's religion (2002–2012)							
Catholic	1,251	28%	883	29%	0.95	0.81 1.11	0.509
Other Christian	2,297	52%	1,582	52%	0.95	0.83 1.10	0.498
Other/none	910	20%	603	20%	Ref.		
Woman's religion (2002–2012)							
Catholic	1,743	23%	1,025	24%	1.02	0.90 1.15	0.775
Other Christian	4,670	62%	2,673	61%	1.03	0.92 1.14	0.637
Other/none	1,085	14%	662	15%	Ref.		
Baseline contraceptive method used							
None/condoms alone	12,298	88%	4,253	71%	Ref.		
OCP	1,128	8%	916	15%	0.78	0.68 0.90	0.001
Injectable	331	2%	615	10%	0.51	0.41 0.64	<0.0001
Implant	81	1%	115	2%	0.59	0.34 1.03	0.065
IUD	59	0%	124	2%	0.50	0.22 1.14	0.098
Number of previous pregnancies (mean, SD) (HR per pregnancy increase)	3.49	2.49	3.76	2.22	0.99	0.98 1.00	0.125
HIV stage of HIV+ partner							
Stage I	4,818	34%	2,156	36%	Ref.		
Stage II	4,684	33%	2,117	35%	1.04	0.97 1.11	0.315
Stage III	3573.00	25%	1,403	23%	1.12	1.05 1.21	0.002
Stage IV	940	7%	380	6%	1.16	1.04 1.29	0.007
Log viral load of HIV+ partner (mean, SD) (HR per log vial load increase)	4.53	0.89	4.39	93%	1.04	0.99 1.09	0.089
Circumcision status (male partner)							
Yes	1,874	13%	773	13%	Ref.		
No	12,134	87%	5,256	87%	1.03	0.95 1.12	0.448
Man lifetime sex partners (mean, SD) (HR per partner increase)	10.78	14.46	11.64	14.64	1.00	1.00 1.00	0.942
Woman lifetime sex partners (mean, SD) (HR per partner increase)	3.53	8.46	2.97	5.45	1.00	1.00 1.01	<0.0001
Postpartum status (time varying) ^a							
Not pregnant/not postpartum	11,363	96%	5,202	99%	Ref.		
Postpartum (up to 6 months)	477	4%	73	1%	1.25	1.18 1.34	<0.0001
Fertility intentions of man (2002–2011)							
Yes, next year	973	22%	237	8%	1.50	1.32 1.70	<0.0001
Yes, but not next year	1,478	33%	1,113	36%	1.11	0.97 1.27	0.126
Don't know/no	2,007	45%	1,718	56%	Ref.		
Fertility intentions of woman (2002–2011)							
Yes, next year	1,479	29%	349	10%	1.48	1.32 1.65	<0.0001
Yes, but not next year	1,051	21%	757	22%	1.12	0.98 1.29	0.102
Don't know/no	2,517	50%	2,259	67%	Ref.		

Analysis excludes $n=40$ women who were sterilized at baseline (not at risk for the outcome of interest).

^aTime-varying variable.

CI, confidence interval; HR, hazard ratio; IQR, interquartile range; SD, standard deviation; USD, United States Dollar.

TABLE 4. ADJUSTED ASSOCIATIONS BETWEEN COVARIATES AND TIME-VARYING CONDOM-ONLY USERS (VS. DUAL METHOD USERS) AMONG SEXUALLY ACTIVE HIV-DISCORDANT COUPLES WHO ARE NOT CURRENTLY PREGNANT AND NOT STERILIZED

	Primary analysis (1994–2012)				Subanalysis (2002–2011)			
	aHR	95% CI		p-Value (two-tail)	aHR	95% CI		p-Value (two-tail)
Couple serostatus								
M+F–	1.15	1.09	1.22	<0.0001	1.14	1.02	1.27	0.021
M–F+	Ref.				Ref.			
Woman's age in years (aHR per 5-year increase)	1.04	1.02	1.06	<0.001	1.06	1.02	1.11	0.003
Baseline contraceptive method used								
None/condoms alone	Ref.				Ref.			
OCP	0.76	0.20	0.87	<0.0001	0.56	0.43	0.73	<0.0001
Injectable	0.48	0.38	0.60	<0.0001	0.39	0.28	0.56	<0.0001
Implant	0.60	0.36	0.995	0.048	1.18	0.90	1.55	0.239
IUD	0.52	0.24	1.13	0.096	n/a			
HIV stage of HIV+ partner								
Stage I	Ref.				Ref.			
Stage II	1.01	0.94	1.08	0.789	1.00	0.88	1.14	0.988
Stage III or IV	1.10	1.03	1.17	0.005	1.11	0.98	1.26	0.106
Woman lifetime number of sex partners (aHR per partner increase)	1.01	1.00	1.01	<0.0001	1.01	1.01	1.01	<0.0001
Postpartum status (time varying) ^a								
Not pregnant/not postpartum	Ref.				Ref.			
Postpartum (up to 6 months)	1.25	1.17	1.34	<0.0001	1.37	1.22	1.54	<0.0001
Fertility intentions of woman (2002–2011)								
Yes, next year					1.39	1.25	1.55	<0.0001
Yes, but not next year					1.20	1.03	1.39	0.017
Don't know/no					Ref.			

Analysis excludes $n=40$ women who were sterilized at baseline (not at risk for the outcome of interest).

^aTime-varying variable.

aHR, adjusted hazard ratio.

not significant likely due to small numbers. Condom-only use was associated with HIV disease stages III–IV and with higher viral load of the HIV+ partner ($p=0.089$). Man's age, number of lifetime partners, and circumcision status were not associated with condom-only use. Women's higher number of lifetime sex partners was significantly associated with condom-only use (HR=1.00, $p<0.0001$). Both men and women wanting a pregnancy in the next year were associated with condom-only use, as were being in the postpartum period during follow-up. Knowledge of and concerns about contraceptive methods were not predictive.

In the primary multivariable model (Table 4), predictors of condom-only use versus dual method use during follow-up intervals ($p<0.05$) included the man being the HIV+ partner (adjusted hazard ratio, aHR=1.15); baseline OCP (aHR=0.76), injectable (aHR=0.48), or implant (aHR=0.60) use; increasing woman's age (aHR=1.01) and lifetime number of sex partners (aHR=1.01); postpartum periods (aHR=1.25); and stage III–IV versus I HIV disease of the index partner (aHR=1.10). In subanalyses, including fertility intentions, wanting to have a child either in the text year (aHR=1.39) or later (aHR=1.20) was also predictive.

Modern contraceptive use with inconsistent condom use

Univariable analysis results are presented for modern contraceptive use with inconsistent condom use versus dual

method use (Tables 5 and 6). Younger ages of men and women were associated with inconsistent condom use among modern contraceptive users, as was use of injectables and implants at baseline. However, over follow-up intervals, time-varying implant use and surgical sterilization (adopted by 68 women after enrollment) were associated with consistent condom use. Women wanting a pregnancy, but not in the next year, were associated with modern contraceptive use with inconsistent condom use, and an interaction between HIV status and circumcision was discovered (with HIV+ circumcised men with wives using modern contraception being at increased hazard for inconsistent condom use). Knowledge of and concerns about contraceptive methods were not predictive.

In the primary multivariable model (Table 6), predictors ($p<0.05$) of modern contraceptive use with inconsistent condom use versus dual method use included woman's decreasing age (aHR=0.99) and HIV+ male circumcision (aHR=1.51) while time-varying implant use (aHR=0.80). In subanalyses, women desiring more children, but not in the next year (aHR=1.25), and time-varying IUD use (aHR=1.6) were predictive of the outcome, while baseline IUD use (aHR=0.61) and HIV+ men not being circumcised (aHR=0.82) were protective.

Discussion

In this study, we explore unintended pregnancy-related risk factors and HIV transmission-related risk factors. In our

TABLE 5. UNADJUSTED ASSOCIATIONS BETWEEN COVARIATES AND TIME-VARYING METHOD USERS (VS. DUAL METHOD USERS) AMONG SEXUALLY ACTIVE HIV-DISCORDANT COUPLES WHO ARE NOT CURRENTLY PREGNANT

	<i>Method using intervals</i>		<i>Dual method using intervals</i>		<i>HR</i>	<i>95% CI</i>		<i>p-Value (two-tail)</i>
	<i>N intervals</i>	<i>%</i>	<i>N intervals</i>	<i>%</i>				
Couple serostatus								
M+F-	1,854	50%	3,343	55%	1.06	0.94	1.18	0.343
M-F+	1,869	50%	2,753	45%	Ref.			
Man's age in years (mean, SD) (HR per 5-year increase)	33.92	7.52	35.30	7.48	0.95	0.91	0.99	0.010
Woman's age in years (mean, SD) (HR per 5-year increase)	27.22	6.03	28.48	6.27	0.95	0.90	0.99	0.013
Household income in USD (median, IQR) (HR per 20 USD increase)	49.56	64.03	55.00	71.40	0.99	0.98	1.01	0.467
Years cohabiting (mean, SD) (HR per 5-year increase)	6.85	5.38	7.65	5.81	0.97	0.92	1.02	0.219
Woman reads Nyanja								
Yes, easily	879	24%	1,407	24%	Ref.			
With difficulty/not at all	2,709	76%	4,475	76%	0.97	0.84	1.12	0.669
Man reads Nyanja								
Yes, easily	1,381	45%	2,073	45%				
With difficulty/not at all	1,688	55%	2,497	55%	0.98	0.86	1.11	0.721
Man's religion (2002–2012)								
Catholic	444	26%	900	29%	0.87	0.68	1.10	0.247
Other Christian	893	53%	1,585	51%	0.99	0.80	1.21	0.923
Other/none	349	21%	615	20%	Ref.			
Woman's religion (2002–2012)								
Catholic	449	20%	1,032	23%	0.88	0.70	1.11	0.273
Other Christian	1,393	64%	2,686	61%	1.02	0.83	1.25	0.847
Other/none	349	16%	682	16%	Ref.			
Baseline contraceptive method used								
None/condoms alone	2,455	66%	4,253	70%	Ref.			
OCP	614	17%	916	15%	1.11	0.94	1.32	0.205
Injectable	433	12%	615	10%	1.25	1.05	1.50	0.015
Implant	95	3%	115	2%	1.44	1.02	2.03	<0.001
IUD	87	2%	124	2%	1.14	0.72	1.79	0.574
Sterilization	19	1%	40	1%	0.93	0.37	2.33	0.883
Time-varying contraceptive method use								
OCP	1,491	40%	2,023	34%	Ref.			
Injectable	1,446	39%	2,107	35%	1.04	0.93	1.16	0.501
Implant	449	12%	1,220	20%	0.81	0.66	1.00	0.055
IUD	231	6%	392	7%	1.09	0.82	1.45	0.558
Sterilization	87	2%	259	4%	0.65	0.44	0.98	0.040
Number of previous pregnancies (mean, SD) (HR per pregnancy increase)	3.68	2.09	3.77	2.22	1.00	0.97	1.02	0.823
HIV stage of HIV+ partner								
Stage I	1,333	36%	2,164	35%	Ref.			
Stage II	1,306	35%	2,120	35%	0.91	0.79	1.05	0.196
Stage III	876	24%	1,428	23%	0.92	0.79	1.07	0.263
Stage IV	208	6%	384	6%	0.90	0.72	1.12	0.340
Log viral load of HIV+ partner (mean, SD) (HR per log viral load increase)	4.49	0.93	4.39	93%	1.03	0.94	1.13	0.489
Circumcision status (male partner)								
Yes	543	15%	773	13%	Ref.			
No	3,170	85%	5,296	87%	0.88	0.75	1.04	0.140
Man lifetime sex partners (mean, SD) (HR per partner increase)	11.41	14.94	11.66	18.44	1.00	1.00	1.00	0.615
Woman lifetime sex partners (mean, SD) (HR per partner increase)	3.03	2.58	2.97	5.44	1.00	0.99	1.01	0.945
Postpartum status (time-varying)								
Not pregnant/not postpartum	4,504	98%	4,059	98%	Ref.			
Postpartum (up to 6 months)	70	2%	63	2%	1.14	0.90	1.43	0.286

(continued)

TABLE 5. (CONTINUED)

	<i>Method using intervals</i>		<i>Dual method using intervals</i>		<i>HR</i>	<i>95% CI</i>		<i>p-Value (two-tail)</i>
	<i>N intervals</i>	<i>%</i>	<i>N intervals</i>	<i>%</i>				
Fertility intentions of man (2002–2011)								
Yes, next year	164	10%	237	8%	1.19	0.93	1.52	0.171
Yes, but not next year	697	41%	1,113	36%	1.17	0.97	1.41	0.108
Don't know/no	825	49%	1,750	56%	Ref.			
Fertility intentions of woman (2002–2011)								
Yes, next year	178	10%	349	10%	0.97	0.74	1.29	0.854
Yes, but not next year	545	30%	757	22%	1.25	1.04	1.49	0.015
Don't know/no	1,105	60%	2,291	67%	Ref.			
Circumcision × serostatus								
M+F–								
Yes	253	7%	306	5%	1.55	1.19	2.01	0.001
No	1,594	43%	3,028	50%	0.99	0.87	1.11	0.815
M–F+								
Yes	290	8%	467	8%	0.91	0.76	1.08	0.289
No	1,576	42%	2,268	37%	Ref.			

cohort, the use of both condoms and contraceptive methods increased drastically from baseline method use (Table 3) to time-varying use after the couple was jointly counseled about their serodiscordant status (Table 5). However, among condom-only using intervals, almost 37% had an indication of unprotected sex, indicating risk of both HIV and unplanned pregnancy

for these couples. Among modern contraceptive using intervals, 38% included an indication of inconsistent condom use, and although risk of unplanned pregnancy was reduced, the risk of HIV transmission remained. Dual method use—combining a modern contraceptive method with consistent condom use in this cohort of HIV serodiscordant couples—was noted in only

TABLE 6. ADJUSTED ASSOCIATIONS BETWEEN COVARIATES AND TIME-VARYING METHOD USERS (VS. DUAL METHOD USERS) AMONG SEXUALLY ACTIVE HIV-DISCORDANT COUPLES WHO ARE NOT CURRENTLY PREGNANT

	<i>Primary analysis (1994–2012)</i>				<i>Subanalysis (2002–2011)</i>			
	<i>aHR</i>	<i>95% CI</i>		<i>p-Value (two-tail)</i>	<i>aHR</i>	<i>95% CI</i>		<i>p-Value (two-tail)</i>
Woman's age in years (aHR per 5-year increase)	0.94	0.90	0.98	0.024	0.98	0.92	1.04	0.766
Baseline contraceptive method used								
None/condoms alone	Ref.				Ref.			
OCP	1.07	0.91	1.27	0.406	0.96	0.77	1.19	0.703
Injectable	1.24	1.04	1.49	0.017	1.32	1.07	1.62	0.008
Implant	1.66	1.16	2.38	0.006	1.98	1.31	2.99	0.001
IUD	1.07	0.64	1.77	0.802	0.61	0.37	0.99	0.048
Sterilization	1.47	0.54	4.01	0.453	1.13	0.45	2.83	0.788
Time-varying contraceptive method use								
OCP	Ref.				Ref.			
Injectable	1.03	0.92	1.15	0.634	1.05	0.89	1.23	0.569
Implant	0.80	0.64	0.99	0.042	0.79	0.62	1.03	0.086
IUD	1.12	0.83	1.53	0.461	1.59	1.76	2.38	0.023
Sterilization	0.71	0.44	1.15	0.161	1.01	0.65	1.56	0.980
Fertility intentions of woman (2002–2011)								
Yes, next year					1.07	0.81	1.41	0.647
Yes, but not next year					1.25	1.05	1.49	0.012
Don't know/no					Ref.			
Circumcision × serostatus								
M+F–								
Yes	1.51	1.14	1.99	0.004	1.59	1.07	2.35	0.022
No	0.97	0.86	1.10	0.645	0.82	0.70	0.97	0.019
M–F+								
Yes	0.93	0.78	1.12	0.446	0.85	0.63	1.15	0.289
No	Ref.				Ref.			

23%–28% of follow-up intervals. We describe the profile of Zambian discordant couples who may require increased fertility goal-based dual method counseling to prevent both HIV/STI and unintended pregnancy.

At least half of couples in our cohort did not want more children, yet 59% of follow-up intervals included only condom use despite the availability of the full range of modern contraceptive options offered at the research clinic. A study among HIV+ women in care and treatment in Swaziland similarly found that most women rely on condoms alone and hypothesized that this is related to a long history of HIV programs focusing solely on condoms for HIV+ people.²⁰ Additionally, 16% of follow-up intervals were among modern method users who were using condoms inconsistently (although as we have reported previously, follow-up intervals with long-acting reversible contraception [LARC] use include significantly fewer intervals with unprotected sex relative to condom use alone^{21,22}). A study in South Africa similarly found that among younger men and women (ages 18–24), dual method use was rare (15.4%) and was associated with higher sexual frequency and men's knowledge of contraceptive methods.²³ Studies among younger populations in sub-Saharan Africa have noted that concerns about possible perceptions of infidelity may be a barrier to condom negotiation.^{24–26} Although we did not find that couples' contraceptive knowledge predicted either outcome, the importance of involving men in informative conversations about contraceptive methods is indicated.

It is important to note that the concept of dual method use has been complicated among target audiences, providers, and national and international health agencies due to confusion between the related terms *dual protection* and *dual method use* (with *dual protection* defined as simultaneous protection against unintended pregnancy and HIV/STIs [possibly with condoms alone] and *dual method use* defined as the simultaneous use of condoms with a more efficacious contraceptive method).^{27,28} Another point of confusion is that different studies of dual method use apply differing definitions, with dual method use sometimes defined as either consistent dual method use over time or at a specific interval (the definition we and others have used),^{29,30} while some typically cross-sectional studies define dual method use as women ever having used both condoms (consistently or inconsistently) plus a modern method within some previous time frame.^{23,31,32}

In our study, older women were more likely to use condoms only (putting them at risk for unintended pregnancy), while younger women using modern methods were more likely to report inconsistent condom use (putting couples at risk for HIV transmission). Older couples may perceive themselves to be at lower risk for pregnancy and thus less likely to adopt modern methods along with their condom use. Conversely, although younger couples seem to be more successfully accessing contraception, they struggle with consistent condom use, possibly due to challenges posed by condom negotiation or gender norms.³³ Among those using condoms only during follow-up, only 12% were using a modern contraceptive method at baseline. Although access to the full range of methods was provided at the research clinic, lack of familiarity may have been an obstacle,^{13,34} independent of age.

We also see that couples who are postpartum may be at increased risk of using condoms only, putting them at risk for

unintended pregnancy. We have previously shown that while Zambian women in postpartum periods are reporting less sex in general,²¹ we show here that postpartum periods are characterized by both occasional unprotected sex and slow adoption of contraception. Poor postpartum dual method use could be due to low-risk perception among couples due to having less sex and lactational amenorrhea. Interestingly, a study among 821 South African women showed that although still suboptimal, the postpartum dual method use was higher among HIV-positive relative to HIV-negative women, and the authors conclude that HIV positivity may motivate women to adopt dual methods.³⁵ We, however, see similar patterns of poor postpartum dual method use regardless of discordant couple serostatus (M+F– or M+F–) indicating a need for risk, contraception, and condom counseling postpartum among all discordant couples. Scale up of postpartum long-acting contraceptive method (IUDs and implant insertion) may be highly beneficial.

Other significant predictors of dual method use may be related to risk perception. Couples with more clinically advanced HIV+ partners were at increased risk of using condoms only without use of a modern contraceptive method, putting them at risk for unintended pregnancy. It is possible that couples with index partners having more clinically advanced HIV disease may not perceive themselves at high risk of pregnancy. Among couples using modern contraception, those with circumcised HIV+ men were more likely to have unprotected sex, while those with uncircumcised HIV+ men were less likely to have unprotected sex relative to HIV– uncircumcised referent group. This is an unexpected and concerning finding. It has been noted that messages regarding the protective effect of circumcision may be misinterpreted at times as being protective for male to female transmission.^{36,37} While some studies have not observed disinhibition³⁸ related to male circumcision, others have seen decreased condom use in circumcised men, although HIV prevalence is still significantly lower in circumcised versus uncircumcised men, regardless of any behavioral disinhibition observed.^{39,40}

The finding that couples with HIV+ uncircumcised men were more likely to use dual methods than contraception alone, but the highest risk group of HIV– uncircumcised men were not, was also surprising and warrants exploration.

As expected, increased fertility intentions are associated with any form of nondual method use, and expanded promotion of safe conception approaches is urgently needed for discordant couples. Targeting prevention efforts to discordant couples desiring pregnancy and discussing safe conception strategies (including intravaginal insemination; low-cost sperm washing; ART for prevention in the index partner; and pre-exposure prophylaxis in the HIV– partner⁴¹) are imperative.

When holistically considering the dual method-associated predictors that emerged in this study (whether risk perception possibly related to age, stage of disease, postpartum periods, circumcision status, or fertility intentions), improving dual method use can be achieved by integrating CVCT with couples' family planning services. We have previously shown that for couples who want to delay fertility, integrated couples' HIV and family planning counseling that provided access to LARC methods as well as reinforced dual-method use counseling led to increased uptake of IUDs and implants and reduced unprotected sex among HIV-discordant couples in Lusaka, Zambia, and Kigali, Rwanda.⁴²

We have also recently reported on the sustained protective behavior changes that couples practice after CVCT, namely decreases in self-reported unprotected sex with the study partner, self-reported sex with outside partners, sperm on a vaginal swab wet prep, and incident STIs.⁴³ Furthermore, regarding issues with contraceptive method education and concerns, we have shown that a video-based intervention providing information to couples on contraceptive methods can significantly increase contraceptive method uptake and decrease unintended pregnancy incidence among contraceptive experienced women.^{7,44} However, over time, method discontinuation and switching^{13,34} confirm the need not only for strong promotion but also support with method adherence and side effect management.

The importance of targeting couples to promote dual method use not only for family planning counseling but also importantly for facilitated HIV serostatus disclosure cannot be understated. In a cross-sectional study of 658 HIV+ women in Nigeria, the nondual method use was significantly associated with nondisclosure of HIV status with sexual partners.³² Similarly, a study in Botswana showed that discussing HIV and contraception with one's sexual partner was associated with dual method use,⁴⁵ a nationally representative sample of young women in South Africa showed that strong communication about condoms and modern contraception with one's sexual partner was associated with dual method use,³⁰ and a study of HIV+ adults in 18 HIV clinics in Kenya, Namibia, and Tanzania also showed that condom and contraception communication were associated with dual method use.⁴⁶ Although we did not specifically measure couple-level communication factors in our study, the CVCT model with integrated family planning counseling provides couples with the tools to facilitate such critical conversations.⁴⁷

A systematic review of the effectiveness of family planning counseling interventions for HIV+ African women (1990–2011) provides an overview of intervention impact on contraceptive uptake and pregnancy incidence and echoes our conclusion that CVCT and couples' family planning counseling should be integrated. This review concluded that successful interventions were focused on integrated family planning counseling and HIV prevention services with a focus on identifying fertility intentions and increasing contraceptive knowledge.⁴⁸ Family planning and HIV prevention programs should integrate counseling on dual method use, and combining condoms for HIV/STI prevention with a long-acting contraceptive for added protection against unintended pregnancy warrants repetition.^{19,49}

Limitations to our study include the potential for misclassification of the outcomes. Such misclassification is more of a concern with measures of unprotected sex and OCP use, compared with injectable contraceptives, implants, and IUD, which were administered/inserted at the research clinic. However, we would not expect such misclassification to be differential by the covariates of interest, and we used multiple measures of unprotected sex (self-report and biological) to mitigate possible misclassification. Self-selection into the cohort likely creates a bias for more health-motivated couples, possibly with more stable long-term relationships, and therefore limits generalizability. From the data, we cannot discern whether women are exclusively breastfeeding during postpartum intervals in the 3 months between study visits; although exclusive breastfeeding can be effective at pre-

venting pregnancy, this method should not be relied on to prevent pregnancy as the ability to exclusively breastfeed may change.

Conclusions

These results highlight the risk profile of Zambian discordant couples who may require dual contraceptive method promotion. Importantly, these are well-counseled couples who receive family planning and condom use counseling, as well as access to contraception, at regular intervals. Our study participants know their joint HIV status and serodiscordancy compared with other settings where testing and disclosure of status are not common. Thus, this study represents a near-ideal world among couples and highlights persistent gaps in consistent condom and family planning uptake. As ART services are expanded and more serodiscordant couples are becoming virally suppressed, prevention of HIV transmission within discordant couples and safe conception strategies will increasingly rely on ART. However, given that many ART-eligible Africans are still not accessing treatment⁵⁰ and ART adherence in Zambia remains imperfect,^{51,52} it remains important to promote low-cost prevention options in cases where virologic suppression for the positive partner is not achieved. Our results highlight the need for counseling to prevent unintended pregnancy and HIV transmission and enable safer conception. This can best be achieved by integrating CVCT with couples' family planning services.

Acknowledgments

This study was supported by the National Institute of Child Health and Development (NICHD R01 HD40125); National Institute of Mental Health (NIMH R01 66767); the AIDS International Training and Research Program Fogarty International Center (D43 TW001042); the Emory Center for AIDS Research (P30 AI050409); National Institute of Allergy and Infectious Diseases (NIAID R01 AI51231; NIAID R01 AI040951; NIAID R01 AI023980; NIAID R01 AI64060; NIAID R37 AI51231); the US Centers for Disease Control and Prevention (5U2GPS000758); and the International AIDS Vaccine Initiative. This study was made possible by the generous support of the American people through the US Agency for International Development (USAID). The contents do not necessarily reflect the views of USAID or the US Government. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Author Disclosure Statement

No competing financial interests exist.

References

1. PEPFAR. Prevention of mother-to-child transmission of HIV: Expert panel report and recommendations to the U.S. congress and U.S. global AIDS coordinator 2010. Available at: www.pepfar.gov/documents/organization/135465.pdf Accessed September 1, 2016.
2. Cates W, Jr., Steiner MJ. Dual protection against unintended pregnancy and sexually transmitted infections: What is the best contraceptive approach? *Sex Transm Dis* 2002;29:168–174.

3. Woodson C, Koo HP. Two good reasons: Women's and men's perspectives on dual contraceptive use. *Soc Sci Med* 1999;49:567–580.
4. Berer M. *Dual protection: Making sex safer for women*. London: Reproductive Health Matters, 1997.
5. Raifman J, Chetty T, Tanser F, et al. Preventing unintended pregnancy and HIV transmission: Effects of the HIV treatment cascade on contraceptive use and choice in rural KwaZulu-Natal. *J Acquir Immune Defic Syndr* (1999) 2014;67 Suppl 4:S218–S227.
6. Polis CB, Bradley SE, Bankole A, Onda T, Croft T, Singh S. Typical-use contraceptive failure rates in 43 countries with Demographic and Health Survey data: Summary of a detailed report. *Contraception* 2016;94:11–17.
7. Wall KM, Haddad L, Vwalika B, et al. Unintended pregnancy among HIV positive couples receiving integrated HIV counseling, testing, and family planning services in Zambia. *PLoS One* 2013;8:e75353.
8. Nakayiwa S, Abang B, Packer L, et al. Desire for children and pregnancy risk behavior among HIV-infected men and women in Uganda. *AIDS Behav* 2006;10(4 Suppl):S95–S104.
9. Myer L, Morroni C, Rebe K. Prevalence and determinants of fertility intentions of HIV-infected women and men receiving antiretroviral therapy in South Africa. *AIDS Patient Care STDs* 2007;21:278–285.
10. Beyeza-Kashesya J, Ekstrom AM, Kaharuzza F, Mirembe F, Neema S, Kulane A. My partner wants a child: A cross-sectional study of the determinants of the desire for children among mutually disclosed sero-discordant couples receiving care in Uganda. *BMC Public Health* 2010;10:247.
11. World Health Organization. *Medical eligibility criteria for contraceptive use*, 5th ed. Geneva, Switzerland: WHO Press, 2015.
12. Wall KM, Kilembe W, Vwalika B, et al. Sustained effect of couples' HIV counselling and testing on reducing unprotected sex among HIV serodiscordant couples Paper presented at: *AIDS* 2016; Durban, South Africa.
13. Haddad L, Wall KM, Vwalika B, et al. Contraceptive discontinuation and switching among couples receiving integrated HIV and family planning services in Lusaka, Zambia. *AIDS* 2013;27 Suppl 1:S93–S103.
14. 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 Sep 6;2(5). pii: e001171.
15. Mark KE, Meinzen-Derr J, Stephenson R, et al. Contraception among HIV concordant and discordant couples in Zambia: A randomized controlled trial. *J Women's Health (Larchmt)* 2007;16:1200–1210.
16. Kempf MC, Allen S, Zulu I, et al. Enrollment and retention of HIV discordant couples in Lusaka, Zambia. *J Acquir Immune Defic Syndr* (1999) 2008;47:116–125.
17. 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;14:18.
18. Dunkle KL, Greenberg L, Lanterman A, Stephenson R, Allen S. Source of new infections in generalised HIV epidemics—Authors' reply. *Lancet* 2008;372:1300–1301.
19. Grabbe K, Stephenson R, Vwalika B, et al. Knowledge, use, and concerns about contraceptive methods among sero-discordant couples in Rwanda and Zambia. *J Women's Health (Larchmt)* 2009;18:1449–1456.
20. Church K, Wringe A, Fakudze P, et al. Reliance on condoms for contraceptive protection among HIV care and treatment clients: A mixed methods study on contraceptive choice and motivation within a generalised epidemic. *Sex Transm Infect* 2014;90:394–400.
21. Wall KM, Kilembe W, Vwalika B, et al. Hormonal contraception does not increase women's HIV acquisition risk in Zambian discordant couples, 1994–2012. *Contraception* 2015;91:480–487.
22. Wall KM, Kilembe W, Vwalika B, et al. Hormonal contraceptive use among HIV-positive women and HIV transmission risk to male partners, Zambia, 1994–2012. *J Infect Dis* 2016;214:1063–1071.
23. Seutlwadi L, Peltzer K. The use of dual or two methods for pregnancy and HIV prevention amongst 18–24-year-olds in a cross-sectional study conducted in South Africa. *Contraception* 2013;87:782–789.
24. Parker L, Pettifor A, Maman S, Sibeko J, MacPhail C. Concerns about partner infidelity are a barrier to adoption of HIV-prevention strategies among young South African couples. *Cult Health Sex* 2014;16:792–805.
25. Harrington EK, Dworkin S, Withers M, Onono M, Kwena Z, Newmann SJ. Gendered power dynamics and women's negotiation of family planning in a high HIV prevalence setting: A qualitative study of couples in western Kenya. *Cult Health Sex* 2016;18:453–469.
26. MacPhail C, Terris-Prestholt F, Kumaranayake L, Ngoako P, Watts C, Rees H. Managing men: Women's dilemmas about overt and covert use of barrier methods for HIV prevention. *Cult Health Sex* 2009;11:485–497.
27. Morroni C, Myer L, Mlobeli R, Gutin S, Grimsrud A. Dual protection among South African women and men: Perspectives from HIV care, family planning and sexually transmitted infection services 2007. Available at: http://pdf.usaid.gov/pdf_docs/PNADT165.pdf Accessed September 2, 2016.
28. UNFPA. *Recommendations on Integration of Reproductive Health & HIV/AIDS* 2004. Available at: www.appg-popdevrh.org.uk/Publications/Linking_SexRH_and_HI-VAIDS_Hearings/Presentations/PDF/1_UNFPA_Hearings_Briefing.pdf Accessed September 2, 2016.
29. Yam EA, Mnisi Z, Mabuza X, et al. Use of dual protection among female sex workers in Swaziland. *Int Perspect Sex Reprod Health* 2013;39:69–78.
30. MacPhail C, Pettifor A, Pascoe S, Rees H. Predictors of dual method use for pregnancy and HIV prevention among adolescent South African women. *Contraception* 2007;75:383–389.
31. Chibwasha CJ, Li MS, Matoba CK, et al. Modern contraceptive and dual method use among HIV-infected women in Lusaka, Zambia. *Infect Dis Obstet Gynecol* 2011;2011:261453.
32. Lawani LO, Onyebuchi AK, Iyoke CA. Dual method use for protection of pregnancy and disease prevention among HIV-infected women in South East Nigeria. *BMC Women's Health* 2014;14:39.
33. Fladseth K, Gafos M, Newell ML, McGrath N. The impact of gender norms on condom use among HIV-positive adults in KwaZulu-Natal, South Africa. *PLoS One* 2015;10:e0122671.
34. Wall KM, Vwalika B, Haddad L, et al. Impact of long-term contraceptive promotion on incident pregnancy: A randomized controlled trial among HIV-positive couples in Lusaka, Zambia. *J Acquir Immune Defic Syndr* (1999) 2013;63:86–95.
35. Marlow HM, Maman S, Moodley D, Curtis S, McNaughton Reyes L. HIV status and postpartum contraceptive use in an

- antenatal population in Durban, South Africa. *Contraception* 2015;91:39–43.
36. Maughan-Brown B, Godlonton S, Thornton R, Venkataramani AS. What do people actually learn from public health campaigns? Incorrect inferences about male circumcision and female HIV infection risk among men and women in Malawi. *AIDS Behav* 2015;19:1170–1177.
 37. Layer EH, Beckham SW, Mgeni L, Shembilu C, Momburi RB, Kennedy CE. “After my husband’s circumcision, I know that I am safe from diseases”: Women’s attitudes and risk perceptions towards male circumcision in Iringa, Tanzania. *PLoS One* 2013;8:e74391.
 38. Agot KE, Kiarie JN, Nguyen HQ, Odhiambo JO, Onyango TM, Weiss NS. Male circumcision in Siaya and Bondo Districts, Kenya: Prospective cohort study to assess behavioral disinhibition following circumcision. *J Acquir Immune Defic Syndr (1999)* 2007;44:66–70.
 39. Kibira SP, Nansubuga E, Tumwesigye NM, Atuyambe LM, Makumbi F. Differences in risky sexual behaviors and HIV prevalence of circumcised and uncircumcised men in Uganda: Evidence from a 2011 cross-sectional national survey. *Reprod Health* 2014;11:25.
 40. Kibira SP, Sandoy IF, Daniel M, Atuyambe LM, Makumbi FE. A comparison of sexual risk behaviours and HIV seroprevalence among circumcised and uncircumcised men before and after implementation of the safe male circumcision programme in Uganda. *BMC Public Health* 2016;16:7.
 41. Ciaranello AL, Matthews LT. Safer conception strategies for HIV-serodiscordant couples: How safe is safe enough? *J Infect Dis* 2015;212:1525–1528.
 42. Khu NH, Vwalika B, Karita E, et al. Fertility goal-based counseling increases contraceptive implant and IUD use in HIV-discordant couples in Rwanda and Zambia. *Contraception* 2013;88:74–82.
 43. Wall KM, Kilembe W, Vwalika B, et al. Sustained effect of couples’ HIV counselling and testing on risk reduction among Zambian HIV serodiscordant couples. *Sex Transm Infect* 2017;93:259–266.
 44. Stephenson R, Vwalika B, Greenberg L, et al. A randomized controlled trial to promote long-term contraceptive use among HIV-serodiscordant and concordant positive couples in Zambia. *J Women’s Health (Larchmt)* 2011;20:567–574.
 45. Kraft JM, Galavotti C, Carter M, et al. Use of dual protection in Botswana. *Stud Fam Plann* 2009;40:319–328.
 46. Antelman G, Medley A, Mbatia R, et al. Pregnancy desire and dual method contraceptive use among people living with HIV attending clinical care in Kenya, Namibia and Tanzania. *J Fam Plann Reprod Health Care* 2015;41:e1.
 47. Hageman KM, Karita E, Kayitenkore K, et al. What the better half is thinking: A comparison of men’s and women’s responses and agreement between spouses regarding reported sexual and reproductive behaviors in Rwanda. *Psychol Res Behav Manage* 2009;2:47–58.
 48. O’Reilly KR, Kennedy CE, Fonner VA, Sweat MD. Family planning counseling for women living with HIV: A systematic review of the evidence of effectiveness on contraceptive uptake and pregnancy incidence, 1990 to 2011. *BMC Public Health* 2013;13:935.
 49. World Health Organization. Exploring common ground: Building a better understanding and a closer alliance between family planning and STI/HIV prevention activities. 1999. <https://core.ac.uk/download/pdf/23798004.pdf> Accessed September 8, 2016.
 50. UNAIDS. Treatment 2015. 2012. Available at: www.unaids.org/sites/default/files/media_asset/JC2484_treatment-2015_en_1.pdf Accessed April 20, 2016.
 51. Scott CA, Iyer HS, McCoy K, et al. Retention in care, resource utilization, and costs for adults receiving antiretroviral therapy in Zambia: A retrospective cohort study. *BMC Public Health* 2014;14:296.
 52. Czaicki NL, Holmes CB, Sikazwe I, et al. Nonadherence to antiretroviral therapy among HIV-infected patients in Zambia is concentrated among a minority of patients and is highly variable across clinics. *AIDS* 2017;31:689–696.

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