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Positive deviance for promoting dual-method contraceptive use among women in Uganda: A cluster randomized controlled trial

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Title: Positive deviance for promoting dual-method contraceptive use among women in Uganda: A cluster randomized controlled trial

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Abstract

Objectives To examine the effects of a positive deviance intervention on dual-method contraceptive use among married or in-union women.

Design Open-label cluster randomized controlled trial.

Setting 20 health facilities in Mbarara District, Uganda.

Participants 960 married or in-union women aged 18–49 years who used highly effective contraceptives. Among them, 734 (76.5%), 787 (82.0%), 779 (81.2%), and 790 (82.3%) completed the two-, four-, six-, and eight-month follow-up surveys, respectively.

Interventions A combination of clinic- and telephone-based counseling and a one-day participatory workshop, which were developed based on a preliminary qualitative study of women practicing dual-method contraception in the study area.

Primary and secondary outcome measures The primary outcome was dual-method contraceptive use which was measured in two timeframes: dual-method contraceptive use at the last sexual intercourse and its consistent use in the two months prior to each follow-up. The secondary outcomes were communication with partners about HIV/STI risk and pregnancy incidence.

Results More women in the intervention group used dual-method contraception at the last sexual intercourse at two months (AOR = 4.29; 95% CI 2.12–8.69) and eight months (AOR = 2.19; 95% CI 1.07–4.48) than in the control group. Moreover, consistent dual-method contraceptive use was more prevalent in the intervention group than in the control group at two months (AOR = 13.71; 95% CI 3.59–52.43), and the intervention effect lasted throughout the follow-up period.

Conclusions The positive deviance intervention increased dual-method contraceptive use among women in Mbarara District, Uganda, and could be effective at reducing the dual risk of unintended pregnancies and HIV infections.

Trial registration UMIN-CTR Clinical Trial, UMIN000037065.

Word count (abstract): 264

Strengths and limitations of this study

- The outcomes were measured based on participants' self-reports and therefore subject to measurement errors.
- Due to the small number of clusters, several characteristics of the participants were not balanced between the intervention and control groups.
- However, mixed-effects logistic regression analysis was performed by controlling the cluster effects and the differences in baseline characteristics to evaluate the intervention's effects.
- This intervention was developed using the positive deviance approach which aims to promote behaviors of individuals who have achieved rare success to other community members.
- Women who used dual-method contraception in the study area contributed the intervention's development and implementation as peer counselors.

Word count (Strengths and limitations of this study): 107

Introduction

Unintended pregnancy and human immunodeficiency virus (HIV) infection remain major public health concerns in sub-Saharan Africa (SSA). In SSA, almost 30% of pregnancies were unintended, whereas women accounted for 59% of an estimated 980,000 new HIV infections that occurred among adults in 2018.[1,2] Sexual intercourse is a major route of HIV transmission, and a significant gender disparity in HIV infection begins when women reach

reproductive age.[3] In SSA, therefore, women of reproductive age bear the dual burden of unintended pregnancies and HIV.

Dual-method contraceptive use has been proposed as an effective strategy for preventing unintended pregnancies and sexually transmitted infections (STIs), including HIV.[4] It is defined as the use of a highly effective contraceptive (HEC) (e.g., injectables, implants, and oral contraceptive pills, intrauterine devices, and sterilization) in combination with a barrier method, such as male or female condoms.[4] Despite the high incidence rate of HIV, it is not commonly practiced in SSA, especially among women in long-term relationships.[4,5] For instance, only 3.8% of married women in Zimbabwe used dual-method contraception with their partners.[5] Furthermore, women in stable relationships tend to prioritize HECs over condoms and are less likely to use condoms with HECs.[6–8] Although the majority of women understand that condom use is critical for preventing HIV/STIs, they do not practice it.[9] Marital sexual intercourse, therefore, becomes one of the major routes of HIV infection because of inconsistent or no condom use in SSA.[10]

Several studies examined interventions for promoting dual-method contraceptive use.[4] However, few showed a significant effect on the dual-method use, and their impact was often unsustainable.[11] To our knowledge, the only intervention that demonstrated a continued effect on the dual-method use over six months was a combination of case management and peer leadership programs among adolescents in the United States of America (USA).[12] In SSA, conditional lottery incentives increased dual-method use among South African women at three months but not at six months after the intervention.[13] Effectiveness of behavioral change interventions on the dual-method use among married or in-union women remains lacking.

The positive deviance approach is based on the premise that there are community members who solve problems while many of their peers do not.[14] This approach seeks unique behaviors of such exceptional people (positive deviants or PDs) and disseminates these behaviors to the whole community through community-led and peer-based interventions.[14,15] We previously conducted a qualitative study to examine the unique behaviors of PDs (i.e., women using dual-method with marital or in-union partners) in Mbarara District, Uganda.[16] These PDs successfully practiced dual-method contraception by initiating discussions, educating their partners on sexual risks and condom use, and obtaining condoms.[16] In this study, we examined the effectiveness of an intervention developed based on those findings to promote dual-method contraceptive use among women in the same area.

Methods

Study design and settings

A cluster randomized controlled trial was conducted for eight months (November 2019 to July 2020) in Mbarara District in Southwestern Uganda. The protocol of the trial has been previously published.[17] The prevalence of HIV is geographically diverse in Uganda, and the Southwestern region has one of the highest prevalence rates of HIV at 7.9% among adults. This rate is higher among women (9.3%) than men (6.3%).[18] An estimated 32% and 2% of married or in-union women use HECs and condoms, respectively.[19] All public health facilities provide HECs and male condoms free of charge. Male condoms are also available for purchase at pharmacies and markets for 0.15 to 0.50 United States dollars (USD).[16]

Study participants and enrollment

Twenty public health facilities were selected out of 48 in Mbarara District. To recruit a sufficient number of participants, all health facilities at the sub-county level or above were selected followed by health facilities at the parish level, which had a high number of outpatients. These facilities included one general hospital, three county-level health centers, 11 sub-county-level health centers, and five parish-level health centers. Among them, seven facilities were located in urban areas.[20]

The inclusion criteria were women (i) aged 18 to 49 years, (ii) having had sexual intercourse in the last three months, (iii) using HECs, and who (iv) desire to avoid pregnancy for 12 months from recruitment, (v) have a husband or live-in sexual partner, and (vi) have access to a valid phone number. The exclusion criteria were women who were (i) pregnant, (ii) infertile for other reasons, and (iii) had been using condoms consistently with an HEC in the last two months before the recruitment. The sample size of 960 was calculated based on the effect size of 2.43 reported in a dual-method intervention trial in the USA, considering an intraclass correlation coefficient of 0.006 and a 26% dropout rate.[11,12,21] The power of the study was set at 80%, and the significance level was set at 5%.

Female research assistants recruited women who visited the family planning sections of the selected health facilities. They approached every third woman after selecting the first woman purposively to inform the opportunity to participate in the study. If a woman was interested, they confirmed HEC use with her family planning client record card and asked questions to verify eligibility. The process was repeated until the required sample size was reached.

Randomization and masking

The 20 health facilities were stratified based on their level and urban or rural status. They were then randomized to either intervention or control group with a 1:1 allocation ratio. An

independent researcher who was not involved in the data collection or analysis carried out the allocation using computer-generated random sequences. Blinding was not feasible in this study. However, the research assistants who performed the outcome assessment were blinded to the intervention allocation.

Intervention

The intervention was developed based on the results of the preliminary study of nine PDs conducted in Mbarara District, Uganda in October 2019. [16] The PDs were identified by screening 150 women using HECs at five health facilities. Then, in-depth interviews were conducted with the PDs. Thematic analysis was performed using the positive deviance framework to identify the unique behaviors associated with dual-method contraceptive use. The findings of the study have been published.[16]

Out of the nine PDs, four joined the intervention as peer counselors, whereas the other five were unable to participate due to other commitments. The four PDs demonstrated dual-method contraceptive use at least two months before the screening. The mean age of the four PDs was 29.8 years (standard deviation [SD] 6.0 years). The researchers (HK and SM) initially developed the intervention based on the preliminary findings. The PDs were then invited to four meetings. In the first meeting, female research assistants explained the positive deviance approach and facilitated a discussion among the PDs to share their experience on how they started dual-method contraceptive use. In the following meetings with the PDs, they facilitated discussions on how to promote dual-method contraceptive use and necessary improvements to the intervention. Several recommendations from the PDs were incorporated into the intervention, such as providing a handout to enable women to share topics learned with their partners and effective communication skills, which were practiced through role-play.

Table 1 summarizes the intervention, which combined clinic- and phone-based counseling and a participatory workshop, to disseminate the unique practices of the PDs.[16] After the baseline interview on the day of enrollment, women received counseling focusing on dual-method contraception in addition to regular family planning counseling. Trained research assistants delivered the counseling for about 20 to 30 minutes. Women received the handout used during the counseling developed either in English or Runyankore and were encouraged to initiate discussions on dual-method contraceptive use with their partners. The handout included several quotes from the PDs.

After two weeks of enrollment, women were invited for a one-day participatory learning workshop at the same health facility where they were recruited. Participation in the workshop was voluntary. The four PDs facilitated the workshop with support from the research assistants. It included role-play exercises to enable women to acquire successful communication skills for discussions with their partners, practice of male condom use, and group discussions about the dual risk of unintended pregnancies and HIV/STIs from their partners.

In addition, women in the intervention group received a bimonthly telephone counseling call from the PDs three times (i.e., three, five, and seven months after enrollment). It aimed to confirm women's dual-method status and challenges, provide reminders regarding the risk of unintended pregnancies and HIV/STIs, and strengthen their capacity to communicate with their partners. In addition, the call included brief health education messages on family planning and HIV/STI based on an existing tool.[22] Each PD provided the same women with counseling each time to build rapport and ensure effective counseling. Each counseling lasted for 15 to 30 minutes. The PDs kept written counseling records and held a group meeting after

each counseling period to reflect on the women's problems and advice given. The research assistants facilitated those meetings and answered questions from the PDs.

Women in the control group received family planning counseling, including dual-method contraceptive use, from female research assistants for 10 to 20 minutes, using the existing tool on the day of enrollment.[22] However, this group of women did not receive the handout. Furthermore, the research assistants provided bimonthly health education three times (i.e., three, five, and seven months after enrollment) by phone. The topics were the same as those for the intervention group. Each call lasted for about ten minutes.

Condoms were provided for free, regardless of the allocation at the selected health facilities. Before providing the intervention, the research assistants received a two-day training on the contents of the existing counseling tool. In addition, the four PDs received a one-day training on counseling and ethics, including the confidentiality of their clients. The PDs joined the intervention as volunteers but received 30,000 Ugandan Shillings (UGX) (equivalent to 9 USD) per day when they engaged in the workshop and the counseling to compensate for their time and transportation.

<Insert Table 1 here>

Outcomes

The primary outcome was dual-method contraceptive use, which was defined as the application of a male or female condom along with an HEC, such as injectables, implants, intrauterine devices, pills, and female sterilization.[4] It was measured in two timeframes: dual-method contraceptive use at the last sexual intercourse and its consistent use in the last two months before each follow-up. The former is easier for women to answer accurately than the latter, which requires to estimate the frequency of condom use in the past.[23] Nevertheless,

consistent dual-method contraceptive use is critical, given that condoms are often used inconsistently.[23] Two questions regarding HEC use and the frequency of condom use were combined to measure consistent dual-method contraceptive use. The following question was posed for HEC use: "Apart from condoms, have you been using any other forms of protection against pregnancy during the past two months?" The frequency of condom use was asked with an item: "How often did you and your partner use a male or female condom during the past two months?" Women answered this question using a four-point scale "every time," "almost every time," "sometimes," and "never." Women using an HEC and a condom every time were considered practicing consistent dual-method contraceptive use.

The secondary outcome was communication about HIV/STI risk with partners in the last two months prior to each follow-up. This outcome was assessed using the following item: "Have you ever discussed HIV/STI risk with your husband/live-in sexual partner in the past two months?" Another secondary outcome was the self-reported incidence of pregnancy in the two months before each follow-up regardless of whether the pregnancy was intended or not. This outcome was assessed using the following questions: "Have you been told by a healthcare provider that you got pregnant for the first time in the past two months?"

In addition, the following information was collected at baseline: age, education, religion, employment, wealth index based on the availability of 18 household assets, number of children, respondent's and partner's pregnancy intention, history of unintended pregnancy, multiple sex partnership, type of HECs in use, respondent's and partner's HIV status, risk perception of HIV/STIs, HIV-related knowledge (HIV-KQ-18),[24] condom use self-efficacy,[25] and sexual relationship control power (the Sexual Relationship Power Scale).[26] Several changes were made to the outcomes after the trial commenced. An outcome for STI incidence was omitted because we found that the reliability of self-reported STI incidence could be low

among the participants during the data collection. Instead, the more measurable outcome of HIV/STI risk communication was added as a possible predictor of dual-method contraceptive use.

Data collection

All research assistants received a two-day training on data collection and ethics before the baseline data collection. After enrollment, the research assistants interviewed women to identify their baseline characteristics using a pre-tested structured questionnaire. Each interview lasted approximately 30 to 45 minutes.

For outcome assessment, three female research assistants carried out follow-up phone calls bimonthly for eight months to assess the influence of the intervention on the primary and secondary outcomes (i.e., two, four, six, and eight months after enrollment). The participants received a text message reminding them to answer the next call or call back if they missed the first call. The assistants called each participant up to five times during each follow-up until they answered. The participants received incentives worth 20,000 UGX (equivalent to 6 USD) for their time after the baseline interview.

Data analysis

Chi-squared tests and independent sample t-tests were performed to compare the general characteristics between the intervention and control groups at baseline and follow-up. Mixed-effects logistic regression analysis was performed to assess the effects of the intervention on the primary and secondary outcomes. Unadjusted odds ratios (ORs) were first estimated by comparing between the control and intervention groups (Model 1). Then, in the main model (Model 2), the intervention effects were presented with adjusted odds ratios (AORs) for the interaction term (group × time) after controlling for cluster effects for all health facilities and

the individuals. The AORs can be interpreted as the difference between the intervention and control groups in the outcome measures between baseline and each follow-up point. In the full model (Model 3), sociodemographic characteristics at baseline were controlled for in addition to the variables included in Model 2. For sensitivity analyses, attrition rates and reasons for dropout were compared between the intervention and control groups using Pearson's chi-squared test. Moreover, differences in baseline characteristics were compared between women lost to follow-up and those who were reached. Analyses were conducted on an intention-to-treat basis. Significance level was set at 5%. STATA version 14 was used for data analyses.

Ethics

Participation in this study was voluntary, and the participants provided written informed consent. The protocol was registered at UMIN-CTR Clinical Trial under identifier number UMIN000037065. The Consolidated Standards of Reporting Trials (CONSORT) checklist is available as Supplementary Table S1.

Patient and public involvement

The nine PDs were identified from the public, and four of them were involved in the design and conduct of the intervention as peer counselors. Moreover, the female research assistants were recruited from the study area and contributed to the intervention's development and implementation. The findings of this study have been shared with them and Mbarara District health authority.

Results

Participant characteristics

Out of 1,956 women screened, 960 were eligible for the trial and allocated to the intervention or control group (Figure 1). Of 480 women in the intervention group, 345 (71.9%) attended the one-day workshop. Moreover, 385 (80.2%), 361 (75.2%), and 369 (76.9%) received counseling at three, five, and eight months after enrollment, respectively. The response rate to follow-up surveys ranged from 76.5% at two months to 82.3% at eight months. Women in the intervention group were more likely to respond at two months (79.8% vs. 73.1%, p = 0.015) and four months (84.6% vs. 79.4%, p = 0.036). The baseline characteristics were compared between women followed up and those lost to follow-up in each group. Supplementary Table 2 presents the results of the sensitivity analysis.

<Insert Figure 1 here>

Table 2 presents the sociodemographic characteristics of 960 women at baseline. The mean age was 30.1 (SD 6.7) years. The mean number of children was three (SD 1.8). Of 960 women, more than 70% completed primary education. Of all, 9% were HIV-positive, 7.6% had an HIV-positive partner, and 84.5% perceived a certain level of risk for HIV/STIs. Injectables were the most common family planning method, used by more than half of women (51.9%), followed by implants (31.6%). Characteristics were similar for the intervention and control groups with a few slight imbalances. Specifically, women in the control group were more likely to have primary or higher education (75.6% vs. 69.8%; p = 0.042), be categorized into the rich quintile (37.7% vs. 28.3%; p = 0.008), and have fewer children (mean: 2.9 vs. 3.2; p = 0.041) and less HIV-related knowledge (mean: 11.3 vs. 11.9; p < 0.001).

<Insert Table 2 here>

Effect of the intervention

Table 3 demonstrates the outcome data by intervention group and time. More women in the intervention than in the control group used dual-method contraception at the last sexual intercourse and consistently at each follow-up point. These differences were largest at two months (dual-method contraceptive use at last sexual intercourse: 42.6% vs. 13.8%; $p < 0.001$; consistent dual-method contraceptive use: 15.5% vs. 1.5%; $p < 0.001$). The proportion of women practicing dual-method contraception in both time frames gradually decreased over time. More women discussed HIV/STI risk with their partners in the intervention than in the control group at each follow-up. The difference was also largest at the first follow-up (83.5% vs. 64.9%; $p < 0.001$). However, pregnancy incidence was not significantly different between the groups. Throughout the data collection period, 6 and 15 women became pregnant in the intervention and control groups, respectively. Notably, the result of the chi-squared test of the accumulated cases of pregnancies in eight months illustrated a significantly lower pregnancy incidence in the intervention group ($p = 0.047$).

<Insert Table 3 here>

Table 4 illustrates the effects of the intervention on primary and secondary outcomes among women at two, four, six, and eight months after enrollment. In Model 2, more women in the intervention group reported dual-method contraceptive use at the last sexual intercourse than in the control group at two months (AOR = 4.29; 95% CI 2.12–8.69, $p < 0.001$). The intervention group also reported more dual-method contraceptive use at the last sexual intercourse at four, six, and eight months, although the difference was statistically significant only at eight months. Moreover, more women in the intervention group practiced consistent dual-method contraceptive use than in the control group at two months (AOR = 13.71; 95% CI 3.59–52.43, $p < 0.001$). The intervention effect remained statistically significant at four, six, and eight months. Moreover, more women in the intervention group reported

communication with their partners regarding HIV/STI risk at two months (AOR = 2.70; 95% CI: 1.72–4.23, p < 0.001). The effect of intervention lasted throughout the follow-up period. However, pregnancy incidence was not significantly different between the groups throughout the follow-up period. The full model (Model 3) demonstrated similar effects estimates to those reported in the main model. The complete results are provided in Supplementary Tables S3-S17.

<Insert Table 4 here>

Discussion

The positive deviance intervention was effective in promoting dual-method contraceptive use and communication about HIV/STI risk among women in long-term relationships in Mbarara District, Uganda, who used highly effective contraceptives. However, we observed no significant difference in the incidence of pregnancy between the intervention and control groups.

The positive deviance intervention increased the uptake and continued use of dual-method contraception among women. The study observed the largest difference in the dual-method use between the intervention and control groups at the two-month assessment, which was the closest time point to the baseline counseling and workshop. In the intervention group, 43% and 16% of women reported the dual-method use at the last sexual intercourse and its consistent use, respectively. The number of women using dual-method contraception decreased in the intervention and control groups over time, as observed in previous studies.[11] However, the significant difference between the groups remained during the follow-up period.

The observed effect was consistent with a previous intervention study that combined case management and peer education program for adolescent girls in the USA. The intervention illustrated continued effects on the dual-method use at 12 and 24 months after enrollment.[12] The peer leadership program aimed to foster prosocial interaction skills and supportive peer relationships among teenagers. The peer supporters were not PDs and provided with intensive standard training. Effective communication with partners on sexual health was one of the key topics covered in the sessions.[12] Similar to this, the current intervention provided bimonthly counseling tailored to the participants' individual needs. However, it was provided by the PDs who had overcome barriers to dual-method contraceptive use. Counseling by PDs may be an alternative strategy because it ensures adequate attention to the diverse issues confronting women and prosocial peer influence on their behaviors.

Few intervention studies have demonstrated an increase in dual-method contraceptive use,[12,13] and adherence to such practice was frequently low.[11] Condom use is often considered a male responsibility[27] and unacceptable in long-term relationships in SSA, especially when women use another contraceptive method. [8,10] The positive deviance intervention can be effective in changing such norms. The PDs who overcame the barriers to dual-method contraceptive use shared their experiences to help other women realize that condom use is normal even among marital or in-union relationships. In addition, the intervention enabled women to negotiate condom use with their partners. The positive deviance intervention could empower women with the skills necessary to play a proactive role in negotiation and condom use with their partners.

The intervention also increased communication about HIV/STI risk between the women and their partners. Although more than half of the women had not discussed such risk at baseline, four out of five women in the intervention group discussed HIV/STI risk at two months. The

intervention group was more likely to have such communication than the control group throughout the eight-month follow-up period. The increase in dual-method contraceptive use could have been underpinned by frequent communication with partners on HIV/STI risk.[28] Failure to practice dual-method contraception was not often due to women's inability, but their partner's unwillingness to use condoms.[11] Therefore, Peipert et al. underscored the importance of education for male partners for promoting dual-method contraception.[11] However, reaching out to male partners may be more difficult compared to providing education to women visiting family planning clinics. During the intervention, women received the handout used in the initial counseling and were encouraged to discuss HIV/STI risk with their partners. A qualitative study found that women were more likely to initiate discussion and persuade their male partners to use condoms in Uganda.[29] The majority of women in this study were willing to discuss such risk with their partners. Considering that women who use HECs visit health facilities presumably more often than men do, educating them on dual-method contraception and encouraging them to share messages with their partners can be an effective strategy.

Despite the increase in dual-method contraceptive use, no significant difference was observed in pregnancy occurrence between the intervention and control groups at each follow-up point. In this study, many women started the dual-method use but practiced it inconsistently. Inconsistent dual-method contraceptive use may explain the lack of effect on avoiding pregnancies.[30] It might also be explained by a lack of statistical power. Only 21 women (about 2% of the participants) became pregnant during the eight-month follow-up. The low incidence of pregnancy is reasonable because we recruited women using an HEC and who wanted to avoid pregnancy at baseline. However, the intervention group showed the lower incidence of pregnancy over time. Thus, a further trial with a larger sample size is recommended to examine the effect of the intervention on the incidence of pregnancy.

The study has several limitations. First, the study measured outcomes based on self-reports from the participants. Therefore, it is subject to measurement errors. Especially, dual-method contraceptive use could have been over-reported given the information provided to participants during the intervention. Women in the intervention group had longer contacts with the PDs, including the five-hour workshop, whereas those in the control group had only telephone-based contacts after the initial clinic-based counseling. Frequent contact in the intervention group may have resulted in the over-reporting of outcomes, which can lead to overestimating the intervention effect. Nevertheless, over-reporting of outcomes was minimized by assuring the participants of the confidentiality of their responses and conducting interviews by experienced female research assistants. Second, we collected data on pregnancy incidence during follow-up, but the rate was too low to use as a proxy for dual-method contraceptive use. Other clinical meaningful data, such as the incidence of STI, should be collected to evaluate interventions for dual-method contraceptive use in future research. Third, several characteristics of the participants were imbalanced between the intervention and control groups due to the relatively small number of clusters. However, random-effect model analysis was performed by controlling for cluster effects and differences in baseline characteristics to evaluate the effects of the intervention. Lastly, this intervention was developed based on the qualitative study of the PDs in Mbarara District and examined its effectiveness among women in the same area. Merely applying the intervention to other communities might not be effective, as communities' local solutions might differ.[31] Therefore, each community must participate in the process of determining its own solutions. Further research is recommended to assess the effectiveness of the positive deviance approach in a given context with careful attention to its process.

Conclusion

The positive deviance intervention increased dual-method contraceptive use among married or in-union women in Mbarara District, Uganda, by disseminating solutions that exist in the community. This approach could be a potential option to reduce the dual risk of unintended pregnancies and HIV infections among women.

Footnotes

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Contributors: HK and MJ conceived the study and contributed to funding acquisition. HK, AS, JK, KICO, and MJ contributed to the study design. HK conducted the literature review. HK, CM, and SM led the development of the data collection instrument, data collection, and quality assessment. HK and AS did the statistical analysis. All authors contributed to data interpretation. HK wrote the original draft. AS, JK, KICO, SM, CM, and MJ reviewed and revised the manuscript. All authors approved the final version for submission.

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Competing interests: None declared.

Patient and public involvement: Patients or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. Refer to the Methods section for further details.

Patient consent: Not required.

Ethics approval: The study was approved by the Research Ethics Committee of the Graduate School of Medicine, University of Tokyo (2019085NI), Institutional Research and Ethics Committee of Mbarara University of Science and Technology (IRB15/06-19), and Uganda National Council of Science and Technology (HS439ES).

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Table 1. Overview of intervention

Training setting	Duration	Topics covered
Clinic-based counseling	20–30 mins	1. Comparing family planning methods 2. HIV/STI risk 3. Ways to avoid HIV/STIs 4. Introduction and demonstration of male condoms 5. Effective communication with partners 6. Information about the workshop
One-day workshop at a health facility	5 hours	1. Introduction of family planning methods 2. Way to avoid unintended pregnancies 3. Introduction of HIV/STI risk 4. Way to avoid HIV/STIs 5. Group discussion 1: Let's consider your HIV/STI risk 6. Practice of condom use 7. Experience of four PDs 8. Role-play exercises: Effective communication with partners - How to initiate discussions about condom use - How to persuade partners - How to avoid conflicts 9. Group Dissuasion 2: Recapitulate takeaway messages - Why is dual-method contraception important? - What are barriers to using dual-method contraception, and how can you overcome them?
Bimonthly phone-based counseling	15–30 mins each	1. Brief health message: - Family planning methods (at 3 months) - Ways to avoid HIV/STIs (at 5 months) - General facts about HIV/STIs (at 7 months) 2. Counseling tailored to individual participants' situation and needs

PD: positive deviant

Table 2. Characteristics of women at baseline by intervention group (n = 960)

Variables	Intervention (n = 480)		Control (n = 480)		Total (n = 960)		
	n	%	n	%	n	%	p-value†
1) Sociodemographic characteristics							
Age in years, mean (SD)	30.4	(6.5)	29.8	(6.8)	30.1	(6.7)	0.126
Education							
Never	145	30.2	117	24.4	262	27.3	**0.042**
Primary and more	335	69.8	363	75.6	698	72.7	
Religion							
Christian	450	93.8	436	90.8	886	92.3	0.090
Muslim	30	6.3	44	9.2	74	7.7	
Wealth index							
Poor	176	36.7	158	32.9	334	34.8	**0.008**
Middle	168	35.0	141	29.4	309	32.2	
Rich	136	28.3	181	37.7	317	33.0	
No. of children, mean (SD)	3.2	(1.7)	2.9	(1.8)	3.0	(1.8)	**0.041**
Pregnancy intention							
No	100	20.8	96	20.0	196	20.4	0.822
Yes	342	71.3	341	71.0	683	71.2	
Don't know	38	7.9	43	9.0	81	8.4	
Partner's pregnancy intention							
No	69	14.4	68	14.2	137	14.3	0.776
Yes	322	67.1	331	69.0	653	68.0	
Don't know	89	18.5	81	16.9	170	17.7	
History of unintended pregnancy							
No	313	65.2	335	69.8	648	67.5	0.130
Yes	167	34.8	145	30.2	312	32.5	
Multiple sex partners							
No	452	94.2	456	95.0	908	94.6	0.568
Yes	28	5.8	24	5.0	52	5.4	
2) HIV-related characteristics							
HIV status							
Negative	438	91.3	436	90.8	874	91.0	0.821
Positive	42	8.8	44	9.2	86	9.0	
Partner's HIV status							
Negative	386	80.4	373	77.7	759	79.1	0.587
Positive	34	7.1	39	8.1	73	7.6	
Don't know	60	12.5	68	14.2	128	13.3	
Disclosure of HIV status							
No	21	4.4	19	4.0	40	4.2	0.747
Yes	459	95.6	461	96.0	920	95.8	
HIV/STI risk perception							
No risk at all	62	12.9	87	18.1	149	15.5	0.124
Small	177	36.9	178	37.1	355	37.0	
Moderate	136	28.3	124	25.8	260	27.1	
Great	105	21.9	91	19.0	196	20.4	
3) HEC use							
Type of HECs							
Injectables	252	52.5	246	51.3	498	51.9	0.599
Implants	155	32.3	148	30.8	303	31.6	
IUDs	43	9.0	54	11.3	97	10.1	
OCPs	27	5.6	31	6.5	9	6.0	
Female sterilization	3	0.6	1	0.2	4	0.4	
Partner's recognition of HEC use							
No	36	7.5	43	9.0	79	8.2	0.411
Yes	444	92.5	437	91.0	881	91.8	
Partner's attitude about HEC use							
Positive	432	90.0	439	91.7	871	90.8	0.229
Negative	36	7.5	35	7.3	71	7.4	
Don't know	12	2.5	5	1.0	17	1.8	
4) Other psychosocial characteristics							
HIV-related knowledge (HIV-KQ-18), mean (SD)	11.9	(2.6)	11.3	(3.0)	11.6	(2.8)	**<0.001**
Condom use self-efficacy scale, mean (SD)	22.3	(9.3)	22.1	(8.3)	22.2	(8.8)	0.682
Sexual Relationship Power Scale							
Low	173	36.0	152	31.7	325	33.9	0.352
Medium	168	35.0	182	37.9	350	36.5	
High	139	29.0	146	30.4	285	29.7	

SD: standard deviation; HEC: highly effective contraceptive; IUD: intrauterine device; OCP: oral contraceptive pill

† Based on chi-squared test for other categorical variables and t-test for continuous variables

536 **Table 3. Dual-method contraceptive use, communication about HIV/STI risk, pregnancy incidence by intervention group and time[a]**

Outcomes	Intervention		Control		Total		
	n	%	n	%	n	%	p-value[†]
Dual-method contraceptive use at last sexual intercourse							
Baseline	41	8.5	28	5.8	69	7.2	0.104
Month 2	157	42.6	46	13.8	203	28.9	**<0.001**
Month 4	110	27.9	55	15.4	165	21.9	**<0.001**
Month 6	91	23.3	40	10.7	131	17.2	**<0.001**
Month 8	82	20.9	33	8.7	115	14.9	**<0.001**
Consistent dual-method contraceptive use							
Baseline	-	-	-	-	-	-	-
Month 2	57	15.5	5	1.5	62	8.8	**<0.001**
Month 4	42	10.7	8	2.2	50	6.7	**<0.001**
Month 6	32	8.2	5	1.3	37	4.9	**<0.001**
Month 8	44	11.2	5	1.3	49	6.4	**<0.001**
Communication about HIV/STI risk							
Baseline	229	47.7	225	46.9	454	47.3	0.796
Month 2	308	83.5	216	64.9	524	74.6	**<0.001**
Month 4	348	88.3	289	80.7	637	84.7	**0.004**
Month 6	360	92.3	292	78.3	652	85.5	**<0.001**
Month 8	333	84.7	288	76.0	621	80.4	**0.002**
Pregnancy incidence							
Baseline	-	-	-	-	-	-	-
Month 2	2	0.5	4	1.1	6	0.8	0.353
Month 4	2	0.5	4	1.1	6	0.8	0.369
Month 6	0	0.0	2	0.5	2	0.3	0.152
Month 8	2	0.5	5	1.3	7	0.9	0.228

[a] Refer to Figure 2 for "n" at baseline and follow-up for each group
[†] Based on chi-squared test

Table 4. Effects of intervention on primary and secondary outcomes among women at 2, 4, 6, and 8 months after enrollment

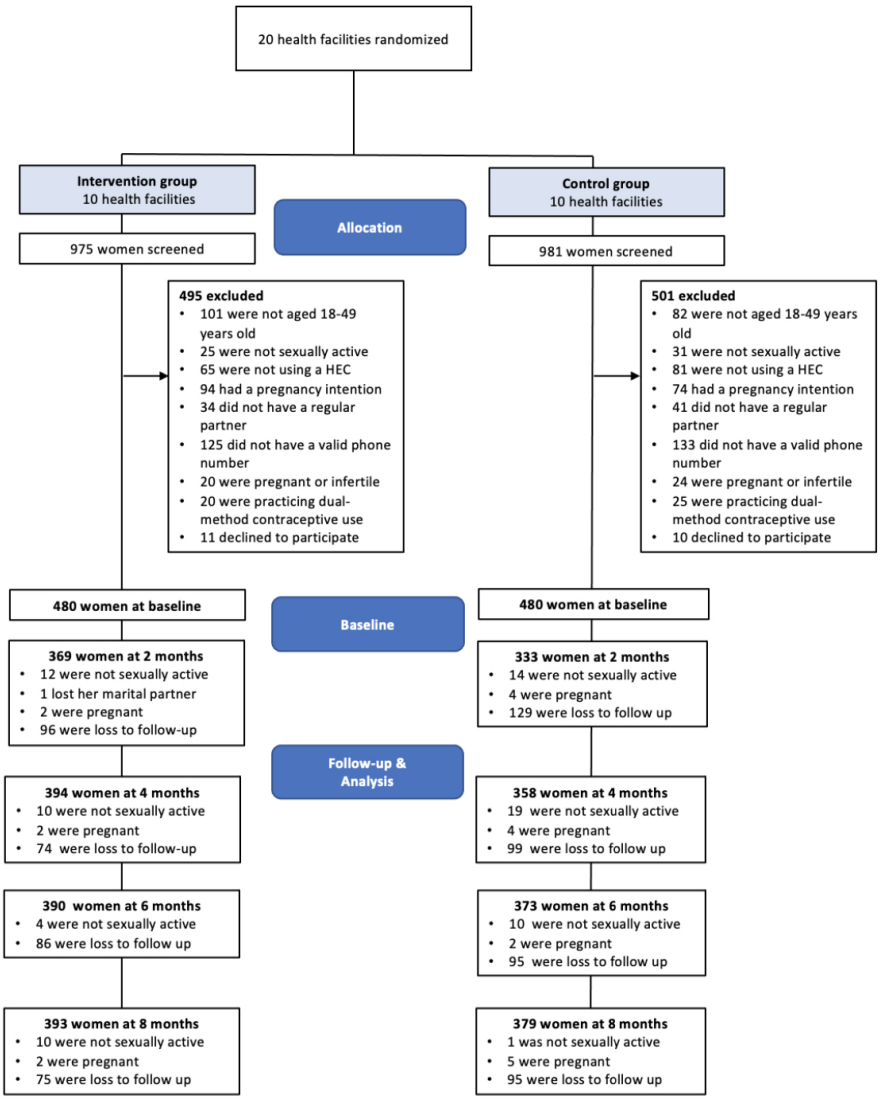
Variables	Month 2			Month 4			Month 6			Month 8		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
	OR (95% CI)	AOR[a] (95% CI)	AOR[b] (95% CI)	OR (95% CI)	AOR[a] (95% CI)	AOR[b] (95% CI)	OR (95% CI)	AOR[a] (95% CI)	AOR[b] (95% CI)	OR (95% CI)	AOR[a] (95% CI)	AOR[b] (95% CI)
Dual-method contraceptive use at last sexual intercourse	4.62***	4.29***	4.12***	2.13***	1.66	1.66	2.53***	2.04	2.03	2.76***	2.19*	2.16*
	(3.18-6.71)	(2.12-8.69)	(2.02-8.39)	(1.49-3.06)	(0.84-3.30)	(0.84-3.30)	(1.69-3.79)	(1.00-4.17)	(0.99-4.14)	(1.79-4.26)	(1.07-4.48)	(1.06-4.41)
Consistent dual-method contraceptive use	11.98***	13.71***	14.53***	5.22***	6.28**	6.30**	6.58***	7.80*	8.04*	9.43***	9.97**	10.72**
	(4.74-30.29)	(3.59-52.43)	(3.63-58.13)	(2.42-11.28)	(2.01-19.60)	(2.20-18.03)	(2.53-17.07)	(1.22-49.73)	(1.17-55.08)	(3.70-24.06)	(2.11-47.15)	(2.03-56.64)
Communication about HIV/STI risk	2.73***	2.70***	2.70***	1.81**	1.76*	1.76*	3.33***	3.23***	3.35***	1.75**	1.75*	1.80*
	(1.92-3.90)	(1.72-4.23)	(1.72-4.24)	(1.21-2.71)	(1.08-2.86)	(1.07-2.89)	(2.13-5.20)	(1.93-5.41)	(1.99-5.66)	(1.22-2.52)	(1.12-2.74)	(1.14-2.84)
Pregnancy incidence	0.46	0.46	1.21	0.47	0.47	0.23	Perfect success			0.38	0.38	0.40
	(0.08-2.50)	(0.08-2.50)	(0.09-15.75)	(0.08-2.56)	(0.08-2.56)	(0.00-17.34)				(0.07-1.96)	(0.07-2.19)	(0.02-8.19)

Note: Table reports effects estimates using odds ratio (OR) and adjusted odds ratio (AOR) from multiple logistic regression using the control group as the reference category.

***p < 0.001,**p < 0.01,*p < 0.05

a. Adjusted for the cluster effect and individuals

b. Adjusted for cluster effect, individuals, age, education, religion, wealth index, number of children, pregnancy intention, partner's pregnancy intention, history of unintended pregnancy, multiple sex partnership, HEC methods, HIV status, partner's HIV status, HIV/STI risk perception, HIV-related knowledge, condom use self-efficacy, and sexual relationship control power.



HEC: highly effective contraceptive

Figure 1. Flow of participants through the study

202x265mm (144 x 144 DPI)

S1 Table CONSORT checklist

CONSORT 2010 checklist of information to include when reporting a randomised trial*

Section/Topic	Item No	Checklist item	Reported on page No
Title and abstract			
	1a	Identification as a randomised trial in the title	p 1
	1b	Structured summary of trial design, methods, results, and conclusions (for specific guidance see CONSORT for abstracts)	p 2 and 3
Introduction			
Background and objectives	2a	Scientific background and explanation of rationale	p 4-6
	2b	Specific objectives or hypotheses	p 6
Methods			
Trial design	3a	Description of trial design (such as parallel, factorial) including allocation ratio	p 6
	3b	Important changes to methods after trial commencement (such as eligibility criteria), with reasons	NA
Participants	4a	Eligibility criteria for participants	p 6 and 7
	4b	Settings and locations where the data were collected	p 6 and 12
Interventions	5	The interventions for each group with sufficient details to allow replication, including how and when they were actually administered	p 8-10
Outcomes	6a	Completely defined pre-specified primary and secondary outcome measures, including how and when they were assessed	p 10-12
	6b	Any changes to trial outcomes after the trial commenced, with reasons	p 11 and 12
Sample size	7a	How sample size was determined	p 7
	7b	When applicable, explanation of any interim analyses and stopping guidelines	NA
Randomisation:			
Sequence generation	8a	Method used to generate the random allocation sequence	p 7 and 8
	8b	Type of randomisation; details of any restriction (such as blocking and block size)	p 7 and 8
Allocation concealment mechanism	9	Mechanism used to implement the random allocation sequence (such as sequentially numbered containers), describing any steps taken to conceal the sequence until interventions were assigned	p 7 and 8

Implementation	10	Who generated the random allocation sequence, who enrolled participants, and who assigned participants to interventions	p 7 and 8
Blinding	11a	If done, who was blinded after assignment to interventions (for example, participants, care providers, those assessing outcomes) and how	p 8
	11b	If relevant, description of the similarity of interventions	NA
Statistical methods	12a	Statistical methods used to compare groups for primary and secondary outcomes	p 12 and 13
	12b	Methods for additional analyses, such as subgroup analyses and adjusted analyses	p 12 and 13
Results			
Participant flow (a diagram is strongly recommended)	13a	For each group, the numbers of participants who were randomly assigned, received intended treatment, and were analysed for the primary outcome	p 14
	13b	For each group, losses and exclusions after randomisation, together with reasons	p 14 and Figure 1
Recruitment	14a	Dates defining the periods of recruitment and follow-up	p 6 and 12
	14b	Why the trial ended or was stopped	p 6
Baseline data	15	A table showing baseline demographic and clinical characteristics for each group	p 27
Numbers analysed	16	For each group, number of participants (denominator) included in each analysis and whether the analysis was by original assigned groups	p 14
Outcomes and estimation	17a	For each primary and secondary outcome, results for each group, and the estimated effect size and its precision (such as 95% confidence interval)	p 14-16
	17b	For binary outcomes, presentation of both absolute and relative effect sizes is recommended	p 14-16
Ancillary analyses	18	Results of any other analyses performed, including subgroup analyses and adjusted analyses, distinguishing pre-specified from exploratory	p 14 and S2-17 Tables
Harms	19	All important harms or unintended effects in each group (for specific guidance see CONSORT for harms)	NA
Discussion			
Limitations	20	Trial limitations, addressing sources of potential bias, imprecision, and, if relevant, multiplicity of analyses	p 19
Generalisability	21	Generalisability (external validity, applicability) of the trial findings	p 19
Interpretation	22	Interpretation consistent with results, balancing benefits and harms, and considering other relevant evidence	p 16-20
Other information			
Registration	23	Registration number and name of trial registry	p 3 and 13
Protocol	24	Where the full trial protocol can be accessed, if available	p 6
Funding	25	Sources of funding and other support (such as supply of drugs), role of funders	p 20

*We strongly recommend reading this statement in conjunction with the CONSORT 2010 Explanation and Elaboration for important clarifications on all the items. If relevant, we also recommend reading CONSORT extensions for cluster randomised trials, non-inferiority and equivalence trials, non-pharmacological treatments, herbal interventions, and pragmatic trials. Additional extensions are forthcoming: for those and for up to date references relevant to this checklist, see www.consort-statement.org.

Table S2. Baseline characteristics of women lost to follow up in the intervention and control groups

Variables	Month 2										Month 4										Month 6										Month 8									
	Intervention					Control					Intervention					Control					Intervention					Control					Intervention					Control				
	Reached		Lost to follow-up			Reached		Lost to follow-up			Reached		Lost to follow-up			Reached		Lost to follow-up			Reached		Lost to follow-up			Reached		Lost to follow-up			Reached		Lost to follow-up			Reached		Lost to follow-up	
	n	%	n	%	p-value†	n	%	n	%	p-value†	n	%	n	%	p-value†	n	%	n	%	p-value†	n	%	n	%	p-value†	n	%	n	%	p-value†	n	%	n	%	p-value†	n	%	n	%	p-value†
1) Socio-demographic characteristics																																								
Age in years, mean (SD)	30.6	(6.5)	29.8	(6.7)	0.291	30.5	(7.0)	27.7	(5.8)	**<0.001**	30.4	(6.4)	30.5	(6.9)	0.965	30.2	(6.9)	28.1	(6.1)	**0.006**	30.6	(6.4)	29.5	(6.8)	0.166	30.1	(6.9)	28.3	(6.2)	**0.016**	30.6	(6.4)	29.5	(7.2)	0.158	30.1	(6.9)	28.5	(6.1)	**0.044**
Education																																								
Never	114	29.8	31	32.0	0.674	78	22.2	39	30.2	0.070	122	30.1	23	31.1	0.859	88	23.1	29	29.3	0.201	118	30.0	27	31.4	0.791	88	22.9	29	30.5	0.119	119	29.4	26	34.7	0.360	87	22.6	30	31.6	0.068
Primary and more	269	70.2	66	68.0		273	77.8	90	69.8		284	70.0	51	68.9		293	76.9	70	70.7		276	70.1	59	68.6		297	77.1	66	69.5		286	70.6	49	65.3		298	77.4	65	68.4	
Religion																																								
Christian	356	93.0	94	96.9	0.150	320	91.2	116	89.9	0.675	378	93.1	72	97.3	0.170	345	90.6	91	91.9	0.674	366	92.9	84	96.9	0.097	349	90.7	87	91.6	0.779	376	92.8	74	98.7	0.055	349	90.7	87	91.6	0.779
Muslim	27	7.1	3	3.1		31	8.8	13	10.1		28	6.9	2	2.7		36	9.5	8	8.1		28	7.1	2	3.1		36	9.4	8	8.4		29	7.2	1	1.3		36	9.4	8	8.4	
Wealth index																																								
Poor	139	36.3	37	38.1	0.821	119	33.9	39	30.2	0.070	142	35.0	34	46.0	0.190	133	34.9	25	25.3	0.188	139	35.3	37	43.0	0.134	135	35.1	23	24.2	0.119	143	35.3	33	44.0	0.112	135	35.1	23	24.2	0.119
Middle	133	34.7	35	36.1		93	26.5	48	37.2		145	35.7	23	31.1		108	28.4	33	33.3		136	34.5	32	37.2		111	28.8	30	31.6		140	34.6	28	37.3		111	28.8	30	31.6	
Rich	111	29.0	25	25.8		139	39.6	42	32.6		119	29.3	17	23.0		140	36.8	41	41.4		119	30.2	17	19.8		139	36.1	42	44.2		122	30.1	14	18.7		139	36.1	42	44.2	
No. of children, mean (SD)	3.2	(1.7)	3.0	(1.7)	0.428	3.0	(1.9)	2.7	(1.7)	0.099	3.2	(1.7)	3.1	(1.9)	0.859	3.0	(1.9)	2.6	(1.7)	**0.044**	3.2	(1.7)	3.0	(1.8)	0.394	3.0	(1.8)	2.8	(1.9)	0.343	3.2	(1.7)	3.0	(1.9)	0.438	2.9	(1.9)	2.8	(1.8)	0.607
Pregnancy intention																																								
No	81	21.2	19	19.6	0.891	76	21.7	20	15.5	0.195	83	20.4	17	23.0	0.391	78	20.5	18	18.2	0.126	84	21.3	16	18.6	0.349	77	20.0	19	20.0	0.190	88	21.7	12	16.0	0.442	75	19.5	21	22.1	0.462
Yes	271	70.8	71	73.2		247	70.4	94	72.9		288	70.9	54	73.0		274	71.9	67	67.7		276	70.1	66	76.7		278	72.2	63	66.3		284	70.1	58	77.3		278	72.2	63	66.3	
Don't know	31	8.1	7	7.2		28	8.0	15	11.6		35	8.6	3	4.1		29	7.6	14	14.1		34	8.6	4	4.7		30	7.8	13	13.7		33	8.2	5	6.7		32	8.3	11	11.6	
Partner's pregnancy intention																																								
No	57	14.9	12	12.4	0.462	53	15.1	15	11.6	0.293	55	13.6	14	18.9	0.454	57	15.0	11	11.1	0.541	58	14.7	11	12.8	0.896	55	14.3	13	13.7	0.833	61	15.1	8	10.7	0.600	54	14.0	14	14.7	0.799
Yes	259	67.6	63	65.0		235	67.0	96	74.4		276	68.0	46	62.2		262	68.8	69	69.7		263	66.8	59	68.6		267	69.4	64	67.4		269	66.4	53	70.7		268	69.6	63	66.3	
Don't know	67	17.5	22	22.7		63	18.0	18	14.0		75	18.5	14	18.9		62	16.3	19	19.2		73	18.5	16	18.6		63	16.4	18	19.0		75	18.5	14	18.7		63	16.4	18	19.0	
History of unintended pregnancy																																								
No	245	64.0	68	70.1	0.257	248	70.7	87	67.4	0.497	266	65.5	47	63.5	0.739	265	69.6	70	70.7	0.824	258	65.5	55	64.0	0.787	265	68.8	70	73.7	0.356	261	64.4	52	69.3	0.414	266	69.1	69	72.6	0.501
Yes	138	36.0	29	29.9		103	29.3	42	32.6		140	34.5	27	36.5		116	30.5	29	29.3		136	34.5	31	36.1		120	31.2	25	26.3		144	35.6	23	30.7		119	30.9	26	27.4	
Multiple sex partners																																								
No	360	94.0	92	94.9	0.750	333	94.9	123	95.4	0.832	382	94.1	70	89.2	0.864	361	94.8	95	96.0	0.623	371	94.2	81	94.2	0.993	365	94.8	91	95.8	0.693	380	93.8	72	96.0	0.461	365	94.8	91	95.8	0.693
Yes	23	6.0	5	5.2		18	5.1	6	4.7		24	5.9	4	10.8		20	5.3	4	4.0		23	5.8	5	5.8		20	5.2	4	4.2		25	6.2	3	4.0		20	5.2	4	4.2	
2) HIV-related characteristics																																								
HIV status																																								
Negative	351	91.6	87	89.7	0.543	123	89.2	313	95.4	**0.038**	372	91.6	66	89.7	0.495	343	90.0	93	93.9	0.229	359	91.1	79	91.9	0.825	347	90.1	89	93.7	0.282	372	91.9	66	88.0	0.278	347	90.1	89	93.7	0.282
Positive	32	8.4	10	10.3		6	10.8	38	4.7		34	8.4	8	10.3		38	10.0	6	6.1		35	8.9	7	8.1		38	9.9	6	6.3		33	8.2	9	12.0		38	9.9	6	6.3	
Partner's HIV status																																								
Negative	308	80.4	78	80.4	0.834	107	75.8	266	83.0	0.163	326	80.3	60	81.1	0.509	289	75.9	84	84.9	0.122	313	79.4	73	84.9	0.225	295	76.6	78	82.1	0.431	324	80.0	62	82.7	0.646	295	76.6	78	82.1	0.431
Positive	26	6.8	8	8.3		6	9.4	33	4.7		27	6.7	7	9.5		35	9.2	4	4.0		27	6.9	7	8.1		34	8.8	5	5.3		28	6.9	6	8.0		34	8.8	5	5.3	
Don't know	49	12.8	11	11.3		16	14.8	52	12.4		53	13.1	7	9.5		57	15.0	11	11.1		54	13.7	6	7.0		56	14.6	12	12.6		53	13.1	7	9.3		56	14.6	12	12.6	
Disclosure of HIV status																																								
No	18	4.7	3	3.1	0.489	4	4.3	15	3.1	0.559	19	4.7	2	2.7	0.444	17	4.5	2	2.0	0.267	18	4.6	3	3.5	0.657	16	4.2	3	3.2	0.655	20	4.9	1	1.3	0.161	15	3.9	4	4.2	0.888
Yes	365	95.3	94	96.9		125	95.7	336	96.9		387	95.3	72	97.3		364	95.5	97	98.0		376	95.4	83	96.5		369	95.8	92	96.8		385	95.1	74	98.7		370	96.1	91	95.8	
HIV/STI risk perception																																								
No risk at all	47	12.3	15	15.5	0.748	20	19.1	67	15.5	0.789	47	11.6	15	20.3	0.193	71	18.6	16	16.2	0.922	43	10.9	19	22.1	**0.044**	70	18.2	17	17.9	0.949	48	11.9	14	18.7	0.395	70	18.2	17	17.9	0.999
Small	140	36.6	37	38.1		48	37.0	130	37.2		154	37.9	23	31.1		142	37.3	36	36.4		148	37.6	29	33.7		145	37.7	33	34.7		149	36.8	28	37.3		143	37.1	35	36.8	
Moderate	112	29.2	24	24.7		34	25.6	90	26.4		117	28.8	19	25.7		97	25.5	27	27.3		116	29.4	20	23.3		98	25.5	26	27.4		117	28.9	19	25.3		99	25.7	25	26.3	
Great	84	21.9	21	21.7		27	18.2	64	20.9		88	21.7	17	23.0		71	18.6	20	20.2		87	22.1	18	20.9		72	18.7	19	20.0		91	22.5	14	18.7		73	19.0	18	19.0	
3) HEC use																																								
Type of HECs																																								
Injectables	198	51.7	54	55.7	0.901	178	50.7	68	52.7	0.910	207	51.0	45	60.8	0.478	190	49.9	56	56.6	0.673	193	49.0	59	68.6	**0.010**	190	49.4	56	59.0	0.380	204	50.4	48	64.0	0.199	190	49.4	56	59.0	0.450
Implants	127	33.2	28	28.9		107	30.5	41	31.8		135	33.3	20	27.0		120	31.5	28	28.3		135	34.3	20	23.3		120	31.2	28	29.5		136	33.6	19	25.3		121	31.4	27	28.4	
IUDs	34	8.9	9	9.3		41	11.7	13	10.1		38	9.4	5	6.8		43	11.3	11	11.1		38	9.6	5	5.8		47	12.2	7	7.4		39	9.6	4	5.3		47	12.2	7	7.4	
OCPs	22	5.7	5	5.2		24	6.8	7	5.4		24	5.9	3	4.1		27	7.1	4	4.0		26	6.6	1	1.2		27	7.0	4	4.2		24	5.9	3	4.0		26	6.8	5	5.3	
Female sterilization	2	0.5	1	1.0		1	0.3	0	0.0		2	0.5	1	1.4		1	0.3	0	0.0		2	0.5	1	1.2		1	0.3	0	0.0		2	0.5	1	1.3		1	0.3	0	0.0	
Partner's recognition of HEC use																																								
No	32	8.4	4	4.1	0.158	29	8.3	14	10.9	0.378	34	8.4	2	2.7	0.088	33	8.7	10	10.1	0.655	34	8.6	2	2.3	**0.044**	32	8.3	11	11.6	0.318	35	8.6	1	1.3	**0.027**	32	8.3	11	11.6	0.318
Yes	351	91.6	93	95.9		322	91.7	115	89.2		372	91.6	72	97.3		348	91.3	89	89.9		360	91.4	84	97.7		353	91.7	84	88.4		370	91.4	74	98.7		353	91.7	84	88.4	
Partner's attitude about HEC use																																								
Positive	344	89.8	88	90.7	0.795	320	91.2	119	92.3	0.838	363	89.4	69	93.2	0.472	350	91.9	89	89.9	0.725	351	89.1	81	94.2	0.292	353	91.7	86	90.5	0.880	361	89.1	71	94.7	0.224	353	91.7	86	90.5	0.880
Negative	30	7.8	6	6.2		26	7.4	9	7.0		33	8.1	3	4.1		26	6.8	9	9.1		33	8.4	3	3.5		27	7.0	8	8.4		34	8.4	2	2.7		27	7.0	8	8.4	
Don't know	9	2.4	3	3.1		5	1.4	1	0.8		10	2.5	2	2.7		5	1.3	1	1.0		10	2.5	2	2.3		5	1.3	1	1.1		10	2.5	2	2.7		5	1.3	1	1.1	
4) Other psychosocial characterictcs																																								
HIV-related knowledge (HIV-KQ-18), mean (SD)	12.0	(2.6)	11.9	(2.6)	0.829	11.3	(3.0)	11.1	(2.8)	0.597	11.9	(2.6)	12.1	(2.6)	0.632	11.2	(3.0)	11.4	(2.9)	0.563	12.0	(2.6)	11.8	(2.8)	0.507	11.3	(3.0)	11.2	(2.9)	0.946	12.0	(2.6)	11.8	(2.4)	0.527	11.2	(3.0)	11.3	(2.8)	0.992
Condom use self-efficacy scale, mean (SD)	22.3	(9.2)	22.1	(9.9)	0.794	21.6	(8.4)	23.2	(7.9)	0.058	22.0	(9.4)	23.6	(9.0)	0.193	21.7	(8.4)	23.4	(8.0)	0.080	22.1	(9.3)	22.9	(9.7)	0.478	21.9	(8.2)	22.7	(8.7)	0.422	22.3	(9.2)	22.1	(10.2)	0.848	22.0	(8.2)	22.4	(8.8)	0.608
Sexual Relationship Power Scale																																								
Low	141	36.8	32	33.0	0.484	114	32.5	38	29.5	0.763	151	37.2	22	29.7	0.416	123	32.3	29	29.3	0.146	144	36.6	29	33.7	0.561	121	31.4	31	29.5	0.442	146	36.1	27	36.0	0.327	122	31.7	30	31.6	0.526
Medium	129	33.7	39	40.2		130	37.0	52	40.3		138	34.0	30	40.5		150	39.4	32	32.3		140	35.5	28	32.6		151	39.2	31	40.3		137	33.8	31	41.3		150	39.0	32	33.7	
High	113	29.5	26	26.8		107	30.5	39	30.2		117	28.8	22	29.7		108	28.4	38	38.4		110	27.9	29	33.7		113	29.4	33	30.2		122	30.1	17	22.7		113	29.4	33	34.7	

SD: standard deviation; HEC: highly effective contraceptive; IUD: intrauterine device; OCP: oral contraceptive pill

† Based on Chi-squared test for categorical variables and t-test for continuous variables.

Table S3. Effects of intervention on dual-method contraceptive use at last sexual intercourse among women at 2 months after enrollement

Variables	Model 1			Model 2			Model 3		
	OR	(95% CI)	p-value	AOR[a]	(95% CI)	p-value	AOR[b]	(95% CI)	p-value
Intervention									
Control	Ref.			Ref.			Ref.		
Intervention	4.62	(3.18 - 6.71)	**<0.001**	1.17	(0.46 - 2.98)	0.745	1.19	(0.48 - 2.95)	0.712
Time				2.76	(1.63 - 4.67)	**<0.001**	2.89	(1.70 - 4.89)	**<0.001**
Intervention*time[c]				4.29	(2.12 - 8.69)	**<0.001**	4.12	(2.02 - 8.39)	**<0.001**
1) Socio-demographic characteristics									
Age in years							1.00	(0.96 - 1.04)	0.958
Education									
Never							Ref.		
Primary and more							0.98	(0.66 - 1.47)	0.935
Religion									
Christian							Ref.		
Muslim							1.42	(0.78 - 2.58)	0.246
Wealth index									
Poor							Ref.		
Middle							1.35	(0.89 - 2.05)	0.164
Rich							1.31	(0.84 - 2.05)	0.240
No. of children							0.87	(0.75 - 1.00)	0.057
Pregnancy intention									
No							Ref.		
Yes							1.17	(0.66 - 2.09)	0.592
Don't know							1.54	(0.71 - 3.34)	0.274
Partner's pregnancy intention									
No							Ref.		
Yes							0.45	(0.24 - 0.85)	**0.013**
Don't know							0.49	(0.25 - 0.96)	**0.038**
History of unintended pregnancy									
No							Ref.		
Yes							0.93	(0.64 - 1.34)	0.680
Multiple sex partners									
No							Ref.		
Yes							3.50	(1.85 - 6.62)	**<0.001**
2) HIV-related characteristics									
HIV status									
Negative							Ref.		
Positive							1.57	(0.71 - 3.49)	0.267
Partner's HIV status									
Negative							Ref.		
Positive							1.27	(0.54 - 2.99)	0.583
Don't know							0.95	(0.57 - 1.58)	0.837
HIV/STI risk perception									
No risk at all							Ref.		
Small							0.80	(0.47 - 1.37)	0.421
Moderate							1.05	(0.60 - 1.83)	0.858
Great							1.18	(0.65 - 2.15)	0.588
3) HEC use									
Type of HECs									
Injectables							Ref.		
Implants							0.94	(0.65 - 1.35)	0.726
IUDs							1.21	(0.69 - 2.12)	0.505
OCPs							0.83	(0.40 - 1.72)	0.611
Female sterilization									Perfect success
4) Other psychosocial charactericts									
HIV-related knowledge (HIV-KQ-18)							1.03	(0.97 - 1.11)	0.338
Condom use self-efficacy scale							1.02	(1.00 - 1.05)	**0.035**
Sexual Relationship Power Scale									
Low							Ref.		
Medium							1.13	(0.76 - 1.69)	0.551
High							1.07	(0.70 - 1.66)	0.748

OR: odds ratio; AOR: adjusted odds ratio; SD: standard deviation; HEC: highly effective contraceptive; IUD: intrauterine device; OCP: oral contraceptive pill

a. Adjusted for the cluster effect and individuals

b. Adjusted for age, education, religion, wealth index, number of children, pregnancy intention, partner's pregnancy intention, history of unintended pregnancy, multiple sex partnership, HIV status, partner's HIV status, HIV/STI risk perception, HIV-related knowledge, condom use self-efficacy, and sexual relationship control power.

c. Intervention*time represents the status of the intervention group at follow-up in comparison with the control group at baseline.

Table S4. Effects of intervention on dual-method contraceptive use at last sexual intercourse among women at 4 months after enrollement

Variables	Model 1			Model 2			Model 3		
	OR	(95% CI)	p-value	AOR[a]	(95% CI)	p-value	AOR[b]	(95% CI)	p-value
Intervention									
Control	Ref.			Ref.			Ref.		
Intervention	2.13	(1.49 - 3.06)	**<0.001**	1.62	(0.81 - 3.26)	0.176	1.66	(0.87 - 3.16)	0.121
Time				3.55	(2.07 - 6.08)	**<0.001**	3.55	(2.08 - 6.08)	**<0.001**
Intervention*time[c]				1.66	(0.84 - 3.30)	0.148	1.66	(0.84 - 3.30)	0.146
1) Socio-demographic characteristics									
Age in years							0.99	(0.95 - 1.03)	0.530
Education									
Never							Ref.		
Primary and more							0.79	(0.51 - 1.22)	0.278
Religion									
Christian							Ref.		
Muslim							1.28	(0.66 - 2.49)	0.465
Wealth index									
Poor							Ref.		
Middle							1.12	(0.71 - 1.76)	0.624
Rich							1.14	(0.70 - 1.85)	0.608
No. of children							0.92	(0.78 - 1.08)	0.314
Pregnancy intention									
No							Ref.		
Yes							0.75	(0.40 - 1.42)	0.376
Don't know							1.17	(0.51 - 2.66)	0.715
Partner's pregnancy intention									
No							Ref.		
Yes							0.55	(0.28 - 1.09)	0.085
Don't know							0.55	(0.26 - 1.15)	0.113
History of unintended pregnancy									
No							Ref.		
Yes							0.62	(0.40 - 0.94)	**0.026**
Multiple sex partners									
No							Ref.		
Yes							2.87	(1.45 - 5.67)	**0.002**
2) HIV-related characteristics									
HIV status									
Negative							Ref.		
Positive							1.61	(0.69 - 3.80)	0.273
Partner's HIV status									
Negative							Ref.		
Positive							1.40	(0.55 - 3.52)	0.480
Don't know							1.26	(0.74 - 2.15)	0.389
HIV/STI risk perception									
No risk at all							Ref.		
Small							0.84	(0.47 - 1.49)	0.544
Moderate							1.01	(0.56 - 1.83)	0.975
Great							0.96	(0.50 - 1.84)	0.894
3) HEC use									
Type of HECs									
Injectables							Ref.		
Implants							0.94	(0.62 - 1.44)	0.788
IUDs							1.18	(0.63 - 2.21)	0.603
OCPs							2.35	(1.17 - 4.74)	**0.017**
Female sterilization							0.97	(0.05 - 19.29)	0.986
4) Other psychosocial charactericts									
HIV-related knowledge (HIV-KQ-18)							1.01	(0.94 - 1.08)	0.858
Condom use self-efficacy scale							1.04	(1.01 - 1.06)	**0.002**
Sexual Relationship Power Scale									
Low							Ref.		
Medium							1.44	(0.91 - 2.27)	0.119
High							1.21	(0.74 - 1.98)	0.443

OR: odds ratio; AOR: adjusted odds ratio; SD: standard deviation; HEC: highly effective contraceptive; IUD: intrauterine device; OCP: oral contraceptive pill

a. Adjusted for the cluster effect and individuals

b. Adjusted for age, education, religion, wealth index, number of children, pregnancy intention, partner's pregnancy intention, history of unintended pregnancy, multiple sex partnership, HIV status, partner's HIV status, HIV/STI risk perception, HIV-related knowledge, condom use self-efficacy, and sexual relationship control power.

c. Intervention*time represents the status of the intervention group at follow-up in comparison with the control group at baseline.

Table S5. Effects of intervention on dual-method contraceptive use at last sexual intercourse among women at 6 months after enrollement

Variables	Model 1			Model 2			Model 3		
	OR	(95% CI)	p-value	AOR[a]	(95% CI)	p-value	AOR[b]	(95% CI)	p-value
Intervention									
Control	Ref.			Ref.			Ref.		
Intervention	2.53	(1.69 - 3.79)	**<0.001**	1.42	(0.55 - 3.67)	0.465	1.40	(0.53 - 3.67)	0.494
Time				2.16	(1.24 - 3.75)	**0.006**	2.17	(1.25 - 3.76)	**0.006**
Intervention*time[c]				2.04	(1.00 - 4.17)	0.051	2.03	(0.99 - 4.14)	0.052
1) Socio-demographic characteristics									
Age in years							0.97	(0.93 - 1.02)	0.208
Education									
Never							Ref.		
Primary and more							0.89	(0.56 - 1.41)	0.618
Religion									
Christian							Ref.		
Muslim							1.36	(0.70 - 2.65)	0.366
Wealth index									
Poor							Ref.		
Middle							0.96	(0.60 - 1.55)	0.875
Rich							0.75	(0.45 - 1.27)	0.283
No. of children							1.02	(0.86 - 1.20)	0.853
Pregnancy intention									
No							Ref.		
Yes							0.84	(0.44 - 1.61)	0.602
Don't know							1.29	(0.55 - 3.03)	0.565
Partner's pregnancy intention									
No							Ref.		
Yes							0.69	(0.34 - 1.41)	0.307
Don't know							0.62	(0.29 - 1.35)	0.228
History of unintended pregnancy									
No							Ref.		
Yes							0.73	(0.48 - 1.13)	0.157
Multiple sex partners									
No							Ref.		
Yes							2.96	(1.50 - 5.85)	**0.002**
2) HIV-related characteristics									
HIV status									
Negative							Ref.		
Positive							1.24	(0.52 - 2.97)	0.629
Partner's HIV status									
Negative							Ref.		
Positive							1.67	(0.64 - 4.31)	0.292
Don't know							**1.09**	(0.62 - 1.92)	0.758
HIV/STI risk perception									
No risk at all							Ref.		
Small							0.76	(0.41 - 1.40)	0.377
Moderate							1.03	(0.55 - 1.92)	0.937
Great							0.77	(0.38 - 1.53)	0.452
3) HEC use									
Type of HECs									
Injectables							Ref.		
Implants							0.92	(0.60 - 1.42)	0.715
IUDs							1.19	(0.63 - 2.25)	0.589
OCPs							2.03	(0.99 - 4.17)	0.054
Female sterilization									Perfect success
4) Other psychosocial charactericts									
HIV-related knowledge (HIV-KQ-18)							1.05	(0.97 - 1.13)	0.226
Condom use self-efficacy scale							1.04	(1.01 - 1.06)	**0.006**
Sexual Relationship Power Scale									
Low							Ref.		
Medium							1.59	(0.99 - 2.54)	0.056
High							1.19	(0.71 - 1.97)	0.513

OR: odds ratio; AOR: adjusted odds ratio; SD: standard deviation; HEC: highly effective contraceptive; IUD: intrauterine device; OCP: oral contraceptive pill

a. Adjusted for the cluster effect and individuals

b. Adjusted for age, education, religion, wealth index, number of children, pregnancy intention, partner's pregnancy intention, history of unintended pregnancy, multiple sex partnership, HIV status, partner's HIV status, HIV/STI risk perception, HIV-related knowledge, condom use self-efficacy, and sexual relationship control power.

c. Intervention*time represents the status of the intervention group at follow-up in comparison with the control group at baseline.

Table S6. Effects of intervention on dual-method contraceptive use at last sexual intercourse among women at 8 months after enrollement

Variables	Model 1			Model 2			Model 3		
	OR	(95% CI)	p-value	AOR[a]	(95% CI)	p-value	AOR[b]	(95% CI)	p-value
Intervention									
Control	Ref.			Ref.			Ref.		
Intervention	2.76	(1.79 - 4.26)	**<0.001**	1.41	(0.58 - 3.40)	0.450	1.39	(0.59 - 3.31)	0.452
Time				1.59	(0.91 - 2.76)	0.101	1.60	(0.92 - 2.77)	0.094
Intervention*time[c]				2.19	(1.07 - 4.48)	**0.032**	2.16	(1.06 - 4.41)	**0.034**
1) Socio-demographic characteristics									
Age in years							0.97	(0.93 - 1.01)	0.114
Education									
Never							Ref.		
Primary and more							1.03	(0.66 - 1.62)	0.884
Religion									
Christian							Ref.		
Muslim							1.13	(0.57 - 2.21)	0.728
Wealth index									
Poor							Ref.		
Middle							1.11	(0.71 - 1.75)	0.647
Rich							0.89	(0.54 - 1.48)	0.664
No. of children							1.04	(0.88 - 1.22)	0.676
Pregnancy intention									
No							Ref.		
Yes							0.82	(0.44 - 1.55)	0.550
Don't know							1.66	(0.75 - 3.65)	0.210
Partner's pregnancy intention									
No							Ref.		
Yes							0.65	(0.33 - 1.28)	0.214
Don't know							0.71	(0.35 - 1.47)	0.359
History of unintended pregnancy									
No							Ref.		
Yes							0.83	(0.55 - 1.25)	0.375
Multiple sex partners									
No							Ref.		
Yes							3.22	(1.69 - 6.12)	**<0.001**
2) HIV-related characteristics									
HIV status									
Negative							Ref.		
Positive							0.97	(0.40 - 2.31)	0.938
Partner's HIV status									
Negative							Ref.		
Positive							2.04	(0.82 - 5.09)	0.128
Don't know							1.04	(0.60 - 1.81)	0.887
HIV/STI risk perception									
No risk at all							Ref.		
Small							0.68	(0.39 - 1.20)	0.187
Moderate							0.79	(0.44 - 1.42)	0.437
Great							0.77	(0.41 - 1.47)	0.429
3) HEC use									
Type of HECs									
Injectables							Ref.		
Implants							0.86	(0.56 - 1.31)	0.483
IUDs							1.23	(0.67 - 2.25)	0.511
OCPs							1.36	(0.66 - 2.80)	0.408
Female sterilization									Perfect success
4) Other psychosocial charactericts									
HIV-related knowledge (HIV-KQ-18)							1.04	(0.96 - 1.12)	0.312
Condom use self-efficacy scale							1.03	(1.00 - 1.05)	**0.029**
Sexual Relationship Power Scale									
Low							Ref.		
Medium							1.29	(0.81 - 2.05)	0.290
High							1.42	(0.87 - 2.31)	0.165

OR: odds ratio; AOR: adjusted odds ratio; SD: standard deviation; HEC: highly effective contraceptive; IUD: intrauterine device; OCP: oral contraceptive pill

a. Adjusted for the cluster effect and individuals

b. Adjusted for age, education, religion, wealth index, number of children, pregnancy intention, partner's pregnancy intention, history of unintended pregnancy, multiple sex partnership, HIV status, partner's HIV status, HIV/STI risk perception, HIV-related knowledge, condom use self-efficacy, and sexual relationship control power.

c. Intervention*time represents the status of the intervention group at follow-up in comparison with the control group at baseline.

Table S7. Effects of intervention on consistent dual-method contraceptive use among women at 2 months after enrollement

Variables	Model 1			Model 2			Model 3		
	OR	(95% CI)	p-value	AOR[a]	(95% CI)	p-value	AOR[b]	(95% CI)	p-value
Intervention									
Control	Ref.			Ref.			Ref.		
Intervention	11.98	(4.74 - 30.29)	**<0.001**	13.71	(3.59 - 52.43)	**<0.001**	14.53	(3.63 - 58.13)	**<0.001**
1) Socio-demographic characteristics									
Age in years							1.01	(0.94 - 1.08)	0.856
Education									
Never							Ref.		
Primary and more							0.69	(0.34 - 1.39)	0.298
Religion									
Christian							Ref.		
Muslim							0.93	(0.30 - 2.85)	0.898
Wealth index									
Poor							Ref.		
Middle							1.47	(0.70 - 3.11)	0.307
Rich							1.37	(0.61 - 3.09)	0.441
No. of children							0.89	(0.69 - 1.16)	0.396
Pregnancy intention									
No							Ref.		
Yes							0.56	(0.20 - 1.54)	0.264
Don't know							1.51	(0.39 - 5.84)	0.551
Partner's pregnancy intention									
No							Ref.		
Yes							0.89	(0.30 - 2.64)	0.834
Don't know							0.59	(0.17 - 2.05)	0.405
History of unintended pregnancy									
No							Ref.		
Yes							0.76	(0.39 - 1.48)	0.421
Multiple sex partners									
No							Ref.		
Yes							3.21	(1.06 - 9.67)	**0.039**
2) HIV-related characteristics									
HIV status									
Negative							Ref.		
Positive							1.47	(0.39 - 5.52)	0.566
Partner's HIV status									
Negative							Ref.		
Positive							1.23	(0.28 - 5.43)	0.785
Don't know							1.15	(0.48 - 2.77)	0.747
HIV/STI risk perception									
No risk at all							Ref.		
Small							1.98	(0.57 - 6.91)	0.283
Moderate							2.37	(0.67 - 8.43)	0.181
Great							4.04	(1.10 - 14.82)	**0.035**
3) HEC use									
Type of HECs									
Injectables							Ref.		
Implants							0.53	(0.27 - 1.04)	0.064
IUDs							0.47	(0.14 - 1.57)	0.219
OCPs							0.16	(0.02 - 1.37)	0.093
Female sterilization									Perfect success
4) Other psychosocial characterictics									
HIV-related knowledge (HIV-KQ-18)							1.02	(0.90 - 1.16)	0.722
Condom use self-efficacy scale							0.98	(0.94 - 1.02)	0.359
Sexual Relationship Power Scale									
Low							Ref.		
Medium							1.36	(0.62 - 2.95)	0.445
High							1.87	(0.84 - 4.17)	0.124

OR: odds ratio; AOR: adjusted odds ratio; SD: standard deviation; HEC: highly effective contraceptive; IUD: intrauterine device; OCP: oral contraceptive pill

a. Adjusted for the cluster effect and individuals

b. Adjusted for age, education, religion, wealth index, number of children, pregnancy intention, partner's pregnancy intention, history of unintended pregnancy, multiple sex partnership, HIV status, partner's HIV status, HIV/STI risk perception, HIV-related knowledge, condom use self-efficacy, and sexual relationship control power.

Table S8. Effects of intervention on consistent dual-method contraceptive use among women at 4 months after enrollement

Variables	Model 1			Model 2			Model 3		
	OR	(95% CI)	p-value	AOR[a]	(95% CI)	p-value	AOR[b]	(95% CI)	p-value
Intervention									
Control	Ref.			Ref.			Ref.		
Intervention	5.22	(2.42 - 11.28)	**<0.001**	6.28	(2.01 - 19.60)	**0.002**	6.30	(2.20 - 18.03)	**0.001**
1) Socio-demographic characteristics									
Age in years							1.05	(0.98 - 1.12)	0.181
Education									
Never							Ref.		
Primary and more							0.56	(0.28 - 1.13)	0.104
Religion									
Christian							Ref.		
Muslim							0.73	(0.19 - 2.82)	0.651
Wealth index									
Poor							Ref.		
Middle							1.63	(0.74 - 3.56)	0.224
Rich							1.51	(0.65 - 3.54)	0.340
No. of children							0.79	(0.59 - 1.05)	0.104
Pregnancy intention									
No							Ref.		
Yes							0.37	(0.13 - 1.06)	0.063
Don't know							0.61	(0.16 - 2.43)	0.488
Partner's pregnancy intention									
No							Ref.		
Yes							1.45	(0.47 - 4.49)	0.523
Don't know							1.08	(0.32 - 3.67)	0.907
History of unintended pregnancy									
No							Ref.		
Yes							0.52	(0.24 - 1.12)	0.094
Multiple sex partners									
No							Ref.		
Yes							0.37	(0.05 - 3.05)	0.356
2) HIV-related characteristics									
HIV status									
Negative							Ref.		
Positive							1.01	(0.24 - 4.31)	0.985
Partner's HIV status									
Negative							Ref.		
Positive							1.84	(0.36 - 9.30)	0.462
Don't know							1.63	(0.68 - 3.92)	0.275
HIV/STI risk perception									
No risk at all							Ref.		
Small							2.14	(0.58 - 7.93)	0.253
Moderate							2.15	(0.56 - 8.32)	0.268
Great							1.65	(0.39 - 7.03)	0.499
3) HEC use									
Type of HECs									
Injectables							Ref.		
Implants							1.01	(0.49 - 2.06)	0.987
IUDs							1.58	(0.54 - 4.62)	0.400
OCPs							0.66	(0.13 - 3.32)	0.618
Female sterilization									Perfect success
4) Other psychosocial characterictics									
HIV-related knowledge (HIV-KQ-18)							0.92	(0.81 - 1.03)	0.148
Condom use self-efficacy scale							1.02	(0.97 - 1.06)	0.443
Sexual Relationship Power Scale									
Low							Ref.		
Medium							0.72	(0.32 - 1.63)	0.434
High							0.96	(0.42 - 2.21)	0.932

OR: odds ratio; AOR: adjusted odds ratio; SD: standard deviation; HEC: highly effective contraceptive; IUD: intrauterine device; OCP: oral contraceptive pill

a. Adjusted for the cluster effect and individuals

b. Adjusted for age, education, religion, wealth index, number of children, pregnancy intention, partner's pregnancy intention, history of unintended pregnancy, multiple sex partnership, HIV status, partner's HIV status, HIV/STI risk perception, HIV-related knowledge, condom use self-efficacy, and sexual relationship control power.

Table S9. Effects of intervention on consistent dual-method contraceptive use among women at 6 months after enrollement

Variables	Model 1			Model 2			Model 3		
	OR	(95% CI)	p-value	AOR[a]	(95% CI)	p-value	AOR[b]	(95% CI)	p-value
Intervention									
Control	Ref.			Ref.			Ref.		
Intervention	6.58	(2.53 - 17.07)	**<0.001**	7.80	(1.22 - 49.73)	**0.030**	8.04	(1.17 - 55.08)	**0.034**
1) Socio-demographic characteristics									
Age in years							1.05	(0.96 - 1.15)	0.311
Education									
Never							Ref.		
Primary and more							1.18	(0.45 - 3.13)	0.738
Religion									
Christian							Ref.		
Muslim							1.75	(0.46 - 6.61)	0.409
Wealth index									
Poor							Ref.		
Middle							1.35	(0.53 - 3.47)	0.528
Rich							0.75	(0.26 - 2.20)	0.604
No. of children							0.90	(0.64 - 1.28)	0.560
Pregnancy intention									
No							Ref.		
Yes							0.73	(0.18 - 2.92)	0.657
Don't know							1.31	(0.23 - 7.51)	0.763
Partner's pregnancy intention									
No							Ref.		
Yes							1.27	(0.30 - 5.40)	0.743
Don't know							0.84	(0.17 - 4.17)	0.836
History of unintended pregnancy									
No							Ref.		
Yes							0.79	(0.32 - 1.96)	0.607
Multiple sex partners									
No							Ref.		
Yes							1.59	(0.29 - 8.78)	0.597
2) HIV-related characteristics									
HIV status									
Negative							Ref.		
Positive							4.08	(0.86 - 19.27)	0.076
Partner's HIV status									
Negative							Ref.		
Positive							0.51	(0.07 - 3.47)	0.489
Don't know							0.93	(0.30 - 2.92)	0.901
HIV/STI risk perception									
No risk at all							Ref.		
Small							1.21	(0.29 - 5.09)	0.791
Moderate							0.91	(0.20 - 4.25)	0.907
Great							0.98	(0.20 - 4.82)	0.983
3) HEC use									
Type of HECs									
Injectables							Ref.		
Implants							1.09	(0.44 - 2.67)	0.853
IUDs							1.95	(0.55 - 6.93)	0.304
OCPs							1.51	(0.27 - 8.57)	0.642
Female sterilization									Perfect success
4) Other psychosocial characterictics									
HIV-related knowledge (HIV-KQ-18)							1.02	(0.87 - 1.18)	0.834
Condom use self-efficacy scale							1.02	(0.97 - 1.07)	0.549
Sexual Relationship Power Scale									
Low							Ref.		
Medium							0.93	(0.36 - 2.43)	0.885
High							0.56	(0.18 - 1.71)	0.310

OR: odds ratio; AOR: adjusted odds ratio; SD: standard deviation; HEC: highly effective contraceptive; IUD: intrauterine device; OCP: oral contraceptive pill

a. Adjusted for the cluster effect and individuals

b. Adjusted for age, education, religion, wealth index, number of children, pregnancy intention, partner's pregnancy intention, history of unintended pregnancy, multiple sex partnership, HIV status, partner's HIV status, HIV/STI risk perception, HIV-related knowledge, condom use self-efficacy, and sexual relationship control power.

Table S10. Effects of intervention on consistent dual-method contraceptive use among women at 8 months after enrollement

Variables	Model 1			Model 2			Model 3		
	OR	(95% CI)	p-value	AOR[a]	(95% CI)	p-value	AOR[b]	(95% CI)	p-value
Intervention									
Control	Ref.			Ref.			Ref.		
Intervention	9.43	(3.70 - 24.06)	**<0.001**	9.97	(2.11 - 47.15)	**0.004**	10.72	(2.03 - 56.64)	**0.005**
1) Socio-demographic characteristics									
Age in years							1.05	(0.96 - 1.14)	0.270
Education									
Never							Ref.		
Primary and more							0.90	(0.40 - 2.00)	0.788
Religion									
Christian							Ref.		
Muslim							1.15	(0.31 - 4.29)	0.832
Wealth index									
Poor							Ref.		
Middle							1.46	(0.63 - 3.38)	0.373
Rich							1.52	(0.61 - 3.80)	0.373
No. of children							0.89	(0.65 - 1.22)	0.463
Pregnancy intention									
No							Ref.		
Yes							0.40	(0.12 - 1.34)	0.137
Don't know							0.93	(0.22 - 3.98)	0.923
Partner's pregnancy intention									
No							Ref.		
Yes							1.80	(0.47 - 6.86)	0.390
Don't know							1.34	(0.34 - 5.24)	0.674
History of unintended pregnancy									
No							Ref.		
Yes							0.86	(0.40 - 1.83)	0.688
Multiple sex partners									
No							Ref.		
Yes							0.94	(0.17 - 5.16)	0.942
2) HIV-related characteristics									
HIV status									
Negative							Ref.		
Positive							1.16	(0.20 - 6.63)	0.868
Partner's HIV status									
Negative							Ref.		
Positive							1.12	(0.18 - 7.00)	0.905
Don't know							0.41	(0.12 - 1.36)	0.146
HIV/STI risk perception									
No risk at all							Ref.		
Small							0.85	(0.27 - 2.70)	0.782
Moderate							0.96	(0.29 - 3.16)	0.944
Great							1.20	(0.33 - 4.34)	0.785
3) HEC use									
Type of HECs									
Injectables							Ref.		
Implants							0.85	(0.38 - 1.89)	0.685
IUDs							2.55	(0.87 - 7.46)	0.087
OCPs							0.60	(0.11 - 3.37)	0.566
Female sterilization									Perfect success
4) Other psychosocial characterictics									
HIV-related knowledge (HIV-KQ-18)							1.02	(0.89 - 1.16)	0.779
Condom use self-efficacy scale							1.00	(0.96 - 1.05)	0.858
Sexual Relationship Power Scale									
Low							Ref.		
Medium							0.90	(0.37 - 2.16)	0.806
High							1.11	(0.44 - 2.83)	0.829

OR: odds ratio; AOR: adjusted odds ratio; SD: standard deviation; HEC: highly effective contraceptive; IUD: intrauterine device; OCP: oral contraceptive pill

a. Adjusted for the cluster effect and individuals

b. Adjusted for age, education, religion, wealth index, number of children, pregnancy intention, partner's pregnancy intention, history of unintended pregnancy, multiple sex partnership, HIV status, partner's HIV status, HIV/STI risk perception, HIV-related knowledge, condom use self-efficacy, and sexual relationship control power.

Table S11. Effects of intervention on communication about HIV/STI risk among women at 2 months after enrollement

Variables	Model 1			Model 2			Model 3		
	OR	(95% CI)	p-value	AOR[a]	(95% CI)	p-value	AOR[b]	(95% CI)	p-value
Intervention									
Control	Ref.			Ref.			Ref.		
Intervention	2.73	(1.92 - 3.90)	**<0.001**	1.03	(0.73 - 1.46)	0.863	0.98	(0.68 - 1.42)	0.920
Time				2.19	(1.62 - 2.97)	**<0.001**	2.29	(1.70 - 3.09)	**<0.001**
Intervention*time[c]				2.70	(1.72 - 4.23)	**<0.001**	2.70	(1.72 - 4.24)	**<0.001**
1) Socio-demographic characteristics									
Age in years							0.99	(0.97 - 1.02)	0.518
Education									
Never							Ref.		
Primary and more							0.92	(0.70 - 1.20)	0.527
Religion									
Christian							Ref.		
Muslim							0.88	(0.59 - 1.32)	0.540
Wealth index									
Poor							Ref.		
Middle							0.98	(0.75 - 1.29)	0.909
Rich							0.97	(0.73 - 1.30)	0.852
No. of children							0.92	(0.84 - 1.02)	0.101
Pregnancy intention									
No							Ref.		
Yes							0.77	(0.52 - 1.13)	0.185
Don't know							0.75	(0.45 - 1.23)	0.247
Partner's pregnancy intention									
No							Ref.		
Yes							1.14	(0.74 - 1.75)	0.560
Don't know							1.13	(0.73 - 1.76)	0.588
History of unintended pregnancy									
No							Ref.		
Yes							1.30	(1.02 - 1.66)	**0.037**
Multiple sex partners									
No							Ref.		
Yes							1.88	(1.12 - 3.17)	**0.017**
2) HIV-related characteristics									
HIV status									
Negative							Ref.		
Positive							2.03	(1.06 - 3.89)	**0.034**
Partner's HIV status									
Negative							Ref.		
Positive							0.87	(0.44 - 1.72)	0.683
Don't know							0.90	(0.65 - 1.25)	0.518
HIV/STI risk perception									
No risk at all							Ref.		
Small							1.07	(0.77 - 1.48)	0.704
Moderate							1.10	(0.78 - 1.55)	0.598
Great							1.04	(0.71 - 1.53)	0.835
3) HEC use									
Type of HECs									
Injectables							Ref.		
Implants							0.97	(0.76 - 1.24)	0.817
IUDs							1.17	(0.80 - 1.70)	0.421
OCPs							1.07	(0.68 - 1.70)	0.765
Female sterilization							3.75	(0.61 - 22.98)	0.153
4) Other psychosocial characterictics									
HIV-related knowledge (HIV-KQ-18)							1.04	(1.00 - 1.09)	0.058
Condom use self-efficacy scale							1.04	(1.02 - 1.05)	**<0.001**
Sexual Relationship Power Scale									
Low							Ref.		
Medium							1.02	(0.79 - 1.33)	0.858
High							1.19	(0.89 - 1.59)	0.248

OR: odds ratio; AOR: adjusted odds ratio; SD: standard deviation; HEC: highly effective contraceptive; IUD: intrauterine device; OCP: oral contraceptive pill

a. Adjusted for the cluster effect and individuals

b. Adjusted for age, education, religion, wealth index, number of children, pregnancy intention, partner's pregnancy intention, history of unintended pregnancy, multiple sex partnership, HIV status, partner's HIV status, HIV/STI risk perception, HIV-related knowledge, condom use self-efficacy, and sexual relationship control power.

c. Intervention*time represents the status of the intervention group at follow-up in comparison with the control group at baseline.

Table S12. Effects of intervention on communication about HIV/STI risk among women at 4 months after enrollement

Variables	Model 1			Model 2			Model 3		
	OR	(95% CI)	p-value	AOR[a]	(95% CI)	p-value	AOR[b]	(95% CI)	p-value
Intervention									
Control	Ref.			Ref.			Ref.		
Intervention	1.81	(1.21 - 2.71)	**0.004**	1.04	(0.72 - 1.50)	0.841	0.99	(0.68 - 1.44)	0.943
Time				5.07	(3.55 - 7.25)	**<0.001**	5.72	(4.08 - 8.02)	**<0.001**
Intervention*time[c]				1.76	(1.08 - 2.86)	**0.023**	1.76	(1.07 - 2.89)	**0.025**
1) Socio-demographic characteristics									
Age in years							1.00	(0.98 - 1.03)	0.973
Education									
Never							Ref.		
Primary and more							0.88	(0.66 - 1.17)	0.372
Religion									
Christian							Ref.		
Muslim							0.88	(0.57 - 1.34)	0.548
Wealth index									
Poor							Ref.		
Middle							1.01	(0.76 - 1.34)	0.947
Rich							0.88	(0.64 - 1.19)	0.396
No. of children							0.92	(0.83 - 1.02)	0.109
Pregnancy intention									
No							Ref.		
Yes							0.97	(0.64 - 1.45)	0.868
Don't know							1.07	(0.64 - 1.81)	0.790
Partner's pregnancy intention									
No							Ref.		
Yes							1.12	(0.71 - 1.76)	0.636
Don't know							0.99	(0.62 - 1.58)	0.964
History of unintended pregnancy									
No							Ref.		
Yes							1.66	(1.28 - 2.16)	**<0.001**
Multiple sex partners									
No							Ref.		
Yes							1.86	(1.08 - 3.19)	**0.025**
2) HIV-related characteristics									
HIV status									
Negative							Ref.		
Positive							1.88	(0.95 - 3.73)	0.072
Partner's HIV status									
Negative							Ref.		
Positive							0.96	(0.46 - 1.98)	0.907
Don't know							0.87	(0.61 - 1.22)	0.410
HIV/STI risk perception									
No risk at all							Ref.		
Small							1.14	(0.80 - 1.61)	0.470
Moderate							1.07	(0.74 - 1.54)	0.725
Great							1.09	(0.73 - 1.64)	0.677
3) HEC use									
Type of HECs									
Injectables							Ref.		
Implants							0.87	(0.67 - 1.13)	0.287
IUDs							1.29	(0.87 - 1.93)	0.206
OCPs							1.24	(0.75 - 2.04)	0.400
Female sterilization							3.41	(0.52 - 22.20)	0.200
4) Other psychosocial characterictics									
HIV-related knowledge (HIV-KQ-18)							1.03	(0.98 - 1.08)	0.219
Condom use self-efficacy scale							1.04	(1.03 - 1.06)	**<0.001**
Sexual Relationship Power Scale									
Low							Ref.		
Medium							1.12	(0.85 - 1.47)	0.419
High							1.32	(0.97 - 1.81)	0.075

OR: odds ratio; AOR: adjusted odds ratio; SD: standard deviation; HEC: highly effective contraceptive; IUD: intrauterine device; OCP: oral contraceptive pill

a. Adjusted for the cluster effect and individuals

b. Adjusted for age, education, religion, wealth index, number of children, pregnancy intention, partner's pregnancy intention, history of unintended pregnancy, multiple sex partnership, HIV status, partner's HIV status, HIV/STI risk perception, HIV-related knowledge, condom use self-efficacy, and sexual relationship control power.

c. Intervention*time represents the status of the intervention group at follow-up in comparison with the control group at baseline.

Table S13. Effects of intervention on communication about HIV/STI risk among women at 6 months after enrollement

Variables	Model 1			Model 2			Model 3		
	OR	(95% CI)	p-value	AOR[a]	(95% CI)	p-value	AOR[b]	(95% CI)	p-value
Intervention									
Control	Ref.			Ref.			Ref.		
Intervention	3.33	(2.13 - 5.20)	**<0.001**	1.05	(0.78 - 1.41)	0.741	1.00	(0.74 - 1.35)	0.991
Time				4.12	(3.04 - 5.59)	**<0.001**	4.45	(3.25 - 6.10)	**<0.001**
Intervention*time[c]				3.23	(1.93 - 5.41)	**<0.001**	3.35	(1.99 - 5.66)	**<0.001**
1) Socio-demographic characteristics									
Age in years							0.99	(0.96 - 1.01)	0.298
Education									
Never							Ref.		
Primary and more							0.91	(0.69 - 1.20)	0.492
Religion									
Christian							Ref.		
Muslim							0.99	(0.65 - 1.51)	0.967
Wealth index									
Poor							Ref.		
Middle							1.01	(0.76 - 1.34)	0.958
Rich							0.90	(0.66 - 1.22)	0.481
No. of children							0.95	(0.86 - 1.05)	0.291
Pregnancy intention									
No							Ref.		
Yes							1.12	(0.75 - 1.67)	0.576
Don't know							0.93	(0.56 - 1.56)	0.795
Partner's pregnancy intention									
No							Ref.		
Yes							0.91	(0.58 - 1.42)	0.678
Don't know							0.89	(0.56 - 1.41)	0.621
History of unintended pregnancy									
No							Ref.		
Yes							1.45	(1.12 - 1.87)	**0.005**
Multiple sex partners									
No							Ref.		
Yes							2.29	(1.32 - 3.99)	**0.003**
2) HIV-related characteristics									
HIV status									
Negative							Ref.		
Positive							1.19	(0.62 - 2.29)	0.591
Partner's HIV status									
Negative							Ref.		
Positive							1.09	(0.54 - 2.19)	0.807
Don't know							1.03	(0.73 - 1.45)	0.858
HIV/STI risk perception									
No risk at all							Ref.		
Small							1.14	(0.81 - 1.61)	0.443
Moderate							1.03	(0.72 - 1.48)	0.875
Great							1.05	(0.70 - 1.56)	0.828
3) HEC use									
Type of HECs									
Injectables							Ref.		
Implants							1.03	(0.80 - 1.33)	0.810
IUDs							0.97	(0.66 - 1.42)	0.869
OCPs							1.30	(0.80 - 2.12)	0.288
Female sterilization							1.51	(0.25 - 9.05)	0.650
4) Other psychosocial charactericts									
HIV-related knowledge (HIV-KQ-18)							1.04	(0.99 - 1.08)	0.106
Condom use self-efficacy scale							1.03	(1.02 - 1.05)	**<0.001**
Sexual Relationship Power Scale									
Low							Ref.		
Medium							1.09	(0.83 - 1.43)	0.551
High							1.27	(0.94 - 1.72)	0.122

OR: odds ratio; AOR: adjusted odds ratio; SD: standard deviation; HEC: highly effective contraceptive; IUD: intrauterine device; OCP: oral contraceptive pill

a. Adjusted for the cluster effect and individuals

b. Adjusted for age, education, religion, wealth index, number of children, pregnancy intention, partner's pregnancy intention, history of unintended pregnancy, multiple sex partnership, HIV status, partner's HIV status, HIV/STI risk perception, HIV-related knowledge, condom use self-efficacy, and sexual relationship control power.

c. Intervention*time represents the status of the intervention group at follow-up in comparison with the control group at baseline.

Table S14. Effects of intervention on communication about HIV/STI risk among women at 8 months after enrollement

Variables	Model 1			Model 2			Model 3		
	OR	(95% CI)	p-value	AOR[a]	(95% CI)	p-value	AOR[b]	(95% CI)	p-value
Intervention									
Control	Ref.			Ref.			Ref.		
Intervention	1.75	(1.22 - 2.52)	**0.002**	1.04	(0.68 - 1.59)	0.858	0.99	(0.65 - 1.51)	0.959
Time				3.65	(2.71 - 4.92)	**<0.001**	3.85	(2.83 - 5.22)	**<0.001**
Intervention*time[c]				1.75	(1.12 - 2.74)	**0.015**	1.80	(1.14 - 2.84)	**0.012**
1) Socio-demographic characteristics									
Age in years							0.99	(0.97 - 1.02)	0.555
Education									
Never							Ref.		
Primary and more							1.07	(0.82 - 1.40)	0.610
Religion									
Christian							Ref.		
Muslim							0.85	(0.57 - 1.29)	0.453
Wealth index									
Poor							Ref.		
Middle							1.05	(0.79 - 1.38)	0.749
Rich							0.98	(0.73 - 1.33)	0.918
No. of children							0.97	(0.88 - 1.07)	0.552
Pregnancy intention									
No							Ref.		
Yes							0.94	(0.64 - 1.39)	0.763
Don't know							0.94	(0.57 - 1.55)	0.814
Partner's pregnancy intention									
No							Ref.		
Yes							1.17	(0.76 - 1.80)	0.474
Don't know							1.20	(0.77 - 1.87)	0.432
History of unintended pregnancy									
No							Ref.		
Yes							1.44	(1.13 - 1.85)	**0.004**
Multiple sex partners									
No							Ref.		
Yes							1.92	(1.13 - 3.24)	**0.015**
2) HIV-related characteristics									
HIV status									
Negative							Ref.		
Positive							2.07	(1.07 - 3.99)	**0.031**
Partner's HIV status									
Negative							Ref.		
Positive							0.72	(0.36 - 1.43)	0.345
Don't know							0.87	(0.62 - 1.21)	0.405
HIV/STI risk perception									
No risk at all							Ref.		
Small							1.15	(0.83 - 1.61)	0.398
Moderate							1.19	(0.84 - 1.69)	0.320
Great							1.16	(0.79 - 1.72)	0.446
3) HEC use									
Type of HECs									
Injectables							Ref.		
Implants							1.11	(0.86 - 1.42)	0.426
IUDs							1.18	(0.81 - 1.72)	0.399
OCPs							1.08	(0.68 - 1.72)	0.753
Female sterilization							2.74	(0.44 - 17.17)	0.283
4) Other psychosocial charactericts									
HIV-related knowledge (HIV-KQ-18)							1.03	(0.99 - 1.08)	0.148
Condom use self-efficacy scale							1.03	(1.01 - 1.04)	**<0.001**
Sexual Relationship Power Scale									
Low							Ref.		
Medium							1.28	(0.98 - 1.67)	0.066
High							1.44	(1.07 - 1.94)	**0.016**

OR: odds ratio; AOR: adjusted odds ratio; SD: standard deviation; HEC: highly effective contraceptive; IUD: intrauterine device; OCP: oral contraceptive pill

a. Adjusted for the cluster effect and individuals

b. Adjusted for age, education, religion, wealth index, number of children, pregnancy intention, partner's pregnancy intention, history of unintended pregnancy, multiple sex partnership, HIV status, partner's HIV status, HIV/STI risk perception, HIV-related knowledge, condom use self-efficacy, and sexual relationship control power.

c. Intervention*time represents the status of the intervention group at follow-up in comparison with the control group at baseline.

Table S15. Effects of intervention on the incidence of pregnancy among women at 2 months after enrollement

Variables	Model 1			Model 2			Model 3		
	OR	(95% CI)	p-value	AOR[a]	(95% CI)	p-value	AOR[b]	(95% CI)	p-value
Intervention									
Control	Ref.			Ref.			Ref.		
Intervention	0.46	(0.08 - 2.50)	0.365	0.46	(0.08 - 2.50)	0.365	1.21	(0.09 - 15.75)	0.882
1) Socio-demographic characteristics									
Age in years							1.16	(0.91 - 1.48)	0.234
Education									
Never							Ref.		
Primary and more									Perfect success
Religion									
Christian							Ref.		
Muslim									Perfect success
Wealth index									
Poor							Ref.		
Middle							0.52	(0.01 - 18.81)	0.724
Rich							3.35	(0.16 - 70.01)	0.435
No. of children							0.91	(0.26 - 3.14)	0.875
Pregnancy intention									
No							Ref.		
Yes							0.03	(0.00 - 1.50)	0.080
Don't know									Perfect success
Partner's pregnancy intention									
No							Ref.		
Yes							2.83	(0.08 - 103.69)	0.571
Don't know									Perfect success
History of unintended pregnancy									
No							Ref.		
Yes							0.90	(0.07 - 11.55)	0.938
Multiple sex partners									
No							Ref.		
Yes									Collinearity
2) HIV-related characteristics									
HIV status									
Negative							Ref.		
Positive									Perfect success
Partner's HIV status									
Negative							Ref.		
Positive							7.37	(0.28 - 191.75)	0.230
Don't know									Perfect success
HIV/STI risk perception									
No risk at all							Ref.		
Small							0.60	(0.05 - 7.82)	0.695
Moderate							0.09	(0.00 - 2.61)	0.160
Great									Perfect success
3) HEC use									
Type of HECs									
Injectables							Ref.		
Implants							5.53	(0.57 - 53.68)	0.140
IUDs									Perfect success
OCPs									Perfect success
Female sterilization									Perfect success
4) Other psychosocial characterictics									
HIV-related knowledge (HIV-KQ-18)							0.97	(0.60 - 1.57)	0.892
Condom use self-efficacy scale							0.89	(0.78 - 1.01)	0.075
Sexual Relationship Power Scale									
Low							Ref.		
Medium							0.01	(0.00 - 2.11)	0.095
High							2.62	(0.27 - 25.85)	0.409

OR: odds ratio; AOR: adjusted odds ratio; SD: standard deviation; HEC: highly effective contraceptive; IUD: intrauterine device; OCP: oral contraceptive pill

a. Adjusted for the cluster effect and individuals

b. Adjusted for age, education, religion, wealth index, number of children, pregnancy intention, partner's pregnancy intention, history of unintended pregnancy, multiple sex partnership, HIV status, partner's HIV status, HIV/STI risk perception, HIV-related knowledge, condom use self-efficacy, and sexual relationship control power.

Table S16. Effects of intervention on the incidence of pregnancy among women at 4 months after enrollement

Variables	Model 1			Model 2			Model 3		
	OR	(95% CI)	p-value	AOR[a]	(95% CI)	p-value	AOR[b]	(95% CI)	p-value
Intervention									
Control	Ref.			Ref.			Ref.		
Intervention	0.47	(0.08 - 2.56)	0.380	0.47	(0.08 - 2.56)	0.380	0.23	(0.00 - 17.34)	0.504
1) Socio-demographic characteristics									
Age in years							0.85	(0.53 - 1.36)	0.499
Education									
Never							Ref.		
Primary and more									Perfect success
Religion									
Christian							Ref.		
Muslim									Perfect success
Wealth index									
Poor							Ref.		
Middle							0.12	(0.00 - 5.79)	0.281
Rich									Perfect success
No. of children							1.08	(0.25 - 4.61)	0.917
Pregnancy intention									
No							Ref.		
Yes							0.03	(0.00 - 21.12)	0.287
Don't know							0.05	(0.00 - 25.14)	0.339
Partner's pregnancy intention									
No							Ref.		
Yes							0.24	(0.00 - 33.85)	0.572
Don't know									Perfect success
History of unintended pregnancy									
No							Ref.		
Yes							2.44	(0.08 - 70.08)	0.603
Multiple sex partners									
No							Ref.		
Yes									Perfect success
2) HIV-related characteristics									
HIV status									
Negative							Ref.		
Positive									Perfect success
Partner's HIV status									
Negative							Ref.		
Positive									Perfect success
Don't know									Perfect success
HIV/STI risk perception									
No risk at all							Ref.		
Small							0.27	(0.01 - 6.94)	0.428
Moderate							0.99	(0.05 - 20.41)	0.995
Great									Perfect success
3) HEC use									
Type of HECs									
Injectables							Ref.		
Implants							0.15	(0.01 - 3.28)	0.230
IUDs									Perfect success
OCPs							0.83	(0.02 - 39.73)	0.925
Female sterilization									Collinearity
4) Other psychosocial characterictics									
HIV-related knowledge (HIV-KQ-18)							0.87	(0.55 - 1.37)	0.546
Condom use self-efficacy scale							1.06	(0.91 - 1.24)	0.463
Sexual Relationship Power Scale									
Low							Ref.		
Medium							0.36	(0.01 - 9.92)	0.547
High							0.72	(0.03 - 16.84)	0.840

OR: odds ratio; AOR: adjusted odds ratio; SD: standard deviation; HEC: highly effective contraceptive; IUD: intrauterine device; OCP: oral contraceptive pill

a. Adjusted for the cluster effect and individuals

b. Adjusted for age, education, religion, wealth index, number of children, pregnancy intention, partner's pregnancy intention, history of unintended pregnancy, multiple sex partnership, HIV status, partner's HIV status, HIV/STI risk perception, HIV-related knowledge, condom use self-efficacy, and sexual relationship control power.

Table S17. Effects of intervention on the incidence of pregnancy among women at 8 months after enrollement

Variables	Model 1			Model 2			Model 3		
	OR	(95% CI)	p-value	AOR[a]	(95% CI)	p-value	AOR[b]	(95% CI)	p-value
Intervention									
Control	Ref.			Ref.			Ref.		
Intervention	0.38	(0.07 - 1.96)	0.246	0.38	(0.07 - 2.19)	0.281	0.40	(0.02 - 8.19)	0.552
1) Socio-demographic characteristics									
Age in years							0.85	(0.64 - 1.13)	0.263
Education									
Never							Ref.		
Primary and more									Perfect success
Religion									
Christian							Ref.		
Muslim									Perfect success
Wealth index									
Poor							Ref.		
Middle							0.08	(0.01 - 1.14)	0.062
Rich									Perfect success
No. of children							1.23	(0.40 - 3.83)	0.716
Pregnancy intention									
No							Ref.		
Yes									Perfect success
Don't know									Perfect success
Partner's pregnancy intention									
No							Ref.		
Yes									Perfect success
Don't know									Perfect success
History of unintended pregnancy									
No							Ref.		
Yes							0.92	(0.05 - 16.15)	0.955
Multiple sex partners									
No							Ref.		
Yes									Perfect success
2) HIV-related characteristics									
HIV status									
Negative							Ref.		
Positive							6.80	(0.17 - 272.13)	0.309
Partner's HIV status									
Negative							Ref.		
Positive									Perfect success
Don't know									Perfect success
HIV/STI risk perception									
No risk at all							Ref.		
Small							2.90	(0.34 - 24.54)	0.328
Moderate									Collinearity
Great									Perfect success
3) HEC use									
Type of HECs									
Injectables							Ref.		
Implants							0.09	(0.00 - 2.08)	0.133
IUDs									Perfect success
OCPs							0.80	(0.04 - 16.43)	0.885
Female sterilization									Perfect success
4) Other psychosocial characterictics									
HIV-related knowledge (HIV-KQ-18)							0.86	(0.56 - 1.34)	0.507
Condom use self-efficacy scale							0.92	(0.79 - 1.07)	0.255
Sexual Relationship Power Scale									
Low							Ref.		
Medium							2.24	(0.15 - 34.45)	0.564
High							3.01	(0.08 - 113.51)	0.552

OR: odds ratio; AOR: adjusted odds ratio; SD: standard deviation; HEC: highly effective contraceptive; IUD: intrauterine device; OCP: oral contraceptive pill

a. Adjusted for the cluster effect and individuals

b. Adjusted for age, education, religion, wealth index, number of children, pregnancy intention, partner's pregnancy intention, history of unintended pregnancy, multiple sex partnership, HIV status, partner's HIV status, HIV/STI risk perception, HIV-related knowledge, condom use self-efficacy, and sexual relationship control power.

Research protocol

Positive deviance for dual-method promotion among women in rural Uganda

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Research protocol

DECLARATION

I hereby declare that the proposal for the research entitled "Positive deviance for dual-method promotion among women in rural Uganda" is my original work and has not been presented for a degree in any other universities.

9 June 2019

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1 Introduction

1.1 Background

In sub-Saharan Africa (SSA), women of reproductive age bear a disproportionate burden of unintended pregnancies and sexually transmitted infections (STIs) including HIV (1). In SSA, an estimated 35% of pregnancies are unintended (2). Moreover, women account for approximately 56% of all adults living with HIV in this region (3). This gender disparity starts when women reach their reproductive age, and women represent 59% of new HIV infections in this region (3, 4).

Unintended pregnancies occur because appropriate contraceptive methods are not available or avoided (5). To prevent this, highly effective contraceptives (HECs), such as hormonal contraceptives (e.g., pills, injectable, and implants), non-hormonal intrauterine device (IUD), and sterilization, were introduced to family planning programs (5). In many countries in SSA, women have started to use these methods more frequently during the past decades (6). HECs are effective in preventing unintended pregnancies but cannot prevent HIV/STIs (7). Therefore, women need to protect themselves from HIV/STIs, regardless of whether they are using HECs or not.

Dual protection is defined as a protection against the dual risks of unintended pregnancy and STIs including HIV (8). It can be accomplished by either using condoms consistently alone or with HECs (dual-method use) (8). Condoms are an effective method for women to prevent HIV/STIs from their sexual partners when being used correctly and consistently (9). However, as being often used incorrectly and inconsistently, condoms can only prevent 85% of pregnancies (10). Dual-method use, thus, has been recommended as the most reliable protection against the dual risks in couples who do not want a child or who want to delay childbirth (7, 8, 11, 12). Nevertheless, it remains uncommon (11). In the United States of America (USA), 7% of reproductive-age women who were sexually active used this method (13). In SSA, most research has focused on dual-method use among women living with HIV and adolescents. For instance, 16% and 39 % of women living with HIV practiced dual-method use in a three-month period in Ethiopia and Kenya, respectively (8, 14), while 7% of South African adolescents aged 15–24 years reported dual-method use (15).

Condom use is necessary for dual protection but not commonly practiced in SSA (9). Several barriers lessen their acceptability. For instance, women often cannot discuss condom use with their partners, as condoms are often perceived as a method for preventing HIV/STIs (8, 16, 17). Thus, condoms are often associated with infidelity and distrust within relationship in SSA (8, 16, 17). For this reason, condom use is not prevalent especially among women in a marital relationship. In Uganda, for example, only 2% of women used a condom with regular partners during the last sexual intercourse, while 37% used a condom with a non-regular partner (18).

Moreover, a trade-off between HEC and condom use is a barrier to practicing dual protection. Women are less likely to use condoms with their male partners when using HECs (19). Condom use may become unacceptable, especially in marital sex, as it is perceived as protection against HIV/STIs rather than pregnancies by using HECs. Both women and men may think condoms are unnecessary with an intimate partner, especially when women are using HECs (20). However, condom use is necessary for women who are at risk of HIV/STIs, regardless of HEC use (16). Extramarital sexual relationships are common, especially among men, in SSA (21). For instance, an estimated 44% of HIV infections occurred among married or cohabiting couples in Kenya (22).

A handful of interventions have been conducted to promote dual-method use in the USA (11). However, few interventions had a significant effect on dual-method use (11, 23), and effects of such interventions were often unsustainable (24). These interventions include computer-based training (24), clinic-based and phone call counseling (25), and a peer-leadership program (26, 27). In addition, one trial of multimedia component and counselling sessions is ongoing (28). Although people are at

considerable risk of unintended pregnancies and HIV/ STIs, no interventions have been examined in resource-limited settings (11). Women and men may perceive the importance of condom use for preventing HIV/STIs, but often do not practice (29). Motivating factors for dual-method use remains unknown when the percentage of such users is low (29).

The positive deviance (PD) approach has the potential to address barriers to sensitive issues such as sexual and reproductive health. This approach seeks behaviors that contribute to otherwise high-risk individuals, or positive deviants, remaining free from a disease or condition and enable communities to adopt such behaviors (30, 31). This approach has addressed the complex development challenges, which are often hard for outsiders to measure, such as gender-related and sociocultural barriers (30). For example, the PD approach was applied to advocate against female genital mutilation using actual words of positive deviants in Egypt (30). Condom use is not prevalent in SSA, especially among married women using HECs. Barriers to condom use are complex and often difficult for outsiders to grasp the whole picture (32). Given limited effect of previous interventions, the PD approach can be an ideal option for promoting dual-method use (31). This study will examine the effect of an intervention formulated under the PD approach on dual-method use among women using HECs with their marital partners in rural Uganda.

To the best of my knowledge, this is the first study to use the PD approach to promote dual-method use. The finding of this study may contribute to increasing evidence on the effectiveness of the PD approach in tackling barriers for dual-method use. Furthermore, the results will be useful to public health policymakers to develop programs to reach women who need dual-method use and to reduce unintended pregnancies and HIV/STIs infections in Uganda.

1.2 Objectives

1. To examine factors associated with condom use among married women using HECs in an HIV-prevalent setting in Uganda.

2. To identify unique behaviors that are common only among married women who practice dual-method use with their partners.

3. To evaluate an intervention formulated under the positive deviance approach for promoting dual-method use among married women using HECs.

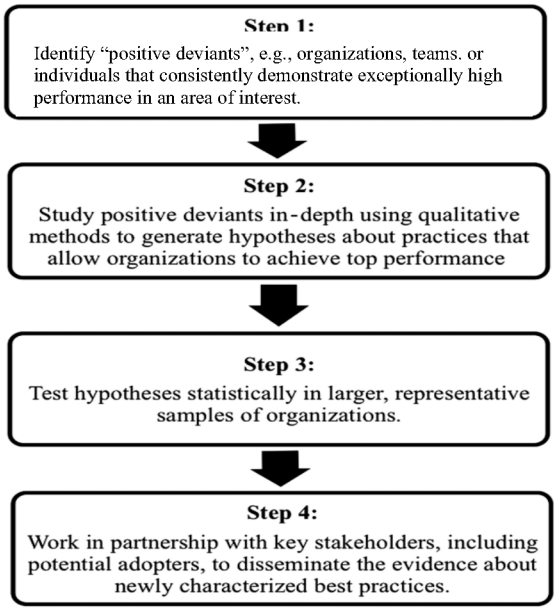
Research protocol

2. Methods

2.1 Study design:

This study will examine whether a PD-led intervention is effective in promoting dual-method use among women who are using HECs with their marital partners. Steps in the positive deviance approach have been illustrated everywhere but adopted flexibly in practice (30, 33).

In this study, dual-method use is defined as the use of male or female condom along with HECs like pills, injectable, implants, male and female sterilization, and IUD consistently in the last two months (8).

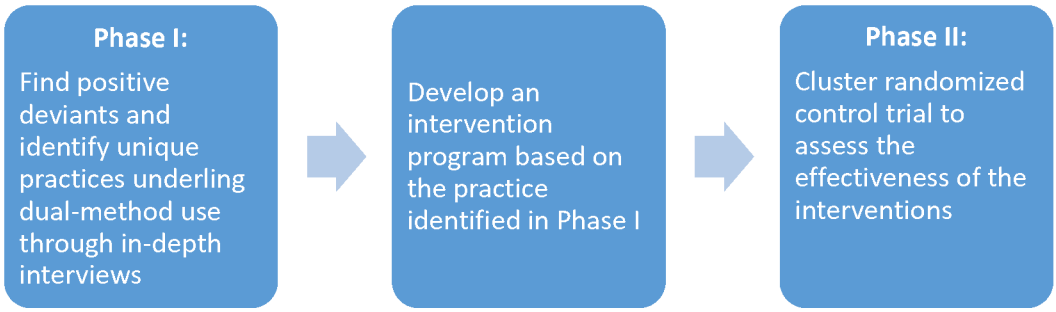


Steps in the positive deviance approach (33)

This study consists of two phases.

In **Phase I**, we will seek women who practice dual-method use with their marital partners (positive deviants) and conduct in-depth interviews to understand their intentional and unintentional behaviors and factors for dual-method use.

In **Phase II**, we will conduct a cluster randomized control trial (C-RCT) to test the effectiveness of the intervention formulated under the positive deviance approach for promoting dual-method use. The intervention will include clinic-based and phone counselling, a participatory learning workshop, and Information, Education and Communication (IEC) materials. They will be tailored based on the unique practice identified in Phase I.



2.2 Study area:

This study will be conducted in Mbarara district, South Western Uganda. Contraceptive use has significantly increased in Uganda. Its use among married women increased from 14% in 2001 to 35% in 2014 (18). Like other countries in SSA, HECs are getting the norm in Uganda, with 32% of currently married women using them in 2014 (18). Injectable is the most used method (19%) followed by implants (6%), female sterilization (3%), male condom (2%), pills (2%) and IUD (2%) (18). Despite the significant increase in contraceptive use, an estimated 44% of pregnancies were unintended in Uganda (34).

The HIV prevalence among adults 15–64 years is 6.2 and is higher among women (7.6%) than among men (4.7%) (35). The South-West region had the second highest HIV prevalence (7.9%) after the Central region (8.0%) in Uganda (35).

Mbarara district has one regional hospital, six general hospitals, four county-level health centers (health center IV), 14 sub-county-level health centers (health center III), 37 parish-level health centers (health center II). Among them, 48 are public health facilities, and 23 facilities are located in urban areas. Family planning service is provided for free at all the levels of health facilities. Male and female condoms are provided free by the Ministry of Health and by local and international nongovernmental organizations (18, 36). Condoms can also be purchased from supermarkets and pharmacies for USD 0.15 to USD 0.50 (36).

2.3 Phase I

In Phase I, positive deviants, or women practicing dual-method use, will be identified through health facility-based cross-sectional survey in selected five health facilities in Mbarara district, Uganda. Trained female research assistants will conduct face-to-face interviews with 150 women using a structured questionnaire. After the initial data collection, we will conduct in-depth interviews with all women who practiced dual-method use (positive deviants) and 10 women who used only HECs. The interviews will be conducted by trained female research assistants to identify unique behaviors underling dual-method use.

2.3.1 Study participants

To be eligible for joining in this study, participants should have the following characteristics:

- Women
- 18-49 years old
- Sexually active
- Using HECs at the time of recruitment
- Have a desire to avoid pregnancy for 12 months from recruitment
- Have a husband or live-in sexual partner
- Have access to a valid phone number

Being sexually active is defined to have had sexual intercourse in the last three months prior to the study (14). Pregnant women and women who are infertile for other reasons will be excluded from this study. Health workers including community health workers, political and religious leaders, and teachers will also be excluded because they may not represent communities or be influenced by their occupations and social status. Existing assessment tools will be used to screen eligible participants, such as Uganda Demographic and Health Survey's questionnaire (18) and Behavioral Surveillance Surveys questionnaire (37).

In addition, male partners of women practicing dual-method use at the time of recruitment will be invited for in-depth interview. Male partners should be aged 18 years or older.

2.3.2 Sample size

One hundred fifty women will be interviewed. This is based on the assumption that at least 7% of women would practice dual-method use (15), and we could find at least 10 women who are considered as a positive deviant. All women who are identified as positive deviants will be invited for the in-depth interviews. For comparison, 10 women who do not practice dual-method use will be randomly selected for the in-depth interviews.

In addition, 5 male partners of women practicing dual-method use at the time of recruitment will be interviewed.

2.3.3 Sampling methods

Five health facilities will be selected purposively. Then, five trained female research assistants will approach female clients in the family planning sections of the selected health facilities. The first client will be selected randomly at each clinic, and then every third client will be informed about the opportunity to participate in this study. If they are interested in participating, the research assistants will ask screening questions using a pretested questionnaire to check their eligibility for the study. This process will be repeated until the required sample size is met.

2.3.4 Data collection

The five female trained research assistants will conduct face-to-face interviews using a pretested structured questionnaire with the participants. These interviews aim to identify women practicing dual-method use and their basic socio-demographic characteristics. Data collection items include basic socio-demographic characteristics, the types of HECs, the frequency of condom use in the past two months, and the histories of unintended pregnancies and diagnosed HIV/STIs. Women using both HECs and condom always will be regarded as practicing dual-method use. Dual-method users without no reported histories of unintended pregnancies and HIV/STIs will be considered as positive deviants. Then, in-depth qualitative interviews will be conducted by the research assistants with all positive deviants to identify their unique practice, such as effective communication for condom use that is actually working. Then, ten women who do not practice dual-method use are randomly selected for in-depth interviews. In addition, 5 male partners of women practicing dual-method use will be purposively selected and invited for in-depth interviews.

These in-depth interviews aim to verify if the practice identified in positive deviants is really unique. This interview will be open-ended, and an interview guide will be used. The interview guide focuses on the following domains: (1) perceptions of condom use and contraception, (2) reasons and motivations for condom use or nonuse, (3) negotiation and communication for condom use, and (4) risk perceptions for or unintended pregnancy and HIV/STIs.

The data collection tools are first developed in English and then translated to Runyankore by a researcher. It is back-translated to English by a different researcher to ensure the accuracy of the translation. All interviews are conducted in either English or Runyankore. In-depth interviews will be audio recorded. Women who turned out not to meet the inclusion criteria during the in-depth interviews will be excluded from the analysis.

A pre-test of the interview guide will be conducted with five women purposively selected at a family planning clinic outside of the study area but in a similar setting.

2.3.5 Compensation

All the participants will be given some commodities worth of 10,000 UGX (equivalent to 3 USD) after the initial interview, and those who participated in the in-depth interview will receive10,000 UGX for their time and transportation after the in-depth interviews.

2.3.6 Data analysis plan

All qualitative interview data will be transcribed and if not in English, translated from Runyankore into English by a researcher. Translated transcriptions will be compared with recorded data by another researcher to ensure their accuracy. Then, two researchers will read all the transcripts and code overarching themes using MAXQDA version 18. The two researchers will compare data between dual-method users and nonusers to identify problems and barriers to adapting dual-method use and how they were overcome by positive deviants with their unique practice.

2.4 Phase II

In Phase II, a C-RCT will be conducted to assess the effectiveness of an intervention formulated under the PD approach on dual-method use by comparing intervention and control groups. The intervention will consist of clinic-based and phone counselling, a participatory workshop and the distribution of IEC materials. All interventions will be tailored based on the unique practice identified in Phase I. The counselling and workshop will be conducted by positive deviants identified during Phase I.

2.4.1 Study participants and recruitment

Eligibility

The same inclusion criteria as Phase I will be used for this intervention study, but women practicing dual-method use in the last two months prior to the recruitment will be excluded. Any women will be given full right to withdraw from this trial at any time without giving a reason.

Sample size

The simple minimum sample size for this RCT is 588. It was calculated by using Open Epi version 3. The power of the study was set at 80%, and the significance level was set at 5%. For assumptions, data from a previous intervention research on the uptake of dual-method use in the USA (Odds ratio: 2.43 with a 95% CI of 1.03 to 2.43) was used (27). Then, an intraclass correlation coefficient (ICC) of 0.006 was considered (36, 37). The ICC was based on a clinic-based condom use intervention in SSA (37). The required minimum sample size was 760 after considering the ICC. Considering 26% dropout rate (24), 960 participants will be recruited (480 participants in each arm).

Sampling methods

Women will be recruited for this study at 20 health facilities in Mbarara district. The 20 health facilities will be purposively selected, considering the size and rural/urban status. Then, the same sampling method as Phase I will be used to recruit eligible women at the health facilities. Eighty women will be recruited from each of hospitals and county-level health centers, 40 from each of sub-county-level health centers and parish-level health centers.

2.4.2 Randomization

To control contamination across individuals, the C-RCT approach will be adopted (38). The 20 health facilities will be stratified based on the level of health facilities and urban/rural status and randomized to an intervention (n = 10 facilities) or control arm (n = 10 facilities), using a computer random number generator. The participants will be given the intervention that the facilities they were recruited at were allocated to.

2.4.3 Blinding

Blinding is not feasible in this kind of educational intervention study (11).

2.4.4 Intervention

This trial aims to evaluate the effectiveness of an intervention for promoting dual-method uptake and adherence among married women using HECs. The intervention will consist of clinic-based and phone counselling, a participatory workshop and the distribution of IEC materials, developed based on the unique practice identified in Phase I.

On the day of enrollment, women in the intervention arm will receive dual-method counseling with a tool developed based on the practice identified in Phase I, in addition to regular family planning counseling using an existing counseling tool (39). The counseling will be conducted for 20-40 minutes by trained research assistants.

Two weeks after the enrollment, women in the intervention arm will be invited for a one-day participatory learning workshop (five hours) at the same health facilities where they are recruited. Women may decide whether to participate or not. The workshop will be facilitated by research assistants and positive deviants, using a training protocol developed after Phase I. It includes simulations and role-plays for successful communication to use a condom with their partners and a group discussion regarding family planning and HIV/STI risk.

Bimonthly telephone counseling and refresher training will be provided by the positive deviants three times (3, 5 and 7 months after the enrollment). It will take 10-20 minutes and aim to remind women of the risk of unintended pregnancies and HIV/STIs and strengthen their capacity to communicate to use a condom with their partners.

In contrast, women in the control group will be provided regular family planning by trained research assistants using the existing material tool on the day of enrollment (39). Moreover, they will receive bimonthly phone calls on family planning and HIV/STI risk by research assistants three times (3, 5 and 7 months after the enrollment).

Condoms will be provided for free, regardless of whether women belong to the intervention or control arm at the selected health facilities.

Intervention	Control
• Regular family planning counseling +dual-method use counselling based on the practice identified in Phase I	• Regular family planning counseling using an existing material

• One-day participatory learning workshops facilitated by research assistants and positive deviants • Bimonthly telephone counselling by positive deviants • Tailored IEC materials including narrative stories from positive deviants	• Bimonthly phone calls on various health topics by research assistants

2.4.5 Outcomes

Primary: Dual-method selection and adherence

The primary outcome is dual-method use in the last two months prior to each follow-up interview (8). The outcome measure combines two questions regarding the frequency of condom use and family planning use.

The frequency of condom use will be asked via an item: "With what frequency did you and your partner use a male or female condom during the past two months?" Women will answer this question using a four-point scale "every time," "almost every time," "sometimes," and "never." Only those who answered with "every time" will be considered as having consistent condom use.

Women will be asked if they have been using any family planning methods via an item: "Without counting condoms, have you been using another form of protection against pregnancy during the past two months?" Responses to these two questions will be used to construct the dual-method use outcome with the following categories:

1) Dual-method use (family planning and consistent condom use)
2) Family planning and inconsistent condom use
3) Single or no method use

Self-reported first occurrence of pregnancy and STIs

Self-reported pregnancy and STI history (chlamydia, gonorrhea, or trichomonas infection) in the last two months will be assessed via the following two items: "Have you been told by a health care provider that you got pregnant for the first time in the past 2 months?" and "Have you been told by a health care provider that you had any STIs such as chlamydia, gonorrhea, or trichomonas infection for the first time in the past 2 months?"(28, 40).

2.4.6 Other information

The following information will be collected in the baseline interviews to conduct descriptive statistics and sub-group analysis and to identify factors associated with condom use: age, education, employment, rural/urban status, reproductive history, pregnancy intention, sexual history, STI history, substance use, domestic violence, current and past contraceptive practice, awareness of dual-method use, spousal communication on family planning, HIV status of participants and their partners, disclosure of HIV status, ART treatment status (24), HIV-related Knowledge (HIV-KQ-18) (41), perceived HIV infection risk (42), condom use self-efficacy (40), sexual relationship control (the Sexual Relationship Power Scale: SRPS) (43, 44), and women's perception of the social acceptability of contraception (45).

2.4.7 Data collection

On the day of enrollment, all women will be interviewed using a structured questionnaire to identify basic baseline characteristics. Then, follow-up survey will be conducted by phone every two months for eight months to evaluate how the intervention influences on dual-method selection and adherence and pregnancy and STI incidence (2,4,6, and 8 months after the enrollment). After the intervention, 15 will be randomly selected from women who started practicing dual-method use and invited for in-depth interview. The in-depth interview aims to gather qualitative data to assess effects of the intervention and patients' feedback for the intervention.

All interview will be conducted by female research assistants using an interview guide. A pre-test of the questionnaire will be conducted among 5% (37 women) of the minimum sample size at a family planning clinic outside of the study area but in a similar setting. All data will be entered using EpiData software.

2.4.8 Compensation

All the participants will be given some commodities worth of 10,000 UGX (equivalent to 3 USD) for their time and participation in the study after the initial interviews. Participants who participated in the learning workshop and the in-depth interview will receive 20,000 UGX (equivalent to 6 USD) for transportation.

2.4.9 Data analysis plan

The background characteristics of women will be compared between the intervention and the control group using Pearson's chi-square or Fisher's exact tests. Multiple logistic regression analysis will be performed to access the effect of the intervention on the following outcomes: dual-method selection and adherence in the past 2 months before each follow-up data collection and self-reporting pregnancy and STIs in the past 2 months. Differences between the two groups at the baseline will be controlled as covariates in the analysis (46). Besides, sub-group analyses will be conducted among HIV-seroconcordant and-discordant couples. An intention-to-treat principle will be adopted for these analyses. Attrition rates and reasons for dropout will be compared between the two groups (47). The outcome data of those dropped out and lost to follow up will be excluded from the analyses. The significance level will be set at 5%. STATA version 13.1(College Station, Texas, USA) will be used for all data analyses.

2.4.10 Probable issues and management

This trial is expected to encounter a high proportion of participants lost to follow-up, which can cause significant biases and affect the power and validity of the RCT (28). Therefore, this study will reduce participants lost to follow up, by establishing and maintaining contact with participants on a monthly basis readdress of the intervention or the control group.

To mitigate the potential emergence of suspicions and domestic conflicts, all participants will be given a leaflet to inform the research objectives and procedures to their partners. Moreover, all telephone counseling and follow-up surveys will be conducted by trained female research assistants. Female research assistants will explain the research objectives and procedures to their partners based on request from participants whenever during the study period.

3. Ethical consideration

Participation in this study will be voluntary. Written consent will be obtained from all women who expressed willingness to participate in the study. Each interview will be taken in a confidential and

secure environment. The entire data set will be recorded in an anonymous form and confidentiality will be assured.

Ethical approval will be obtained from the Research Ethics Committee of the Graduate School of Medicine, the University of Tokyo, Japan, the Institutional Research and Ethics Committee (MUST-REC) of Mbarara University of Science and Technology, Mbarara, Uganda and Uganda National Council of Science and Technology (UNCST), Kampala, Uganda. Moreover, written approvals will be obtained from each health facility under study.

4. Funding

This study will be supported by FASID Scholarship Program: Assistance for Higher Education.

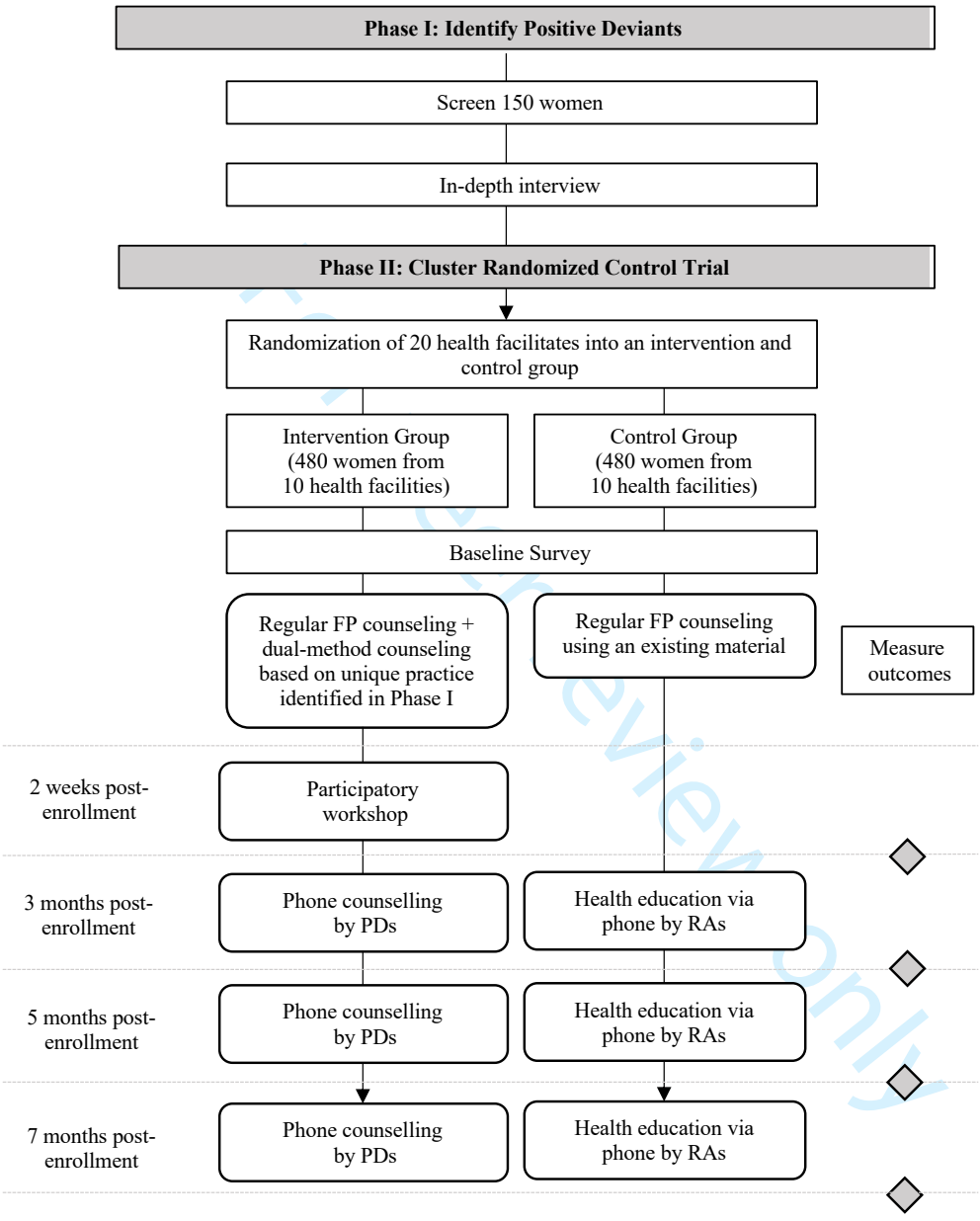
5. Budget Plan

	Person	Day/Month	Unit Cost (USD)	Total (USD)
Ethical Review Fee				
The University of Tokyo	-	-	300	300
Mbarara University of Science and Technology	-	-	300	300
Uganda National Council for Science and Technology	-	-	300	300
TOTAL				900
	Person	Day/Month	Unit Cost (UGX)	Total (UGX)
Phase I				
Allowance for Research Assistants	5	10	30,000	1,500,000
Transport for Research Assistants	5	10	20,000	1,000,000
Compensation for participants (initial interview)	150	1	10,000	1,500,000
Compensation for participants (in-depth interview)	20	1	10,000	200,000
Phase II (Baseline)				
Allowance for Research Assistants	5	20	30,000	3,000,000
Transport for Research Assistants	5	20	20,000	2,000,000
Compensation for participants (including pre-test)	997	1	10,000	4,985,000
Phase II (Follow UP)				
Allowance for Research Assistants	5	8	30,000	1,200,000
Allowance for counselors (PD)	10	8	30,000	2,400,000
Communication	15	8	50,000	6,000,000

Phase II (Workshop)				
Allowance for Facilitators (PD)	3	20	30,000	1,800,000
Transport for Facilitators (PD)	3	20	20,000	1,200,000
Transport for participants	480	1	20,000	9,600,000
Printing IEC Materials	480	1	3,000	1,440,000
TOTAL (UGX)				42,810,000
TOTAL (USD)				10,977
GRAUND TOTAL (USD)				**11,877**

Research protocol

Appendixes



FP: Family Planning
PD: Positive Deviants
RA: Research Assistant

Fig. 1. Study Flow Chart

Research protocol

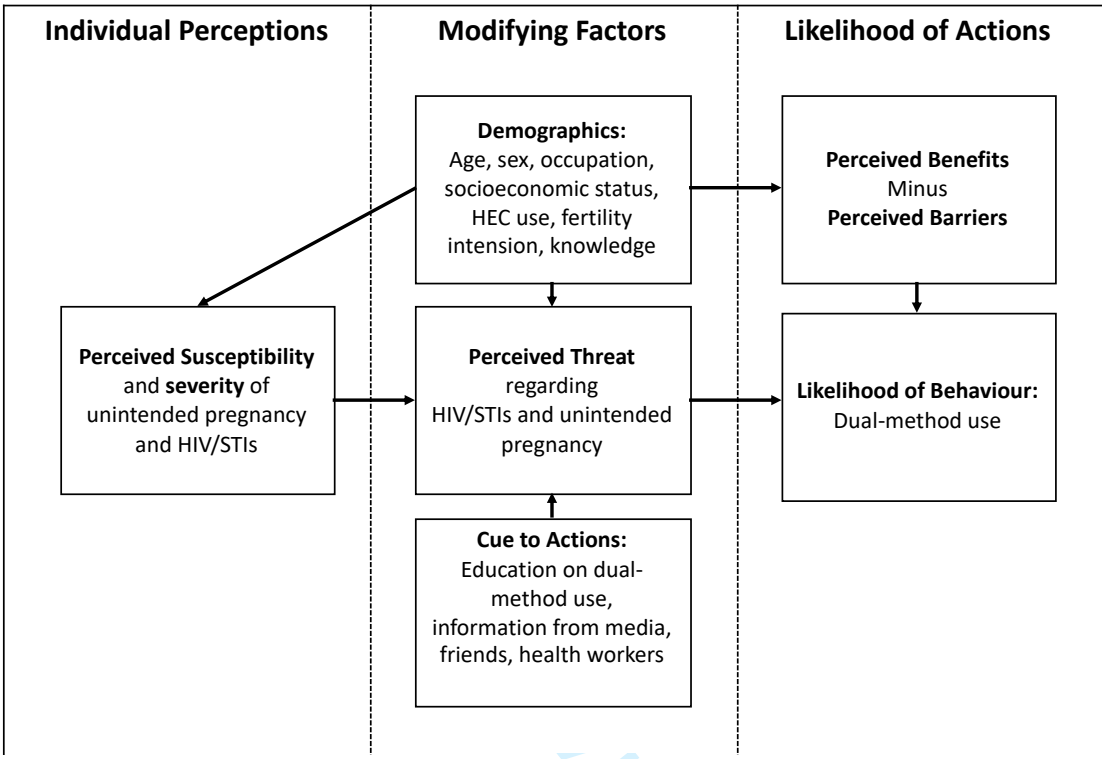
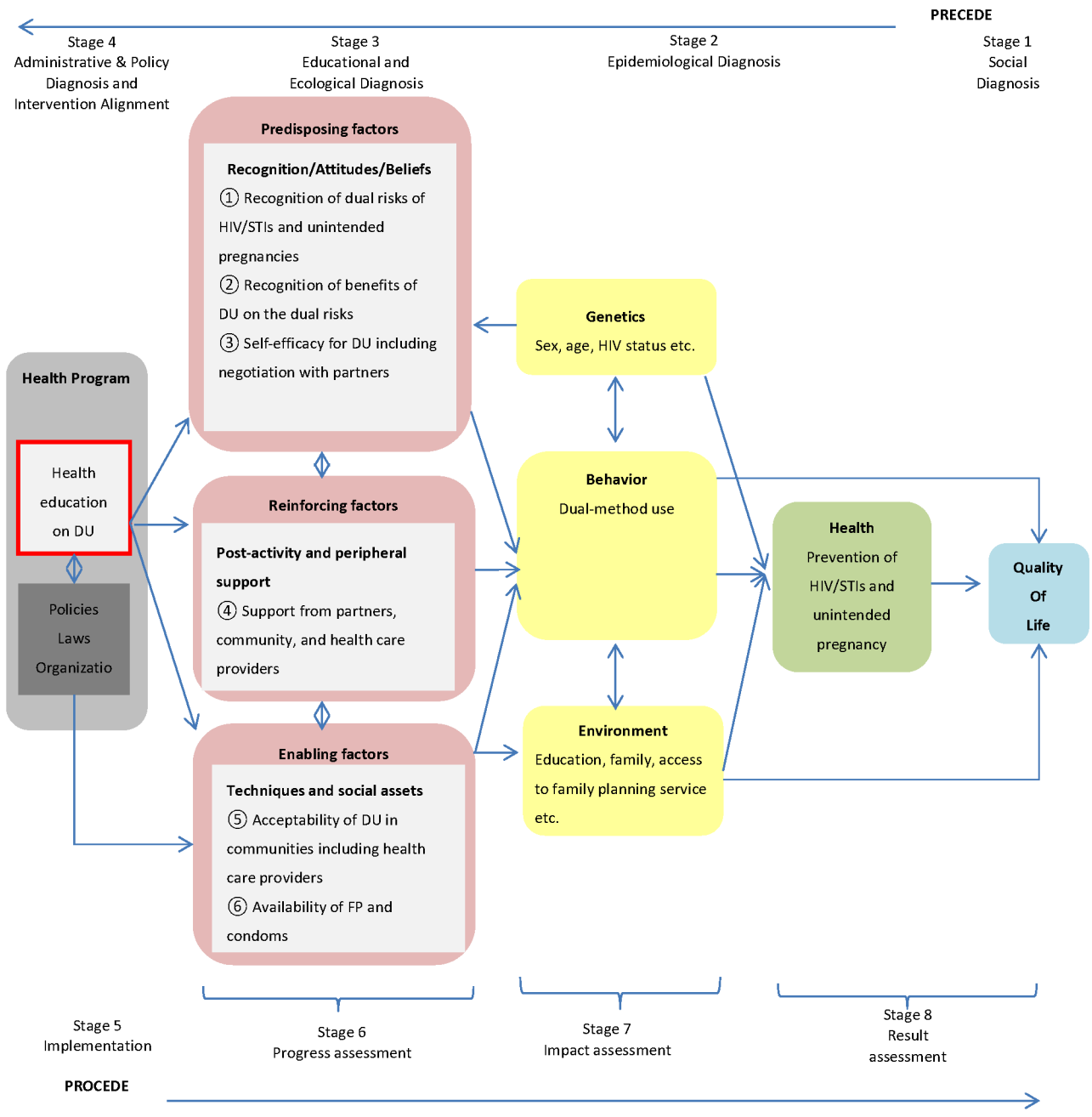


Figure 2. Conceptual Framework adapted and modified from Health Belief Model (32)



DU: Dual-method Use; FP: Family Planning

Figure 3. Conceptual framework applying the planned intervention to PRECEDE-PROCEED Model (48)

Research protocol

Research schedule

	2019									2020												2021		
	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
Ethical Application																								
Phase I																								
Phase II: Recruitment/Baseline Survey																								
Phase II: Intervention (Phone counseling)																								
Phase II: Intervention (Workshop)																								
Phase II: Follow Up Survey																								
Data Analysis/Thesis Writing																								

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Title: Positive deviance for promoting dual-method contraceptive use among women in Uganda: A cluster randomized controlled trial

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Abstract

Objective To examine the effects of a positive deviance intervention on dual-method contraceptive use among married or in-union women.

Design Open-label cluster randomized controlled trial.

Setting 20 health facilities in Mbarara District, Uganda.

Participants 960 married or in-union women aged 18–49 years using a non-barrier modern contraceptive method.

Interventions A combination of clinic- and telephone-based counseling and a one-day participatory workshop, which were developed based on a preliminary qualitative study of women practicing dual-method contraception.

Primary outcome measure Dual-method contraceptive use which was measured in two timeframes: its use at the last sexual intercourse and its consistent use in the two months prior to each follow-up. The outcome was measured based on participants' self-reports, and the effect of intervention was assessed using a mixed-effects logistic regression model.

Results More women in the intervention group used dual-method contraception at the last sexual intercourse at two months (AOR = 4.12; 95% CI 2.02–8.39) and eight months (AOR = 2.16; 95% CI 1.06–4.41) than in the control group. At four and six months, however, the proportion of dual-method contraceptive users was not significantly different between the two groups. Its consistent use was more prevalent in the intervention group than in the control group at two months (AOR = 14.53; 95% CI 3.63–58.13), and the intervention effect lasted throughout the follow-up period.

Conclusions The positive deviance intervention increased dual-method contraceptive use among women, and could be effective at reducing the dual risk of unintended pregnancies

and HIV infections. This study demonstrated that the intervention targeting only women can change behaviors of couples to practice dual-method contraception. Because women using non-barrier modern contraceptives may be more reachable than men, interventions targeting such women should be recommended.

Trial registration UMIN-CTR Clinical Trial, UMIN000037065.

Word count (abstract): 291

Strengths and limitations of this study

- The outcomes were measured based on participants' self-reports and therefore subject to measurement errors because of recall and social desirability biases.
- Due to the small number of clusters, several characteristics of the participants were not balanced between the intervention and control groups.
- However, mixed-effects logistic regression analysis was performed by controlling the cluster effects and the differences in baseline characteristics to evaluate the intervention's effects.
- This intervention was developed using the positive deviance approach which aims to promote behaviors of individuals who have achieved rare success to other community members.
- Women who used dual-method contraception in the study area contributed the intervention's development and implementation as peer counselors.

Word count (Strengths and limitations of this study): 108

Introduction

Unintended pregnancy and human immunodeficiency virus (HIV) infection remain major public health concerns in sub-Saharan Africa (SSA). In SSA, almost 30% of pregnancies were unintended, whereas women accounted for 59% of an estimated 980,000 new HIV infections that occurred among adults in 2018.[1,2] Sexual intercourse is a major route of HIV transmission, and a significant gender disparity in HIV infection begins when women reach reproductive age.[3] Women contract HIV five to seven years of age earlier than men, and

women aged 15–24 years are 2.4 times more likely to become infected with HIV than their male counterparts.[2,4] In SSA, therefore, women of reproductive age bear the dual burden of unintended pregnancies and HIV.

Dual-method contraceptive use has been proposed as an effective strategy for preventing unintended pregnancies and sexually transmitted infections (STIs), including HIV.[5] It is defined as the use of a non-barrier modern contraceptive method (e.g., injectables, implants, oral contraceptive pills, intrauterine devices, and sterilization) in combination with a barrier method, such as male or female condoms.[5] Despite the high incidence rate of HIV, dual-method contraception is not commonly practiced in SSA, especially among women in long-term relationships.[5,6] For instance, only 3.8% of married women in Zimbabwe used dual-method contraception with their partners.[6] In South Africa, only 16.2% of married and cohabiting women reported consistent condom use, and they faced several barriers to using condoms, such as infidelity and distrust within relationships.[7] Furthermore, women in stable relationships tend to prioritize non-barrier methods over barrier methods and are less likely to use condoms when using other methods.[8,9] Although the majority of women understand that condom use is critical for preventing HIV/STIs, they do not practice it.[10] Marital sexual intercourse becomes one of the major routes of HIV infection because of inconsistent or no condom use in SSA.[11]

Several studies examined interventions for promoting dual-method contraceptive use.[5] However, few showed a significant effect on the dual-method use, and their impact was often unsustainable.[12] To our knowledge, the only intervention that demonstrated a continued effect on the dual-method use over six months was a combination of case management and peer leadership programs among adolescents in the United States of America (USA).[13] In SSA, conditional lottery incentives increased dual-method use among South African women at

three months but not at six months after the intervention.[14] Effectiveness of behavioral change interventions on the dual-method use among married or in-union women remains lacking in SSA.[5]

Uganda is one of the countries most affected by the HIV epidemic, with an adult prevalence (aged 15–64 years) of 6.2% in 2017.[15] Like other SSA countries, this rate was higher among women (7.6%) than men (4.7%).[15] Uganda has marked a substantial increase in the use of modern contraceptives.[16] The prevalence of such use has increased from 14% in 2001 to 35% in 2016 among married or in-union women.[16,17] Non-barrier modern contraceptives are the most popular methods, with 32% of currently married or in-union women of reproductive age using them.[17] However, condom use remains low in Uganda, especially among women in long-term relationships. That is, only 2% of women reported condom use with regular partners during their last sexual intercourse.[17]

The positive deviance approach is based on the premise that there are community members who solve problems while many of their peers do not.[18] This approach seeks unique behaviors of such exceptional people (positive deviants or PDs) and disseminates these behaviors to the whole community through community-led and peer-based interventions.[18,19] We previously conducted a qualitative study to examine the unique behaviors of PDs (i.e., women using dual-method with marital or in-union partners) in Mbarara District, Uganda.[20] These PDs successfully practiced dual-method contraception by initiating discussions, educating their partners on sexual risks and condom use, and obtaining condoms.[20] In this study, we examined the effectiveness of an intervention developed based on those findings to promote dual-method contraceptive use among women in the same area.

Methods

Study design and settings

A cluster randomized controlled trial was conducted for eight months (November 2019 to July 2020) in Mbarara District in Southwestern Uganda. The protocol of the trial has been previously published.[21] The population of Mbarara District is 472,629 (female = 50.6%; male = 49.4%), and about a half of the female population (45.7%) are estimated within the reproductive ages (15 - 49 years).[22]

The prevalence of HIV is geographically diverse in Uganda, and the Southwestern region has one of the highest prevalence rates of HIV at 7.9% among adults. This rate is higher among women (9.3%) than men (6.3%).[15] All public health facilities provide non-barrier modern contraceptives and male condoms free of charge. Male condoms are also available for purchase at pharmacies and markets for 0.15 to 0.50 United States dollars (USD).[20]

To recruit a sufficient number of participants, 20 facilities were purposively selected out of 48 public health facilities in Mbarara District.[23] All health facilities at the sub-county level or above were selected followed by health facilities at the parish level, which had a high number of outpatients.[23] These facilities included one general hospital, three county-level health centers, 11 sub-county-level health centers, and five parish-level health centers. Among them, seven facilities were located in urban areas.[23]

Study participants and enrollment

The inclusion criteria were women (i) aged 18 to 49 years, (ii) having had sexual intercourse in the last three months, (iii) using non-barrier modern contraceptives, and who (iv) desire to avoid pregnancy for 12 months from recruitment, (v) have a husband or live-in sexual

partner, and (vi) have access to a valid phone number. The exclusion criteria were women who were (i) pregnant, (ii) infertile for other reasons, and (iii) had been using condoms consistently with a non-barrier modern contraceptive in the last two months before the recruitment. The sample size of 960 was calculated based on the effect size of 2.43 reported in a dual-method intervention trial in the USA, considering an intraclass correlation coefficient of 0.006 and a 26% dropout rate.[12,13,24] The power of the study was set at 80%, and the significance level was set at 5%. OpenEpi version 3 was used to calculate the sample size.

Convenience sampling method was used to recruit study participants. Female research assistants recruited women at the selected health facilities. They approached every third woman visiting the family planning section at each facility to minimize selection bias and informed them the opportunity to participate in the study. If a woman was interested, they confirmed non-barrier modern contraceptive use with her family planning client record card and asked questions to verify eligibility. The process was repeated until the required sample size was reached.

Randomization and masking

The 20 health facilities were stratified based on their level and urban or rural status. They were then randomized to either intervention or control group with a 1:1 allocation ratio. Then, 960 women were allocated to the intervention (n = 480) or control group (n = 480) based on the facilities at which they were recruited. An independent researcher who was not involved in the data collection or analysis carried out the allocation using computer-generated random sequences. Blinding was not feasible in this study due to the nature of the intervention. However, the research assistants who performed the outcome assessment were not informed the intervention allocation.

Intervention

The intervention was developed based on the results of the preliminary study of nine PDs conducted in Mbarara District, Uganda in October 2019.[20] The PDs were identified by screening 150 women using non-barrier modern contraceptives at five health facilities. Then, in-depth interviews were conducted with the PDs. Thematic analysis was performed using the positive deviance framework to identify the unique behaviors associated with dual-method contraceptive use. The findings of the study have been published.[20]

Out of the nine PDs, four joined the intervention as peer counselors, whereas the other five were unable to participate due to other commitments. The four PDs demonstrated dual-method contraceptive use at least two months before the screening. The mean age of the four PDs was 29.8 years (standard deviation [SD] 6.0 years).

Table 1 summarizes the intervention, which combined clinic- and phone-based counseling and a participatory workshop, to disseminate the unique practices of the PDs.[20] After the baseline interview on the day of enrollment, women received counseling focusing on dual-method contraception in addition to regular family planning counseling. Trained research assistants delivered the counseling for about 20 to 30 minutes. Women received the handout used during the counseling developed either in English or Runyankore and were encouraged to initiate discussions on dual-method contraceptive use with their partners. The handout included several quotes from the PDs, such as "If I tell him to use a condom suddenly before having sex, he may get surprised and angry… if he gets mad, it is difficult to keep discussing it. So, I brought up this sensitive topic when he seemed to be in a good mood."[20]

After two weeks of enrollment, women in the intervention group were invited for a one-day participatory learning workshop at the same health facility where they were recruited.

Participation in the workshop was voluntary. The four PDs facilitated the workshop with support from the research assistants. It included role-play exercises to enable women to acquire successful communication skills for discussions with their partners, practice of male condom use, and group discussions about the dual risk of unintended pregnancies and HIV/STIs from their partners.

In addition, women in the intervention group received a bimonthly telephone counseling call from the PDs three times (i.e., three, five, and seven months after enrollment). It aimed to confirm women's dual-method contraceptive use and challenges, provide reminders regarding the risk of unintended pregnancies and HIV/STIs, and strengthen their capacity to communicate with their partners. In addition, the call included brief health education messages on family planning and HIV/STI based on an existing tool.[25] Each PD provided the same women with counseling each time to build rapport and ensure effective counseling. Each counseling lasted for 15 to 30 minutes.

Women in the control group received family planning counseling, including dual-method contraceptive use, from female research assistants for 10 to 20 minutes, using the existing tool on the day of enrollment.[25] However, this group of women did not receive the handout. Furthermore, the research assistants provided bimonthly health education three times (i.e., three, five, and seven months after enrollment) by phone. The topics were the same as those for the intervention group. Each call lasted for about ten minutes.

Condoms were provided for free, regardless of the allocation at the selected health facilities. Before providing the intervention, the research assistants received a two-day training on the contents of the existing counseling tool. In addition, the four PDs received a one-day training on counseling and ethics, including the confidentiality of their clients. The PDs joined the intervention as volunteers but received 30,000 Ugandan Shillings (UGX) (equivalent to 9

USD) per day when they engaged in the workshop and the counseling to compensate for their time and transportation.

<Insert Table 1 here>

Outcomes

The primary outcome was dual-method contraceptive use, which was defined as the application of a male or female condom along with a non-barrier modern contraceptive method.[5] It was measured in two timeframes: dual-method contraceptive use at the last sexual intercourse and its consistent use in the last two months before each follow-up. The former is easier for women to answer accurately than the latter, which requires to estimate the frequency of condom use in the past.[26] Nevertheless, consistent dual-method contraceptive use is critical, given that condoms are often used inconsistently.[26]

Three questions regarding non-barrier modern contraceptive use, condom use at the last sexual intercourse, and its frequency in the past two months were combined to measure the primary outcome. The following question was posed for non-barrier modern contraceptive use: "Apart from condoms, have you been using any other forms of protection against pregnancy during the past two months?" Condom use at the last sexual intercourse was determined by asking, "Did you use a male or female condom the last time you had sexual relations with your husband or live-in sexual partner?" Women who answered "yes" to both questions were considered to be practicing dual-method contraceptive use at the last sexual intercourse. The frequency of condom use was asked with an item: "How often did you and your partner use a male or female condom during the past two months?" Women answered this question using a four-point scale "every time," "almost every time," "sometimes," and

"never." Women using a non-barrier modern contraceptive and a condom every time were considered practicing consistent dual-method contraceptive use.

Other information

The following information was collected at baseline: age, education, religion, employment, wealth index based on the availability of 18 household assets, number of children, respondent's and partner's pregnancy intention, history of unintended pregnancy, multiple sex partnership, type of non-barrier modern contraceptives in use, respondent's and partner's HIV status, risk perception of HIV/STIs, HIV-related knowledge (HIV-KQ-18),[27] condom use self-efficacy,[28] and sexual relationship control power (the Sexual Relationship Power Scale).[29]

Data collection

All research assistants received a two-day training on data collection and ethics before the baseline data collection. After enrollment, the research assistants interviewed women to identify their baseline characteristics using a pre-tested structured questionnaire. Each interview lasted approximately 30 to 45 minutes.

For outcome assessment, three female research assistants carried out follow-up phone calls bimonthly for eight months to assess the influence of the intervention on the primary and secondary outcomes (i.e., two, four, six, and eight months after enrollment). The participants received a text message reminding them to answer the next call or call back if they missed the first call. The assistants called each participant up to five times during each follow-up until they answered. The participants received incentives worth 20,000 UGX (equivalent to 6 USD) for their time after the baseline interview.

Data analysis

Chi-squared tests and independent sample t-tests were performed to compare the general characteristics between the intervention and control groups at baseline and follow-up. Mixed-effects logistic regression analysis was performed to assess the effects of the intervention on the primary and secondary outcomes. Unadjusted odds ratios (ORs) were first estimated by comparing between the control and intervention groups (Model 1). Then, in the main model (Model 2), the intervention effects were presented with adjusted odds ratios (AORs) for the interaction term (group × time) after controlling for cluster effects for all health facilities and the individuals and baseline sociodemographic characteristics. The AORs can be interpreted as the difference between the intervention and control groups in the outcome measures between baseline and each follow-up point.

For sensitivity analyses, attrition rates and reasons for dropout were compared between the intervention and control groups using Pearson's chi-squared test. Moreover, differences in baseline characteristics were compared between women lost to follow-up and those who were reached. Analyses were conducted based on the intention-to-treat principle. Significance level was set at 5%. Data were entered using EpiData version 3, and the data processing and statistical analyses were performed using Stata version 14.

Ethics

Participation in this study was voluntary, and the participants provided written informed consent. The protocol was registered at UMIN-CTR Clinical Trial under identifier number UMIN000037065. The Consolidated Standards of Reporting Trials (CONSORT) checklist is available as Supplementary Table S1.

Patient and public involvement

The nine PDs were identified from the public, and four of them were involved in the design and conduct of the intervention as peer counselors. Moreover, the female research assistants were recruited from the study area and contributed to the intervention's development and implementation. The findings of this study have been shared with them and Mbarara District health authority.

Results

Participant flow

Out of 1,956 women screened, 960 were eligible for the trial and allocated to the intervention or control group (Figure 1). Of 480 women in the intervention group, 345 (71.9%) attended the one-day workshop. Moreover, 385 (80.2%), 361 (75.2%), and 369 (76.9%) received counseling at three, five, and seven months after enrollment, respectively.

The response rates to follow-up surveys ranged from 76.5% at two months to 82.3% at eight months. Women in the intervention group were more likely to respond at two months (79.8% vs. 73.1%, p = 0.015) and four months (84.6% vs. 79.4%, p = 0.036). The most of baseline characteristics, however, were balanced between women lost to follow-up and those reached in both intervention and control groups. Therefore, the risk of bias was estimated to be low. No statistically significant differences were observed in the response rates between the two groups at six and eight months. Supplementary Table 2 presents the results of the sensitivity analysis.

<Insert Figure 1 here>

Participant characteristics

Table 2 presents the sociodemographic characteristics of 960 women at baseline. The mean age was 30.1 (SD 6.7) years. The mean number of children was three (SD 1.8). Of 960 women, more than 70% completed primary education. Of all, 9% were HIV-positive, 7.6% had an HIV-positive partner, and 84.5% perceived a certain level of risk for HIV/STIs. Injectables were the most common family planning method, used by more than half of women (51.9%), followed by implants (31.6%). Characteristics were similar for the intervention and control groups with a few slight imbalances. Specifically, women in the control group were more likely to have primary or higher education (75.6% vs. 69.8%; $p = 0.042$), be categorized into the rich quintile (37.7% vs. 28.3%; $p = 0.008$), and have fewer children (mean: 2.9 vs. 3.2; $p = 0.041$) and less HIV-related knowledge (mean: 11.3 vs. 11.9; $p < 0.001$).

<Insert Table 2 here>

Effect of the intervention

Table 3 demonstrates the outcome data by intervention group and time. More women in the intervention than in the control group used dual-method contraception at the last sexual intercourse and consistently at each follow-up point. These differences were largest at two months (dual-method contraceptive use at last sexual intercourse: 42.6% vs. 13.8%; $p < 0.001$; consistent dual-method contraceptive use: 15.5% vs. 1.5%; $p < 0.001$). The proportion of women practicing dual-method contraception in both time frames gradually decreased over time. At eight months, more women reported dual-method contraception use in the intervention group compared to the control group (dual-method contraceptive use at last sexual intercourse: 20.9% vs. 8.7%; $p < 0.001$; consistent dual-method contraceptive use: 11.2% vs. 1.3%; $p < 0.001$).

<Insert Table 3 here>

Table 4 illustrates the effects of the intervention on the primary outcome among women at two, four, six, and eight months after enrollment. In the main model, more women in the intervention group reported dual-method contraceptive use at the last sexual intercourse than in the control group at two months (AOR = 4.12; 95% CI 2.02–8.39, p < 0.001). The intervention group also reported more dual-method contraceptive use at the last sexual intercourse at four, six, and eight months, although the difference was statistically significant only at eight months (AOR = 2.16; 95% CI 1.06–4.41, p = 0.034). Moreover, more women in the intervention group practiced consistent dual-method contraceptive use than in the control group at two months (AOR = 14.53; 95% CI 3.63–58.13, p < 0.001). The intervention effect remained statistically significant at four, six, and eight months.

The baseline characteristics positively associated with dual-method contraceptive use at the last sexual intercourse include self-efficacy for condom use and multiple sexual partnership. The dual-method use was negatively associated with partner's pregnancy intention and history of unintended pregnancy. HIV/STI risk perception was associated with its consistent use at two months. The complete results are provided in Supplementary Tables S3-S10.

<Insert Table 4 here>

Discussion

The positive deviance intervention was effective in promoting the uptake and continued use of dual-method contraception among women in long-term relationships who used non-barrier modern contraceptives. The study observed the largest difference in the dual-method use between the intervention and control groups at the two-month assessment, which was the closest time point to the baseline counseling and workshop. The number of women using dual-

method contraception decreased in the intervention and control groups over time, as observed in previous studies.[12] However, the significant difference between the groups remained during the follow-up period.

The observed effect was consistent with a previous intervention study that combined case management and peer education program for adolescent girls in the USA.[13] The intervention illustrated continued effects on the dual-method use at 12 and 24 months after enrollment.[13] The peer leadership program aimed to foster prosocial interaction skills and supportive peer relationships among teenagers.[13] The peer supporters were not PDs and provided with intensive standard training.[13] Effective communication with partners on sexual health was one of the key topics covered in the sessions.[13] Similar to this, the current intervention provided bimonthly counseling tailored to the participants' individual needs. However, it was provided by the PDs who had overcome barriers to dual-method contraceptive use. Counseling by PDs may be an alternative strategy because it ensures adequate attention to the diverse issues confronting women and prosocial peer influence on their behaviors.

Few intervention studies have demonstrated an increase in dual-method contraceptive use,[12-14] and adherence to such practice was frequently low.[12] Condom use is often considered a male responsibility and unacceptable in long-term relationships in SSA, especially when women use another contraceptive method.[7,9,11,30] The positive deviance intervention can be effective in changing such norms. The PDs who overcame the barriers to dual-method contraceptive use shared their experiences to help other women realize that condom use is normal even among marital or in-union relationships.

Moreover, one of strong predictors of dual-method contraceptive use was self-efficacy for condom use in this study. Self-efficacy for condom use was associated with actual dual-method contraceptive use at the last sexual intercourse throughout the follow-up period. Similar

association between self-efficacy and actual condom use was observed among Rwandan adolescents.[31]Therefore, it is crucial to increase women's perceived capability of using condoms skillfully and negotiating their use with partners. The positive deviance intervention could empower women with the skills necessary to play a proactive role in negotiation and condom use with their partners.

Condom use is not an individual action; therefore, a couple-level intervention would be ideal to promote the dual-method use.[12] However, reaching out to male partners may be more difficult compared to providing education to women visiting family planning clinics. This study demonstrated that the intervention targeting only women is effective at changing behaviors of couples to practice dual-method contraception. The finding supports the results of a qualitative study of couples using condoms in Uganda; women were more likely to initiate discussion and persuade their male partners to use condoms.[32] Considering that women who use modern contraceptives visit health facilities presumably more often than men do, educating them on dual-method contraception can be an effective strategy.

Despite the increase in dual-method contraceptive use, it was practiced inconsistently, especially among women in the control group. The result is consistent with findings of other intervention studies in the USA and South Africa.[12,14] For instance, 32% of women at high risk for unintended pregnancies and STIs initiated dual-method contraception after receiving an individualized computer-based intervention, but only 9% reported its consistent use.[12] The inconsistent use may explain the limited effects of dual-method contraception on preventing STIs and unintended pregnancies in the former intervention studies in the USA.[12,33] However, unintended pregnancy and STI incidences were significantly lower among HIV-infected women practicing dual-method contraception compared to non-users in Nigeria.[34] The dual-method use can be effective at reducing such risks if being practiced consistently. Although

this study did not measure HIV/STI incidence as an outcome, it is expected that the risk was reduced among women who reported consistent dual-method contraceptive use.

The study has several limitations. First, the study measured outcomes based on self-reports from the participants. Therefore, it is subject to measurement errors. Especially, given the information provided, dual-method contraceptive use could have been over-reported, which can lead to overestimating the intervention effect. Nevertheless, over-reporting of outcomes was minimized by assuring the participants of the confidentiality of their responses and conducting interviews by experienced female research assistants. Second, we did not measure HIV/STI incidence as an outcome. It is recommended to measure biological outcomes with behavioral outcomes to evaluate dual-method contraceptive interventions in future research. Lastly, this intervention was developed based on the qualitative study of the PDs in Mbarara District and examined its effectiveness among women in the same area. Merely applying the intervention to other communities might not be effective, as communities' local solutions might differ.[35] Therefore, each community must participate in the process of determining its own solutions. Further research is recommended to assess the effectiveness of the positive deviance approach in a given context with careful attention to its process.

Conclusions

The positive deviance intervention increased dual-method contraceptive use among married or in-union women in Mbarara District, Uganda, by disseminating solutions that exist in the community. This approach could be a potential option to reduce the dual risk of unintended pregnancies and HIV/STIs among women. This study demonstrated that the intervention targeting only women can change behaviors of couples to practice dual-method

contraception. Because women using non-barrier modern contraceptives may be more reachable than men, interventions targeting such women should be recommended.

Footnotes

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Patient and public involvement: Patients or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. Refer to the Methods section for further details.

Patient consent: Not required.

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Figure Legend:

Figure 1. Flow of participants through the study

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Table 1. Overview of intervention

Training setting	Duration	Topics covered
Clinic-based counseling	20–30 mins	1. Comparing family planning methods* 2. HIV/STI risk* 3. Ways to avoid HIV/STIs* 4. Introduction and demonstration of male condoms 5. Effective communication with partners 6. Information about the workshop
One-day workshop at a health facility facilitated by PDs	5 hours	1. Introduction of family planning methods 2. Way to avoid unintended pregnancies 3. Introduction of HIV/STI risk 4. Way to avoid HIV/STIs 5. Group discussion 1: Let's consider your HIV/STI risk 6. Practice of condom use 7. Experience of four PDs 8. Role-play exercises: Effective communication with partners - How to initiate discussions about condom use - How to persuade partners - How to avoid conflicts 9. Group Dissuasion 2: Recapitulate takeaway messages - Why is dual-method contraception important? - What are barriers to using dual-method contraception, and how can you overcome them?
Bimonthly phone-based counseling	15–30 mins each	1. Brief health message*: - Family planning methods (at 3 months)* - Ways to avoid HIV/STIs (at 5 months)* - General facts about HIV/STIs (at 7 months)* 2. Counseling tailored to individual participants' situation and needs

PD: positive deviant

* Women in the control group received only these interventions using the existing tool.

Table 2. Characteristics of women at baseline by intervention group (n = 960)

Variables	Intervention (n = 480)		Control (n = 480)		Total (n = 960)		
	n	%	n	%	n	%	p-value†
1) Sociodemographic characteristics							
Age in years, mean (SD)	30.4	(6.5)	29.8	(6.8)	30.1	(6.7)	0.126
Education							
Never	145	30.2	117	24.4	262	27.3	**0.042**
Primary and more	335	69.8	363	75.6	698	72.7	
Religion							
Christian	450	93.8	436	90.8	886	92.3	0.090
Muslim	30	6.3	44	9.2	74	7.7	
Wealth index							
Poor	176	36.7	158	32.9	334	34.8	**0.008**
Middle	168	35.0	141	29.4	309	32.2	
Rich	136	28.3	181	37.7	317	33.0	
No. of children, mean (SD)	3.2	(1.7)	2.9	(1.8)	3.0	(1.8)	**0.041**
Pregnancy intention							
No	100	20.8	96	20.0	196	20.4	0.822
Yes	342	71.3	341	71.0	683	71.2	
Don't know	38	7.9	43	9.0	81	8.4	
Partner's pregnancy intention							
No	69	14.4	68	14.2	137	14.3	0.776
Yes	322	67.1	331	69.0	653	68.0	
Don't know	89	18.5	81	16.9	170	17.7	
History of unintended pregnancy							
No	313	65.2	335	69.8	648	67.5	0.130
Yes	167	34.8	145	30.2	312	32.5	
Multiple sex partners							
No	452	94.2	456	95.0	908	94.6	0.568
Yes	28	5.8	24	5.0	52	5.4	
2) HIV-related characteristics							
HIV status							
Negative	438	91.3	436	90.8	874	91.0	0.821
Positive	42	8.8	44	9.2	86	9.0	
Partner's HIV status							
Negative	386	80.4	373	77.7	759	79.1	0.587
Positive	34	7.1	39	8.1	73	7.6	
Don't know	60	12.5	68	14.2	128	13.3	
Disclosure of HIV status							
No	21	4.4	19	4.0	40	4.2	0.747
Yes	459	95.6	461	96.0	920	95.8	
HIV/STI risk perception							
No risk at all	62	12.9	87	18.1	149	15.5	0.124
Small	177	36.9	178	37.1	355	37.0	
Moderate	136	28.3	124	25.8	260	27.1	
Great	105	21.9	91	19.0	196	20.4	
3) Non-barrier modern contraceptive use							
Methods in use							
Injectables	252	52.5	246	51.3	498	51.9	0.599
Implants	155	32.3	148	30.8	303	31.6	
IUDs	43	9.0	54	11.3	97	10.1	
OCPs	27	5.6	31	6.5	9	6.0	
Female sterilization	3	0.6	1	0.2	4	0.4	
Partner's recognition of contraceptive use							
No	36	7.5	43	9.0	79	8.2	0.411
Yes	444	92.5	437	91.0	881	91.8	
Partner's attitude about contraceptive use							
Positive	432	90.0	439	91.7	871	90.8	0.229
Negative	36	7.5	35	7.3	71	7.4	
Don't know	12	2.5	5	1.0	17	1.8	
4) Other psychosocial characteristics							
HIV-related knowledge (HIV-KQ-18), mean (SD)	11.9	(2.6)	11.3	(3.0)	11.6	(2.8)	**<0.001**
Condom use self-efficacy scale, mean (SD)	22.3	(9.3)	22.1	(8.3)	22.2	(8.8)	0.682
Sexual Relationship Power Scale							
Low	173	36.0	152	31.7	325	33.9	0.352
Medium	168	35.0	182	37.9	350	36.5	
High	139	29.0	146	30.4	285	29.7	

SD: standard deviation; IUD: intrauterine device; OCP: oral contraceptive pill

† Based on chi-squared test for other categorical variables and t-test for continuous variables

Table 3. Dual-method contraceptive use by intervention group and time[a]

Outcomes	Intervention		Control		Total		
	n	%	n	%	n	%	p-value[†]
Dual-method contraceptive use at last sexual intercourse							
Baseline	41	8.5	28	5.8	69	7.2	0.104
Month 2	157	42.6	46	13.8	203	28.9	**<0.001**
Month 4	110	27.9	55	15.4	165	21.9	**<0.001**
Month 6	91	23.3	40	10.7	131	17.2	**<0.001**
Month 8	82	20.9	33	8.7	115	14.9	**<0.001**
Consistent dual-method contraceptive use							
Baseline	-	-	-	-	-	-	-
Month 2	57	15.5	5	1.5	62	8.8	**<0.001**
Month 4	42	10.7	8	2.2	50	6.7	**<0.001**
Month 6	32	8.2	5	1.3	37	4.9	**<0.001**
Month 8	44	11.2	5	1.3	49	6.4	**<0.001**

[a] Refer to Figure 1 for "n" at baseline and follow-up for each group
[†] Based on chi-squared test

Table 4. Effects of intervention on primary outcome among women at 2, 4, 6, and 8 months after enrollment

Variables	Month 2		Month 4		Month 6		Month 8	
	Model 1 OR (95% CI)	Model 2 AOR[a] (95% CI)	Model 1 OR (95% CI)	Model 2 AOR[a] (95% CI)	Model 1 OR (95% CI)	Model 2 AOR[a] (95% CI)	Model 1 OR (95% CI)	Model 2 AOR[a] (95% CI)
Dual-method contraceptive use at last sexual intercourse	4.62*** (3.18- 6.71)	4.12*** (2.02-8.39)	2.13*** (1.49-3.06)	1.66 (0.84-3.30)	2.53*** (1.69-3.79)	2.03 (0.99-4.14)	2.76*** (1.79-4.26)	2.16* (1.06-4.41)
Consistent dual-method contraceptive use	11.98*** (4.74-30.29)	14.53*** (3.63-58.13)	5.22*** (2.42-11.28)	6.30** (2.20-18.03)	6.58*** (2.53-17.07)	8.04* (1.17-55.08)	9.43*** (3.70-24.06)	10.72** (2.03-56.64)

Note: Table reports effects estimates using odds ratio (OR) and adjusted odds ratio (AOR) from multiple logistic regression using the control group as the reference category.

***p < 0.001,**p < 0.01,*p < 0.05

a. Adjusted for cluster effect, individuals, age, education, religion, wealth index, number of children, pregnancy intention, partner's pregnancy intention, history of unintended pregnancy, multiple sex partnership, non-barrier modern contraceptive methods, HIV status, partner's HIV status, HIV/STI risk perception, HIV-related knowledge, condom use self-efficacy, and sexual relationship control power.

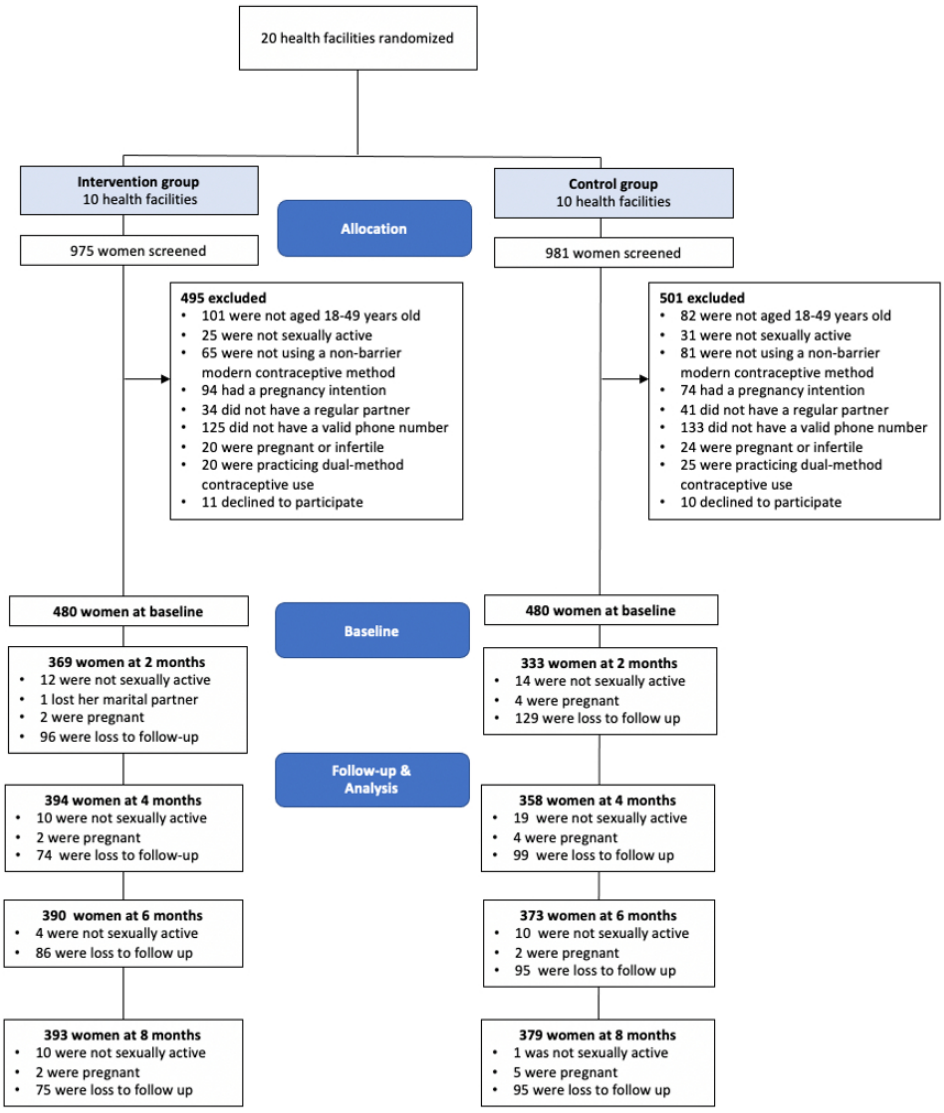

Figure 1. Flow of participants through the study

S1 Table CONSORT checklist

CONSORT 2010 checklist of information to include when reporting a randomised trial*

Section/Topic	Item No	Checklist item	Reported on page No
Title and abstract			
	1a	Identification as a randomised trial in the title	p 1
	1b	Structured summary of trial design, methods, results, and conclusions (for specific guidance see CONSORT for abstracts)	p 2 and 3
Introduction			
Background and objectives	2a	Scientific background and explanation of rationale	p 4-6
	2b	Specific objectives or hypotheses	p 6
Methods			
Trial design	3a	Description of trial design (such as parallel, factorial) including allocation ratio	p 7
	3b	Important changes to methods after trial commencement (such as eligibility criteria), with reasons	NA
Participants	4a	Eligibility criteria for participants	p 7 and 8
	4b	Settings and locations where the data were collected	p 7
Interventions	5	The interventions for each group with sufficient details to allow replication, including how and when they were actually administered	p 9-11
Outcomes	6a	Completely defined pre-specified primary and secondary outcome measures, including how and when they were assessed	p 11 and 12
	6b	Any changes to trial outcomes after the trial commenced, with reasons	NA
Sample size	7a	How sample size was determined	p 8
	7b	When applicable, explanation of any interim analyses and stopping guidelines	NA
Randomisation:			
Sequence generation	8a	Method used to generate the random allocation sequence	p 8
	8b	Type of randomisation; details of any restriction (such as blocking and block size)	p 8
Allocation concealment mechanism	9	Mechanism used to implement the random allocation sequence (such as sequentially numbered containers), describing any steps taken to conceal the sequence until interventions were assigned	p 8

Implementation	10	Who generated the random allocation sequence, who enrolled participants, and who assigned participants to interventions	p 8
Blinding	11a	If done, who was blinded after assignment to interventions (for example, participants, care providers, those assessing outcomes) and how	p 8
	11b	If relevant, description of the similarity of interventions	NA
Statistical methods	12a	Statistical methods used to compare groups for primary and secondary outcomes	p 13
	12b	Methods for additional analyses, such as subgroup analyses and adjusted analyses	p 13
Results			
Participant flow (a diagram is strongly recommended)	13a	For each group, the numbers of participants who were randomly assigned, received intended treatment, and were analysed for the primary outcome	p 14
	13b	For each group, losses and exclusions after randomisation, together with reasons	p 14 and Figure 1
Recruitment	14a	Dates defining the periods of recruitment and follow-up	p 7 and 12
	14b	Why the trial ended or was stopped	p 7 and 12
Baseline data	15	A table showing baseline demographic and clinical characteristics for each group	Table 2
Numbers analysed	16	For each group, number of participants (denominator) included in each analysis and whether the analysis was by original assigned groups	p 14
Outcomes and estimation	17a	For each primary and secondary outcome, results for each group, and the estimated effect size and its precision (such as 95% confidence interval)	p 15-16
	17b	For binary outcomes, presentation of both absolute and relative effect sizes is recommended	p 15-16
Ancillary analyses	18	Results of any other analyses performed, including subgroup analyses and adjusted analyses, distinguishing pre-specified from exploratory	p 14 and S2-10 Tables
Harms	19	All important harms or unintended effects in each group (for specific guidance see CONSORT for harms)	NA
Discussion			
Limitations	20	Trial limitations, addressing sources of potential bias, imprecision, and, if relevant, multiplicity of analyses	p 19
Generalisability	21	Generalisability (external validity, applicability) of the trial findings	p 19
Interpretation	22	Interpretation consistent with results, balancing benefits and harms, and considering other relevant evidence	p 16-20
Other information			
Registration	23	Registration number and name of trial registry	p 3 and 13
Protocol	24	Where the full trial protocol can be accessed, if available	p 7
Funding	25	Sources of funding and other support (such as supply of drugs), role of funders	p 20

*We strongly recommend reading this statement in conjunction with the CONSORT 2010 Explanation and Elaboration for important clarifications on all the items. If relevant, we also recommend reading CONSORT extensions for cluster randomised trials, non-inferiority and equivalence trials, non-pharmacological treatments, herbal interventions, and pragmatic trials. Additional extensions are forthcoming: for those and for up to date references relevant to this checklist, see www.consort-statement.org.

Table S2. Baseline characteristics of women lost to follow up in the intervention and control groups

Variables	Month 2										Month 4										Month 6										Month 8									
	Intervention					Control					Intervention					Control					Intervention					Control					Intervention					Control				
	Reached		Lost to follow-up			Reached		Lost to follow-up			Reached		Lost to follow-up			Reached		Lost to follow-up			Reached		Lost to follow-up			Reached		Lost to follow-up			Reached		Lost to follow-up			Reached		Lost to follow-up	
	n	%	n	%	p-value†	n	%	n	%	p-value†	n	%	n	%	p-value†	n	%	n	%	p-value†	n	%	n	%	p-value†	n	%	n	%	p-value†	n	%	n	%	p-value†	n	%	n	%	p-value†
1) Socio-demographic characteristics																																								
Age in years, mean (SD)	30.6	(6.5)	29.8	(6.7)	0.291	30.5	(7.0)	27.7	(5.8)	**<0.001**	30.4	(6.4)	30.5	(6.9)	0.965	30.2	(6.9)	28.1	(6.1)	**0.006**	30.6	(6.4)	29.5	(6.8)	0.166	30.1	(6.9)	28.3	(6.2)	**0.016**	30.6	(6.4)	29.5	(7.2)	0.158	30.1	(6.9)	28.5	(6.1)	**0.044**
Education																																								
Never	114	29.8	31	32.0	0.674	78	22.2	39	30.2	0.070	122	30.1	23	31.1	0.859	88	23.1	29	29.3	0.201	118	30.0	27	31.4	0.791	88	22.9	29	30.5	0.119	119	29.4	26	34.7	0.360	87	22.6	30	31.6	0.068
Primary and more	269	70.2	66	68.0		273	77.8	90	69.8		284	70.0	51	68.9		293	76.9	70	70.7		276	70.1	59	68.6		297	77.1	66	69.5		286	70.6	49	65.3		298	77.4	65	68.4	
Religion																																								
Christian	356	93.0	94	96.9	0.150	320	91.2	116	89.9	0.675	378	93.1	72	97.3	0.170	345	90.6	91	91.9	0.674	366	92.9	84	96.9	0.097	349	90.7	87	91.6	0.779	376	92.8	74	98.7	0.055	349	90.7	87	91.6	0.779
Muslim	27	7.1	3	3.1		31	8.8	13	10.1		28	6.9	2	2.7		36	9.5	8	8.1		28	7.1	2	3.1		36	9.4	8	8.4		29	7.2	1	1.3		36	9.4	8	8.4	
Wealth index																																								
Poor	139	36.3	37	38.1	0.821	119	33.9	39	30.2	0.070	142	35.0	34	46.0	0.190	133	34.9	25	25.3	0.188	139	35.3	37	43.0	0.134	135	35.1	23	24.2	0.119	143	35.3	33	44.0	0.112	135	35.1	23	24.2	0.119
Middle	133	34.7	35	36.1		93	26.5	48	37.2		145	35.7	23	31.1		108	28.4	33	33.3		136	34.5	32	37.2		111	28.8	30	31.6		140	34.6	28	37.3		111	28.8	30	31.6	
Rich	111	29.0	25	25.8		139	39.6	42	32.6		119	29.3	17	23.0		140	36.8	41	41.4		119	30.2	17	19.8		139	36.1	42	44.2		122	30.1	14	18.7		139	36.1	42	44.2	
No. of children, mean (SD)	3.2	(1.7)	3.0	(1.7)	0.428	3.0	(1.9)	2.7	(1.7)	0.099	3.2	(1.7)	3.1	(1.9)	0.859	3.0	(1.9)	2.6	(1.7)	**0.044**	3.2	(1.7)	3.0	(1.8)	0.394	3.0	(1.8)	2.8	(1.9)	0.343	3.2	(1.7)	3.0	(1.9)	0.438	2.9	(1.9)	2.8	(1.8)	0.607
Pregnancy intention																																								
No	81	21.2	19	19.6	0.891	76	21.7	20	15.5	0.195	83	20.4	17	23.0	0.391	78	20.5	18	18.2	0.126	84	21.3	16	18.6	0.349	77	20.0	19	20.0	0.190	88	21.7	12	16.0	0.442	75	19.5	21	22.1	0.462
Yes	271	70.8	71	73.2		247	70.4	94	72.9		288	70.9	54	73.0		274	71.9	67	67.7		276	70.1	66	76.7		278	72.2	63	66.3		284	70.1	58	77.3		278	72.2	63	66.3	
Don't know	31	8.1	7	7.2		28	8.0	15	11.6		35	8.6	3	4.1		29	7.6	14	14.1		34	8.6	4	4.7		30	7.8	13	13.7		33	8.2	5	6.7		32	8.3	11	11.6	
Partner's pregnancy intention																																								
No	57	14.9	12	12.4	0.462	53	15.1	15	11.6	0.293	55	13.6	14	18.9	0.454	57	15.0	11	11.1	0.541	58	14.7	11	12.8	0.896	55	14.3	13	13.7	0.833	61	15.1	8	10.7	0.600	54	14.0	14	14.7	0.799
Yes	259	67.6	63	65.0		235	67.0	96	74.4		276	68.0	46	62.2		262	68.8	69	69.7		263	66.8	59	68.6		267	69.4	64	67.4		269	66.4	53	70.7		268	69.6	63	66.3	
Don't know	67	17.5	22	22.7		63	18.0	18	14.0		75	18.5	14	18.9		62	16.3	19	19.2		73	18.5	16	18.6		63	16.4	18	19.0		75	18.5	14	18.7		63	16.4	18	19.0	
History of unintended pregnancy																																								
No	245	64.0	68	70.1	0.257	248	70.7	87	67.4	0.497	266	65.5	47	63.5	0.739	265	69.6	70	70.7	0.824	258	65.5	55	64.0	0.787	265	68.8	70	73.7	0.356	261	64.4	52	69.3	0.414	266	69.1	69	72.6	0.501
Yes	138	36.0	29	29.9		103	29.3	42	32.6		140	34.5	27	36.5		116	30.5	29	29.3		136	34.5	31	36.1		120	31.2	25	26.3		144	35.6	23	30.7		119	30.9	26	27.4	
Multiple sex partners																																								
No	360	94.0	92	94.9	0.750	333	94.9	123	95.4	0.832	382	94.1	70	89.2	0.864	361	94.8	95	96.0	0.623	371	94.2	81	94.2	0.993	365	94.8	91	95.8	0.693	380	93.8	72	96.0	0.461	365	94.8	91	95.8	0.693
Yes	23	6.0	5	5.2		18	5.1	6	4.7		24	5.9	4	10.8		20	5.3	4	4.0		23	5.8	5	5.8		20	5.2	4	4.2		25	6.2	3	4.0		20	5.2	4	4.2	
2) HIV-related characteristics																																								
HIV status																																								
Negative	351	91.6	87	89.7	0.543	123	89.2	313	95.4	**0.038**	372	91.6	66	89.7	0.495	343	90.0	93	93.9	0.229	359	91.1	79	91.9	0.825	347	90.1	89	93.7	0.282	372	91.9	66	88.0	0.278	347	90.1	89	93.7	0.282
Positive	32	8.4	10	10.3		6	10.8	38	4.7		34	8.4	8	10.3		38	10.0	6	6.1		35	8.9	7	8.1		38	9.9	6	6.3		33	8.2	9	12.0		38	9.9	6	6.3	
Partner's HIV status																																								
Negative	308	80.4	78	80.4	0.834	107	75.8	266	83.0	0.163	326	80.3	60	81.1	0.509	289	75.9	84	84.9	0.122	313	79.4	73	84.9	0.225	295	76.6	78	82.1	0.431	324	80.0	62	82.7	0.646	295	76.6	78	82.1	0.431
Positive	26	6.8	8	8.3		6	9.4	33	4.7		27	6.7	7	9.5		35	9.2	4	4.0		27	6.9	7	8.1		34	8.8	5	5.3		28	6.9	6	8.0		34	8.8	5	5.3	
Don't know	49	12.8	11	11.3		16	14.8	52	12.4		53	13.1	7	9.5		57	15.0	11	11.1		54	13.7	6	7.0		56	14.6	12	12.6		53	13.1	7	9.3		56	14.6	12	12.6	
Disclosure of HIV status																																								
No	18	4.7	3	3.1	0.489	4	4.3	15	3.1	0.559	19	4.7	2	2.7	0.444	17	4.5	2	2.0	0.267	18	4.6	3	3.5	0.657	16	4.2	3	3.2	0.655	20	4.9	1	1.3	0.161	15	3.9	4	4.2	0.888
Yes	365	95.3	94	96.9		125	95.7	336	96.9		387	95.3	72	97.3		364	95.5	97	98.0		376	95.4	83	96.5		369	95.8	92	96.8		385	95.1	74	98.7		370	96.1	91	95.8	
HIV/STI risk perception																																								
No risk at all	47	12.3	15	15.5	0.748	20	19.1	67	15.5	0.789	47	11.6	15	20.3	0.193	71	18.6	16	16.2	0.922	43	10.9	19	22.1	**0.044**	70	18.2	17	17.9	0.949	48	11.9	14	18.7	0.395	70	18.2	17	17.9	0.999
Small	140	36.6	37	38.1		48	37.0	130	37.2		154	37.9	23	31.1		142	37.3	36	36.4		148	37.6	29	33.7		145	37.7	33	34.7		149	36.8	28	37.3		143	37.1	35	36.8	
Moderate	112	29.2	24	24.7		34	25.6	90	26.4		117	28.8	19	25.7		97	25.5	27	27.3		116	29.4	20	23.3		98	25.5	26	27.4		117	28.9	19	25.3		99	25.7	25	26.3	
Great	84	21.9	21	21.7		27	18.2	64	20.9		88	21.7	17	23.0		71	18.6	20	20.2		87	22.1	18	20.9		72	18.7	19	20.0		91	22.5	14	18.7		73	19.0	18	19.0	
3) HEC use																																								
Type of HECs																																								
Injectables	198	51.7	54	55.7	0.901	178	50.7	68	52.7	0.910	207	51.0	45	60.8	0.478	190	49.9	56	56.6	0.673	193	49.0	59	68.6	**0.010**	190	49.4	56	59.0	0.380	204	50.4	48	64.0	0.199	190	49.4	56	59.0	0.450
Implants	127	33.2	28	28.9		107	30.5	41	31.8		135	33.3	20	27.0		120	31.5	28	28.3		135	34.3	20	23.3		120	31.2	28	29.5		136	33.6	19	25.3		121	31.4	27	28.4	
IUDs	34	8.9	9	9.3		41	11.7	13	10.1		38	9.4	5	6.8		43	11.3	11	11.1		38	9.6	5	5.8		47	12.2	7	7.4		39	9.6	4	5.3		47	12.2	7	7.4	
OCPs	22	5.7	5	5.2		24	6.8	7	5.4		24	5.9	3	4.1		27	7.1	4	4.0		26	6.6	1	1.2		27	7.0	4	4.2		24	5.9	3	4.0		26	6.8	5	5.3	
Female sterilization	2	0.5	1	1.0		1	0.3	0	0.0		2	0.5	1	1.4		1	0.3	0	0.0		2	0.5	1	1.2		1	0.3	0	0.0		2	0.5	1	1.3		1	0.3	0	0.0	
Partner's recognition of contraceptive use																																								
No	32	8.4	4	4.1	0.158	29	8.3	14	10.9	0.378	34	8.4	2	2.7	0.088	33	8.7	10	10.1	0.655	34	8.6	2	2.3	**0.044**	32	8.3	11	11.6	0.318	35	8.6	1	1.3	**0.027**	32	8.3	11	11.6	0.318
Yes	351	91.6	93	95.9		322	91.7	115	89.2		372	91.6	72	97.3		348	91.3	89	89.9		360	91.4	84	97.7		353	91.7	84	88.4		370	91.4	74	98.7		353	91.7	84	88.4	
Partner's attitude about contraceptive use																																								
Positive	344	89.8	88	90.7	0.795	320	91.2	119	92.3	0.838	363	89.4	69	93.2	0.472	350	91.9	89	89.9	0.725	351	89.1	81	94.2	0.292	353	91.7	86	90.5	0.880	361	89.1	71	94.7	0.224	353	91.7	86	90.5	0.880
Negative	30	7.8	6	6.2		26	7.4	9	7.0		33	8.1	3	4.1		26	6.8	9	9.1		33	8.4	3	3.5		27	7.0	8	8.4		34	8.4	2	2.7		27	7.0	8	8.4	
Don't know	9	2.4	3	3.1		5	1.4	1	0.8		10	2.5	2	2.7		5	1.3	1	1.0		10	2.5	2	2.3		5	1.3	1	1.1		10	2.5	2	2.7		5	1.3	1	1.1	
4) Other psychosocial characterics																																								
HIV-related knowledge (HIV-KQ-18), mean (SD)	12.0	(2.6)	11.9	(2.6)	0.829	11.3	(3.0)	11.1	(2.8)	0.597	11.9	(2.6)	12.1	(2.6)	0.632	11.2	(3.0)	11.4	(2.9)	0.563	12.0	(2.6)	11.8	(2.8)	0.507	11.3	(3.0)	11.2	(2.9)	0.946	12.0	(2.6)	11.8	(2.4)	0.527	11.2	(3.0)	11.3	(2.8)	0.992
Condom use self-efficacy scale, mean (SD)	22.3	(9.2)	22.1	(9.9)	0.794	21.6	(8.4)	23.2	(7.9)	0.058	22.0	(9.4)	23.6	(9.0)	0.193	21.7	(8.4)	23.4	(8.0)	0.080	22.1	(9.3)	22.9	(9.7)	0.478	21.9	(8.2)	22.7	(8.7)	0.422	22.3	(9.2)	22.1	(10.2)	0.848	22.0	(8.2)	22.4	(8.8)	0.608
Sexual Relationship Power Scale																																								
Low	141	36.8	32	33.0	0.484	114	32.5	38	29.5	0.763	151	37.2	22	29.7	0.416	123	32.3	29	29.3	0.146	144	36.6	29	33.7	0.561	121	31.4	31	29.5	0.442	146	36.1	27	36.0	0.327	122	31.7	30	31.6	0.526
Medium	129	33.7	39	40.2		130	37.0	52	40.3		138	34.0	30	40.5		150	39.4	32	32.3		140	35.5	28	32.6		151	39.2	31	40.3		137	33.8	31	41.3		150	39.0	32	33.7	
High	113	29.5	26	26.8		107	30.5	39	30.2		117	28.8	22	29.7		108	28.4	38	38.4		110	27.9	29	33.7		113	29.4	33	30.2		122	30.1	17	22.7		113	29.4	33	34.7	

SD: standard deviation; IUD: intrauterine device; OCP: oral contraceptive pill

† Based on Chi-squared test for categorical variables and t-test for continuous variables.

Table S3. Effects of intervention on dual-method contraceptive use at last sexual intercourse among women at 2 months after enrollement

Variables	Model 1			Model 2		
	OR	(95% CI)	p-value	AOR[a]	(95% CI)	p-value
Intervention						
Control	Ref.			Ref.		
Intervention	4.62	(3.18 - 6.71)	**<0.001**	1.19	(0.48 - 2.95)	0.712
Time				2.89	(1.70 - 4.89)	**<0.001**
Intervention*time[b]				4.12	(2.02 - 8.39)	**<0.001**
1) Socio-demographic characteristics						
Age in years				1.00	(0.96 - 1.04)	0.958
Education						
Never				Ref.		
Primary and more				0.98	(0.66 - 1.47)	0.935
Religion						
Christian				Ref.		
Muslim				1.42	(0.78 - 2.58)	0.246
Wealth index						
Poor				Ref.		
Middle				1.35	(0.89 - 2.05)	0.164
Rich				1.31	(0.84 - 2.05)	0.240
No. of children				0.87	(0.75 - 1.00)	0.057
Pregnancy intention						
No				Ref.		
Yes				1.17	(0.66 - 2.09)	0.592
Don't know				1.54	(0.71 - 3.34)	0.274
Partner's pregnancy intention						
No				Ref.		
Yes				0.45	(0.24 - 0.85)	**0.013**
Don't know				0.49	(0.25 - 0.96)	**0.038**
History of unintended pregnancy						
No				Ref.		
Yes				0.93	(0.64 - 1.34)	0.680
Multiple sex partners						
No				Ref.		
Yes				3.50	(1.85 - 6.62)	**<0.001**
2) HIV-related characteristics						
HIV status						
Negative				Ref.		
Positive				1.57	(0.71 - 3.49)	0.267
Partner's HIV status						
Negative				Ref.		
Positive				1.27	(0.54 - 2.99)	0.583
Don't know				0.95	(0.57 - 1.58)	0.837
HIV/STI risk perception						
No risk at all				Ref.		
Small				0.80	(0.47 - 1.37)	0.421
Moderate				1.05	(0.60 - 1.83)	0.858
Great				1.18	(0.65 - 2.15)	0.588
3) Non-barrier modern contraceptive use						
Methods in use						
Injectables				Ref.		
Implants				0.94	(0.65 - 1.35)	0.726
IUDs				1.21	(0.69 - 2.12)	0.505
OCPs				0.83	(0.40 - 1.72)	0.611
Female sterilization						Perfect success
4) Other psychosocial characterictics						
HIV-related knowledge (HIV-KQ-18)				1.03	(0.97 - 1.11)	0.338
Condom use self-efficacy scale				1.02	(1.00 - 1.05)	**0.035**
Sexual Relationship Power Scale						
Low				Ref.		
Medium				1.13	(0.76 - 1.69)	0.551
High				1.07	(0.70 - 1.66)	0.748

OR: odds ratio; AOR: adjusted odds ratio; SD: standard deviation; IUD: intrauterine device; OCP: oral contraceptive pill

a. Adjusted for cluster effect, individuals, age, education, religion, wealth index, number of children, pregnancy intention, partner's pregnancy intention, history of unintended pregnancy, multiple sex partnership, non-barrier modern contraceptive methods, HIV status, partner's HIV status, HIV/STI risk perception, HIV-related knowledge, condom use self-efficacy, and sexual relationship control power.

b. Intervention*time represents the status of the intervention group at follow-up in comparison with the control group at baseline.

Table S4. Effects of intervention on dual-method contraceptive use at last sexual intercourse among women at 4 months after enrollement

Variables	Model 1				Model 2			
	OR	(95% CI)		p-value	AOR[a]	(95% CI)		p-value
Intervention								
Control	Ref.				Ref.			
Intervention	2.13	1.49	3.06	**<0.001**	1.66	0.87	3.16	0.121
Time					3.55	2.08	6.08	**<0.001**
Intervention*time[b]					1.66	0.84	3.30	0.146
1) Socio-demographic characteristics								
Age in years					0.99	0.95	1.03	0.530
Education								
Never					Ref.			
Primary and more					0.79	0.51	1.22	0.278
Religion								
Christian					Ref.			
Muslim					1.28	0.66	2.49	0.465
Wealth index								
Poor					Ref.			
Middle					1.12	0.71	1.76	0.624
Rich					1.14	0.70	1.85	0.608
No. of children					0.92	0.78	1.08	0.314
Pregnancy intention								
No					Ref.			
Yes					0.75	0.40	1.42	0.376
Don't know					1.17	0.51	2.66	0.715
Partner's pregnancy intention								
No					Ref.			
Yes					0.55	0.28	1.09	0.085
Don't know					0.55	0.26	1.15	0.113
History of unintended pregnancy								
No					Ref.			
Yes					0.62	0.40	0.94	**0.026**
Multiple sex partners								
No					Ref.			
Yes					2.87	1.45	5.67	**0.002**
2) HIV-related characteristics								
HIV status								
Negative					Ref.			
Positive					1.61	0.69	3.80	0.273
Partner's HIV status								
Negative					Ref.			
Positive					1.40	0.55	3.52	0.480
Don't know					1.26	0.74	2.15	0.389
HIV/STI risk perception								
No risk at all					Ref.			
Small					0.84	0.47	1.49	0.544
Moderate					1.01	0.56	1.83	0.975
Great					0.96	0.50	1.84	0.894
3) Non-barrier modern contraceptive use								
Methods in use								
Injectables					Ref.			
Implants					0.94	0.62	1.44	0.788
IUDs					1.18	0.63	2.21	0.603
OCPs					2.35	1.17	4.74	**0.017**
Female sterilization					0.97	0.05	19.29	0.986
4) Other psychosocial characterictics								
HIV-related knowledge (HIV-KQ-18)					1.01	0.94	1.08	0.858
Condom use self-efficacy scale					1.04	1.01	1.06	**0.002**
Sexual Relationship Power Scale								
Low					Ref.			
Medium					1.44	0.91	2.27	0.119
High					1.21	0.74	1.98	0.443

OR: odds ratio; AOR: adjusted odds ratio; SD: standard deviation; IUD: intrauterine device; OCP: oral contraceptive pill

a. Adjusted for cluster effect, individuals, age, education, religion, wealth index, number of children, pregnancy intention, partner's pregnancy intention, history of unintended pregnancy, multiple sex partnership, non-barrier modern contraceptive methods, HIV status, partner's HIV status, HIV/STI risk perception, HIV-related knowledge, condom use self-efficacy, and sexual relationship control power.

b. Intervention*time represents the status of the intervention group at follow-up in comparison with the control group at baseline.

Table S5. Effects of intervention on dual-method contraceptive use at last sexual intercourse among women at 6 months after enrollement

Variables	Model 1			Model 2		
	OR	(95% CI)	p-value	AOR[a]	(95% CI)	p-value
Intervention						
Control	Ref.			Ref.		
Intervention	2.53	(1.69 - 3.79)	**<0.001**	1.40	(0.53 - 3.67)	0.494
Time				2.17	(1.25 - 3.76)	**0.006**
Intervention*time[b]				2.03	(0.99 - 4.14)	0.052
1) Socio-demographic characteristics						
Age in years				0.97	(0.93 - 1.02)	0.208
Education						
Never				Ref.		
Primary and more				0.89	(0.56 - 1.41)	0.618
Religion						
Christian				Ref.		
Muslim				1.36	(0.70 - 2.65)	0.366
Wealth index						
Poor				Ref.		
Middle				0.96	(0.60 - 1.55)	0.875
Rich				0.75	(0.45 - 1.27)	0.283
No. of children				1.02	(0.86 - 1.20)	0.853
Pregnancy intention						
No				Ref.		
Yes				0.84	(0.44 - 1.61)	0.602
Don't know				1.29	(0.55 - 3.03)	0.565
Partner's pregnancy intention						
No				Ref.		
Yes				0.69	(0.34 - 1.41)	0.307
Don't know				0.62	(0.29 - 1.35)	0.228
History of unintended pregnancy						
No				Ref.		
Yes				0.73	(0.48 - 1.13)	0.157
Multiple sex partners						
No				Ref.		
Yes				2.96	(1.50 - 5.85)	**0.002**
2) HIV-related characteristics						
HIV status						
Negative				Ref.		
Positive				1.24	(0.52 - 2.97)	0.629
Partner's HIV status						
Negative				Ref.		
Positive				1.67	(0.64 - 4.31)	0.292
Don't know				**1.09**	(0.62 - 1.92)	0.758
HIV/STI risk perception						
No risk at all				Ref.		
Small				0.76	(0.41 - 1.40)	0.377
Moderate				1.03	(0.55 - 1.92)	0.937
Great				0.77	(0.38 - 1.53)	0.452
3) Non-barrier modern contraceptive use						
Methods in use						
Injectables				Ref.		
Implants				0.92	(0.60 - 1.42)	0.715
IUDs				1.19	(0.63 - 2.25)	0.589
OCPs				2.03	(0.99 - 4.17)	0.054
Female sterilization						Perfect success
4) Other psychosocial characterictics						
HIV-related knowledge (HIV-KQ-18)				1.05	(0.97 - 1.13)	0.226
Condom use self-efficacy scale				1.04	(1.01 - 1.06)	**0.006**
Sexual Relationship Power Scale						
Low				Ref.		
Medium				1.59	(0.99 - 2.54)	0.056
High				1.19	(0.71 - 1.97)	0.513

OR: odds ratio; AOR: adjusted odds ratio; SD: standard deviation; IUD: intrauterine device; OCP: oral contraceptive pill

a. Adjusted for cluster effect, individuals, age, education, religion, wealth index, number of children, pregnancy intention, partner's pregnancy intention, history of unintended pregnancy, multiple sex partnership, non-barrier modern contraceptive methods, HIV status, partner's HIV status, HIV/STI risk perception, HIV-related knowledge, condom use self-efficacy, and sexual relationship control power.

b. Intervention*time represents the status of the intervention group at follow-up in comparison with the control group at baseline.

Table S6. Effects of intervention on dual-method contraceptive use at last sexual intercourse among women at 8 months after enrollement

Variables	Model 1				Model 2			
	OR	(95% CI)		p-value	AOR[a]	(95% CI)		p-value
Intervention								
Control	Ref.				Ref.			
Intervention	2.76	(1.79	- 4.26)	**<0.001**	1.39	(0.59	- 3.31)	0.452
Time					1.60	(0.92	- 2.77)	0.094
Intervention*time[b]					2.16	(1.06	- 4.41)	**0.034**
1) Socio-demographic characteristics								
Age in years					0.97	(0.93	- 1.01)	0.114
Education								
Never					Ref.			
Primary and more					1.03	(0.66	- 1.62)	0.884
Religion								
Christian					Ref.			
Muslim					1.13	(0.57	- 2.21)	0.728
Wealth index								
Poor					Ref.			
Middle					1.11	(0.71	- 1.75)	0.647
Rich					0.89	(0.54	- 1.48)	0.664
No. of children					1.04	(0.88	- 1.22)	0.676
Pregnancy intention								
No					Ref.			
Yes					0.82	(0.44	- 1.55)	0.550
Don't know					1.66	(0.75	- 3.65)	0.210
Partner's pregnancy intention								
No					Ref.			
Yes					0.65	(0.33	- 1.28)	0.214
Don't know					0.71	(0.35	- 1.47)	0.359
History of unintended pregnancy								
No					Ref.			
Yes					0.83	(0.55	- 1.25)	0.375
Multiple sex partners								
No					Ref.			
Yes					3.22	(1.69	- 6.12)	**<0.001**
2) HIV-related characteristics								
HIV status								
Negative					Ref.			
Positive					0.97	(0.40	- 2.31)	0.938
Partner's HIV status								
Negative					Ref.			
Positive					2.04	(0.82	- 5.09)	0.128
Don't know					1.04	(0.60	- 1.81)	0.887
HIV/STI risk perception								
No risk at all					Ref.			
Small					0.68	(0.39	- 1.20)	0.187
Moderate					0.79	(0.44	- 1.42)	0.437
Great					0.77	(0.41	- 1.47)	0.429
3) Non-barrier modern contraceptive use								
Methods in use								
Injectables					Ref.			
Implants					0.86	(0.56	- 1.31)	0.483
IUDs					1.23	(0.67	- 2.25)	0.511
OCPs					1.36	(0.66	- 2.80)	0.408
Female sterilization								Perfect success
4) Other psychosocial characterictics								
HIV-related knowledge (HIV-KQ-18)					1.04	(0.96	- 1.12)	0.312
Condom use self-efficacy scale					1.03	(1.00	- 1.05)	**0.029**
Sexual Relationship Power Scale								
Low					Ref.			
Medium					1.29	(0.81	- 2.05)	0.290
High					1.42	(0.87	- 2.31)	0.165

OR: odds ratio; AOR: adjusted odds ratio; SD: standard deviation; IUD: intrauterine device; OCP: oral contraceptive pill

a. Adjusted for cluster effect, individuals, age, education, religion, wealth index, number of children, pregnancy intention, partner's pregnancy intention, history of unintended pregnancy, multiple sex partnership, non-barrier modern contraceptive methods, HIV status, partner's HIV status, HIV/STI risk perception, HIV-related knowledge, condom use self-efficacy, and sexual relationship control power.

b. Intervention*time represents the status of the intervention group at follow-up in comparison with the control group at baseline.

Table S7. Effects of intervention on consistent dual-method contraceptive use among women at 2 months after enrollement

Variables	Model 1			Model 2		
	OR	(95% CI)	p-value	AOR[a]	(95% CI)	p-value
Intervention						
Control	Ref.			Ref.		
Intervention	11.98	(4.74 - 30.29)	**<0.001**	14.53	(3.63 - 58.13)	**<0.001**
1) Socio-demographic characteristics						
Age in years				1.01	(0.94 - 1.08)	0.856
Education						
Never				Ref.		
Primary and more				0.69	(0.34 - 1.39)	0.298
Religion						
Christian				Ref.		
Muslim				0.93	(0.30 - 2.85)	0.898
Wealth index						
Poor				Ref.		
Middle				1.47	(0.70 - 3.11)	0.307
Rich				1.37	(0.61 - 3.09)	0.441
No. of children				0.89	(0.69 - 1.16)	0.396
Pregnancy intention						
No				Ref.		
Yes				0.56	(0.20 - 1.54)	0.264
Don't know				1.51	(0.39 - 5.84)	0.551
Partner's pregnancy intention						
No				Ref.		
Yes				0.89	(0.30 - 2.64)	0.834
Don't know				0.59	(0.17 - 2.05)	0.405
History of unintended pregnancy						
No				Ref.		
Yes				0.76	(0.39 - 1.48)	0.421
Multiple sex partners						
No				Ref.		
Yes				3.21	(1.06 - 9.67)	**0.039**
2) HIV-related characteristics						
HIV status						
Negative				Ref.		
Positive				1.47	(0.39 - 5.52)	0.566
Partner's HIV status						
Negative				Ref.		
Positive				1.23	(0.28 - 5.43)	0.785
Don't know				1.15	(0.48 - 2.77)	0.747
HIV/STI risk perception						
No risk at all				Ref.		
Small				1.98	(0.57 - 6.91)	0.283
Moderate				2.37	(0.67 - 8.43)	0.181
Great				4.04	(1.10 - 14.82)	**0.035**
3) Non-barrier modern contraceptive use						
Methods in use						
Injectables				Ref.		
Implants				0.53	(0.27 - 1.04)	0.064
IUDs				0.47	(0.14 - 1.57)	0.219
OCPs				0.16	(0.02 - 1.37)	0.093
Female sterilization						Perfect success
4) Other psychosocial characterictics						
HIV-related knowledge (HIV-KQ-18)				1.02	(0.90 - 1.16)	0.722
Condom use self-efficacy scale				0.98	(0.94 - 1.02)	0.359
Sexual Relationship Power Scale						
Low				Ref.		
Medium				1.36	(0.62 - 2.95)	0.445
High				1.87	(0.84 - 4.17)	0.124

OR: odds ratio; AOR: adjusted odds ratio; SD: standard deviation; IUD: intrauterine device; OCP: oral contraceptive pill

a. Adjusted for cluster effect, individuals, age, education, religion, wealth index, number of children, pregnancy intention, partner's pregnancy intention, history of unintended pregnancy, multiple sex partnership, non-barrier modern contraceptive methods, HIV status, partner's HIV status, HIV/STI risk perception, HIV-related knowledge, condom use self-efficacy, and sexual relationship control power.

Table S8. Effects of intervention on consistent dual-method contraceptive use among women at 4 months after enrollement

Variables	Model 1			Model 2		
	OR	(95% CI)	p-value	AOR[a]	(95% CI)	p-value
Intervention						
Control	Ref.			Ref.		
Intervention	5.22	(2.42 - 11.28)	**<0.001**	6.30	(2.20 - 18.03)	**0.001**
1) Socio-demographic characteristics						
Age in years				1.05	(0.98 - 1.12)	0.181
Education						
Never				Ref.		
Primary and more				0.56	(0.28 - 1.13)	0.104
Religion						
Christian				Ref.		
Muslim				0.73	(0.19 - 2.82)	0.651
Wealth index						
Poor				Ref.		
Middle				1.63	(0.74 - 3.56)	0.224
Rich				1.51	(0.65 - 3.54)	0.340
No. of children				0.79	(0.59 - 1.05)	0.104
Pregnancy intention						
No				Ref.		
Yes				0.37	(0.13 - 1.06)	0.063
Don't know				0.61	(0.16 - 2.43)	0.488
Partner's pregnancy intention						
No				Ref.		
Yes				1.45	(0.47 - 4.49)	0.523
Don't know				1.08	(0.32 - 3.67)	0.907
History of unintended pregnancy						
No				Ref.		
Yes				0.52	(0.24 - 1.12)	0.094
Multiple sex partners						
No				Ref.		
Yes				0.37	(0.05 - 3.05)	0.356
2) HIV-related characteristics						
HIV status						
Negative				Ref.		
Positive				1.01	(0.24 - 4.31)	0.985
Partner's HIV status						
Negative				Ref.		
Positive				1.84	(0.36 - 9.30)	0.462
Don't know				1.63	(0.68 - 3.92)	0.275
HIV/STI risk perception						
No risk at all				Ref.		
Small				2.14	(0.58 - 7.93)	0.253
Moderate				2.15	(0.56 - 8.32)	0.268
Great				1.65	(0.39 - 7.03)	0.499
3) Non-barrier modern contraceptive use						
Methods in use						
Injectables				Ref.		
Implants				1.01	(0.49 - 2.06)	0.987
IUDs				1.58	(0.54 - 4.62)	0.400
OCPs				0.66	(0.13 - 3.32)	0.618
Female sterilization						Perfect success
4) Other psychosocial characterictics						
HIV-related knowledge (HIV-KQ-18)				0.92	(0.81 - 1.03)	0.148
Condom use self-efficacy scale				1.02	(0.97 - 1.06)	0.443
Sexual Relationship Power Scale						
Low				Ref.		
Medium				0.72	(0.32 - 1.63)	0.434
High				0.96	(0.42 - 2.21)	0.932

OR: odds ratio; AOR: adjusted odds ratio; SD: standard deviation; IUD: intrauterine device; OCP: oral contraceptive pill

a. Adjusted for cluster effect, individuals, age, education, religion, wealth index, number of children, pregnancy intention, partner's pregnancy intention, history of unintended pregnancy, multiple sex partnership, non-barrier modern contraceptive methods, HIV status, partner's HIV status, HIV/STI risk perception, HIV-related knowledge, condom use self-efficacy, and sexual relationship control power.

Table S9. Effects of intervention on consistent dual-method contraceptive use among women at 6 months after enrollement

Variables	Model 1			Model 2		
	OR	(95% CI)	p-value	AOR[a]	(95% CI)	p-value
Intervention						
Control	Ref.			Ref.		
Intervention	6.58	(2.53 - 17.07)	**<0.001**	8.04	(1.17 - 55.08)	**0.034**
1) Socio-demographic characteristics						
Age in years				1.05	(0.96 - 1.15)	0.311
Education						
Never				Ref.		
Primary and more				1.18	(0.45 - 3.13)	0.738
Religion						
Christian				Ref.		
Muslim				1.75	(0.46 - 6.61)	0.409
Wealth index						
Poor				Ref.		
Middle				1.35	(0.53 - 3.47)	0.528
Rich				0.75	(0.26 - 2.20)	0.604
No. of children				0.90	(0.64 - 1.28)	0.560
Pregnancy intention						
No				Ref.		
Yes				0.73	(0.18 - 2.92)	0.657
Don't know				1.31	(0.23 - 7.51)	0.763
Partner's pregnancy intention						
No				Ref.		
Yes				1.27	(0.30 - 5.40)	0.743
Don't know				0.84	(0.17 - 4.17)	0.836
History of unintended pregnancy						
No				Ref.		
Yes				0.79	(0.32 - 1.96)	0.607
Multiple sex partners						
No				Ref.		
Yes				1.59	(0.29 - 8.78)	0.597
2) HIV-related characteristics						
HIV status						
Negative				Ref.		
Positive				4.08	(0.86 - 19.27)	0.076
Partner's HIV status						
Negative				Ref.		
Positive				0.51	(0.07 - 3.47)	0.489
Don't know				0.93	(0.30 - 2.92)	0.901
HIV/STI risk perception						
No risk at all				Ref.		
Small				1.21	(0.29 - 5.09)	0.791
Moderate				0.91	(0.20 - 4.25)	0.907
Great				0.98	(0.20 - 4.82)	0.983
3) Non-barrier modern contraceptive use						
Methods in use						
Injectables				Ref.		
Implants				1.09	(0.44 - 2.67)	0.853
IUDs				1.95	(0.55 - 6.93)	0.304
OCPs				1.51	(0.27 - 8.57)	0.642
Female sterilization						Perfect success
4) Other psychosocial characterictics						
HIV-related knowledge (HIV-KQ-18)				1.02	(0.87 - 1.18)	0.834
Condom use self-efficacy scale				1.02	(0.97 - 1.07)	0.549
Sexual Relationship Power Scale						
Low				Ref.		
Medium				0.93	(0.36 - 2.43)	0.885
High				0.56	(0.18 - 1.71)	0.310

OR: odds ratio; AOR: adjusted odds ratio; SD: standard deviation; IUD: intrauterine device; OCP: oral contraceptive pill

a. Adjusted for cluster effect, individuals, age, education, religion, wealth index, number of children, pregnancy intention, partner's pregnancy intention, history of unintended pregnancy, multiple sex partnership, non-barrier modern contraceptive methods, HIV status, partner's HIV status, HIV/STI risk perception, HIV-related knowledge, condom use self-efficacy, and sexual relationship control power.

Table S10. Effects of intervention on consistent dual-method contraceptive use among women at 8 months after enrollement

Variables	Model 1			Model 2		
	OR	(95% CI)	p-value	AOR[a]	(95% CI)	p-value
Intervention						
Control	Ref.			Ref.		
Intervention	9.43	(3.70 - 24.06)	**<0.001**	10.72	(2.03 - 56.64)	**0.005**
1) Socio-demographic characteristics						
Age in years				1.05	(0.96 - 1.14)	0.270
Education						
Never				Ref.		
Primary and more				0.90	(0.40 - 2.00)	0.788
Religion						
Christian				Ref.		
Muslim				1.15	(0.31 - 4.29)	0.832
Wealth index						
Poor				Ref.		
Middle				1.46	(0.63 - 3.38)	0.373
Rich				1.52	(0.61 - 3.80)	0.373
No. of children				0.89	(0.65 - 1.22)	0.463
Pregnancy intention						
No				Ref.		
Yes				0.40	(0.12 - 1.34)	0.137
Don't know				0.93	(0.22 - 3.98)	0.923
Partner's pregnancy intention						
No				Ref.		
Yes				1.80	(0.47 - 6.86)	0.390
Don't know				1.34	(0.34 - 5.24)	0.674
History of unintended pregnancy						
No				Ref.		
Yes				0.86	(0.40 - 1.83)	0.688
Multiple sex partners						
No				Ref.		
Yes				0.94	(0.17 - 5.16)	0.942
2) HIV-related characteristics						
HIV status						
Negative				Ref.		
Positive				1.16	(0.20 - 6.63)	0.868
Partner's HIV status						
Negative				Ref.		
Positive				1.12	(0.18 - 7.00)	0.905
Don't know				0.41	(0.12 - 1.36)	0.146
HIV/STI risk perception						
No risk at all				Ref.		
Small				0.85	(0.27 - 2.70)	0.782
Moderate				0.96	(0.29 - 3.16)	0.944
Great				1.20	(0.33 - 4.34)	0.785
3) Non-barrier modern contraceptive use						
Methods in use						
Injectables				Ref.		
Implants				0.85	(0.38 - 1.89)	0.685
IUDs				2.55	(0.87 - 7.46)	0.087
OCPs				0.60	(0.11 - 3.37)	0.566
Female sterilization						Perfect success
4) Other psychosocial characericts						
HIV-related knowledge (HIV-KQ-18)				1.02	(0.89 - 1.16)	0.779
Condom use self-efficacy scale				1.00	(0.96 - 1.05)	0.858
Sexual Relationship Power Scale						
Low				Ref.		
Medium				0.90	(0.37 - 2.16)	0.806
High				1.11	(0.44 - 2.83)	0.829

OR: odds ratio; AOR: adjusted odds ratio; SD: standard deviation; IUD: intrauterine device; OCP: oral contraceptive pill

a. Adjusted for cluster effect, individuals, age, education, religion, wealth index, number of children, pregnancy intention, partner's pregnancy intention, history of unintended pregnancy, multiple sex partnership, non-barrier modern contraceptive methods, HIV status, partner's HIV status, HIV/STI risk perception, HIV-related knowledge, condom use self-efficacy, and sexual relationship control power.