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Ryan Burke Date

Intervention and Retention Predictors for a Couples' HIV Intervention Randomized Control Trial

By

Ryan Burke

Master of Public Health

Global Epidemiology

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Kristin Wall Ph.D., M.S.

Faculty Thesis Advisor

_____

Susan Allen M.D., MPH

Thesis Field Advisor

Intervention and Retention Predictors for a Couples' HIV Intervention Randomized Control Trial

By

Ryan Burke

Bachelors of Science in Public Health
Minors in Biology and Politcal Science

University of Massachusetts, Amherst

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Faculty Thesis Advisor: Kristin Wall, PhD.

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Abstract

Intervention and Retention Predictors for a Couples' HIV Intervention Randomized Control Trial

By Ryan Burke

Background. Selective study participation and retention in clinical trials raise questions about the generalizability and validity of the results from clinical trials. Here we identify predictors of intervention participation and study retention of HIV negative concordant cohabitating couples in a randomized control trial in Zambia designed to reduce HIV risk from concurrent sexual partners.

Methods. Ten government clinics in Lusaka and Ndola, Zambia were randomized to receive the intervention or control. After couples completed Couples' Voluntary Counseling and Testing they were invited to enroll in the study. Couples receiving the behavioral intervention discussed the importance and method of protecting your partnership from HIV infection. Couples in the control intervention received messages on good health practices for non-communicable and neglected tropical diseases. Logistic regression analyses were conducted to identify predictors for intervention participation and study retention, defined as couples making a baseline and first study visit as "Intervention", and couples who were enrolled and made at least one post-intervention follow-up visit as "Retained". The comparison group was couples who completed the baseline questionnaire only and did not return for the intervention or follow-up.

Results. Of 1,812 couples completing the baseline visit, 1,243 returned to receive an intervention (69%) and of those 1,163 (93%) were retained. A higher number of children in the household under age 16 (adjusted odds ratio per additional child, aOR=1.15;95%CI:1.05-1.26), having previously attended couples counseling (aOR=1.32;95%CI:1.03-1.68), the woman partner having a history of sexually transmitted infection (STI) treatment (aOR = 2.53; 95%CI:1.23-5.19), and lower sex frequency (aOR =1.02;95%CI:1.01-1.02) were associated with returning for the intervention visit. Post-intervention, couples with older women partners (aOR = 1.04 per year increase;95%CI:1.00-1.08) were more likely to be retained and couples having less frequent sex due to having a baby/post-partum abstinence (aOR =0.29;95%CI:0.095-0.881) were less likely to be retained.

Conclusion. This clinical trial is designed to reduce HIV incidence among concordant negative couples in high-risk areas. Given predictors of intervention participation and retention, the trial findings will be most generalizable to couples who had previously received CVCT, who have younger children, but not infants, less frequent sex, a woman partner who has been treated for an STI, and older women partners.

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CHAPTER I: LITERATURE REVIEW

HIV and Sub-Saharan Africa

UNAIDS reports, as of the end of 2015, Human Immunodeficiency Virus (HIV) has infected between 34.0 and 39.8 million people globally (1). They estimate that around 70% of those living with HIV, or 25.5 million, live in sub-Saharan Africa. This region is also currently observing 46% of new HIV infections across the globe (2), (3).

HIV can be transmitted in several different ways, and the epidemiology of the disease is different across the globe. Doctor's and the Centers for Disease Control (CDC) first recognized HIV in the United States in homosexual populations in New York City and San Francisco (4, 5). Over the years there has been a general decline in the number of incident HIV cases within the United States, but rates are still high among men who have sex with men (MSM), especially Black/African-American MSM (6). HIV is predominately spread among heterosexual couples within the context of sub-Saharan Africa (7). Individuals who are married, ever were married (divorce or widowed) had a two to three times higher likelihood of being HIV positive when compared to their unmarried counterparts (8). In Sub-Saharan African countries with ongoing HIV transmission a large proportion of adults aged 20-49 are in cohabitating couples (9, 10). Unlike the United States, it is not the MSM community who has the highest risk of infection, rather heterosexual couples. As a result, prevention methods in sub-Saharan Africa should focus on couples' level intervention to best adapt to the epidemiology of the HIV epidemic in this region. The following sections focus on HIV prevention in the scope of dyadic relationships.

Couples and HIV

Within a couple, there are three possibilities of HIV serostatus. The couples may both be infected with HIV, concordant positive, one partner maybe infected, discordant, or both may not be infected, concordant negative (11). For couples where both partners are infected, the goal is to provide treatment and education so that they may reduce the risk of transmitting HIV to other sexual partners and vertical transmission of mother to child. Among discordant couples, there is a great risk for partners to transmit HIV to their partner, with HIV seroconversion ranging from 22% to 26% in some Sub-Saharan African countries (12). Many HIV incident cases occur within cohabitating heterosexual relationships, with 29.4% of HIV incident cases occurring within concordant negative couples (13). This occurs when one member of the dyad has a concurrent partner putting themselves and the other member of their dyad at risk for HIV, syphilis, or other sexually transmitted infections. Concurrent partnerships are not something specific to concordant negative couples. Chemaitelly reports that 30.4% of HIV incident cases occurs within HIV sero-discordant couples, with about 0.7% due to outside partners (13).

HIV Prevention Techniques

Condoms

The topic of condom efficacy in the prevention of HIV, syphilis, and other sexually transmitted infections (STIs) has been investigated over the years. Condoms prevent the transmission of urethral or vaginal secretions to mucosal surfaces by creating a barrier between the male urethra and the vagina, cervix, or anus. In 2000, the United States National Institute of Health (NIH) published a review determining that there was only sufficient evidence to support the claim that condoms prevent transmission of HIV to females and males, as well as gonorrhea to males (14). In the following years, further research has demonstrated that the condom is effective in preventing several STIs. The

NIH only focused on proper and consistent condom usage, which is not always feasible in a real-life setting, especially among couples. Condoms need to be used consistently and correctly to prevent STIs as it only takes one transmission event to cause an STI (14).

Condom usage among couples is often a partnership decision, and can be low for many reasons. There is the sense of trust between partners and wanting to demonstrate that trust through being more intimate and not using a condom. People often feel that they are labeled as promiscuous if they ask to wear a condom, making wearing condoms not desirable (15). There is a power aspect among couples as well that can effect condom usage during sexual intercourse. The partner often effects that person's choice of when to use a condom. Prior research indicates that the male partner in heterosexual couples is generally more influential. This means the female member of the dyad will yield to the male's desires, which can include unsafe sex practices (16).

In sub-Saharan Africa, there is also a negative stigma about being a single mother. (Single mom cohort data) For them to find a new partner they often feel a push to not use a condom with a partner. Hoping to demonstrate trust, intimacy, and commitment to that individual, leaving them exposed to the risk of HIV and other STIs (17).

Male Circumcision

Male Circumcision is the procedure of cutting the foreskin from the penis. An association between male circumcision and HIV transmission was noticed as the HIV epidemic began in the 1980's. While these preliminary studies focused on MSM populations, multiple large randomized clinical trials conducted in Africa, where a majority of HIV cases are transmitted between heterosexual couples, have demonstrated a significant protection from HIV/AIDS transmission among those with a circumcised penis (18, 19),(20).

Investigators are researching the pathophysiology of male circumcision and its role in the reduction of HIV transmission but hypothesize it be multifactorial. One hypothesized pathway is through the removal of the foreskin; we also remove a large amount of Langerhans cells. These cells supply a receptor site for HIV to enter into the host cells, and through their removal it is thought the risk of HIV declines (21). Male circumcision also replaces the rich vascular tissue of the foreskin with scar tissue, which prevents the penetration of vaginal and cervical fluids (22).

Some ethical, social, and economic factors affect the uptake of voluntary medical male circumcision. Among discordant couples within Zambia (F+M-) multiple disadvantages to male circumcision were highlighted, from pain, cultural disapproval, too expensive, and the female partners worried it would promote risky sexual behavior (23). Among males in Rakai District, Uganda some similar reasons were elaborated more in a qualitative study looking at the multilevel influences on VMMC. Along with the initial cost of the procedure, the days missed from work for the procedure and recovery can set a family/individual back financially. The study participants also identified religion as a major factor in their decision, as they identified as Christian and felt that only those that are Muslim or are converting get circumcised (24).

The WHO and UNAIDS identifies a level of 90 % of males between 10-29 years old being circumcised by 2021 as ideal to help prevent transmission of HIV in Sub-Saharan Africa (25). This may prove to be difficult due to religious, monetary, and several other influences that can influence a person's decision about VMMC.

Pre-Exposure Prophylaxis (PrEP)

Pre-Exposure Prophylaxis, or PrEP, is the use of antiretrovirals by high-risk HIV negative persons to prevent new infections. In 2012 the WHO issued guidelines regarding

the use of PrEP for uninfected partners within a HIV discordant dyad. Later, in 2014, they revised their recommendations to include MSM, only to change it again to cover all population groups at a substantial risk of HIV infection. They identify this as about an HIV incidence of 3 per 100 person-years or higher (26). This would include much of the people living in sub-Saharan Africa where HIV incidence ranges from 0.8 to 17.0 per 100 person-years across multiple populations (27).

Policy makers should consider several other factors to determine if PrEP is appropriate to provide effective HIV prevention. Adherence to the program is related to the effectiveness of the antiretroviral as it needs to be taken regularly like antiretroviral therapy (ART) for those who are HIV positive. In sub-Saharan Africa acceptance is high among women, with some concerns about cost, safety, and side effects of PrEP. There is also some fear of the social repercussions of taking PrEP as they may be identified as HIV positive and be subject to HIV stigma (28). With cost being identified as a possible driver for non-adherence to PrEP in sub-Saharan Africa, other interventions may be preferable in low-resource settings (29). Among concordant negative couples, the benefits of PrEP may not outweigh the other impacts of following this HIV prevention technique. Primarily HIV incidence among this population is mostly below the WHO HIV incidence threshold of 3.0 per 100 person-years (27). In heterosexual couples in females are afraid that adhering to PrEP would create the image that they are promiscuous and have multiple partners (30). While having concurrent partners is how HIV is introduced into a HIV negative relationship, there may be more effective means of HIV prevention among this population.

Couples Counseling/Testing

Couples Voluntary Counseling/Testing (CVCT) is the process of a couple receiving counseling and HIV test results together (31). With HIV transmission occurring among heterosexual couples and a majority of Africans in cohabitating relationships, approaching the HIV epidemic at the couples' level can be advantageous (7). Previous studies have shown that knowledge of one's serostatus can have an impact on a person's risk behavior (32). When it was just individuals who received HIV counseling and testing, there was not an observable change in their risk behavior (3). Among couples who are tested together, it is less likely that an HIV negative person will acquire HIV when compared to a HIV negative person who is tested individually (33). Couples testing has demonstrated that it is more effective in promoting safe sex practices, repeat HIV testing, and greater adherence to ART for HIV positive partners (34). Couple counselling and testing promotes a supportive environment between the partners and allows them to develop a plan on how to proceed after their results (35).

It is important to promote risk reduction in HIV concordant negative couples as well as promote treatment for discordant couples to prevent one partner from transmitting HIV to the negative partner. Seventy percent of new HIV infections are among discordant couples, and couples voluntary counseling and testing can reduce that by two-thirds (36). In many situations, the HIV positive partner is unaware of their serostatus leading to a greater risk of transmitting it to their spouse.

CVCT does have some possible drawbacks when one partner is positive and the other is negative. The positive partner fears abandonment, or the female partner can be abused due to their serostatus. CVCT addresses that issue with comprehensive training for the counselors on how to deal with these issues (34, 37).

Negotiated Safety

Negotiated Safety (NS) is a HIV prevention technique that started primarily among MSM partners. It was first reported in 1993 among Australian MSM couples (38). It is a course of actions where the partners discuss ways they can mitigate their risk of HIV infections. Negotiated Safety typically revolves around safe sex agreements where if the partner is going to find an outside partner they agree to follow safe sex practices (39). These may include: couples testing, sero-negative concordance with partners, condom use with casual partners outside of your main partner, monogamy, and breach disclosure (40). The presence of a NS agreement is a predictor for safe sex, as seronegative individuals were less likely to have unprotected anal sex with casual partners. Few articles have researched negotiated safety among heterosexual couples. When it has been researched it appears that the negotiation is about condom usage and does not expand to cover the aforementioned prevention techniques like serostatus disclosure (41, 42).

Adoption of negotiated safety techniques between partners is dependent on several predictors. Among young MSM couples, the perception of the partner's desire for UAS increased the likelihood of the usage of NS techniques. A second predictor for NS adoption is their perception of their risk of HIV infection (40). While the majority of these studies focus on MSM couples, HIV is still transmitted sexually among heterosexual couples. Adoption of NS techniques, especially in sub-Saharan Africa where a majority of new HIV infections are acquired within cohabitating heterosexual couples.

CHAPTER II: MANUSCRIPT

ABSTRACT

Background. Selective study participation and retention in clinical trials raise questions about the generalizability and validity of the results from clinical trials. Here we identify predictors of intervention participation and study retention of HIV negative concordant cohabitating couples in a randomized control trial in Zambia designed to reduce HIV risk from concurrent sexual partners.

Methods. Ten government clinics in Lusaka and Ndola, Zambia were randomized to receive the intervention or control. After couples completed Couples' Voluntary Counseling and Testing they were invited to enroll in the study. Couples receiving the behavioral intervention discussed the importance and method of protecting your partnership from HIV infection. Couples in the control intervention received messages on good health practices for non-communicable and neglected tropical diseases. Logistic regression analyses were conducted to identify predictors for intervention participation and study retention, defined as couples making a baseline and first study visit as "Intervention", and couples who were enrolled and made at least one post-intervention follow-up visit as "Retained". The comparison group was couples who completed the baseline questionnaire only and did not return for the intervention or follow-up.

Results. Of 1,812 couples completing the baseline visit, 1,243 returned to receive an intervention (69%) and of those 1,163 (93%) were retained. A higher number of children in the household under age 16 (adjusted odds ratio per additional child, aOR=1.15;95%CI:1.05-1.26), having previously attended couples counseling (aOR=1.32;95%CI:1.03-1.68), the woman partner having a history of sexually transmitted infection (STI) treatment (aOR = 2.53; 95%CI:1.23-5.19), and lower sex

frequency (aOR =1.02;95%CI:1.01-1.02) were associated with returning for the intervention visit. Post-intervention, couples with older women partners (aOR = 1.04 per year increase;95%CI:1.00-1.08) were more likely to be retained and couples having less frequent sex due to having a baby/post-partum abstinence (aOR =0.29;95%CI:0.095-0.881) were less likely to be retained.

Conclusion. This clinical trial is designed to reduce HIV incidence among concordant negative couples in high-risk areas. Given predictors of intervention participation and retention, the trial findings will be most generalizable to couples who had previously received CVCT, who have younger children, but not infants, less frequent sex, a woman partner who has been treated for an STI, and older women partners.

BACKGROUND

In Zambia, 70% of adults aged 20-49 are in cohabitating couples (43).HIV is predominately spread among heterosexual couples in Sub-Saharan Africa (7), requiring the attention of HIV prevention techniques. Among cohabitating couples, 30.4% of new HIV infections are estimated to occur within serodiscordant couples and 22.5% of new HIV infections are estimated to occur within concordant negative couples due to concurrent partnerships (13). Concurrent partnerships have been identified by previous research studies as well as the Zambia National AIDS Council, UNAIDS, and The Global HIV/AIDS Program (GHAP) The World Bank as a key driver in HIV transmission (44-46).

Couples' Voluntary HIV Counseling and Testing (CVCT) has been demonstrated as an effective means of preventing new HIV infections and is recommended by the World Health Organization (WHO) (31). Studies in Rwanda and Zambia have shown that after CVCT, HIV seroconversions in the negative partner of a HIV serodiscordant couple

decline by 30.6% to 84.5% % (36). Another study in Zambia showed that CVCT also reduced HIV incidence in concordant negative couples by 43% (47). However, despite this prevention impact, of the new HIV infections that occur after CVCT, more than a third of them are in concordant negative couples (48). An increased understanding of the epidemiology of HIV among HIV concordant negative couples is necessary to improve prevention efforts in this group.

We are currently conducting a randomized controlled trial with HIV concordant negative couples undergoing CVCT in Ndola and Lusaka, Zambia. The intervention, Strengthening our Vows (SOV), is based on establishing couple-level sexual agreements, a concept first explored among men who have sex with men (MSM) populations and first reported in literature in 1993 (38). The SOV intervention aims to improve communication between cohabitating couples regarding concurrent partners, HIV testing, and protecting their relationship from HIV infection.

Selective participation and retention in clinical trials raise questions about the generalizability and validity of the results from clinical trials (49). A well-designed clinical trial will generate true results, but without a representative study population, these results may lack external validity. Losing study participants to attrition can introduce bias away or towards the null, depending on the outcomes of those who did not drop out (49, 50). Here, we identify predictors of participation and retention of HIV negative concordant cohabitating couples in the SOV trial.

METHODS

SOV RCT Study Design

The study was designed as a randomized control trial in 10 government clinics in Ndola and Lusaka, Zambia where CVCT services are currently provided. The clinics

were randomized to five pairs with one clinic receiving the behavioral intervention, SOV, and the other receiving the control intervention, GHPP. After a couple had participated in and went through CVCT in one of the 10 randomized clinics, they were presented with the opportunity to enroll in the study. Eligibility criteria included: both partners' HIV negative, cohabitating for at least three months, the woman aged 18-45 years old, the man aged 18-65 years old, neither partner on antiretroviral therapy, including Post Exposure Prophylaxis (PEP) or Pre-Exposure Prophylaxis (PrEP), available for follow-up for the duration of the study, willing to provide contact information and to be contacted by study staff. Eligible and consenting couples answered a baseline questionnaire (termed visit zero, 'V0'). Following this visit, couples were then asked to return over the next 6 months to complete four study visits (V1, V2, V3, V4). Visit 1 (V1), included the behavioral and control intervention depending on which study arm a couple was in. Screening and treatment for syphilis and trichomonas were provided for both arms, and blood pressure, diabetes and schistosomiasis testing and treatment for the control arm. Visit 2 (V2), consisted of a follow-up questionnaire and repeat STI screening and testing for both arms. Visits 3 (V3) and 4 (V4) were similar to V2 but with a slightly different follow-up questionnaire. Finally, visit 4 (V4) included blood pressure, diabetes and schistosomiasis testing and treatment for the control intervention arm, and an abbreviated version of the program they did not receive at V1. REDCap (Research Electronic Data Capture) is a secure, web-based application designed to support data capture for research studies, providing: 1) an intuitive interface for validated data entry; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages; and 4) procedures for

importing data from external sources. All lab testing results were input into Microsoft Access.

Baseline exposures of interest

Men and women were interviewed separately. Age in years were recorded for both partners within a dyad. Monthly familial income was recorded from self-reported incomes of both female and male partners in the local currency Kwacha (ZMW). Language literacy variables were dichotomized to "Yes/Some" understanding or reading literacy in local languages (Bemba or Nyanja) and "No" literacy. Both partners were asked about their sexual history, whether they had ever had an outside partner, and if they had ever received treatment for a STI. Self-reported couples level variables included the number of years' couples had been cohabitating at baseline and whether they had previously attended CVCT. Women were asked the number of children under 16 in the household, pregnancy status as "Yes" or "No" and which contraceptive method they used, if any. Study data were collected and managed using REDCap electronic data capture tools hosted at Emory University (51).

Outcomes of interest: Intervention and Retention

Couples who did not return after the baseline (V0) visit were compared with those who returned and participated in the intervention (V1). Retention was determined to be all couples who had at least one follow-up visit (V2 or V3 or V4) after completing V0 and V1. This group was compared to those who did not return after V1. A visual depiction of the intervention and retention procedures can be seen in Figure 1.

Analysis

Data from the baseline questionnaires was uploaded to REDCap. Data was then downloaded to Microsoft Excel and Microsoft Access to conduct data cleaning and identify data entry errors or missing data. Afterwards data was imported into SAS 9.4 (SAS Institute, Cary, N.C.). Descriptive statistics (counts and percentages for categorical variables and mean/medians and standard deviations/IQRs for continuous variables) for all exposures of interest were calculated for all couples screened; these statistics were also calculated by intervention and retention status. Variables that were not distributed normally were log transformed to meet the normality assumption. Bivariate logistic regression models generated crude odds ratios (OR) for the associations between each exposure variable and the two outcomes of interest. Variables that were significant in the bivariate analyses were then considered for the multivariate logistic regression model. Collinearity was assessed in the full models utilizing a SAS macro. Measures of association are presented as adjusted odds ratios (aOR) with 95% confidence intervals (CI).

RESULTS

Enrollment, intervention, and retention

Of the 1,812 couples invited to join the trial, 1,724 (95.1%) consented to be in the trial, with 88 (4.9%) couples not consenting to be in the study. Among the 1,724 consenting couples, 1,695 (96.2%) were eligible and completed V0. Of those 1,695 couples, 1,243 (74.9%) returned for V1 (“Intervention” group), with 452 (27.2%) couples never returning after V0. In the group that received an intervention, 1,163 (93.6%) couples completed follow-up visits with 80 (6.4%) couples never making a follow-up visit. (Fig. 1).

Crude differences by intervention and retention groups

Demographics. Couples that received the intervention in the study were slightly older than couples that completed only the baseline study visit (Tables 1, 3). Men who made visit 1 were on average 32.2 years old compared with 31.1 years for those not returning after V0. Corresponding values for women were 26.5 years and 25.4 years. The median family monthly income was 1150 Kwacha (ZMW) (about $121 USD) for all couples at baseline. It was slightly higher in the baseline only group at 1200 ZMW ($127 USD), and this was significantly different from the intervention group (Table 3).

The number of years a couple had been cohabiting at the time of their baseline visit was an average of 6.25 years for couples receiving the intervention, 4.90 years for non-intervention couples, 6.28 years for retained couples, and 6.10 years for non-follow-up couples (Tables 1,2). The bivariate analyses, seen in Table 3, demonstrated a significant difference between number of years cohabitating comparing the intervention and non-intervention couples ($P<0.0001$). The number of children under the age of 16 also varied between comparison groups. Intervention group households averaged 2.26 children, while baseline only group couples averaged 1.76 children. When comparing those with and without follow-up after the intervention, the number of children under the age of 16 years old in the house were 2.28 and 1.66 children respectively.

Sexual Health. Examining prior STI treatment and history of outside sex partners there are some differences among the comparison groups. A larger proportion of men reported having been treated for STIs compared with women in all study groups (Tables 1,2). Women in the intervention group reported higher percentages of STI treatment when compared to women in the baseline-only (5.2% vs. 2.0%, $P= 0.0055$). A larger proportion of men reported ever having a concurrent partner during the marriage compared with

women. Among couples where the man reported ever had an outside partner, the odds of that couple returning for the intervention increased by 58% (P=0.0154).

*Contraceptive Methods***.** Long-acting reversible contraceptives (LARC) were not a common family planning method. Instead, condoms, the lactational amenorrhea method (LAM), or nothing at all was the most popular with 62.7% of couples selecting these as their family planning method (Table 1). Overall there were six options to select from, and the only response having a significant difference among comparison groups was an increase in the use of a LARC implant in the intervention group when compared to the baseline only group (P=0.0319).

Literacy. Understanding and reading comprehension of Bemba and Nyanja, the two most popular native languages of Lusaka and Ndola, were measured to ascertain literacy of study participants at baseline. In all comparison groups understanding of Bemba or Nyanja was high. Reading comprehension levels were lower for both sexes when compared to their understanding of the local languages. Female reading comprehension levels were substantially lower than that of their male counterparts, with 91.6% of males stating they could read Nyanja or Bemba at baseline compared to 78.3% of females (Table 1). The differences between the comparison groups baseline only versus intervention and couples retained versus couples with no follow-up were not statistically significant for any of the language variables considered.

Factors associated with intervention participation in adjusted analyses

A larger number of covariates were considered in the univariate and bivariate analyses covering more of the couple's demographics, sexual health past and present, and language variables can be seen in the Appendix. All variables that were significant in the

bivariate analyses comparing enrollment to baseline only and retention to non-follow-up couples can be observed in Table 3.

A higher number of children in the household under age 16 (adjusted odds ratio, aOR=1.15;95%CI:1.05-1.26), having previously attended couples counseling (aOR=1.32;95%CI:1.03-1.68), the woman having a history of STI treatment (aOR =2.53;95%CI:1.23-5.19) and lower sex frequency (aOR =1.02;95%CI:1.01-1.02) predictive of returning for the intervention visit (Table 4). These results adjusted for age of partners in the dyad, study arm, monthly income, years cohabitating, male partners ever having an outside partner, and contraceptive methods (Intrauterine devices, implant, injectable, pills, tubal litigation, and none, condom or LAM), which were not statistically significantly associated with the outcome.

Factors associated with retention in adjusted analyses

Couples with older women partners (aOR =1.04;95%CI:1.00-1.08) were more likely to be retained and couples having less frequent sex due to having a baby (aOR =0.29;95CI%:0.095-0.881)were less likely to be retained (Table 5).

DISCUSSION

Heterosexual couples are the largest HIV at-risk group in Sub-Saharan Africa (7). Allen et al. reported that after CVCT a significant reduction in the incidence of HIV among sero-discordant and sero-concordant positive HIV couples was present, and the prevention impact of CVCT has been noted for concordant negative couples (32, 47). However, residual infections in couples are still occurring after CVCT. In concordant negative couples, the infection has to first enter the relationship through one partner

having a concurrent partner whom is HIV positive. Preventing a person in a cohabitating relationship from becoming HIV positive can prevent a concordant negative couple from becoming discordant, increasing the risk of HIV infection for their uninfected partner (52). Among discordant couples a percentage of them must also be infected by having outside partners other than their spouse (13). A program that can effectively address the risks of having concurrent partnerships may be able to help prevent new HIV infections from occurring in all cohabitating couples.

A randomized clinical trial is currently assessing whether a behavioral modification initiative, Strengthening Our Vows, can improve the reduction of HIV/STI incidence among cohabitating concordant negative couples in Zambia after CVCT. By drawing on other successful STI prevention techniques, such as Negotiated Safety, a popular sexual agreement utilized by MSM couples, CVCT can be strengthened (53),(54).

In order to understand who we can generalize our trial results to; we explored study participation and retention. In our randomized control trial, we observed a high level of participation and retention, with 74.9% of couples completing the informed consent and baseline data collection returning for an intervention, and among them, 93.6% made follow-up study visits.

Barriers to participation in a study intervention included the number of times a couple had sex in the previous month. The observed decrease in the odds of a couple receiving the intervention as the number of times they had sex with their partner increases was small but statistically significant. When consenting to participate, couples are told that they will be taking part in a study aimed to improve family and household health.

Couples that have more sex may view their relationship as a healthy one and decide that they do not need to partake in couples counseling to improve their relationship. This finding supports the previous research by Wadsworth et. al, which suggested the higher frequency of sexual activity corresponded to happiness (55). The magnitude of this finding is small though, so it is hard to make any conclusive observations on it.

Some significant predictors of intervention participation include the higher number of children under 16 in the household, previously attending CVCT, and the female partner receiving treatment for an STI. In the consenting document presented to couples as they decide whether to participate or not, the benefits of the study are explained. In addition to improving household and family health, couples were informed of receiving treatment for schistosomiasis, which is often thought of as a disease that only affects children as well as treatment for syphilis and trichomonas. This knowledge may explain why the odds of study participation increased for couples where the female partner had a previous history of STI treatment. Previous attendance through CVCT adds to the previous findings reported by Kempf (2008), that recruitment and participation for couples' level interventions can be improved upon by focusing on couples that already participate in couples' HIV prevention practices (56).

Finally, we saw a trend between lower family income and participation ($p=0.06$). Families with a lower monthly income are possibly more reliant on the types of goods and services provided by taking part in a randomized clinical trial. Alternatively, it is possible that couples were less likely to participate as familial monthly income increased because of work commitments.

While only a few predictors of retention were statistically significant, some findings can still be drawn from them. Couples that had an infant in the household that prevented them from having sex in the month prior to enrollment were less likely to be retained. If a couple had an infant in the household that requires constant attention, they may not have had the time to make repeated study visits. Couples with infants may have had other doctor's appointments to make, along with caring for the child. This calls to attention the need to incorporate discussions about healthy lifestyle choices for all members of the family at any doctor visits. The other predictor for retention in the clinical trial increasing female partner age. One possible reason for this could be older women have more influence in the relationship than a younger women, allowing them to influence the couple's decisions on whether or not to stay in a study (57-59).

In this study literacy did not make a significant difference between the comparison groups, however literacy in the study population was slightly higher that the national average of 61.4% (60), likely because the study was conducted in urban areas. Future developments of couple's level interventions need to incorporate methods of reaching illiterate populations. Multimedia interventions may prove to be successful in the future. In 2008, a Zambian television series "Club Risky Business" was launched to promote *One Love Kwasila!* A campaign designed to reduce the number of concurrent sexual partnerships among urban and peri-urban men. Exposure was measured as high as 27% with the program Facebook page totaling over 4,700 fans. The show focused on teaching men the risks of concurrent partnerships and provided more education on HIV/AIDS (61). The show was only aired on a private channel though which could

exclude many of those we would be attempting to target with a multimedia response like this one.

Strengths of the trial include the run-in design, improving study participation and retention of the study population. In addition, the use of electronic data collection methods prevented study proctors from skipping questions, resulting in fewer missing data. Also by targeting Lusaka and Ndola as the recruitment sites, the study population represents the most at-risk group for HIV infection. As of 2014, the Lusaka and Copperbelt provinces, which include Lusaka and Ndola, had the two highest HIV prevalence levels at 16.3% and 18.2% respectively (43).

Limitations of the study as mentioned before, is the possible lack of generalizability to the whole population of cohabitating couples in Zambia. The literacy in the study population was higher than the national average, possibly leading to higher retention rates. Efforts towards designing programs for illiterate populations needs to be improved. Recruitment practices may need to extend outside of urban areas, as rural populations are not represented in our study population.

CONCLUSION

This clinical trial is designed to reduce HIV incidence among concordant negative couples in high-risk areas. Given predictors of intervention participation and retention, the trial findings will be most generalizable to couples undergoing CVCT who have younger children, less frequent sex, a female partner who has received previous treatment for an STI, increasing female partner age, and not having an infant in the house. Given the area of recruitment and baseline data, the results will also be generalizable to urban, literate cohabitating couples.

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TABLES

Table 1. Baseline characteristics, stratified by Intervention

Characteristics at baseline	Concordant negative couples at Baseline (N = 1,695 couples)		Intervention (N = 1,243 couples)		Non-Intervention (N = 452 couples)	
	N/mean	%/SD	N/mean	%/SD	N/mean	%/SD
Demographics						
Male Age in years*†	31.9	7.8	32.2	7.9	31.1	7.6
Female Age in years*†	26.2	6.6	26.5	6.8	25.4	6.2
Pregnancy**[a]	451	26.6%	324	26.1%	127	28.1%
City**						
Lusaka	335	19.8%	253	20.4%	82	18.1%
Ndola	1,360	80.2%	990	79.6%	370	81.9%
Arm						
Good Health Practices Plus	879	51.9%	626	50.4%	253	56.0%
Strengthening our Vows	816	48.1%	617	49.6%	199	44.0%
Family Income(ZMW) ***†	1,150	1,300	1,150	1,300	1,200	1200
Demographics Couple Together						
Number of children under 16 in household*†	2.12	1.65	2.26	1.66	1.76	1.58
Years Cohabiting*†	5.89	5.82	6.25	5.95	4.90	5.34
Previously attended CVCT**[a†]	1,220	36.0%	948	38.1%	272	30.1%
Past Sexual Treatment						
Male STI tx ever **[a]	209	12.3%	164	13.2%	45	10.0%
Female STI tx ever **[a†]	74	4.4%	65	5.2%	9	2.0%
Ever outside partners for Males**[a†]	200	11.8%	161	13.0%	39	8.6%
Ever outside partners For Females**[a]	19	1.1%	15	1.2%	4	0.9%
Contraceptive method **[a]						
Intrauterine Device	12	0.7%	9	0.7%	3	0.7%
Implant†	199	11.7%	157	12.6%	42	9.3%
Injectable	286	16.9%	217	17.5%	69	15.3%
Pills	135	8.0%	100	8.0%	35	7.7%
Tubal Litigation	1	0.1%	1	0.1%	0	0.0%
None/Condom/LAM	1,062	62.7%	759	61.1%	303	67.0%
Language Comprehension**[a]						
Male Understanding Bemba or Nyanja	1,691	99.8%	1,240	99.8%	451	99.8%
Female Understanding Bemba or Nyanja	1,691	99.8%	1,239	99.7%	452	100.0%
Male Reading Bemba or Nyanja	1,553	91.6%	1,143	92.0%	410	90.7%
Female Reading Bemba or Nyanja	1,328	78.3%	970	78.0%	358	79.2%

* Mean/Standard Deviation ***Median/(IQR) ZMW- Zambian Kwacha tx-Treatment

** N/(%) [a]Only affirmative is shown LAM- Lactational Amenorrhea Method

CVCT- Couples Voluntary Counseling & Testing STI-Sexually Transmitted Infection

†-Indicates significance in bivariate analysis comparing Intervention to Non-Intervention

Table 2. Baseline characteristics, stratified by retention

Characteristics at baseline	Retained (N =1,163 Couples) N/mean	%/SD	Intervention only (N = 80 Couples) N/mean	%/SD
Demographics				
Male Age in years*	32.3	7.8	30.9	8.5
Female Age in years*	26.6	6.8	25.1	6.4
Pregnancy**[a]	306	26.3%	18	22.5%
City**				
Lusaka	242	20.8%	11	13.8%
Ndola	921	79.2%	69	86.3%
Arm				
Good Health Practices Plus	578	49.7%	48	60.0%
Strengthening our Vows	585	50.3%	32	40.0%
Family Income(ZMW) ***	1,150	1,300	1,100	1,349
Demographics Couple				
Number of children under 16 in household*	2.28	1.66	1.66	0.83
Years Cohabiting*	6.28	5.94	6.10	1.47
Previously attended CVCT**[a]	445	38.3%	29	36.3%
Past Sexual Treatment				
Male STI tx ever **[a]	159	13.7%	5	6.3%
Female STI tx ever **[a]	63	5.4%	2	2.5%
Ever outside partners for Males**[a]	151	13.0%	10	12.5%
Ever outside partners For Females**[a]	14	1.2%	1	1.3%
Contraceptive method **[a]				
Intrauterine Device	8	0.7%	1	1.3%
Implant	149	12.8%	8	10.0%
Injectable	198	17.0%	19	23.8%
Pills	96	8.3%	4	5.0%
Tubal Litigation	1	0.1%	0	0.0%
None/Condom/LAM	711	61.1%	48	60.0%
Language Comprehension**[a]				
Male Understanding Bemba or Nyanja	1,161	99.8%	79	98.8%
Female Understanding Bemba or Nyanja	1,160	99.7%	79	98.8%
Male Reading Bemba or Nyanja	1,068	91.8%	75	93.8%
Female Reading Bemba or Nyanja	907	78.0%	63	78.8%

* Mean/Standard Deviation ***Median/(IQR) ZMW- Zambian Kwacha

** N/(%) [a]Only affirmative is shown LAM- Lactational Amenorrhea Method

CVCT- Couples Voluntary Counseling & Testing STI-Sexually Transmitted Infection tx-Treatment

†-Indicates significance in bivariate analysis comparing Retention to Intervention only

Table 3. Bivariate Analyses of Intervention and Retention Predictors

	Intervention				Retention			
Characteristics at Baseline	**OR**	**95% CI**		**P (2-sided)**	**OR**	**95% CI**		**P (2-sided)**
Demographics								
Male Age in years*[b]	1.02	1.00	1.03	0.0085	1.02	0.99	1.06	0.1434
Female Age in years*†[b]	1.03	1.01	1.04	0.0032	1.04	1.00	1.08	0.0486
Pregnancy	0.90	0.71	1.15	0.4028	1.23	0.72	2.11	0.4533
City (Ndola=REF)	1.15	0.87	1.52	0.3120	1.65	0.86	3.16	0.1330
Arm (SOV=REF)	0.80	0.64	0.99	0.0411	0.66	0.42	1.05	0.0765
Family Income(ZMW)[ac]*	0.90	0.80	1.00	0.0458	0.98	0.80	1.21	0.8582
Demographics Couple Together								
Number of children under 16 in household*[d]	1.22	1.14	1.31	<0.0001	1.11	0.96	1.28	0.1507
Years Cohabiting*[b]	1.05	1.03	1.06	<0.0001	1.01	0.97	1.05	0.5478
Previously attended CVCT*	1.43	1.22	1.69	<0.0001	1.09	0.68	1.75	0.7156
Past Sexual Treatment								
Male STI tx ever	1.37	0.97	1.95	0.0739	2.38	0.95	5.96	0.0655
Female STI tx ever*	2.72	1.34	5.50	0.0055	2.23	0.54	9.30	0.2695
Ever outside partners for Males*	1.58	1.09	2.28	0.0154	1.04	0.53	2.07	0.9008
Females	1.37	0.45	4.13	0.5821	0.96	0.12	7.41	0.9708
Number of times had sex with partner in last month[e]	0.98	0.97	0.99	<0.0001	1.00	0.98	1.02	0.9018
Reason no sex (Infant in house)†	1.34	0.54	3.32	0.5288	0.30	0.10	0.90	0.0326
Contraceptive method*								
IUD	1.20	0.32	4.45	0.7878	0.54	0.07	4.41	0.5652
Implant	1.49	1.04	2.15	0.0319	1.26	0.58	2.71	0.5594
Injectable	1.26	0.93	1.05	0.1396	0.70	0.40	1.22	0.2136
Pills	1.14	0.76	1.71	0.5267	1.62	0.57	4.59	0.3640
Tubal Litigation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
None/Condom/LAM	REF				REF			
Language Comprehension**[a]								
Male Understanding Bemba or Nyanja	0.92	0.10	8.84	0.9399	7.36	0.66	82.02	0.1045
Female Understanding Bemba or Nyanja	N/A	N/A	N/A	N/A	4.90	0.51	47.63	0.1705
Male Reading Bemba or Nyanja	1.17	0.80	1.71	0.4129	0.75	0.30	1.90	0.5435
Female Reading Bemba or Nyanja	0.93	0.72	1.22	0.6061	0.96	0.55	1.66	0.8735

a- Log transformed to meet normal distribution assumption

* - Indicates significance and included in consideration for multivariate model for intervention model

†- Indicates significance and included in consideration for multivariate model for retention model

b-Per 1 year increase
c-Per 1 unit increase
d- Per 1 child increase
e-Per 1 sex act increase
N/A indicates not available
REF indicates Reference group

OR- Odds Ratio
CI- Confidence Interval
SOV- Strengthening our Vows
CVCT- Couples Voluntary Counseling & Testing
ZMW- Zambian Kwacha
IUD -Intrauterine Device
LAM- Lactational Amenorrhea Method

Table 4. Multivariate Analyses of Participation Predictors

	Participation			
Characteristics at Baseline	**aOR**	**95%CI**		**P(2-sided)**
Demographics				
Male Age in years*	0.99	0.96	1.02	0.3641
Female Age in years*	1.00	0.96	1.04	0.8798
Arm (SOV=REF)	1.00	0.79	1.26	0.9988
Family Income(ZMW)**	0.90	0.80	1.01	0.0631
Demographics Couple Together				
Number of children under 16 in household***†	1.15	1.05	1.26	0.0029
Years Cohabiting*	1.03	0.99	1.06	0.108
Previously attended CVCT†	1.32	1.03	1.68	0.0266
Past Sexual Treatment				
Female STI tx ever†	2.53	1.23	5.19	0.0117
Last month number of times had sex with partner**†	0.98	0.98	0.99	0.0002
Ever outside partners for Males	1.44	0.98	2.09	0.0607
Contraceptive method				
IUD	0.88	0.22	3.46	0.8511
Implant	1.17	0.80	1.71	0.4251
Injectable	1.10	0.81	1.51	0.5440
Pills	1.05	0.70	1.60	0.8044
Tubal Litigation	N/A	N/A	N/A	N/A
None/Condom/LAM	REF			

Log transformed to meet normal distribution assumption
*- Per 1 year increase
**-Per 1 unit increase
***-Per child increase
†-Statistically Significant
N/A indicates not available
REF indicates Reference group
CVCT- Couples' Voluntary Counseling and Testing
STI- Sexually Transmitted Infection
tx- Treatment
aOR– Adjusted Odds Ratio
CI- Confidence interval

Table 5. Multivariate Analyses of Retention Predictors

	Retention			
Characteristics at Baseline	**aOR**	**95%CI**		**P(2-sided)**
Female Age in years*†	1.04	1.001	1.08	0.0451
Reason no Sex (Infant in house) †	0.29	0.095	0.881	0.0289

*- Per 1 year increase
†-Statistically Significant
aOR- Adjusted Odds Ratio
CI- Confidence Interval

FIGURES

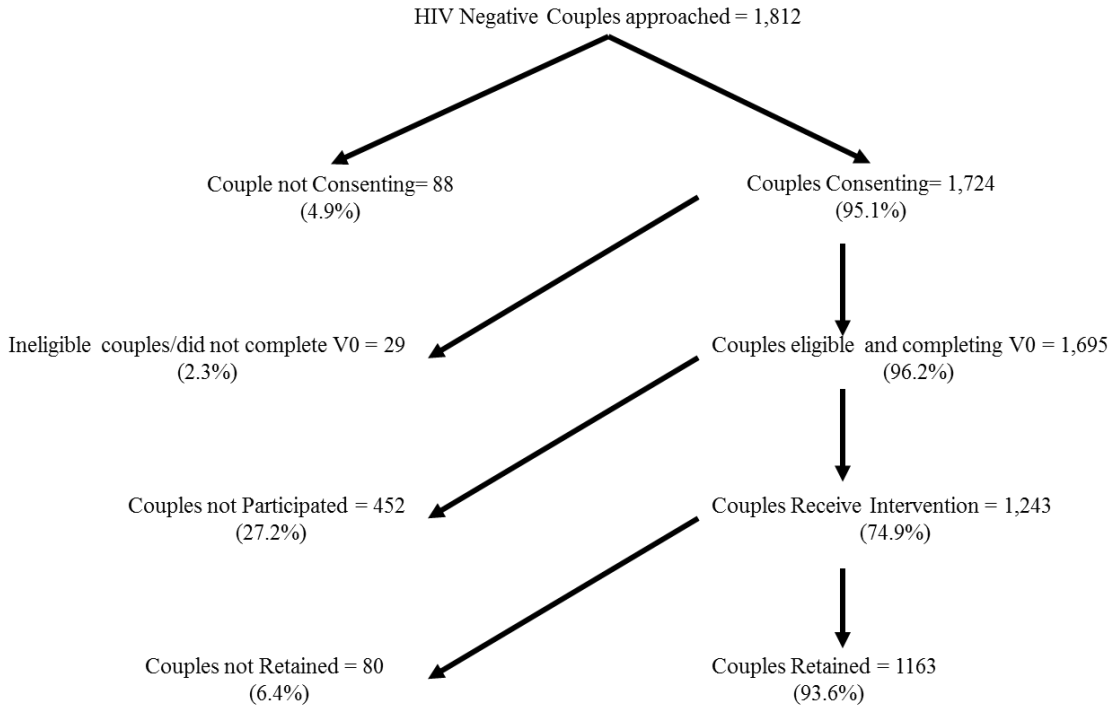

Figure 1. Intervention and Retention in HIV concordant negative couples
V0- Baseline
V1- Intervention
Intervention- V0 and V1
Retention- Study Participation and one follow-up study visit

CHAPTER III: PUBLIC HEALTH IMPLICATIONS

From the results of this analysis on study participation and retention of a clinical trial some of the findings can be applied to future studies. Primarily improving study participation and retention in a clinical trial can help ensure that the study results are generalizable to a larger population. The rewards and benefits for a trial can possibly be tailored to meet the needs of some of the populations you may expect having a hard time getting to enroll or make follow-up visits. Also continuing to focus on the couples' dynamic in HIV/AIDS prevention as well as STI prevention is important. Through the literature review and analysis for my thesis, it is apparent that just treating the individual, for something that requires two, is not an efficient use of time or resources. To ensure that the funds allocated toward HIV/AIDS prevention are utilized properly, more emphasis needs to be placed on CVCT, and couples counseling regarding sexual agreements, encouraging a more open dialogue regarding sexual health. Lastly, health literacy is something that I believe is extremely important and something this couples' level intervention attempted to address. By utilizing images and videos to promote the message of safe sex and improved communication among partners, our program helped prevent a large number of dropouts due to people not understanding what was going on and possibly feeling embarrassed. All prevention programs, especially where the target populations have low literacy levels, should utilize visual cues and devices to communicate their initiative.

APPENDIX

Table i. Baseline characteristics, stratified by Intervention

	Total (N = 1695 couples)		Intervention (N = 1243 couples)		V0 only (N = 452 couples)		Unadjusted OR	95%CI		p-value (two-tailed)
Characteristics at baseline	**N/mean**	**%/SD**	**N/mean**	**%/SD**	**N/mean**	**%/SD**				
Demographics										
Male Age in years*	31.9	7.8	32.2	7.9	31.1	7.6	1.02	1.00	1.03	0.0085
Female Age in years*	26.2	6.6	26.5	6.8	25.4	6.2	1.03	1.01	1.04	0.0032
Age range in years*	5.7	3.6	5.7	3.6	5.6	3.7	1.00	0.97	1.03	0.7803
Pregnancy**[a]	451	26.6%	324	26.1%	127	28.1%	0.90	0.71	1.15	0.4028
Contraceptive method**										
IUD	12	0.7%	9	0.7%	3	0.7%	1.20	0.32	4.45	0.7878
Implant	199	11.7%	157	12.6%	42	9.3%	1.49	1.04	2.15	0.0319
Injectable	286	16.9%	217	17.5%	69	15.3%	1.26	0.93	1.05	0.1396
Pills	135	8.0%	100	8.0%	35	7.7%	1.14	0.76	1.71	0.5267
Tubal Litigation	1	0.1%	1	0.1%	0	0.0%	NA	NA	NA	0.9994
None/Condom/LAM	1062	62.7%	759	61.1%	303	67.0%	REF			
City**										
Lusaka	335	19.8%	253	20.4%	82	18.1%	1.15	0.87	1.52	0.3120
Ndola	1360	80.2%	990	79.6%	370	81.9%				
Male Income (ZMW)***	800	800	800	928	800	800	0.91	0.83	1.00	0.0588
Female Income (ZMW)***	250	650	200	700	300	600	0.96	0.92	0.99	0.0160
Sexual history Past and Current										
Lifetime sex partners for Males*	5.12	8.58	5.13	9.73	5.10	5.85	0.92	0.77	1.09	0.3390
Lifetime sex partners for Females*	1.91	1.51	1.86	1.30	2.05	1.98	0.76	0.57	1.02	0.0695
First time sexual intercourse for Males *	18.65	4.03	18.72	4.04	18.46	4.00	1.02	0.99	1.55	0.2385
First time sexual intercourse for Females	17.65	2.55	17.64	2.59	17.69	2.44	0.99	0.61	1.04	0.7297
Ever outside partners for Males)**[a]	200	11.8%	161	13.0%	39	8.6%	1.58	1.09	2.28	0.0154
Ever outside partners For Females **[a]	19	1.1%	15	1.2%	4	0.9%	1.37	0.45	4.13	0.5821
Number of outside partners for Males *	0.23	0.99	0.23	0.86	0.23	1.29	1.00	0.90	1.11	0.9966
Number of outside partners for Females*	0.02	0.17	0.02	0.18	0.01	0.15	1.17	0.59	2.32	0.6484

Table i. Baseline characteristics, stratified by Intervention

	Total (N = 1695 couples)		Intervention (N = 1243 couples)		V0 only (N = 452 couples)		Unadjusted OR	95%CI		p-value (two-tailed)
Characteristics at baseline	**N/mean**	**%/SD**	**N/mean**	**%/SD**	**N/mean**	**%/SD**				
Who are outside partners for males (select all that apply)**										
Coworker										
Yes	28	1.7%	26	1.5%	2	0.1%	0.21	0.05	0.88	0.0329
No/None	1667	98.3%	1217	71.8%	450	26.5%	REF			
Friend										
Yes	105	6.2%	84	5.0%	21	1.2%	0.67	0.41	1.10	0.1128
No/None	1590	93.8%	1159	68.4%	431	25.4%	REF			
Neighbor										
Yes	21	1.2%	14	0.8%	7	0.4%	1.38	0.55	3.44	0.4888
No/None	1674	98.8%	1229	72.5%	445	26.3%	REF			
Long Term Partner										
Yes	56	3.3%	41	2.4%	15	0.9%	1.01	0.55	1.84	0.9837
No/None	1639	96.7%	1202	70.9%	437	25.8%	REF			
Forced										
Yes	0	0.0%	0	0.0%	0	0.0%	NA	NA	NA	NA
No/None	1695	100.0%	1243	73.3%	452	26.7%	REF			
Money										
Yes	4	0.2%	2	0.1%	2	0.1%	2.76	0.39	19.64	0.3111
No/None	1691	99.8%	1241	73.2%	450	26.5%	REF			
Presents										
Yes	4	0.2%	4	0.2%	0	0.0%	NA	NA	NA	NA
No/None	1691	99.8%	1239	73.1%	452	26.7%	REF			
Other										
Yes	14	0.8%	12	0.7%	2	0.1%	0.46	0.10	2.05	0.3050
No/None	1681	99.2%	1231	72.6%	450	26.5%	REF			
Last month number of times had sex with partner*										
	13.08	12.53	12.18	11.91	15.56	13.79	0.98	0.97	0.99	<0.0001
Sex with partner last month**										
Yes	1633	96.4%	1197	96.3%	436	96.7%	0.90	0.49	1.62	0.7145
No	61	3.6%	46	3.7%	15	3.3%	REF			
Reasons no sex**										
Travel										
Yes	13	0.8%	10	0.8%	3	0.7%	1.21	0.33	4.43	0.7692
No/None	1682	99.2%	1233	99.2%	449	99.3%	REF			
Baby										
Yes	28	1.7%	22	1.8%	6	1.3%	1.34	0.54	3.32	0.5288
No/None	1667	98.3%	1221	98.2%	446	98.7%	REF			
Sick										
Yes	7	0.4%	5	0.4%	2	0.4%	0.91	0.18	4.70	0.9091
No/None	1688	99.6%	1238	99.6%	450	99.6%	REF			
Menses										
Yes	2	0.1%	1	0.1%	1	0.2%	0.36	0.02	5.82	0.4741
No/None	1693	99.9%	1242	99.9%	451	99.8%	REF			
Other										
Yes	12	0.7%	9	0.7%	3	0.7%	1.09	0.29	4.05	0.8958
No/None	1683	99.3%	1234	99.3%	449	99.3%	REF			

Table i. Baseline characteristics, stratified by Intervention

	Total (N = 1695 couples)		Intervention (N = 1243 couples)		V0 only (N = 452 couples)		Unadjusted OR	95%CI		p-value (two-tailed)
Characteristics at baseline	**N/mean**	**%/SD**	**N/mean**	**%/SD**	**N/mean**	**%/SD**				
Past Sexual Treatment										
Male STI tx ever**										
Yes	209	12.3%	164	13.2%	45	10.0%	1.37	0.97	1.95	0.0739
No	1486	87.7%	1079	86.8%	407	90.0%	REF			
Female STI tx ever**										
Yes	74	4.4%	65	5.2%	9	2.0%	2.72	1.34	5.50	0.0055
No	1621	95.6%	1178	94.8%	443	98.0%	REF			
Demographics Couple Together										
#of children under 16 in household	2.12	1.65	2.26	1.66	1.76	1.58	1.22	1.14	1.31	<0.0001
Years Cohabiting	5.89	5.82	6.25353982	5.94710249	4.90265487	5.34264392	1.05	1.03	1.06	<0.0001
Previous CVCT attendance as couple										
Previously attended CVCT **	1220	36.0%	948	38.1%	272	30.1%	1.43	1.22	1.69	<0.0001
Male Understanding Bemba or Nyanja										
Yes/Somewhat (1)	1691	99.8%	1240	99.8%	451	99.8%	0.92	0.10	8.84	0.9399
None (0)	4	0.2%	3	0.2%	1	0.2%	REF			
Female Understanding Bemba or Nyanja										
Yes/Somewhat (1)	1691	99.8%	1239	99.7%	452	100.0%	NA			NA
None (0)	4	0.2%	4	0.3%	0	0.0%				
Male Reading Bemba or Nyanja										
Yes/Somewhat (1)	1553	91.6%	1143	92.0%	410	90.7%	1.17	0.80	1.71	0.4129
None (0)	142	8.4%	100	8.0%	42	9.3%	REF			
Female Reading Bemba or Nyanja										
Yes/Somewhat (1)	1328	78.3%	970	78.0%	358	79.2%	0.93	0.72	1.22	0.6061
None (0)	367	21.7%	273	22.0%	94	20.8%	REF			
Male Understanding English										
Yes/Somewhat (1)	1504	88.7%	1109	89.2%	395	87.4%	1.19	0.86	1.66	0.2924
None (0)	191	11.3%	134	10.8%	57	12.6%	REF			
Female Understanding English										
Yes/Somewhat (1)	1229	72.5%	890	71.6%	339	75.0%	0.84	0.66	1.08	0.166
None (0)	466	27.5%	353	28.4%	113	25.0%	REF			
Male Reading English										
Yes/Somewhat (1)	1439	84.9%	1066	85.8%	373	82.5%	1.28	0.95	1.71	0.1002
None (0)	256	15.1%	177	14.2%	79	17.5%	REF			
Female Reading English										
Yes/Somewhat (1)	1139	67.2%	827	66.5%	312	69.0%	0.89	0.71	1.13	0.3336
None (0)	556	32.8%	416	33.5%	140	31.0%	REF			

* Mean/Standard Deviation

** N/(%)

***Median/(IQR)

^Only Affirmative is shown

OR- Odds Ratio

CI- Confidence Interval

SOV- Strengthening our Vows

CVCT- Couples Voluntary Counseling & Testing

ZMW- Zambian Kwacha

IUD -Intrauterine Device

LAM- Lactational Amenorrhea Method

Table ii. Baseline characteristics, stratified by retention								
	Retained (N =1163)		V0/V1 only (N = 80)		Unadjusted OR	95%CI		p-value (two-tailed)
Characteristics at baseline	**N/mean**	**%/SD**	**N/mean**	**%/SD**				
Demographics								
Male Age in years*	32.28	7.85	30.94	8.50	1.02	0.99	1.06	0.1434
Female Age in years*	26.61	6.80	25.05	6.43	1.04	1.00	1.08	0.0486
Age range in years*	5.67	3.56	5.89	4.35	0.98	0.93	1.05	0.6021
Pregnancy**[a]	306	26.3%	18	22.5%	1.23	0.72	2.11	0.4533
Contraceptive method**								
IUD	8	0.7%	1	1.3%	0.54	0.07	4.41	0.5652
Implant	149	12.8%	8	10.0%	1.26	0.58	2.71	0.5594
Injectable	198	17.0%	19	23.8%	0.70	0.40	1.22	0.2136
Pills	96	8.3%	4	5.0%	1.62	0.57	4.59	0.3640
Tubal Litigation	1	0.1%	0	0.0%	NA	NA	NA	NA
None/Condom/LAM	711	61.1%	48	60.0%	REF			
City**								
Lusaka	242	20.8%	11	13.8%	1.65	0.86	3.16	0.1330
Ndola	921	79.2%	69	86.3%				
Male Income (ZMW)***Log	800	850	890	1050	0.88	0.72	1.09	0.2533
Female Income (ZMW)***Log	200	700	102.5	500	1.07	0.99	1.15	0.0757
Sexual history Past and Current								
Lifetime sex partners for Males*LOG	5.15	9.88	4.85	7.22	1.29	0.88	1.91	0.1960
Lifetime sex partners for Females*LOG	1.87	1.33	1.63	0.89	1.78	0.86	3.65	0.1180
First time sexual intercourse for Males*	18.71	4.06	18.84	3.77	0.99	0.94	1.05	0.7862
First time sexual intercourse for Females*	17.64	2.63	17.64	1.86	1.00	0.92	2.42	0.9895
Ever outside partners for Males**[a]	151	13.0%	10	12.5%	1.04	0.53	2.07	0.9008
Ever outside partners For Females**[a]	14	1.2%	1	1.3%	0.96	0.12	7.41	0.9708
Number of outside partners for Males*	0.24	0.87	0.19	0.66	1.08	0.78	1.50	0.6305
Number of outside partners for Females*	0.02	0.19	0.01	0.11	2.19	0.26	5.73	0.7940
Who are outside partners for males (select all that apply)**								
Coworker								
Yes	25	2.1%	1	1.3%	0.58	0.08	4.31	0.5912
No/None	1138	97.9%	79	98.8%	REF			
Friend								
Yes	76	6.5%	8	10.0%	1.59	0.74	3.42	0.2363
No/None	1087	93.5%	72	90.0%	REF			
Neighbor								
Yes	14	1.2%	0	0.0%	NA	NA	NA	NA
No/None	1149	98.8%	80	100.0%	REF			
Long Term Partner								
Yes	38	3.3%	3	3.8%	1.15	0.35	3.82	0.8153
No/None	1125	96.7%	77	96.3%	REF			
Forced								
Yes	0	0.0%	0	0.0%	NA	NA	NA	NA
No/None	1163	100.0%	80	100.0%	REF			
Money								
Yes	2	0.2%	0	0.0%	NA	NA	NA	NA
No/None	1161	99.8%	80	100.0%	REF			
Presents								
Yes	4	0.3%	0	0.0%	NA	NA	NA	NA
No/None	1159	99.7%	80	100.0%	REF			
Other								
Yes	12	1.0%	0	0.0%	NA	NA	NA	NA
No/None	1151	99.0%	80	100.0%	REF			
Last month number of times had sex with partner*								
	12.17	11.98	12.34	10.99	1.00	0.98	1.02	0.9018

* Mean/Standard Deviation
** N/(%)
***Median/(IQR)

Table ii. Baseline characteristics, stratified by retention (cont).								
	Retained (N =1163)		V0/V1 only (N = 80)		Unadjusted OR	95%CI		p-value (two-tailed)
Characteristics at baseline	**N/mean**	**%/SD**	**N/mean**	**%/SD**				
Sex with partner last month**								
Yes	1121	96.4%	76	95.0%	1.40	0.49	4.02	0.5264
No	42	3.6%	4	5.0%	REF			
Reasons no sex**								
Travel								
Yes	10	0.9%	0	0.0%	NA	NA	NA	NA
No/None	1153	99.1%	80	100.0%	REF			
Baby								
Yes	18	1.5%	4	5.0%	0.30	0.10	0.90	0.0326
No/None	1145	98.5%	76	95.0%				
Sick								
Yes	5	0.4%	0	0.0%	NA	NA	NA	NA
No/None	1158	99.6%	80	100.0%	REF			
Menses								
Yes	1	0.1%	0	0.0%	NA	NA	NA	NA
No/None	1162	99.9%	80	100.0%	REF			
Other								
Yes	9	0.8%	0	0.0%	NA	NA	NA	NA
No/None	1154	99.2%	80	100.0%	REF			
Past Sexual Treatment								
Male STI tx ever**								
Yes	159	13.7%	5	6.3%	2.38	0.95	5.96	0.0655
No	1004	86.3%	75	93.8%	REF			
Female STI tx ever**								
Yes	63	5.4%	2	2.5%	2.23	0.54	9.30	0.2695
No	1100	94.6%	78	97.5%	REF			
Demographics Couple Together								
#of children under 16 in household*	2.28	1.66	1.66	0.83	1.11	0.96	1.28	0.1507
Years Cohabiting*	6.28	5.94	6.10	1.47	1.01	0.97	1.05	0.5478
Previously attended CVCT**	445	38.3%	29	36.3%	1.09	0.68	1.75	0.7156
Male Understanding Bemba or Nyanja**								
Yes/Somewhat (1)	1161	99.8%	79	98.8%	7.36	0.66	82.02	0.1045
None (0)	2	0.2%	1	1.3%	REF			
Female Understanding Bemba or Nyanja**								
Yes/Somewhat (1)	1160	99.7%	79	98.8%	4.90	0.51	47.63	0.1705
None (0)	3	0.3%	1	1.3%	REF			
Male Reading Bemba or Nyanja**								
Yes/Somewhat (1)	1068	91.8%	75	93.8%	0.75	0.30	1.90	0.5435
None (0)	95	8.2%	5	6.3%	REF			
Female Reading Bemba or Nyanja**								
Yes/Somewhat (1)	907	78.0%	63	78.8%	0.96	0.55	1.66	0.8735
None (0)	256	22.0%	17	21.3%	REF			
Male Understanding English**								
Yes/Somewhat (1)	1035	89.0%	74	92.5%	0.66	0.28	1.54	0.3314
None (0)	128	11.0%	6	7.5%	REF			
Female Understanding English**								
Yes/Somewhat (1)	830	71.4%	60	75.0%	0.83	0.49	1.40	0.4864
None (0)	333	28.6%	20	25.0%	REF			
Male Reading English**								
Yes/Somewhat (1)	995	85.6%	71	88.8%	0.75	0.37	1.53	0.4308
None (0)	168	14.4%	9	11.3%	REF			
Female Reading English**								
Yes/Somewhat (1)	774	66.6%	53	66.3%	1.01	0.63	1.64	0.9558
None (0)	389	33.4%	27	33.8%	REF			

* Mean/Standard Deviation
** N/(%)
***Median/(IQR)

SAS Code

```
libname thesis  'E:\THESIS';

PROC IMPORT OUT=WORK.AIM3LABLSK
            DATATABLE='A3OL Lablog'
            DBMS=ACCESSCS REPLACE;
   DATABASE="E:\THESIS\CVCT ME Data.mdb";
   USEDATE=YES;
   SCANTIME=NO;
   DBSASLABEL=NONE;
RUN;

PROC IMPORT OUT=WORK.AIM3LABNDO
            DATATABLE='A3OL Lablog'
            DBMS=ACCESSCS REPLACE;

DATABASE="\\eu.emory.edu\SOM\Pathology\RZHRG\MiscShare\WORKSTUDY\2016-
2017\Burke, Ryan\Aim 3 Data 31Jan17\CN CVCT ME
Data_newqueriesinprogress.mdb";
   USEDATE=YES;
   SCANTIME=NO;
   DBSASLABEL=NONE;
RUN;

data AIM3VISITS (keep= combid combid2 combid3 sex sday smonth syear
testsite district cvctid visit_number visitdate syphilis rpr qc_rpr
trich qc_trich blood comments );
set AIM3LABLSK AIM3LABNDO;
if TESTSITE in ('CMA','DOH','KAW','KLO','KNK','LUB','NWM','NKZ') then
District = 'NDO';
else if TESTSITE in ('MAT' 'GEO') then District = 'LSK';
else District = '';
combid = catt (of testsite cvctid);
combid2 = catt(of testsite cvctid sex);
combid3= catt (of testsite cvctid sex visit_number);
visitdate = INput(compress(trim(sday)||trim(smonth)||trim(syear)),
date9.);
syphilis= rpr;
FORMAT visitdate date9.;
run;

proc sort data=aim3visits;
by combid3 visitdate;
run;



proc freq data=aim3visits; *Checking above coding;
tables syphilis/ missing;
where district='NDO';
title "Syphilis Ndola-Access";
run;

proc freq data=aim3visits;
tables syphilis/ missing;
```

```
where district='LSK';
Title "Syphilis Lusaka-Access";
run;

data aim3visits2 (keep= combid combid2 combid3 sex sday smonth syear
district testsite cvctid visit_number visitdate syphilis qc_rpr trich
qc_trich blood comments count);
format combid2 combid3 sday smonth syear district testsite cvctid sex
visit_number visitdate syphilis qc_rpr trich qc_trich blood comments
count;
format visitdate date9.;
set aim3visits;
count +1;
by combid3 visitdate;
if first.combid3 then count = 1;
run;

proc freq data=aim3visits2; *Checking above coding;
tables syphilis/ missing;
where district='NDO';
title "Syphilis Ndola-Access";
run;

proc freq data=aim3visits2;
tables syphilis/ missing;
where district='LSK';
Title "Syphilis Lusaka-Access";
run;

*Temp fix for participants with multiple visits in order to continue
with transposing and comparing the data8;
data aim3visits3;
set aim3visits2;
if (visit_number= 1 and count=2) then visit_number= 1.1;
else if (visit_number= 2 and count=2) then visit_number= 2.1;
else if (visit_number= 3 and count=2) then visit_number= 3.1;
else if (visit_number= 4 and count=2) then visit_number= 4.1;
else visit_number= visit_number;
run;

proc sort data=aim3visits3;
by combid2;
run;

data participantids(Keep= combid2 testsite cvctid sex);
set aim3visits3;
run;

proc sort data=participantids;
by combid2;
run;

data participantids2;
set participantids;
by combid2;
if first.combid2;
run;
```

```
proc transpose data=aim3visits3 out=syphilis_out prefix=syphilis;
   by combid2;
   id visit_number;
   var syphilis;
run;

proc transpose data=aim3visits3 out=qcrpr_out prefix=qcrpr;
   by combid2;
   id visit_number;
   var qc_rpr;
run;

proc transpose data=aim3visits3 out=trich_out prefix=trich;
   by combid2;
   id visit_number;
   var trich;
run;

proc transpose data=aim3visits3 out=qctrich_out prefix=qctrich;
   by combid2;
   id visit_number;
   var qc_trich;
run;
proc transpose data=aim3visits3 out=comments_out prefix=comments;
   by combid2;
   id visit_number;
   var comments;
run;

proc transpose data=aim3visits3 out=visitdate_out prefix=visitdate;
   by combid2;
   id visit_number;
   var visitdate;
run;

data aim3visits4 (keep= combid2 testsite cvctid sex visitdate0_1
syphilis0_1 qcrpr0_1 trich0_1 qctrich0_1 comments0_1
visitdate1_0 syphilis1_0 qcrpr1_0 trich1_0 qctrich1_0 comments1_0
visitdate1_1 syphilis1_1  trich1_1 qctrich1_1 qcrpr1_1 comments1_1
visitdate2_0 syphilis2_0 qcrpr2_0 trich2_0 qctrich2_0 comments2_0
visitdate2_1 syphilis2_1 qcrpr2_1 trich2_1 qctrich2_1 comments2_1
visitdate2_2 syphilis2_2 qcrpr2_2 trich2_2 qctrich2_2 comments2_2
visitdate3_0 syphilis3_0 qcrpr3_0 trich3_0 qctrich3_0 comments3_0
visitdate3_1 syphilis3_1 qcrpr3_1 trich3_1 qctrich3_1 comments3_1
visitdate4_0 syphilis4_0 qcrpr4_0 trich4_0 qctrich4_0 comments4_0
visitdate4_1 syphilis4_1 qcrpr4_1 trich4_1 qctrich4_1 comments4_1);
merge  participantids2 syphilis_out (drop=_name_) qcrpr_out
(drop=_name_) visitdate_out (drop=_name_) trich_out (drop=_name_)
qctrich_out (drop=_name_)comments_out (drop=_name_);
    by combid2;
run;

data aim3visits4;
format combid combid2 testsite cvctid sex visitdate0_1 syphilis0_1
qcrpr0_1 trich0_1 qctrich0_1 comments0_1
visitdate1_0 syphilis1_0 qcrpr1_0 trich1_0 qctrich1_0 comments1_0
```

```
visitdate1_1 syphilis1_1 trich1_1 qctrich1_1 qcrpr1_1 comments1_1
visitdate2_0 syphilis2_0 qcrpr2_0 trich2_0 qctrich2_0 comments2_0
visitdate2_1 syphilis2_1 qcrpr2_1 trich2_1 qctrich2_1 comments2_1
visitdate2_2 syphilis2_2 qcrpr2_2 trich2_2 qctrich2_2 comments2_2
visitdate3_0 syphilis3_0 qcrpr3_0 trich3_0 qctrich3_0 comments3_0
visitdate3_1 syphilis3_1 qcrpr3_1 trich3_1 qctrich3_1 comments3_1
visitdate4_0 syphilis4_0 qcrpr4_0 trich4_0 qctrich4_0 comments4_0
visitdate4_1 syphilis4_1 qcrpr4_1 trich4_1 qctrich4_1 comments4_1;
set aim3visits4;

combid = catt (of testsite cvctid);
inlab=1;
run;

proc sort data=aim3visits4;
by combid;
run;


PROC IMPORT OUT=WORK.AIM3BASELSK
            DATATABLE='A3OL Redcap_BaseQuestionnaire'
            DBMS=ACCESSCS REPLACE;
   DATABASE="H:\CVCT ME Data.mdb";
   USEDATE=YES;
   SCANTIME=NO;
   DBSASLABEL=NONE;
RUN;

PROC IMPORT OUT=WORK.AIM3BASENDO
            DATATABLE='A3OL Redcap_BaseQuestionnaire'
            DBMS=ACCESSCS REPLACE;
   DATABASE="H:\CN CVCT ME Data.mdb";
   USEDATE=YES;
   SCANTIME=NO;
   DBSASLABEL=NONE;
RUN;


data AIM3BASE (drop= redcap_event_name record_id);
set AIM3BASELSK AIM3BASENDO;
if TESTSITE in ('CMA','DOH','KAW','KLO','KNK','LUB','NWM','NKZ') then
District = 'NDO';
else if TESTSITE in ('MAT' 'GEO') then District = 'LSK';
else District = '';
combid = catt (of testsite cvctid);
combid2 = catt(of testsite cvctid sex);
FORMAT baseq_date date9.;
run;

proc sort data=AIM3BASE;
by combid;
run;

proc sort data=aim3visits4;
by combid;
run;
```

```
data AIM3;
merge AIM3BASE (in=a) aim3visits4 (in=b);
by combid;
if a;
run;

proc print data=AIM3;
where inlab=.;
title "Not in Lab but have Baseline";
run;

Data AIM3_2;
set AIM3;
if visitdate1_0 ne . then lab1=1;
if visitdate1_0 = . then lab1=2;
if visitdate2_0 ne . then lab2=1;
if visitdate2_0 = . then lab2=2;
if visitdate3_0 ne . then lab3=1;
if visitdate3_0 = . then lab3=2;
if visitdate4_0 ne . then lab4=1;
if visitdate4_0 = . then lab4=2;
run;


PROC IMPORT OUT=WORK.cvctlsk
            DATATABLE='CVCTEXPANSION'
            DBMS=ACCESSCS REPLACE;

DATABASE="\\eu.emory.edu\SOM\Pathology\RZHRG\MiscShare\WORKSTUDY\2016-
2017\Burke, Ryan\Aim 3 Data 23Jan17\CVCT ME Data.mdb";
   USEDATE=YES;
   SCANTIME=NO;
   DBSASLABEL=NONE;
RUN;

PROC IMPORT OUT=WORK.cvctn
            DATATABLE='CVCTEXPANSION'
            DBMS=ACCESSCS REPLACE;

DATABASE="\\eu.emory.edu\SOM\Pathology\RZHRG\MiscShare\WORKSTUDY\2016-
2017\Burke, Ryan\Aim 3 Data 23Jan17\CN CVCT ME Data.mdb";
   USEDATE=YES;
   SCANTIME=NO;
   DBSASLABEL=NONE;
RUN;


data work.cvctn;
set cvctn;
 district='NDO';
 combid = catt(of testsite cvctid);
 incvct=1;
 run;

*Bringing in Lsk CVCT Data****Update Date****;
data work.cvctlsk ;
set cvctlsk;
```

```
 district='LSK';
 combid = catt(of testsite cvctid);
 incvct=1;
 run;


data allcvct (drop = sday smonth syear scom1 scom2 scom3 comments
testsite);
set cvctn cvctlsk;

      CVCTDATE=INput(compress(trim(sday)||trim(smonth)||trim(syear)),
date9.);
      FORMAT CVCTDATE date9.;
cvctcomments = comments;
agerange=smanage-swomanage;
run;

proc sort data=allcvct; by combid; run;
proc sort data= AIM3_2; by combid; run;

data AIM3_3;
merge allcvct (in=b) AIM3_2 (in=a);
by combid;
if a;
run;

data AIM3_3;
set AIM3_3;
if testsite in ('MAT','DOH','CMA','LUB','KLO') then arm = 'GHPP';
else if testsite in ('GEO','KAW','KNK','NKZ','NWM') then arm = 'SOV';
else arm = '';

run;

Data AIM3_enroll;
set thesis.AIM3_3;
If (lab1=2 AND lab2=2 AND lab3=2 AND lab4=2) then enroll=0;
else enroll=1;
run;

proc freq data=aim3_enroll;
tables enroll;
run;


data aim3_enroll;
set thesis.AIM3_3;
If (lab1=2 AND lab2=2 AND lab3=2 AND lab4=2) then enroll=0;
else enroll=1;
if cvctid=7730 or cvctid=4281 then enroll=0;
If FPMETHOD = 'IUD' then do ;
                  IUD = 1;
                  Implant=0;
                  Injectable = 0;
                  Pills = 0;
                  TubL = 0;
                  end;
```

```
If FPMETHOD = 'Implanon' then do ;
                    IUD = 0;
                    Implant=1;
                    Injectable = 0;
                    Pills = 0;
                    TubL = 0;
                    end;
If FPMETHOD = 'Injectable' then do ;
                    IUD = 0;
                    Implant=0;
                    Injectable = 1;
                    Pills = 0;
                    TubL = 0;
                    end;
If FPMETHOD = 'Jadelle' then do ;
                    IUD = 0;
                    Implant=1;
                    Injectable = 0;
                    Pills = 0;
                    TubL = 0;
                    end;
If FPMETHOD = 'Norplant' then do ;
                    IUD = 0;
                    Implant=1;
                    Injectable = 0;
                    Pills = 0;
                    TubL = 0;
                    end;
If FPMETHOD = 'Pills' then do ;
                    IUD = 0;
                    Implant=0;
                    Injectable = 0;
                    Pills = 1;
                    TubL = 0;
                    end;
If FPMETHOD = 'Tubal Ligation' then do ;
                    IUD = 0;
                    Implant=0;
                    Injectable = 0;
                    Pills = 0;
                    TubL = 1;
                    end;
If FPMETHOD = 'Other' OR FPMethod = 'None' then do ;
                    IUD = 0;
                    Implant=0;
                    Injectable = 0;
                    Pills = 0;
                    TubL = 0;
                    end;

if baseq_sexspouse1mo > 0 then sexspouse1mo=1;
if baseq_sexspouse1mo = 0 then sexspouse1mo=2;

run;


data AIM3_sex;
```

```
set AIM3_enroll;
if sex = "F" then do;
baseq_income_f = baseq_income;
baseq_readny_f = baseq_readny;
baseq_underny_f = baseq_underny;
baseq_readbem_f = baseq_readbem;
baseq_underbem_f = baseq_underbem;
baseq_readeng_f = baseq_readeng;
baseq_undereng_f = baseq_undereng;
baseq_lifesex_f = baseq_lifesex;
baseq_sexage_f = baseq_sexage;
baseq_sexcp_f = baseq_sexcp;
baseq_numcp_f = baseq_numcp;

baseq_whocp___coworker_f = baseq_whocp___coworker;
baseq_whocp___friend_f = baseq_whocp___friend;
baseq_whocp___neighbor_f = baseq_whocp___neighbor;
baseq_whocp___ltpart_f = baseq_whocp___ltpartner;
baseq_whocp___forced_f = baseq_whocp___forced;
baseq_whocp___money_f = baseq_whocp___money;
baseq_whocp___presents_f = baseq_whocp___presents;
baseq_whocp___other_f = baseq_whocp___other;

baseq_condomfreq_f = baseq_condomfreq;
baseq_alcoholcp_f = baseq_alcoholcp;

baseq_cpongoing_f = baseq_cpongoing;
baseq_cpongoingtype___coworker_f = baseq_cpongoingtype___coworker;
baseq_cpongoingtype___friend_f = baseq_cpongoingtype___friend;
baseq_cpongoingtype___neighbor_f = baseq_cpongoingtype___neighbor;
baseq_cpongoingtype___ltpart_f = baseq_cpongoingtype___ltpartner;
baseq_cpongoingtype___forced_f = baseq_cpongoingtype___forced;
baseq_cpongoingtype___money_f = baseq_cpongoingtype___money;
baseq_cpongoingtype___presents_f = baseq_cpongoingtype___presents;
baseq_cpongoingtype___other_f = baseq_cpongoingtype___other;

baseq_sexspouse1mo = baseq_sexspouse1mo;
sexspouse1mo = sexspouse1mo;

baseq_nosexwhy___travel_f = baseq_nosexwhy___travel;
baseq_nosexwhy___baby_f = baseq_nosexwhy___baby;
baseq_nosexwhy___sick_f = baseq_nosexwhy___sick;
baseq_nosexwhy___menses_f = baseq_nosexwhy___menses;
baseq_nosexwhy___other_f = baseq_nosexwhy___other;

baseq_stitrt_f = baseq_stitrt;
baseq_stitrtwed_f = baseq_stitrtwed;
baseq_syphilis_f =baseq_syphilis;
baseq_ulcers_f = baseq_ulcers;
baseq_gonorrhea_f = baseq_gonorrhea;
baseq_discharge_f = baseq_discharge;
baseq_numhouse = baseq_numhouse;
baseq_numhouse_under16 =baseq_numhouse_under16;
syrcohabit = syrcohabit;
sex_f=sex;
end;
if sex="M" then do;
```

```
baseq_income_m = baseq_income;
baseq_readny_m = baseq_readny;
baseq_underny_m = baseq_underny;
baseq_readbem_m = baseq_readbem;
baseq_underbem_m = baseq_underbem;
baseq_readeng_m = baseq_readeng;
baseq_undereng_m = baseq_undereng;
baseq_lifesex_m = baseq_lifesex;
baseq_sexage_m = baseq_sexage;
baseq_sexcp_m = baseq_sexcp;
baseq_numcp_m = baseq_numcp;

baseq_whocp___coworker_m = baseq_whocp___coworker;
baseq_whocp___friend_m = baseq_whocp___friend;
baseq_whocp___neighbor_m = baseq_whocp___neighbor;
baseq_whocp___ltpart_m = baseq_whocp___ltpartner;
baseq_whocp___forced_m = baseq_whocp___forced;
baseq_whocp___money_m = baseq_whocp___money;
baseq_whocp___presents_m = baseq_whocp___presents;
baseq_whocp___other_m = baseq_whocp___other;

baseq_condomfreq_m = baseq_condomfreq;
baseq_alcoholcp_m = baseq_alcoholcp;

baseq_cpongoing_m = baseq_cpongoing;
baseq_cpongoingtype___coworker_m = baseq_cpongoingtype___coworker;
baseq_cpongoingtype___friend_m = baseq_cpongoingtype___friend;
baseq_cpongoingtype___neighbor_m = baseq_cpongoingtype___neighbor;
baseq_cpongoingtype___ltpart_m = baseq_cpongoingtype___ltpartner;
baseq_cpongoingtype___forced_m = baseq_cpongoingtype___forced;
baseq_cpongoingtype___money_m = baseq_cpongoingtype___money;
baseq_cpongoingtype___presents_m = baseq_cpongoingtype___presents;
baseq_cpongoingtype___other_m = baseq_cpongoingtype___other;

baseq_nosexwhy___travel_m = baseq_nosexwhy___travel;
baseq_nosexwhy___baby_m = baseq_nosexwhy___baby;
baseq_nosexwhy___sick_m = baseq_nosexwhy___sick;
baseq_nosexwhy___menses_m = baseq_nosexwhy___menses;
baseq_nosexwhy___other_m = baseq_nosexwhy___other;

baseq_stitrt_m = baseq_stitrt;
baseq_stitrtwed_m = baseq_stitrtwed;
baseq_syphilis_m =baseq_syphilis;
baseq_ulcers_m = baseq_ulcers;
baseq_gonorrhea_m = baseq_gonorrhea;
baseq_discharge_m = baseq_discharge;
sex_m=sex;
end;

run;

Data thesis.AIM3_retain;
set thesis.AIM3_enroll;
If (lab1=1 AND lab2=2 AND lab3=2 AND lab4=2) then retain=0;
If (lab1=1) AND (lab2=1 OR lab3=1 OR lab4=1) then retain=1;
if enroll = 0 then delete;
run;
```

```
proc freq data=thesis.AIM3_retain;
tables retain;
run;

proc freq data=aim3_enroll_M;
tables enroll;
run;

proc freq data=thesis.aim3_enroll;
tables enroll;
run;

data try;
set thesis.aim3_enroll;
if baseq_readny_m = 1 OR baseq_readbem_m = 1 OR baseq_readny_m = 2 OR
baseq_readbem_m = 2 then M_readbemny = 1;
else M_readbemny = 0;

if baseq_underny_m = 1 or baseq_underbem_m = 1 OR baseq_underny_m = 2
or baseq_underbem_m = 2 then M_underbemny = 1;
else M_underbemny = 0;

if baseq_readny_f = 1 OR baseq_readbem_f = 1 OR baseq_readny_f = 2 OR
baseq_readbem_f = 2 then F_readbemny = 1;
else F_readbemny = 0;

if baseq_underny_f = 1 OR baseq_underbem_f = 1 OR baseq_underny_f = 2
OR baseq_underbem_f = 2 then F_underbemny = 1;
else F_underbemny = 0;

if baseq_readeng_f = 1 OR baseq_readeng_f = 2 then F_readeng = 1;
else F_readeng = 0;

if baseq_readeng_m = 1 OR baseq_readeng_m = 2 then M_readeng = 1;
else M_readeng = 0;

if baseq_undereng_f = 1 OR baseq_undereng_f = 2 then F_undereng = 1;
else F_undereng = 0;

if baseq_undereng_m = 1 OR baseq_undereng_m = 2 then M_undereng = 1;
else M_undereng = 0;

run;



proc freq data=try;
tables M_readbemny*baseq_readny_m*baseq_readbem_m
F_readbemny*baseq_readny_f*baseq_readbem_f
M_underbemny*baseq_underny_m*baseq_underbem_m
F_underbemny*baseq_underny_f*baseq_underbem_f
M_undereng*baseq_undereng_m
;
run;

proc freq data=try;
```

```
tables M_readbemny*enroll
F_readbemny*enroll
M_underbemny*enroll
F_underbemny*enroll
M_readeng*enroll
F_readeng*enroll
M_undereng*enroll
F_undereng*enroll
;
run;

proc logistic data=try descending;
            model enroll = M_readbemny;
run;*Not significant;

proc logistic data=try descending;
            model enroll = F_readbemny;
run;*Not significant;

proc logistic data=try descending;
            model enroll = M_underbemny;
run;*Not significant;

proc logistic data=try descending;
            model enroll = F_underbemny;
run;*NA;



proc logistic data=try descending;
            model enroll = M_readeng;
run;*Not significant;

proc logistic data=try descending;
            model enroll = F_readeng;
run;*Not significant;


proc logistic data=try descending;
            model enroll = M_undereng;
run;*Not significant;

proc logistic data=try descending;
            model enroll = F_undereng;
run;*NA;

**************************;

proc genmod data=try descending;
            model enroll = M_readbemny/link=logit dist=binomial;
run;*Not significant;

proc genmod data=try descending;
            model enroll = F_readbemny/link=logit dist=binomial;
run;*Not significant;

proc genmod data=try descending;
```

```
            model enroll = M_underbemny/link=logit dist=binomial;
run;*Not significant;

proc genmod data=try descending;
            model enroll = F_underbemny/link=logit dist=binomial;
run;*NA;



proc genmod data=try descending;
            model enroll = M_readeng/link=logit dist=binomial;
run;*Not significant;

proc genmod data=try descending;
            model enroll = F_readeng /link=logit dist=binomial;
run;*Not significant;


proc genmod data=try descending;
            model enroll = M_undereng /link=logit dist=binomial;
run;*Not significant;

proc genmod data=try descending;
            model enroll = F_undereng /link=logit dist=binomial;
run;*NA;


proc genmod data=try descending;
        class baseq_sexcp_m(ref="2") baseq_stitrt_f(ref="2")
sprecvct(ref="2")/param=ref;
            model enroll = iud implant injectable pills tubl
log_income_f baseq_sexcp_m baseq_whocp___coworker_m baseq_sexspouse1mo
baseq_stitrt_f
                                    baseq_numhouse_under16 syrcohabit
sprecvct F_underbemny/ link=logit dist=binomial;
run;

proc logistic data=try descending;
        class baseq_sexcp_m(ref="2") baseq_stitrt_f(ref="2")
sprecvct(ref="2")/param=ref;
            model enroll = iud implant injectable pills tubl
log_income_f baseq_sexcp_m baseq_whocp___coworker_m baseq_sexspouse1mo
baseq_stitrt_f
                                    baseq_numhouse_under16 syrcohabit
sprecvct F_underbemny;
run;


proc genmod data=try descending;
        class baseq_underny_m baseq_underny_f baseq_undereng_f
baseq_readeng_m baseq_sexcp_m baseq_stitrt_f sprecvct;
            model enroll =  iud implant injectable pills tubl
baseq_underny_m baseq_underny_f baseq_undereng_f
                                    baseq_readeng_m log_income_f
baseq_sexcp_m baseq_whocp___coworker_m baseq_sexspouse1mo
baseq_stitrt_f
```

```
                                        baseq_numhouse_under16 syrcohabit
sprecvct M_underbemny F_underbemny
/ link=logit dist=binomial;
run;

proc logistic data=thesis.AIM3_enroll descending;
        class baseq_underny_m baseq_underny_f baseq_undereng_f
baseq_readeng_m baseq_sexcp_m baseq_stitrt_f sprecvct;
            model enroll = city iud implant injectable pills tubl
baseq_underny_m baseq_underny_f baseq_undereng_f
                                        baseq_readeng_m log_income_f
baseq_sexcp_m baseq_whocp___coworker_m baseq_sexspouse1mo
baseq_stitrt_f
                                        baseq_numhouse_under16 syrcohabit
sprecvct city_munderny city_funderny city_fundereng city_mreadeng
;
run;
```

```
data try2;
set thesis.aim3_retain;if baseq_readny_m = 1 OR baseq_readbem_m = 1 OR
baseq_readny_m = 2 OR baseq_readbem_m = 2 then M_readbemny = 1;
else M_readbemny = 0;

if baseq_underny_m = 1 or baseq_underbem_m = 1 OR baseq_underny_m = 2
or baseq_underbem_m = 2 then M_underbemny = 1;
else M_underbemny = 0;

if baseq_readny_f = 1 OR baseq_readbem_f = 1 OR baseq_readny_f = 2 OR
baseq_readbem_f = 2 then F_readbemny = 1;
else F_readbemny = 0;

if baseq_underny_f = 1 OR baseq_underbem_f = 1 OR baseq_underny_f = 2
OR baseq_underbem_f = 2 then F_underbemny = 1;
else F_underbemny = 0;

if baseq_readeng_f = 1 OR baseq_readeng_f = 2 then F_readeng = 1;
else F_readeng = 0;

if baseq_readeng_m = 1 OR baseq_readeng_m = 2 then M_readeng = 1;
else M_readeng = 0;

if baseq_undereng_f = 1 OR baseq_undereng_f = 2 then F_undereng = 1;
else F_undereng = 0;

if baseq_undereng_m = 1 OR baseq_undereng_m = 2 then M_undereng = 1;
else M_undereng = 0;

run;

proc freq data=try2;
```

```
tables M_readbemny*retain
F_readbemny*retain
M_underbemny*retain
F_underbemny*retain
M_readeng*retain
F_readeng*retain
M_undereng*retain
F_undereng*retain
;
run;


proc logistic data=try2 descending;
            model retain = M_readbemny;
run;

proc logistic data=try2 descending;
            model retain = F_readbemny;
run;


proc logistic data=try2 descending;
            model retain = M_underbemny;
run;

proc logistic data=try2 descending;
            model retain = F_underbemny;
run;


proc logistic data=try2 descending;
      model retain = swomanage baseq_nosexwhy___baby M_readbemny
M_underbemny F_readbemny F_underbemny;
run;


proc genmod data=try2 descending;
      model retain = swomanage baseq_nosexwhy___baby M_readbemny
M_underbemny F_readbemny F_underbemny;
/ link=logit dist=binomial covb;
run;


data try3;
set thesis.aim3_enroll;
if baseq_readny_m = 3 OR baseq_readbem_m = 3 OR baseq_readny_f = 3 OR
baseq_readbem_f = 3 then c_readbemny = 0;
else c_readbemny = 1;

if baseq_underny_m = 3 or baseq_underbem_m = 3 OR baseq_underny_f = 3
or baseq_underbem_f = 3 then c_underbemny = 0;
else c_underbemny = 1;

if baseq_readeng_f = 3 OR baseq_readeng_m = 3 then c_readeng = 0;
else c_readeng = 1;

if baseq_undereng_f = 3 OR baseq_undereng_m = 3 then c_undereng = 0;
```

```
else c_undereng = 1;

run;

proc freq data=try3;
tables c_readbemny*baseq_readny_m*baseq_readbem_m;
run;

proc freq data=try3;
tables
c_readbemny*enroll
c_underbemny*enroll
c_readeng*enroll
c_undereng*enroll
;
run;

proc logistic data=try3 descending;
      model enroll = c_readbemny;
run;

proc logistic data=try3 descending;
      model enroll = c_underbemny;
run;

proc logistic data=try3 descending;
      model enroll = c_readeng;
run;

proc logistic data=try3 descending;
      model enroll = c_undereng;
run;

data try4;
set thesis.aim3_enroll;
if baseq_readny_m = 1 OR baseq_readbem_m = 1 OR baseq_readny_f = 1 OR
baseq_readbem_f = 1 then c_readbemny = 1;
else c_readbemny = 0;

if baseq_underny_m = 1 or baseq_underbem_m = 1 OR baseq_underny_f = 1
or baseq_underbem_f = 1 then c_underbemny = 1;
else c_underbemny = 0;

if baseq_readeng_f = 1 OR baseq_readeng_m = 1 then c_readeng = 1;
else c_readeng = 0;

if baseq_undereng_f = 1 OR baseq_undereng_m = 1 then c_undereng = 1;
else c_undereng = 0;

run;

proc freq data=try4;
tables c_readbemny*baseq_readny_m*baseq_readbem_m;
run;

proc freq data=try4;
tables
```

```
c_readbemny*enroll
c_underbemny*enroll
c_readeng*enroll
c_undereng*enroll
;
run;

proc logistic data=try4 descending;
      model enroll = c_readbemny;
run;

proc logistic data=try4 descending;
      model enroll = c_underbemny;
run;

proc logistic data=try4 descending;
      model enroll = c_readeng;
run;

proc logistic data=try4 descending;
      model enroll = c_undereng;
run;

libname thesis 'E:\THESIS';

**Enroll**;
proc sort data=thesis.aim3_enroll;
by enroll;
run;

proc freq data=thesis.aim3_enroll;
tables arm;
run;

proc freq data=thesis.aim3_enroll;
tables arm;
by enroll;
run;

proc logistic data=thesis.aim3_enroll desc;
class arm;
model enroll = arm;
run;

proc univariate data=thesis.AIM3_enroll;
var smanage swomanage /*agerange*/;
run;

proc univariate data=thesis.AIM3_enroll;
var smanage swomanage /*agerange*/;
by enroll;
run;

proc genmod data=thesis.AIM3_enroll descending;
        model enroll = agerange / link=logit dist=binomial;
run;
```

```
proc genmod data=thesis.AIM3_enroll descending;
        model enroll = smanage / link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_enroll descending;
        model enroll = swomanage / link=logit dist=binomial;
run;

proc logistic data=thesis.aim3_enroll descending;
model enroll = swomanage;
run;

proc freq data=thesis.aim3_enroll;
tables spreg;
run;

proc freq data=thesis.aim3_enroll;
tables spreg;
by enroll;
run;

proc genmod data=thesis.AIM3_enroll descending;
        class spreg;
            model enroll = spreg / link=logit dist=binomial;
run;


proc freq data=thesis.aim3_enroll;
tables district*city;
run;

proc freq data=thesis.aim3_enroll;
tables district;
by enroll;
run;

proc genmod data=thesis.AIM3_enroll descending;
        class district;
            model enroll = district / link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_enroll descending;
            model enroll = city / link=logit dist=binomial;
run;

proc freq data=thesis.aim3_enroll;
tables iud implant injectable pills tubl;
run;

proc freq data=thesis.aim3_enroll;
tables iud implant injectable pills tubl;
by enroll;
run;

proc genmod data=thesis.AIM3_enroll descending;
            model enroll = iud implant injectable pills tubl /
link=logit dist=binomial;
```

```
run;

proc means data=thesis.AIM3_enroll median qrange;
var income;
run;

proc means data=thesis.AIM3_enroll median qrange;
var income;
by enroll;
run;

proc genmod data=thesis.AIM3_enroll descending;
        model enroll = log_income / link=logit dist=binomial;
run;


proc freq data=thesis.AIM3_enroll;
tables M_readbemny*enroll
F_readbemny*enroll
M_underbemny*enroll
F_underbemny*enroll
M_readeng*enroll
F_readeng*enroll
M_undereng*enroll
F_undereng*enroll
;
run;

proc logistic data=thesis.AIM3_enroll descending;
            model enroll = M_readbemny;
run;*Not significant;

proc logistic data=thesis.AIM3_enroll descending;
            model enroll = F_readbemny;
run;*Not significant;

proc logistic data=thesis.AIM3_enroll descending;
            model enroll = M_underbemny;
run;*Not significant;

proc logistic data=thesis.AIM3_enroll descending;
            model enroll = F_underbemny;
run;*NA;



proc logistic data=thesis.AIM3_enroll descending;
            model enroll = M_readeng;
run;*Not significant;

proc logistic data=thesis.AIM3_enroll descending;
            model enroll = F_readeng;
run;*Not significant;


proc logistic data=thesis.AIM3_enroll descending;
            model enroll = M_undereng;
```

```
run;*Not significant;

proc logistic data=thesis.AIM3_enroll descending;
            model enroll = F_undereng;
run;*NA;


*Lifetime Sex Partners*;

proc univariate data=thesis.AIM3_enroll;
var baseq_lifesex_m;
run;

proc univariate data=thesis.AIM3_enroll;
var baseq_lifesex_m;
by enroll;
run;

proc genmod data=thesis.AIM3_enroll descending;
        model enroll = baseq_lifesex_m / link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_enroll descending;
        model enroll = log_baseq_lifesex_m / link=logit dist=binomial;
run;

proc univariate data=thesis.AIM3_enroll;
var baseq_lifesex_f;
run;

proc univariate data=thesis.AIM3_enroll;
var baseq_lifesex_f;
by enroll;
run;

proc genmod data=thesis.AIM3_enroll descending;
        model enroll = baseq_lifesex_f / link=logit dist=binomial;
run;


proc genmod data=thesis.AIM3_enroll descending;
        model enroll = log_baseq_lifesex_f / link=logit dist=binomial;
run;

**First sexual intercourse**;

proc univariate data=thesis.AIM3_enroll;
var baseq_sexage_m;
run;

proc univariate data=thesis.AIM3_enroll;
var baseq_sexage_m;
by enroll;
run;

proc genmod data=thesis.AIM3_enroll descending;
        model enroll = baseq_sexage_m / link=logit dist=binomial;
```

```
run;

proc univariate data=thesis.AIM3_enroll;
var baseq_sexage_f;
run;

proc univariate data=thesis.AIM3_enroll;
var baseq_sexage_f;
by enroll;
run;

proc genmod data=thesis.AIM3_enroll descending;
        model enroll = baseq_sexage_f / link=logit dist=binomial;
run;
**Ever Outside Partner**;;

proc freq data=thesis.AIM3_enroll;
tables baseq_sexcp_m;
run;

proc freq data=thesis.AIM3_enroll;
tables baseq_sexcp_m;
by enroll;
run;

proc genmod data=thesis.AIM3_enroll descending;
        class baseq_sexcp_m;
            model enroll = baseq_sexcp_m / link=logit dist=binomial;
run;

proc freq data=thesis.AIM3_enroll;
tables baseq_sexcp_f;
run;

proc freq data=thesis.AIM3_enroll;
tables baseq_sexcp_f;
by enroll;
run;

proc genmod data=thesis.AIM3_enroll descending;
        class baseq_sexcp_f;
            model enroll = baseq_sexcp_f / link=logit dist=binomial;
run;

**Number of outside partners**;
data thesis.aim3_enroll;
set thesis.aim3_enroll;
if baseq_sexcp_f=1 then baseq_numcp_f=baseq_numcp_f;
if baseq_sexcp_f=2 then baseq_numcp_f=0;
if baseq_sexcp_m=1 then baseq_numcp_m=baseq_numcp_m;
if baseq_sexcp_m=2 then baseq_numcp_m=0;
run;

proc univariate data=thesis.AIM3_enroll;
var baseq_numcp_m;
run;
```

```
proc univariate data=thesis.AIM3_enroll;
var baseq_numcp_m;
by enroll;
run;

proc genmod data=thesis.AIM3_enroll descending;
        model enroll = baseq_numcp_m / link=logit dist=binomial;
run;

proc univariate data=thesis.AIM3_enroll;
var baseq_numcp_f;
run;

proc univariate data=thesis.AIM3_enroll;
var baseq_numcp_f;
by enroll;
run;

proc genmod data=thesis.AIM3_enroll descending;
        model enroll = baseq_numcp_f / link=logit dist=binomial;
run;

*Who were the outside partners*;

proc freq data=thesis.AIM3_enroll;
tables baseq_whocp___coworker_m baseq_whocp___friend_m
baseq_whocp___neighbor_m
      baseq_whocp___ltpart_m baseq_whocp___forced_m
baseq_whocp___money_m
      baseq_whocp___presents_m baseq_whocp___other_m;
run;

proc freq data=thesis.AIM3_enroll;
tables baseq_whocp___coworker_m baseq_whocp___friend_m
baseq_whocp___neighbor_m
      baseq_whocp___ltpart_m baseq_whocp___forced_m
baseq_whocp___money_m
      baseq_whocp___presents_m baseq_whocp___other_m;
      by enroll;
run;
/*
proc genmod data=thesis.AIM3_enroll;
            model enroll = baseq_whocp___coworker_m
baseq_whocp___friend_m baseq_whocp___neighbor_m
      baseq_whocp___ltpart_m baseq_whocp___forced_m
baseq_whocp___money_m
      baseq_whocp___presents_m baseq_whocp___other_m / link=logit
dist=binomial;
run;*/


proc freq data=thesis.AIM3_enroll;
tables baseq_whocp___coworker_f baseq_whocp___friend_f
baseq_whocp___neighbor_f
      baseq_whocp___ltpart_f baseq_whocp___forced_f
baseq_whocp___money_f
      baseq_whocp___presents_f baseq_whocp___other_f;
```

```
run;

proc freq data=thesis.AIM3_enroll;
tables baseq_whocp___coworker_f baseq_whocp___friend_f
baseq_whocp___neighbor_f
      baseq_whocp___ltpart_f baseq_whocp___forced_f
baseq_whocp___money_f
      baseq_whocp___presents_f baseq_whocp___other_f;
      by enroll;
run;
/*
proc genmod data=thesis.AIM3_enroll;
            model enroll = baseq_whocp___coworker_f
baseq_whocp___friend_f baseq_whocp___neighbor_f
      baseq_whocp___ltpart_f baseq_whocp___forced_f
baseq_whocp___money_f
      baseq_whocp___presents_f baseq_whocp___other_f / link=logit
dist=binomial;
run;*/

proc genmod data=thesis.AIM3_enroll;
            model enroll = baseq_whocp___coworker_m
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_enroll;
            model enroll = baseq_whocp___friend_m
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_enroll;
            model enroll = baseq_whocp___neighbor_m
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_enroll;
            model enroll = baseq_whocp___ltpart_m
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_enroll;
            model enroll = baseq_whocp___forced_m
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_enroll;
            model enroll = baseq_whocp___money_m
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_enroll;
            model enroll = baseq_whocp___presents_m
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_enroll;
            model enroll = baseq_whocp___other_m
```

```
/ link=logit dist=binomial;
run;

*FEMALE OUTSIDE PARTNERS;

proc genmod data=thesis.AIM3_enroll;
            model enroll = baseq_whocp___coworker_f
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_enroll;
            model enroll = baseq_whocp___friend_f
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_enroll;
            model enroll = baseq_whocp___neighbor_f
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_enroll;
            model enroll = baseq_whocp___ltpart_f
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_enroll;
            model enroll = baseq_whocp___forced_f
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_enroll;
            model enroll = baseq_whocp___money_f
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_enroll;
            model enroll = baseq_whocp___presents_f
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_enroll;
            model enroll = baseq_whocp___other_f
/ link=logit dist=binomial;
run;

**Condom Use w/ Outside Partners**;

proc freq data=thesis.AIM3_enroll;
tables baseq_condomfreq_m;
run;

proc freq data=thesis.AIM3_enroll;
tables baseq_condomfreq_m;
by enroll;
run;

proc genmod data=thesis.AIM3_enroll descending;
```

```
        class baseq_condomfreq_m;
            model enroll = baseq_condomfreq_m / link=logit
dist=binomial;
run;

proc freq data=thesis.AIM3_enroll;
tables baseq_condomfreq_f;
run;

proc freq data=thesis.AIM3_enroll;
tables baseq_condomfreq_f;
by enroll;
run;

proc genmod data=thesis.AIM3_enroll descending;
        class baseq_condomfreq_f;
            model enroll = baseq_condomfreq_f / link=logit
dist=binomial;
run;

**Outside partner Alcohol**;

proc freq data=thesis.AIM3_enroll;
tables baseq_alcoholcp_m;
run;

proc freq data=thesis.AIM3_enroll;
tables baseq_alcoholcp_m;
by enroll;
run;

proc genmod data=thesis.AIM3_enroll descending;
        class baseq_alcoholcp_m;
            model enroll = baseq_alcoholcp_m / link=logit
dist=binomial;
run;


proc freq data=thesis.AIM3_enroll;
tables baseq_alcoholcp_f;
run;

proc freq data=thesis.AIM3_enroll;
tables baseq_alcoholcp_f;
by enroll;
run;

proc genmod data=thesis.AIM3_enroll descending;
        class baseq_alcoholcp_f;
            model enroll = baseq_alcoholcp_f / link=logit
dist=binomial;
run;
**Current concurrent partner;

proc freq data=thesis.AIM3_enroll;
tables baseq_cpongoing_m;
run;
```

```
proc freq data=thesis.AIM3_enroll;
tables baseq_cpongoing_m;
by enroll;
run;

proc genmod data=thesis.AIM3_enroll descending;
        class baseq_cpongoing_m;
            model enroll = baseq_cpongoing_m/ link=logit dist=binomial;
run;

proc freq data=thesis.AIM3_enroll;
tables baseq_cpongoing_f;
run;

proc freq data=thesis.AIM3_enroll;
tables baseq_cpongoing_f;
by enroll;
run;

proc genmod data=thesis.AIM3_enroll descending;
        class baseq_cpongoing_f;
            model enroll = baseq_cpongoing_f/ link=logit dist=binomial;
run;

*On going partner type;

proc freq data=thesis.AIM3_enroll;
tables baseq_cpongoingtype___coworker_m baseq_cpongoingtype___friend_m
baseq_cpongoingtype___neighbor_m
      baseq_cpongoingtype___ltpart_m baseq_cpongoingtype___forced_m
baseq_cpongoingtype___money_m
      baseq_cpongoingtype___presents_m baseq_whocp___other_m;
run;

proc freq data=thesis.AIM3_enroll;
tables baseq_cpongoingtype___coworker_m baseq_cpongoingtype___friend_m
baseq_cpongoingtype___neighbor_m
      baseq_cpongoingtype___ltpart_m baseq_cpongoingtype___forced_m
baseq_cpongoingtype___money_m
      baseq_cpongoingtype___presents_m baseq_whocp___other_m;
by enroll;
run;

/*proc genmod data=thesis.AIM3_enroll descending;
            model enroll = baseq_cpongoingtype___coworker_m
baseq_cpongoingtype___friend_m baseq_cpongoingtype___neighbor_m
      baseq_cpongoingtype___ltpart_m baseq_cpongoingtype___forced_m
baseq_cpongoingtype___money_m
      baseq_cpongoingtype___presents_m baseq_whocp___other_m /
link=logit dist=binomial;
run;*/

proc freq data=thesis.AIM3_enroll;
tables baseq_cpongoingtype___coworker_f baseq_cpongoingtype___friend_f
baseq_cpongoingtype___neighbor_f
```

```
      baseq_cpongoingtype___ltpart_f baseq_cpongoingtype___forced_f
baseq_cpongoingtype___money_f
      baseq_cpongoingtype___presents_f baseq_whocp___other_f;
run;

proc freq data=thesis.AIM3_enroll;
tables baseq_cpongoingtype___coworker_f baseq_cpongoingtype___friend_f
baseq_cpongoingtype___neighbor_f
      baseq_cpongoingtype___ltpart_f baseq_cpongoingtype___forced_f
baseq_cpongoingtype___money_f
      baseq_cpongoingtype___presents_f baseq_whocp___other_f;
by enroll;
run;

/*proc genmod data=thesis.AIM3_enroll descending;
            model enroll = baseq_cpongoingtype___coworker_f
baseq_cpongoingtype___friend_f baseq_cpongoingtype___neighbor_f
      baseq_cpongoingtype___ltpart_f baseq_cpongoingtype___forced_f
baseq_cpongoingtype___money_f
      baseq_cpongoingtype___presents_f baseq_whocp___other_f /
link=logit dist=binomial;
run;*/

proc genmod data=thesis.AIM3_enroll;
            model enroll = baseq_cpongoingtype___coworker_m
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_enroll;
            model enroll = baseq_cpongoingtype___friend_m
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_enroll;
            model enroll = baseq_cpongoingtype___neighbor_m
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_enroll;
            model enroll = baseq_cpongoingtype___ltpart_m
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_enroll;
            model enroll = baseq_cpongoingtype___forced_m
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_enroll;
            model enroll = baseq_cpongoingtype___money_m
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_enroll;
            model enroll = baseq_cpongoingtype___presents_m
/ link=logit dist=binomial;
run;
```

```
proc genmod data=thesis.AIM3_enroll;
            model enroll = baseq_cpongoingtype___other_m
/ link=logit dist=binomial;
run;

*FEMALES*;
proc genmod data=thesis.AIM3_enroll;
            model enroll = baseq_cpongoingtype___coworker_f
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_enroll;
            model enroll = baseq_cpongoingtype___friend_f
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_enroll;
            model enroll = baseq_cpongoingtype___neighbor_f
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_enroll;
            model enroll = baseq_cpongoingtype___ltpart_f
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_enroll;
            model enroll = baseq_cpongoingtype___forced_f
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_enroll;
            model enroll = baseq_cpongoingtype___money_f
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_enroll;
            model enroll = baseq_cpongoingtype___presents_f
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_enroll;
            model enroll = baseq_cpongoingtype___other_f
/ link=logit dist=binomial;
run;



**Last month # of times had sex with spouse**;

proc freq data=thesis.aim3_enroll;
tables sexspouse1mo*baseq_sexspouse1mo;
run;

proc freq data=thesis.aim3_enroll;
tables baseq_sexspouse1mo;
```

```
where baseq_sexspouse1mo=0;
run;

proc univariate data=thesis.AIM3_enroll;
var baseq_sexspouse1mo;
run;

proc univariate data=thesis.AIM3_enroll;
var baseq_sexspouse1mo;
by enroll;
run;

proc genmod data=thesis.AIM3_enroll descending;
        model enroll = baseq_sexspouse1mo/ link=logit dist=binomial;
run;

proc freq data=thesis.aim3_enroll;
tables sexspouse1mo;
run;

proc freq data=thesis.aim3_enroll;
tables sexspouse1mo;
by enroll;
run;

proc genmod data=thesis.AIM3_enroll descending;
            class sexspouse1mo;
        model enroll = sexspouse1mo / link=logit dist=binomial;
run;

proc freq data=thesis.aim3_enroll;
tables sexspouse1mo_f;
run;

proc freq data=thesis.aim3_enroll;
tables sexspouse1mo_f;
by enroll;
run;

proc genmod data=thesis.AIM3_enroll descending;
            class sexspouse1mo_f;
        model enroll = sexspouse1mo_f / link=logit dist=binomial;
run;

**Why no sex**;

proc freq data=thesis.aim3_enroll;
tables baseq_nosexwhy___travel baseq_nosexwhy___baby
baseq_nosexwhy___sick baseq_nosexwhy___menses
baseq_nosexwhy___other/missing;
run;

proc freq data=thesis.aim3_enroll;
tables baseq_nosexwhy___travel baseq_nosexwhy___baby
baseq_nosexwhy___sick baseq_nosexwhy___menses
baseq_nosexwhy___other/missing;
by enroll;
```

```
run;
/*
proc genmod data=thesis.AIM3_enroll descending;
            model enroll = baseq_nosexwhy___travel_f
baseq_nosexwhy___baby_f
baseq_nosexwhy___sick_f baseq_nosexwhy___menses_f
baseq_nosexwhy___other_f / link=logit dist=binomial;
run;
*/
proc genmod data=thesis.AIM3_enroll descending;
            model enroll = baseq_nosexwhy___travel
 / link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_enroll descending;
            model enroll = baseq_nosexwhy___baby
 / link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_enroll descending;
            model enroll = baseq_nosexwhy___sick
 / link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_enroll descending;
            model enroll = baseq_nosexwhy___menses
 / link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_enroll descending;
            model enroll = baseq_nosexwhy___other
 / link=logit dist=binomial;
run;

**STI Tx ever;

proc freq data=thesis.AIM3_enroll;
tables baseq_stitrt_m;
run;

proc freq data=thesis.AIM3_enroll;
tables baseq_stitrt_m;
by enroll;
run;

proc genmod data=thesis.AIM3_enroll descending;
        class baseq_stitrt_m;
            model enroll = baseq_stitrt_m / link=logit dist=binomial;
run;


proc freq data=thesis.AIM3_enroll;
tables baseq_stitrt_f;
run;

proc freq data=thesis.AIM3_enroll;
tables baseq_stitrt_f;
```

```
by enroll;
run;

proc genmod data=thesis.AIM3_enroll descending;
        class baseq_stitrt_f;
            model enroll = baseq_stitrt_f / link=logit dist=binomial;
run;



**STI Tx since marriage**;
proc freq data=thesis.AIM3_enroll;
tables baseq_stitrtwed_m;
run;

proc freq data=thesis.AIM3_enroll;
tables baseq_stitrtwed_m;
by enroll;
run;

proc genmod data=thesis.AIM3_enroll descending;
        class baseq_stitrtwed_m;
            model enroll = baseq_stitrtwed_m / link=logit
dist=binomial;
run;


proc freq data=thesis.AIM3_enroll;
tables baseq_stitrtwed_f;
run;

proc freq data=thesis.AIM3_enroll;
tables baseq_stitrtwed_f;
by enroll;
run;

proc genmod data=thesis.AIM3_enroll descending;
        class baseq_stitrtwed_f;
            model enroll = baseq_stitrtwed_f / link=logit
dist=binomial;
run;

*syphilis;
proc freq data=thesis.AIM3_enroll;
tables baseq_syphilis_m;
run;

proc freq data=thesis.AIM3_enroll;
tables baseq_syphilis_m;
by enroll;
run;

proc genmod data=thesis.AIM3_enroll descending;
        class baseq_syphilis_m;
            model enroll = baseq_syphilis_m / link=logit dist=binomial;
run;
```

```
proc freq data=thesis.AIM3_enroll;
tables baseq_syphilis_f;
run;

proc freq data=thesis.AIM3_enroll;
tables baseq_syphilis_f;
by enroll;
run;

proc genmod data=thesis.AIM3_enroll descending;
        class baseq_syphilis_f;
            model enroll = baseq_syphilis_f / link=logit dist=binomial;
run;

*ulcers;
proc freq data=thesis.AIM3_enroll;
tables baseq_ulcers_m;
run;

proc freq data=thesis.AIM3_enroll;
tables baseq_ulcers_m;
by enroll;
run;

proc genmod data=thesis.AIM3_enroll descending;
        class baseq_ulcers_m;
            model enroll = baseq_ulcers_m / link=logit dist=binomial;
run;

proc freq data=thesis.AIM3_enroll;
tables baseq_ulcers_f;
run;

proc freq data=thesis.AIM3_enroll;
tables baseq_ulcers_f;
by enroll;
run;

proc genmod data=thesis.AIM3_enroll descending;
        class baseq_ulcers_f;
            model enroll = baseq_ulcers_f / link=logit dist=binomial;
run;

*Gonorrhea;
proc freq data=thesis.AIM3_enroll;
tables baseq_gonorrhea_m;
run;

proc freq data=thesis.AIM3_enroll;
tables baseq_gonorrhea_m;
by enroll;
run;

proc genmod data=thesis.AIM3_enroll descending;
        class baseq_gonorrhea_m;
            model enroll = baseq_gonorrhea_m / link=logit
dist=binomial;
```

```
run;

proc freq data=thesis.AIM3_enroll;
tables baseq_gonorrhea_f;
run;

proc freq data=thesis.AIM3_enroll;
tables baseq_gonorrhea_f;
by enroll;
run;

proc genmod data=thesis.AIM3_enroll descending;
        class baseq_gonorrhea_f;
            model enroll = baseq_gonorrhea_f / link=logit
dist=binomial;
run;

*discharge;
proc freq data=thesis.AIM3_enroll;
tables baseq_discharge_m;
run;

proc freq data=thesis.AIM3_enroll;
tables baseq_discharge_m;
by enroll;
run;

proc genmod data=thesis.AIM3_enroll descending;
        class baseq_discharge_m;
            model enroll = baseq_discharge_m / link=logit
dist=binomial;
run;

proc freq data=thesis.AIM3_enroll;
tables baseq_discharge_f;
run;

proc freq data=thesis.AIM3_enroll;
tables baseq_discharge_f;
by enroll;
run;

proc genmod data=thesis.AIM3_enroll descending;
        class baseq_discharge_f;
            model enroll = baseq_discharge_f / link=logit
dist=binomial;
run;

**Number of ppl in house**;

proc univariate data=thesis.AIM3_enroll;
var baseq_numhouse;
run;

proc univariate data=thesis.AIM3_enroll;
var baseq_numhouse;
by enroll;
```

```
run;

proc genmod data=thesis.AIM3_enroll descending;
        model enroll = baseq_numhouse / link=logit dist=binomial;
run;

**Under 16 in house**;

proc univariate data=thesis.AIM3_enroll;
var baseq_numhouse_under16;
run;

proc univariate data=thesis.AIM3_enroll;
var baseq_numhouse_under16;
by enroll;
run;

proc genmod data=thesis.AIM3_enroll descending;
        model enroll = baseq_numhouse_under16 / link=logit
dist=binomial;
run;

**Months cohabitating**;

proc univariate data=thesis.AIM3_enroll;
var syrcohabit;
run;

proc univariate data=thesis.AIM3_enroll;
var syrcohabit;
by enroll;
run;

proc genmod data=thesis.AIM3_enroll descending;
        model enroll = syrcohabit / link=logit dist=binomial;
run;


**Previous attended CVCT**;
proc freq data=thesis.aim3_enroll;
tables SPRECVCT;
run;

proc freq data=thesis.aim3_enroll;
tables SPRECVCT;
by enroll;
run;

proc genmod data=thesis.AIM3_enroll descending;
        class SPRECVCT;
            model enroll = SPRECVCT / link=logit dist=binomial;
run;

**Full Model**;

*****************************************************************
*****************************************************************
```

```
*************************************************************************
************************************************************
Retention
*************************************************************************
************************************************************
************************************************************************
;

**Retain**;


proc sort data=thesis.aim3_retain;
by retain;
run;


proc freq data=thesis.aim3_retain;
tables arm;
run;

proc freq data=thesis.aim3_retain;
tables arm;
by retain;
run;

proc logistic data=thesis.aim3_retain desc;
class arm;
model retain = arm;
run;

data thesis.aim3_retain;
set thesis.aim3_retain;
agerange = smanage - swomanage;
run;

proc univariate data=thesis.AIM3_retain;
var smanage swomanage agerange;
run;

proc univariate data=thesis.AIM3_retain;
var smanage swomanage agerange;
by retain;
run;

proc genmod data=thesis.AIM3_retain descending;
        model retain = agerange / link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_retain descending;
        model retain = smanage / link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_retain descending;
        model retain = swomanage / link=logit dist=binomial;
run;

proc freq data=thesis.aim3_retain;
```

```
tables spreg;
run;

proc freq data=thesis.aim3_retain;
tables spreg;
by retain;
run;

proc genmod data=thesis.AIM3_retain descending;
        class spreg;
            model retain = spreg / link=logit dist=binomial;
run;

proc freq data=thesis.aim3_retain;
tables district;
run;

proc freq data=thesis.aim3_retain;
tables district;
by retain;
run;

proc genmod data=thesis.AIM3_retain descending;
        class district;
            model retain = district / link=logit dist=binomial;
run;

proc freq data=thesis.aim3_retain;
tables iud implant injectable pills tubl;
run;

proc freq data=thesis.aim3_retain;
tables iud implant injectable pills tubl;
by retain;
run;

proc genmod data=thesis.AIM3_retain descending;
            model retain = iud implant injectable pills tubl /
link=logit dist=binomial;
run;

proc means data=thesis.AIM3_retain median qrange;
var income;
run;

proc means data=thesis.AIM3_retain median qrange;
var income;
by retain;
run;

proc genmod data=thesis.AIM3_retain descending;
        model retain = baseq_income_m / link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_retain descending;
        model retain = log_income_m / link=logit dist=binomial;
run;
```

```
proc freq data=thesis.AIM3_retain;
tables M_readbemny*retain
F_readbemny*retain
M_underbemny*retain
F_underbemny*retain
M_readeng*retain
F_readeng*retain
M_undereng*retain
F_undereng*retain
;
run;


proc logistic data=thesis.AIM3_retain descending;
            model retain = M_readbemny;
run;*Not significant;

proc logistic data=thesis.AIM3_retain descending;
            model retain = F_readbemny;
run;*Not significant;


proc logistic data=thesis.AIM3_retain descending;
            model retain = M_underbemny;
run;*Not significant;

proc logistic data=thesis.AIM3_retain descending;
            model retain = F_underbemny;
run;*NA;

proc logistic data=thesis.AIM3_retain descending;
            model retain = M_readeng;
run;*Not significant;

proc logistic data=thesis.AIM3_retain descending;
            model retain = F_readeng;
run;*Not significant;

proc logistic data=thesis.AIM3_retain descending;
            model retain = M_undereng;
run;*Not significant;

proc logistic data=thesis.AIM3_retain descending;
            model retain = F_undereng;
run;*NA;

*Lifetime Sex Partners*;

proc univariate data=thesis.AIM3_retain;
var baseq_lifesex_m;
run;

proc univariate data=thesis.AIM3_retain;
var baseq_lifesex_m;
by retain;
```

```
run;

proc genmod data=thesis.AIM3_retain descending;
        model retain = baseq_lifesex_m / link=logit dist=binomial;
run;
proc genmod data=thesis.AIM3_retain descending;
        model retain = log_baseq_lifesex_m / link=logit dist=binomial;
run;

proc univariate data=thesis.AIM3_retain;
var baseq_lifesex_f;
run;

proc univariate data=thesis.AIM3_retain;
var baseq_lifesex_f;
by retain;
run;

proc genmod data=thesis.AIM3_retain descending;
        model retain = baseq_lifesex_f / link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_retain descending;
        model retain = log_baseq_lifesex_f / link=logit dist=binomial;
run;

**First sexual intercourse**;

proc univariate data=thesis.AIM3_retain;
var baseq_sexage_m;
run;

proc univariate data=thesis.AIM3_retain;
var baseq_sexage_m;
by retain;
run;

proc genmod data=thesis.AIM3_retain descending;
        model retain = baseq_sexage_m / link=logit dist=binomial;
run;

proc univariate data=thesis.AIM3_retain;
var baseq_sexage_f;
run;

proc univariate data=thesis.AIM3_retain;
var baseq_sexage_f;
by retain;
run;

proc genmod data=thesis.AIM3_retain descending;
        model retain = baseq_sexage_f / link=logit dist=binomial;
run;
**Ever Outside Partner**;;

proc freq data=thesis.AIM3_retain;
tables baseq_sexcp_m;
```

```
run;

proc freq data=thesis.AIM3_retain;
tables baseq_sexcp_m;
by retain;
run;

proc genmod data=thesis.AIM3_retain descending;
        class baseq_sexcp_m;
            model retain = baseq_sexcp_m / link=logit dist=binomial;
run;

proc freq data=thesis.AIM3_retain;
tables baseq_sexcp_f;
run;

proc freq data=thesis.AIM3_retain;
tables baseq_sexcp_f;
by retain;
run;

proc genmod data=thesis.AIM3_retain descending;
        class baseq_sexcp_f;
            model retain = baseq_sexcp_f / link=logit dist=binomial;
run;

**Number of outside partners**;
data include;
set thesis.aim3_retain;
if baseq_sexcp_f=1 then baseq_numcp_f=baseq_numcp_f;
if baseq_sexcp_f=2 then baseq_numcp_f=0;
if baseq_sexcp_m=1 then baseq_numcp_m=baseq_numcp_m;
if baseq_sexcp_m=2 then baseq_numcp_m=0;
run;
/*
proc univariate data=thesis.AIM3_retain;
var baseq_numcp_m;
run;

proc univariate data=thesis.AIM3_retain;
var baseq_numcp_m;
by retain;
run;

proc genmod data=thesis.AIM3_retain descending;
        model retain = baseq_numcp_m / link=logit dist=binomial;
run;
*/
proc univariate data=include;
var baseq_numcp_m;
run;

proc univariate data=include;
var baseq_numcp_m;
by retain;
run;
```

```
proc genmod data=include descending;
        model retain = baseq_numcp_m / link=logit dist=binomial;
run;
/*
proc univariate data=thesis.AIM3_retain;
var baseq_numcp_f;
run;

proc univariate data=thesis.AIM3_retain;
var baseq_numcp_f;
by retain;
run;

proc genmod data=thesis.AIM3_retain descending;
        model retain = baseq_numcp_f / link=logit dist=binomial;
run;
*/

proc univariate data=include;
var baseq_numcp_f;
run;

proc univariate data=include;
var baseq_numcp_f;
by retain;
run;

proc genmod data=include descending;
        model retain = baseq_numcp_f / link=logit dist=binomial;
run;
*Who were the outside partners*;

proc freq data=thesis.AIM3_retain;
tables baseq_whocp___coworker_m baseq_whocp___friend_m
baseq_whocp___neighbor_m
      baseq_whocp___ltpart_m baseq_whocp___forced_m
baseq_whocp___money_m
      baseq_whocp___presents_m baseq_whocp___other_m;
run;

proc freq data=thesis.AIM3_retain;
tables baseq_whocp___coworker_m baseq_whocp___friend_m
baseq_whocp___neighbor_m
      baseq_whocp___ltpart_m baseq_whocp___forced_m
baseq_whocp___money_m
      baseq_whocp___presents_m baseq_whocp___other_m;
      by retain;
run;

/*proc genmod data=thesis.AIM3_retain;
            model retain = baseq_whocp___coworker_m
baseq_whocp___friend_m baseq_whocp___neighbor_m
      baseq_whocp___ltpart_m baseq_whocp___forced_m
baseq_whocp___money_m
      baseq_whocp___presents_m baseq_whocp___other_m / link=logit
dist=binomial;
run;*/
```

```
proc freq data=thesis.AIM3_retain;
tables baseq_whocp___coworker_f baseq_whocp___friend_f
baseq_whocp___neighbor_f
      baseq_whocp___ltpart_f baseq_whocp___forced_f
baseq_whocp___money_f
      baseq_whocp___presents_f baseq_whocp___other_f;
run;

proc freq data=thesis.AIM3_retain;
tables baseq_whocp___coworker_f baseq_whocp___friend_f
baseq_whocp___neighbor_f
      baseq_whocp___ltpart_f baseq_whocp___forced_f
baseq_whocp___money_f
      baseq_whocp___presents_f baseq_whocp___other_f;
      by retain;
run;

/*proc genmod data=thesis.AIM3_retain;
            model retain = baseq_whocp___coworker_f
baseq_whocp___friend_f baseq_whocp___neighbor_f
      baseq_whocp___ltpart_f baseq_whocp___forced_f
baseq_whocp___money_f
      baseq_whocp___presents_f baseq_whocp___other_f / link=logit
dist=binomial;
run;*/



proc genmod data=thesis.AIM3_retain;
            model retain = baseq_whocp___coworker_m
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_retain;
            model retain = baseq_whocp___friend_m
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_retain;
            model retain = baseq_whocp___neighbor_m
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_retain;
            model retain = baseq_whocp___ltpart_m
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_retain;
            model retain = baseq_whocp___forced_m
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_retain;
            model retain = baseq_whocp___money_m
```

```
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_retain;
            model retain = baseq_whocp___presents_m
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_retain;
            model retain = baseq_whocp___other_m
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_retain;
            model retain = baseq_whocp___coworker_f
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_retain;
            model retain = baseq_whocp___friend_f
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_retain;
            model retain = baseq_whocp___neighbor_f
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_retain;
            model retain = baseq_whocp___ltpart_f
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_retain;
            model retain = baseq_whocp___forced_f
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_retain;
            model retain = baseq_whocp___money_f
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_retain;
            model retain = baseq_whocp___presents_f
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_retain;
            model retain = baseq_whocp___other_f
/ link=logit dist=binomial;
run;

**Condom Use w/ Outside Partners**;

proc freq data=thesis.AIM3_retain;
tables baseq_condomfreq_m;
```

```
run;

proc freq data=thesis.AIM3_retain;
tables baseq_condomfreq_m;
by retain;
run;

proc genmod data=thesis.AIM3_retain descending;
        class baseq_condomfreq_m;
            model retain = baseq_condomfreq_m / link=logit
dist=binomial;
run;

proc freq data=thesis.AIM3_retain;
tables baseq_condomfreq_f;
run;

proc freq data=thesis.AIM3_retain;
tables baseq_condomfreq_f;
by retain;
run;

proc genmod data=thesis.AIM3_retain descending;
        class baseq_condomfreq_f;
            model retain = baseq_condomfreq_f / link=logit
dist=binomial;
run;

**Outside partner Alcohol**;

proc freq data=thesis.AIM3_retain;
tables baseq_alcoholcp_m;
run;

proc freq data=thesis.AIM3_retain;
tables baseq_alcoholcp_m;
by retain;
run;

proc genmod data=thesis.AIM3_retain descending;
        class baseq_alcoholcp_m;
            model retain = baseq_alcoholcp_m / link=logit
dist=binomial;
run;


proc freq data=thesis.AIM3_retain;
tables baseq_alcoholcp_f;
run;

proc freq data=thesis.AIM3_retain;
tables baseq_alcoholcp_f;
by retain;
run;

proc genmod data=thesis.AIM3_retain descending;
        class baseq_alcoholcp_f;
```

```
            model retain = baseq_alcoholcp_f / link=logit
dist=binomial;
run;
**Current concurrent partner;

proc freq data=thesis.AIM3_retain;
tables baseq_cpongoing_m;
run;

proc freq data=thesis.AIM3_retain;
tables baseq_cpongoing_m;
by retain;
run;

proc genmod data=thesis.AIM3_retain descending;
        class baseq_cpongoing_m;
            model retain = baseq_cpongoing_m/ link=logit dist=binomial;
run;

proc freq data=thesis.AIM3_retain;
tables baseq_cpongoing_f;
run;

proc freq data=thesis.AIM3_retain;
tables baseq_cpongoing_f;
by retain;
run;

proc genmod data=thesis.AIM3_retain descending;
        class baseq_cpongoing_f;
            model retain = baseq_cpongoing_f/ link=logit dist=binomial;
run;

*On going partner type;

proc freq data=thesis.AIM3_retain;
tables baseq_cpongoingtype___coworker_m baseq_cpongoingtype___friend_m
baseq_cpongoingtype___neighbor_m
      baseq_cpongoingtype___ltpart_m baseq_cpongoingtype___forced_m
baseq_cpongoingtype___money_m
      baseq_cpongoingtype___presents_m baseq_whocp___other_m;
run;

proc freq data=thesis.AIM3_retain;
tables baseq_cpongoingtype___coworker_m baseq_cpongoingtype___friend_m
baseq_cpongoingtype___neighbor_m
      baseq_cpongoingtype___ltpart_m baseq_cpongoingtype___forced_m
baseq_cpongoingtype___money_m
      baseq_cpongoingtype___presents_m baseq_whocp___other_m;
by retain;
run;
/*
proc genmod data=thesis.AIM3_retain descending;
            model retain = baseq_cpongoingtype___coworker_m
baseq_cpongoingtype___friend_m baseq_cpongoingtype___neighbor_m
      baseq_cpongoingtype___ltpart_m baseq_cpongoingtype___forced_m
baseq_cpongoingtype___money_m
```

```
      baseq_cpongoingtype___presents_m baseq_whocp___other_m /
link=logit dist=binomial;
run;*/

proc freq data=thesis.AIM3_retain;
tables baseq_cpongoingtype___coworker_f baseq_cpongoingtype___friend_f
baseq_cpongoingtype___neighbor_f
      baseq_cpongoingtype___ltpart_f baseq_cpongoingtype___forced_f
baseq_cpongoingtype___money_f
      baseq_cpongoingtype___presents_f baseq_whocp___other_f;
run;

proc freq data=thesis.AIM3_retain;
tables baseq_cpongoingtype___coworker_f baseq_cpongoingtype___friend_f
baseq_cpongoingtype___neighbor_f
      baseq_cpongoingtype___ltpart_f baseq_cpongoingtype___forced_f
baseq_cpongoingtype___money_f
      baseq_cpongoingtype___presents_f baseq_whocp___other_f;
by retain;
run;
/*
proc genmod data=thesis.AIM3_retain descending;
            model retain = baseq_cpongoingtype___coworker_f
baseq_cpongoingtype___friend_f baseq_cpongoingtype___neighbor_f
      baseq_cpongoingtype___ltpart_f baseq_cpongoingtype___forced_f
baseq_cpongoingtype___money_f
      baseq_cpongoingtype___presents_f baseq_whocp___other_f /
link=logit dist=binomial;
run;
*/

proc genmod data=thesis.AIM3_retain;
            model retain = baseq_cpongoingtype___coworker_m
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_retain;
            model retain = baseq_cpongoingtype___friend_m
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_retain;
            model retain = baseq_cpongoingtype___neighbor_m
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_retain;
            model retain = baseq_cpongoingtype___ltpart_m
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_retain;
            model retain = baseq_cpongoingtype___forced_m
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_retain;
```

```
            model retain = baseq_cpongoingtype___money_m
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_retain;
            model retain = baseq_cpongoingtype___presents_m
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_retain;
            model retain = baseq_cpongoingtype___other_m
/ link=logit dist=binomial;
run;

**FEMALES**;

proc genmod data=thesis.AIM3_retain;
            model retain = baseq_cpongoingtype___coworker_f
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_retain;
            model retain = baseq_cpongoingtype___friend_f
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_retain;
            model retain = baseq_cpongoingtype___neighbor_f
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_retain;
            model retain = baseq_cpongoingtype___ltpart_f
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_retain;
            model retain = baseq_cpongoingtype___forced_f
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_retain;
            model retain = baseq_cpongoingtype___money_f
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_retain;
            model retain = baseq_cpongoingtype___presents_f
/ link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_retain;
            model retain = baseq_cpongoingtype___other_f
/ link=logit dist=binomial;
run;
```

```
**Last month # of times had sex with spouse**;

proc univariate data=thesis.AIM3_retain;
var baseq_sexspouse1mo;
run;

proc univariate data=thesis.AIM3_retain;
var baseq_sexspouse1mo_f;
run;

proc univariate data=thesis.AIM3_retain;
var baseq_sexspouse1mo;
by retain;
run;

proc genmod data=thesis.AIM3_retain descending;
        model retain = baseq_sexspouse1mo / link=logit dist=binomial;
run;

proc freq data=thesis.aim3_retain;
tables sexspouse1mo;
run;

proc freq data=thesis.aim3_retain;
tables sexspouse1mo;
by retain;
run;

proc genmod data=thesis.AIM3_retain descending;
            class sexspouse1mo;
        model retain = sexspouse1mo / link=logit dist=binomial;
run;

**Why no sex**;

proc freq data=thesis.aim3_retain;
tables baseq_nosexwhy___travel baseq_nosexwhy___baby
baseq_nosexwhy___sick baseq_nosexwhy___menses
baseq_nosexwhy___other/missing;
run;

proc freq data=thesis.aim3_retain;
tables baseq_nosexwhy___travel baseq_nosexwhy___baby
baseq_nosexwhy___sick baseq_nosexwhy___menses
baseq_nosexwhy___other/missing;
by retain;
run;

/*proc genmod data=thesis.AIM3_retain descending;
            model retain = baseq_nosexwhy___travel
baseq_nosexwhy___baby
baseq_nosexwhy___sick baseq_nosexwhy___menses
baseq_nosexwhy___other / link=logit dist=binomial;
run;*/

proc genmod data=thesis.AIM3_retain descending;
            model retain = baseq_nosexwhy___travel
```

```
 / link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_retain descending;
            model retain = baseq_nosexwhy___baby
 / link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_retain descending;
            model retain = baseq_nosexwhy___sick
 / link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_retain descending;
            model retain = baseq_nosexwhy___menses
 / link=logit dist=binomial;
run;

proc genmod data=thesis.AIM3_retain descending;
            model retain = baseq_nosexwhy___other
 / link=logit dist=binomial;
run;


**STI Tx ever;

proc freq data=thesis.AIM3_retain;
tables baseq_stitrt_m;
run;

proc freq data=thesis.AIM3_retain;
tables baseq_stitrt_m;
by retain;
run;

proc genmod data=thesis.AIM3_retain descending;
        class baseq_stitrt_m;
            model retain = baseq_stitrt_m / link=logit dist=binomial;
run;


proc freq data=thesis.AIM3_retain;
tables baseq_stitrt_f;
run;

proc freq data=thesis.AIM3_retain;
tables baseq_stitrt_f;
by retain;
run;

proc genmod data=thesis.AIM3_retain descending;
        class baseq_stitrt_f;
            model retain = baseq_stitrt_f / link=logit dist=binomial;
run;
```

```
**STI Tx since marriage**;
proc freq data=thesis.AIM3_retain;
tables baseq_stitrtwed_m;
run;

proc freq data=thesis.AIM3_retain;
tables baseq_stitrtwed_m;
by retain;
run;

proc genmod data=thesis.AIM3_retain descending;
        class baseq_stitrtwed_m;
            model retain = baseq_stitrtwed_m / link=logit
dist=binomial;
run;


proc freq data=thesis.AIM3_retain;
tables baseq_stitrtwed_f;
run;

proc freq data=thesis.AIM3_retain;
tables baseq_stitrtwed_f;
by retain;
run;

proc genmod data=thesis.AIM3_retain descending;
        class baseq_stitrtwed_f;
            model retain = baseq_stitrtwed_f / link=logit
dist=binomial;
run;

*syphilis;
proc freq data=thesis.AIM3_retain;
tables baseq_syphilis_m;
run;

proc freq data=thesis.AIM3_retain;
tables baseq_syphilis_m;
by retain;
run;

proc genmod data=thesis.AIM3_retain descending;
        class baseq_syphilis_m;
            model retain = baseq_syphilis_m / link=logit dist=binomial;
run;

proc freq data=thesis.AIM3_retain;
tables baseq_syphilis_f;
run;

proc freq data=thesis.AIM3_retain;
tables baseq_syphilis_f;
by retain;
run;

proc genmod data=thesis.AIM3_retain descending;
```

```
        class baseq_syphilis_f;
            model retain = baseq_syphilis_f / link=logit dist=binomial;
run;

*ulcers;
proc freq data=thesis.AIM3_retain;
tables baseq_ulcers_m;
run;

proc freq data=thesis.AIM3_retain;
tables baseq_ulcers_m;
by retain;
run;

proc genmod data=thesis.AIM3_retain descending;
        class baseq_ulcers_m;
            model retain = baseq_ulcers_m / link=logit dist=binomial;
run;

proc freq data=thesis.AIM3_retain;
tables baseq_ulcers_f;
run;

proc freq data=thesis.AIM3_retain;
tables baseq_ulcers_f;
by retain;
run;

proc genmod data=thesis.AIM3_retain descending;
        class baseq_ulcers_f;
            model retain = baseq_ulcers_f / link=logit dist=binomial;
run;

*Gonorrhea;
proc freq data=thesis.AIM3_retain;
tables baseq_gonorrhea_m;
run;

proc freq data=thesis.AIM3_retain;
tables baseq_gonorrhea_m;
by retain;
run;

proc genmod data=thesis.AIM3_retain descending;
        class baseq_gonorrhea_m;
            model retain = baseq_gonorrhea_m / link=logit
dist=binomial;
run;

proc freq data=thesis.AIM3_retain;
tables baseq_gonorrhea_f;
run;

proc freq data=thesis.AIM3_retain;
tables baseq_gonorrhea_f;
by retain;
run;
```

```
proc genmod data=thesis.AIM3_retain descending;
        class baseq_gonorrhea_f;
            model retain = baseq_gonorrhea_f / link=logit
dist=binomial;
run;

*discharge;
proc freq data=thesis.AIM3_retain;
tables baseq_discharge_m;
run;

proc freq data=thesis.AIM3_retain;
tables baseq_discharge_m;
by retain;
run;

proc genmod data=thesis.AIM3_retain descending;
        class baseq_discharge_m;
            model retain = baseq_discharge_m / link=logit
dist=binomial;
run;

proc freq data=thesis.AIM3_retain;
tables baseq_discharge_f;
run;

proc freq data=thesis.AIM3_retain;
tables baseq_discharge_f;
by retain;
run;

proc genmod data=thesis.AIM3_retain descending;
        class baseq_discharge_f;
            model retain = baseq_discharge_f / link=logit
dist=binomial;
run;

**Number of ppl in house**;

proc univariate data=thesis.AIM3_retain;
var baseq_numhouse;
run;

proc univariate data=thesis.AIM3_retain;
var baseq_numhouse;
by retain;
run;

proc genmod data=thesis.AIM3_retain descending;
        model retain = baseq_numhouse / link=logit dist=binomial;
run;


**Under 16 in house**;

proc univariate data=thesis.AIM3_retain;
```

```
var baseq_numhouse_under16;
run;

proc univariate data=thesis.AIM3_retain;
var baseq_numhouse_under16;
by retain;
run;

proc genmod data=thesis.AIM3_retain descending;
        model retain = baseq_numhouse_under16 / link=logit
dist=binomial;
run;

**Months cohabitating**;

proc univariate data=thesis.AIM3_retain;
var syrcohabit;
run;

proc univariate data=thesis.AIM3_retain;
var syrcohabit;
by retain;
run;

proc genmod data=thesis.AIM3_retain descending;
        model retain = syrcohabit / link=logit dist=binomial;
run;


**Previous attended CVCT**;
proc freq data=thesis.aim3_retain;
tables SPRECVCT;
run;

proc freq data=thesis.aim3_retain;
tables SPRECVCT;
by retain;
run;

proc genmod data=thesis.AIM3_retain descending;
        class SPRECVCT;
            model retain = SPRECVCT / link=logit dist=binomial;
run;

***Model****;
*Not putting in male genital ulcers because there are too many
missings;
proc genmod data=thesis.AIM3_retain descending;
        class baseq_underbem_f;
            model retain = swomanage baseq_underbem_f
baseq_nosexwhy___baby/ link=logit dist=binomial;
run;


************************************************************
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```

```
*************************************************************
                              Collinearity
*************************************************************
*************************************************************
*************************************************************
*************************************************************;

filename collin "E:\THESIS\collin_2011.sas";
%include collin;

ods output genmod.parminfo=parms;
ods output genmod.covb=covdsn;

proc genmod data=thesis.AIM3_enroll descending;
        class baseq_sexcp_m baseq_stitrt_f sprecvct arm;
            model enroll =  SMANAGE SWOMANAGE arm iud implant
injectable pills tubl log_income baseq_sexcp_m
            baseq_sexspouse1mo baseq_stitrt_f baseq_numhouse_under16
syrcohabit sprecvct
/ link=logit dist=binomial covb;
run;

 %COLLIN(COVDSN=COVDSN, PROCDR=GENMOD, PARMINFO=Parms,
OUTPUT=collin_enroll)


*NEW RETAIN;


ods output genmod.parminfo=parms;
ods output genmod.covb=covdsn;

proc genmod data=thesis.AIM3_retain descending;
            model retain = swomanage baseq_nosexwhy___baby
/ link=logit dist=binomial covb;
run;

 %COLLIN(COVDSN=COVDSN, PROCDR=GENMOD, PARMINFO=Parms,
OUTPUT=collin_retain)
       *NO COLLINEARITY;
```

EMORY UNIVERSITY | Institutional Review Board

TO: Susan Allen, MD, MPH
Principal Investigator
*SOM: Pathology: Admin

DATE: September 7th, 2016

RE: **Continuing Review Expedited Approval**
CR1_IRB00083001

IRB00083001
A randomized control study to evaluate a novel intervention to reduce risk factors associated with HIV acquisition from concurrent partners among HIV concordant negative couples in Zambia

Thank you for submitting a renewal application for this protocol. The Emory IRB reviewed it by the expedited process on **September 7th, 2016**, per 45 CFR 46.110, the Federal Register expeditable categories F2, F3, and F7 , and/or 21 CFR 56.110. This reapproval is effective from **September 9th, 2016** through **September 8th, 2017**. Thereafter, continuation of human subjects research activities requires the submission of another renewal application, which must be reviewed and approved by the IRB prior to the expiration date noted above. Please note carefully the following items with respect to this reapproval:

- OneLove_Aim3_Protocol_v1.3_28Mar2016_clean.docx

Any reportable events (e.g., unanticipated problems involving risk to subjects or others, noncompliance, breaches of confidentiality, HIPAA violations, protocol deviations) must be reported to the IRB according to our Policies & Procedures at www.irb.emory.edu, immediately, promptly, or periodically. Be sure to check the reporting guidance and contact us if you have questions. Terms and conditions of sponsors, if any, also apply to reporting.

Before implementing any change to this protocol (including but not limited to sample size, informed consent, and study design), you must submit an amendment request and secure IRB approval.

In future correspondence about this matter, please refer to the IRB file ID, name of the Principal Investigator, and study title. Thank you.

Sincerely,

Parul Reddy
Analyst Assistant
This letter has been digitally signed

CC:

Drakes	Janeen	*SOM: Pathology: Admin
Parker	Rachel	*SOM: Pathology: Admin
Sharkey	Tyronza	*Office of Clinical Research

Tichacek	Amanda	*SOM: Pathology: Admin
Inambao	Mubiana	*SOM: Pathology: Admin
Kilembe	William	*Office of Clinical Research
Wall	Kristin	*SPH: Epidemiology

Emory University
1599 Clifton Road, 5th Floor - Atlanta, Georgia 30322
Tel: 404.712.0720 - Fax: 404.727.1358 - Email: irb@emory.edu - Web: http://www.irb.emory.edu/