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Role of Male Partner Involvement in ART Retention and Adherence in Malawi's Option B+ Program

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Abstract

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Malawi's Option B+ program provides all HIV-infected pregnant women free lifelong antiretroviral therapy (ART), but challenges remain regarding retention and ART adherence, potentially due to male partner barriers. We explored relationships between male partner involvement and Option B+ retention and adherence. In 2014, a randomized controlled trial in Malawi compared male recruitment strategies for couple HIV testing and counseling (cHTC) at an antenatal clinic. This secondary analysis was conducted among the entire cohort (N=200) of women, irrespective of randomization status. We assessed whether cHTC attendance, early disclosure of HIV-positive status, and partner ART reminders were associated with retention and adherence at one month after starting treatment. Retention was defined as attending HIV clinic follow-up within one day of running out of pills. Adherence was defined as taking 95% of ARTs by pill count. We used binomial regression to calculate adjusted risk ratios (aRR) and 95% confidence intervals (CI). Median female age was 26 years. Most women (79%) were retained; of these, 68% were adherent. Receiving cHTC was associated with improved retention (aRR 1.33, 95% CI 1.12, 1.59). Receiving male partner ART reminders was weakly associated with retention (aRR 1.16, 95% CI 0.96, 1.39). Disclosure within one day was not associated with retention (aRR 1.08, 95% CI: 0.91, 1.28). Among those who were retained, these three behaviors were not associated with improved 95% adherence. CHTC could play an important role in improving Option B+ retention. Increasing cHTC participation and enhancing adherence-related messages within cHTC are important.

Keywords

partner involvement; Option B+; retention; adherence; PMTCT

Introduction

In July 2011, Malawi's Ministry of Health introduced lifelong antiretroviral therapy (ART) for all HIV-infected pregnant and breastfeeding women at the time of HIV diagnosis, referred to as Option B+ (Schouten et al., 2011). This approach to prevention of mother-to-child transmission (PMTCT) of HIV simplified ART initiation since it eliminated CD4 counts as a barrier to determining ART eligibility ("Impact of an Innovative Approach to Prevent Mother-to-Child Transmission of HIV — Malawi, July 2011–September 2012," n.d.). Within Option B+ and in the broader HIV diagnosis and treatment cascade, the Joint United Nations Programme on HIV/AIDS set ambitious 90% targets for HIV diagnosis, ART retention, and viral suppression, referred to as the 90–90–90 goals (UNAIDS, 2014).

While Malawi's Option B+ program has effectively approached the first target through universal testing (Barr, Jahn, Gupta, Maida, & Chimbwandira, n.d.), countries throughout the region have struggled with the latter two targets. Malawi's Option B+ pregnant patients have a much higher probability of immediately dropping out of care than patients initiating ART for clinical reasons, undermining retention and viral suppression targets (Tenthani et al., 2014). In both Malawi and Zimbabwe, 17% are not retained in care at 6 months after ART initiation, most within the first 3 months (Dzangare et al., 2016; Tenthani et al., 2014). Women are lost at various stages of the PMTCT cascade (Chan et al., 2016; Cowan et al., 2015). Retention in care is lower in models of care where ART is provided initially at an

antenatal clinic (ANC) instead of an ART clinic (van Lettow et al., 2014). Though one cross-sectional study in Ethiopia demonstrated 87% adherence in Option B+ women (Ebuy, Yebyo, & Alemayehu, 2015), a systematic review demonstrated only 74% of pregnant women meeting adequate adherence of 80% (Nachega et al., 2012). Barriers to adequate adherence include ART side effects and feeling healthy (Kim et al., 2016).

Lack of male involvement is a frequently cited barrier to ART initiation and retention in care (Bwirire et al., 2008; Clouse et al., 2014; Gourlay, Birdthistle, Mburu, Iorpenda, & Wringe, 2013; Kim et al., 2016), yet specific behaviors are understudied. Recent work in Mozambique demonstrates negative cultural assumptions associated with male partner involvement and positive effects on antenatal HIV care when changing those community norms (Audet, Blevins, et al., 2016; Audet, Chire, et al., 2016). Similarly, male partner involvement has been associated with positive PMTCT outcomes (Crepaz, Tungol-Ashmon, Vosburgh, Baack, & Mullins, 2015; Farquhar et al., 2004; Mohlala, Boily, & Gregson, 2011), but the mechanisms involved are not well understood.

Couple HIV testing and counseling (cHTC) might facilitate mutual understanding of women's pill-taking and care-seeking needs and promote partner support. Early HIV status disclosure may ease adherence to care and ARTs, eliminating the need to hide these behaviors. Partner reminders could improve memory and motivation to take pills or come to the clinic.

In the context of Malawi's Option B+ program, we assessed three modifiable partner behaviors – uptake of cHTC, early disclosure of HIV status, and partner ART reminders – then assessed their relationships with two key indicators: retention in care and ART adherence. By evaluating modifiable behaviors, we sought to better understand how partner involvement could be leveraged to meet the 90–90–90 targets and ultimately improve maternal and PMTCT outcomes.

Methods

IRB Approval

Approval was provided by National Health Sciences Research Committee of Malawi and UNC School of Medicine Institutional Review Board. The protocol was registered on clinicaltrials.gov (NCT02139176).

Setting

The study was conducted at Bwaila District Hospital, the major maternity hospital in Lilongwe, the capital of Malawi. This maternity hospital manages 15,000 deliveries per year, where 11% of women are HIV-infected. Option B+ services began in 2011. Just prior to this study, 85–90% of women came to their first ANC visit without their partner and thus received individual HTC, while the remainder received cHTC (Mphonda et al., 2014).

Participants

Pregnant women who presented for their first ANC visit from March–September 2014 were screened for the study. Women were eligible if they tested HIV-positive that day, were

pregnant, were over 18 years old or 16–17 years and married, had not received cHTC that visit, intended to remain in Lilongwe for one month, and had a locatable sex partner in Lilongwe.

Study Design

The parent study was a non-blinded randomized controlled trial that compared two strategies for the primary outcome of cHTC. Women were randomly assigned to two groups: paper invitations only versus paper invitations plus phone and physical tracing of partners. The invitations and tracing messages encouraged men to attend the ANC with their female partners for health information within one week of randomization and did not mention the woman's HIV-positive status or cHTC. If assigned tracing, this began after one week.

The parent study consisted of three sequential visits: a female baseline visit, a couple visit, and a female follow-up visit. The female baseline visit occurred on the day of HIV diagnosis. Women were screened, consented, randomized, and asked about baseline factors, including past HIV testing and status disclosure. The couple visit occurred within one month of the female baseline visit. The male partner consented to the study, received health information, and underwent a behavioral survey. The couple then underwent cHTC together, through which a clinic counselor provided couple pre-test counseling, HIV testing, and couple post-test counseling about HIV prevention, care-seeking, and adherence. The female follow-up visit was scheduled for the day of the first ART refill visit, one month after the baseline visit. It consisted of a behavioral questionnaire, including questions about the presence and timing of HIV status disclosure to their partner as well as partner ART reminders. Study participants received a transport allowance at each visit.

This secondary analysis was conducted among the entire cohort ($N = 200$) of women, irrespective of randomization, and linked survey predictor data from the women's baseline and follow-up study visits to clinical outcome data.

Data Collection

Data were collected on paper forms for all three study visits and then double entered into a Microsoft Access database. Adherence and retention data for the one-month HIV clinic follow-up appointment were collected by providers and entered into Malawi's Baobab electronic medical record system and linked to the study data using unique identifiers. For this analysis, we created a single dataset merging these two data sources.

Measures

The outcomes of interest were retention in HIV care and adherence to ART, based on electronic HIV clinic records (Douglas et al., 2010). ART refill visits were scheduled within 30 days of the initial visit. Retention was dichotomized into those who attended follow-up within 31 days versus those who did not. This strict definition of retention was selected as it allowed for only minor interruptions in pill-taking and did not preclude 95% ART adherence. At the follow-up visit, clinicians counted remaining pills and determined the number of pills taken. Adherence was calculated based on the number of pills taken divided by the number of days elapsed. We dichotomized adherence into those who had taken at

least 95% of their pills versus those who had not. A cutoff of 95% was selected for this study since this is a generally accepted level of pill adherence needed to attain viral suppression (Castelnuovo et al., 2016; Lima et al., 2008; Mutumba et al., 2016). To isolate adherence from retention, adherence analyses only included those who were retained.

We included male partner involvement variables if they reflected modifiable behaviors: attending cHTC together, whether or not the woman had disclosed her HIV-positive status to the male partner within one day of HIV diagnosis, and partner reminders to take ARTs. We hypothesized that cHTC could facilitate mutual awareness of the importance of care-seeking and retention and foster reciprocal behavioral support. Early disclosure could allow a woman to engage in ART-related behaviors without needing to hide her status. Partner reminders could help women remember to attend ART appointments or take pills.

Statistical Analysis

We calculated frequencies and percentages of demographic characteristics for those who did and did not attend cHTC, the primary outcome of interest in the main study.

Our analysis focused on which partner dynamics were associated with clinic retention and ART adherence using adjusted and unadjusted binomial regression analysis. A priori, we decided to adjust for female age and randomization status. Additionally, we explored adjustment for female education status, hunger in the past 30 days, whether the female partner earned a salary, and the type of flooring in the woman's house. These additional factors were selected as known potential confounders that existed in the dataset and were included in the adjusted models via backward elimination if they caused at least a 10% change in the beta coefficient for the factor of interest. Adjusted and unadjusted risk ratios (aRRs and RRs) were calculated with 95% confidence intervals (CIs). A p-value of 0.1 was considered a statistical trend and <0.05 was a significant association. A sensitivity analysis with an adherence cut-off of 90% assessed if trends were robust to a less strict definition.

The proportions who achieved 90% retention and 95% adherence were calculated and graphed as a cascade. Graphs were presented for the overall cohort and stratified by male involvement behaviors. Analysis was done using SAS 9.4.

Results

Sample

Two hundred women were enrolled, with a median age of 26 years (interquartile range (IQR) 22–30 years). Prior to enrollment, 11% self-reported having never been tested for HIV, 71% previously tested HIV-negative, and 18% previously tested HIV-positive. Of those who had tested HIV-positive previously, 25% had disclosed prior to the study. A majority of women (63%) did not know their partner's HIV status at baseline. Almost all women (99%) planned to deliver the invitation to a male partner who they were married to, living with, and believed to be the father of the current pregnancy. Median relationship length was 4 years (IQR 1–8 years).

As reported previously, 52% of those in the invitation only arm and 74% of those in the invitation plus tracing arm presented for cHTC, $p = .001$ (Rosenberg et al., 2015). This totaled to 126 couples attending cHTC (63%) and 74 couples not attending (37%) (Figure 1). Female baseline characteristics demonstrated similar distributions between these two groups (Table 1).

Of the 200 women at baseline, 182 (91%) attended the study follow-up visit where information on partner disclosure timing and partner ART reminders was collected. Of those 182, 9 (5%) disclosed prior to the study, 141 (77%) disclosed within one day of diagnosis, 18 (10%) disclosed between one day of diagnosis and the follow-up visit, and 14 (8%) did not disclose (Figure 1). In total, 82% disclosed within one day of diagnosis. Attrition analysis demonstrated no significant differences between those who completed the study follow-up visit and those who did not.

Of the 182 who completed the study follow-up visit, 177 were asked about partner ART reminders (97%) and 5 (3%) had missing information. Of those asked, 75% were being reminded by their partner to take ARTs.

Statistical Modeling

Of the 200 enrolled women, 179 (90%) returned for their first HIV clinic visit: 158 (79%) within 31 days, 15 (8%) from 32 to 60 days, and 6 (3%) after 60 days. The 21 who attended after 31 days and the 21 who did not attend at all were considered non-retained (Figure 1). Median time to follow-up was 28 days (IQR 28–30 days).

Receiving cHTC through the study was associated with improved retention (aRR 1.33, 95% CI 1.12, 1.59). There was little relationship between those who disclosed within one day of diagnosis and retention (aRR 1.08, 95% CI 0.91, 1.28). There was a trend between male partner ART reminders and improved retention (aRR 1.16, 95% CI 0.96, 1.39) (Table 2).

Of the 158 who attended HIV clinic follow-up within 31 days, median adherence was 96.4% (IQR 86.2%–100%). Median adherence for the 108 women (68%) with at least 95% ART adherence was 100% (IQR 96.6%–100%), while median adherence for the 50 (32%) non-adherers was 86.0% (IQR 77.7%–89.6%) (Figure 1). Among the subset of retained women, receiving cHTC through the study was not associated with ART adherence (aRR 1.01, 95% CI 0.80, 1.27). Those who disclosed within one day of diagnosis had comparable adherence to those who did not disclose or disclosed later (aRR 1.23, 95% CI 0.87, 1.73). Male partner ART reminders were not associated with 95% adherence (aRR 1.09, 95% CI 0.84, 1.41) (Table 2). These relationships were comparable when an adherence cut-off of 90% was used instead of a 95% cutoff (cHTC aRR 0.94; early disclosure aRR 1.27; ART reminders aRR 1.12).

Higher retention was achieved if one male partner involvement behavior (87–89%) or all three behaviors were exhibited (92%) than if any single behavior was absent (65–78% retention). Similarly, higher adherence was achieved if one behavior was exhibited (69%) or all three were exhibited (74%) than if any single behavior was absent (60–68% adherence) (Figure 2).

Discussion

This secondary analysis demonstrated that certain modifiable partner behaviors can positively influence certain 90–90–90 targets within an Option B+ program. Women who came for cHTC and those who received male partner reminders were more likely to return on time for a first follow-up visit, an indicator of the second “90”. Among those who experienced all three behaviors, 92% were retained on-time for their first ART refill visit, 12% higher than the overall cohort. Among this retained group, these three partner behaviors appeared to have little relationship with adherence, although all behaviors were on the protective side of the null.

cHTC was strongly associated with improved retention. Attending cHTC has previously been associated with women completing ART follow-up, but this was in a retrospective analysis with a looser definition of retention and not within Option B+ (Kalembo, Zgambo, Mulaga, Yukai, & Ahmed, 2013). Our findings reinforce WHO’s recommendation that cHTC is important for PMTCT and ART uptake (“WHO | Consolidated guidelines on HIV testing services,” n.d.). These findings add to the well-established benefits of cHTC for increasing condom use among HIV-discordant couples (Kilembe et al., 2015; McMahon et al., 2015). Interventions that target male partners, like cHTC, have been shown to improve HIV testing rates and couple communication (Kimani et al., 2015; Plazy et al., 2013). Our study builds on these previously reported benefits of cHTC by demonstrating the link between cHTC and HIV clinic retention in a new context.

Early disclosure was not statistically associated with improved retention, a surprising finding. However, those who disclosed early had somewhat greater retention (87%) than those who did not (78%). In qualitative work with this and other Option B+ populations, women explained that taking HIV medication was not possible without HIV status disclosure (Ebuy et al., 2015). Though we hypothesized that early disclosure was needed to prevent loss from the HIV care cascade within this vulnerable period after HIV diagnosis and care initiation (Haas et al., 2016), it might not be a prerequisite for retention. Alternatively, disclosure may not have been sufficient for pill-taking but instead supported cHTC, the more meaningful type of involvement. Thirdly, it is possible that a small association was present but undetected by our sample size.

Partner ART reminders were weakly associated with improved retention. Qualitative work in similar populations found reminder strategies to be a facilitator to both retention and ART adherence, leading to a recommendation that reminder devices and tools be used to improve adherence (Holtzman, Brady, & Yehia, 2015). Many reminder strategies, though, rely on mobile technology (Bezabhe, Chalmers, Bereznicki, Gee, & Peterson, 2016; Holtzman et al., 2015; Kebede, Zeleke, Asemahagn, & Fritz, 2015; Madhvani, Longinetti, Santacatterina, Forsberg, & El-Khatib, 2015). Women of lower education or socioeconomic status in sub-Saharan Africa might not have phones or utilize them as aids regularly (Madhvani et al., 2015). In fact, a substantial share of women in our study had no phone. In line with previous tuberculosis drug adherence literature regarding guardian-based direct observation (Manders et al., 2001), spoken partner reminders within the home for ART drug adherence are a

natural extension of the tuberculosis direct observation method of achieving regular reminders without relying on resource-intensive methods like mobile technology.

There were limited relationships between these three behaviors and adherence, although all three behaviors were on the protective side of the null. One possibility is that adherence was poorly measured, leading to null-biased results. Another possibility is that the effect size is modest and undetectable in this small sample. A third possibility is that cHTC does not adequately counsel on adherence strategies, and future cHTC may need to focus on partner support for adherence behaviors. Future work is needed to learn how to improve adherence in this population as couple-based interventions have been linked to improvements in ART adherence in other settings (El-Bassel et al., 2010). More specific ART adherence messaging within cHTC might contribute to male partner involvement improving women's adherence.

In the context of the 90–90–90 targets, the retention outcome is a marker of the second 90% target, retention in HIV care. Women with partners exhibiting all three of these behaviors had retention that exceeded 90%, whereas all other sub-populations did not. This strongly suggests that multiple male partner involvement strategies may be needed to achieve this first 90% target. The adherence outcome is a correlate to the third 90% target, viral suppression. Though subsequent viral suppression was not assessed, adherence is a strong predictor of viral suppression (Chi et al., 2009; Nachega et al., 2007). Using adherence as an indicator for viral suppression, the third 90% target was not met within any subpopulation but was highest amongst those with all three male partner behaviors. This suggests that male partner involvement strategies may also help the third 90% target, but additional or stronger adherence support is needed.

One limitation was a small sample size. Since 9% of women did not attend the study follow-up visit, our sample size was further reduced for certain analyses. Adherence analyses had smaller sample sizes than retention analyses, but this was a conscious analytic decision to determine if male involvement had any added benefits beyond retention.

Another limitation was the non-randomized design. Though the parent study was a randomized controlled trial, this secondary analysis was observational and may not have accounted for all possible confounders, such as partner power dynamics. However, the parent study found the study arm, which was strongly associated with cHTC-uptake, was associated with a more relaxed measure of Option B+ retention (Rosenberg et al., 2015).

Active male involvement interventions could play an important role in supporting Option B + 90–90–90 targets, especially the second “90,” retention in care. Strategies for increasing cHTC participation include prioritizing WHO recommendations for cHTC at the Ministry of Health level (“WHO | Consolidated guidelines on HIV testing services,” n.d.), distributing paper partner invitations at first ANC visits (Rosenberg et al., 2015), and increasing capacity for cHTC through training and reinforcing cHTC to HTC counselors. Future studies can further assess the effects of modifiable partner dynamics in achieving the latter two 90% targets of long-term ART retention and viral suppression, as well as mother-to-child transmission outcomes.

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REFERENCES

- Audet CM, Blevins M, Chire YM, Aliyu MH, Vaz LME, Antonio E, ... Vermund SH (2016). Engagement of Men in Antenatal Care Services: Increased HIV Testing and Treatment Uptake in a Community Participatory Action Program in Mozambique. *AIDS and Behavior*, 20(9), 2090–2100. 10.1007/s10461-016-1341-x [PubMed: 26906021]
- Audet CM, Chire YM, Vaz LME, Bechtel R, Carlson-Bremer D, Wester CW, ... González-Calvo L (2016). Barriers to Male Involvement in Antenatal Care in Rural Mozambique. *Qualitative Health Research*, 26(12), 1721–1731. 10.1177/1049732315580302 [PubMed: 25854615]
- Barr BT, Jahn A, Gupta SK, Maida A, & Chimbwandira F (n.d.). Option B+ in Malawi: Have 4 Years of “Treat All” Shown That 90–90–90 Is Achievable? | CROI Conference. Presented at the Conference on Retroviruses and Opportunistic Infections, Boston, USA Retrieved from <http://www.croiconference.org/sessions/option-b-malawi-have-4-years-treat-all-shown-90-90-90-achievable>
- Bezabhe WM, Chalmers L, Bereznicki LR, Gee P, & Peterson GM (2016). Antiretroviral adherence and treatment outcomes among adult Ethiopian patients. *AIDS Care*, 1–5. 10.1080/09540121.2016.1139039
- Bwirire LD, Fitzgerald M, Zachariah R, Chikafa V, Massaquoi M, Moens M, ... Schouten EJ (2008). Reasons for loss to follow-up among mothers registered in a prevention-of-mother-to-child transmission program in rural Malawi. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 102(12), 1195–1200. 10.1016/j.trstmh.2008.04.002 [PubMed: 18485431]
- Castelnuovo B, Kiragga A, Mubiru F, Kambugu A, Kamya M, & Reynolds SJ (2016). First-line antiretroviral therapy durability in a 10-year cohort of naïve adults started on treatment in Uganda. *Journal of the International AIDS Society*, 19(1). 10.7448/IAS.19.1.20773
- Chan AK, Kanike E, Bedell R, Mayuni I, Manyera R, Mlotha W, ... van Lettow M (2016). Same day HIV diagnosis and antiretroviral therapy initiation affects retention in Option B+ prevention of mother-to-child transmission services at antenatal care in Zomba District, Malawi. *Journal of the International AIDS Society*, 19(1). 10.7448/IAS.19.1.20672
- Chi BH, Cantrell RA, Zulu I, Mulenga LB, Levy JW, Tambatamba BC, ... Stringer JS (2009). Adherence to first-line antiretroviral therapy affects non-virologic outcomes among patients on treatment for more than 12 months in Lusaka, Zambia. *International Journal of Epidemiology*, 38(3), 746–756. 10.1093/ije/dyp004 [PubMed: 19223334]
- Clouse K, Schwartz S, Van Rie A, Bassett J, Yende N, & Pettifor A (2014). “What they wanted was to give birth; nothing else”: barriers to retention in option B+ HIV care among postpartum women in South Africa. *Journal of Acquired Immune Deficiency Syndromes* (1999), 67(1), e12–18. 10.1097/QAI.0000000000000263 [PubMed: 24977376]
- Cowan JF, Micek M, Cowan JFG, Napúa M, Hoek R, Gimbel S, ... Chapman RR (2015). Early ART initiation among HIV-positive pregnant women in central Mozambique: a stepped wedge randomized controlled trial of an optimized Option B+ approach. *Implementation Science: IS*, 10 10.1186/s13012-015-0249-6

- Crepaz N, Tungol-Ashmon MV, Vosburgh HW, Baack BN, & Mullins MM (2015). Are couple-based interventions more effective than interventions delivered to individuals in promoting HIV protective behaviors? A meta-analysis. *AIDS Care*, 27(11), 1361–1366. 10.1080/09540121.2015.1112353 [PubMed: 26608175]
- Douglas GP, Gadabu OJ, Joukes S, Mumba S, McKay MV, Ben-Smith A, ... Chimbwandira F (2010). Using Touchscreen Electronic Medical Record Systems to Support and Monitor National Scale-Up of Antiretroviral Therapy in Malawi. *PLOS Med*, 7(8), e1000319 10.1371/journal.pmed.1000319 [PubMed: 20711476]
- Dzangare J, Takarinda KC, Harries AD, Tayler-Smith K, Mhangara M, Apollo TM, ... Mugurungi O (2016). HIV testing uptake and retention in care of HIV-infected pregnant and breastfeeding women initiated on “Option B+” in rural Zimbabwe. *Tropical Medicine & International Health*, 21(2), 202–209. 10.1111/tmi.12637 [PubMed: 26555353]
- Ebuy H, Yebyo H, & Alemayehu M (2015). Level of adherence and predictors of adherence to the Option B+ PMTCT programme in Tigray, northern Ethiopia. *International Journal of Infectious Diseases*, 33, 123–129. 10.1016/j.ijid.2014.12.026 [PubMed: 25529555]
- El-Bassel N, Gilbert L, Witte S, Wu E, Hunt T, & Remien RH (2010). Couple-Based HIV Prevention in the United States: Advantages, Gaps, and Future Directions: *JAIDS Journal of Acquired Immune Deficiency Syndromes*, 55, S98–S101. 10.1097/QAI.0b013e3181fbf407 [PubMed: 21406997]
- Farquhar C, Kiarie JN, Richardson BA, Kabura MN, John FN, Nduati RW, ... John-Stewart GC (2004). Antenatal Couple Counseling Increases Uptake of Interventions to Prevent HIV-1 Transmission. *Journal of Acquired Immune Deficiency Syndromes* (1999), 37(5), 1620–1626. [PubMed: 15577420]
- Gourlay A, Birdthistle I, Mburu G, Iorpenda K, & Wringe A (2013). Barriers and facilitating factors to the uptake of antiretroviral drugs for prevention of mother-to-child transmission of HIV in sub-Saharan Africa: a systematic review. *Journal of the International AIDS Society*, 16(1). 10.7448/IAS.16.1.18588
- Haas AD, Tenthani L, Msukwa MT, Tal K, Jahn A, Gadabu OJ, ... Keiser O (2016). Retention in care during the first 3 years of antiretroviral therapy for women in Malawi’s option B+ programme: an observational cohort study. *The Lancet. HIV*, 3(4), e175–182. 10.1016/S2352-3018(16)00008-4 [PubMed: 27036993]
- Holtzman CW, Brady KA, & Yehia BR (2015). Retention in Care and Medication Adherence: Current Challenges to Antiretroviral Therapy Success. *Drugs*, 75(5), 445–454. 10.1007/s40265-015-0373-2 [PubMed: 25792300]
- Impact of an Innovative Approach to Prevent Mother-to-Child Transmission of HIV — Malawi, July 2011–September 2012 (n.d.). Retrieved March 12, 2016, from <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6208a3.htm>
- Kalembo FW, Zgambo M, Mulaga AN, Yukai D, & Ahmed NI (2013). Association between Male Partner Involvement and the Uptake of Prevention of Mother-to-Child Transmission of HIV (PMTCT) Interventions in Mwanza District, Malawi: A Retrospective Cohort Study. *PLOS ONE*, 8(6), e66517 10.1371/journal.pone.0066517 [PubMed: 23776683]
- Kebede M, Zeleke A, Asemahagn M, & Fritz F (2015). Willingness to receive text message medication reminders among patients on antiretroviral treatment in North West Ethiopia: A cross-sectional study. *BMC Medical Informatics and Decision Making*, 15 10.1186/s12911-015-0193-z
- Kilembe W, Wall KM, Mokgoro M, Mwaanga A, Disen E, Kamusoko M, ... Allen S (2015). Implementation of couples’ voluntary HIV counseling and testing services in Durban, South Africa. *BMC Public Health*, 15 10.1186/s12889-015-1959-z
- Kim MH, Zhou A, Mazenga A, Ahmed S, Markham C, Zomba G, ... Abrams EJ (2016). Why Did I Stop? Barriers and Facilitators to Uptake and Adherence to ART in Option B+ HIV Care in Lilongwe, Malawi. *PLoS ONE*, 11(2). 10.1371/journal.pone.0149527
- Kimani J, Warren CE, Abuya T, Ndwiga C, Mayhew S, Vassall A, ... Askew I (2015). Use of HIV counseling and testing and family planning services among postpartum women in Kenya: a multicentre, non-randomised trial. *BMC Women’s Health*, 15 10.1186/s12905-015-0262-6

- Lima VD, Harrigan R, Murray M, Moore DM, Wood E, Hogg RS, & Montaner JS (2008). Differential impact of adherence on long-term treatment response among naive HIV-infected individuals: *AIDS*, 22(17), 2371–2380. 10.1097/QAD.0b013e328315cdd3 [PubMed: 18981777]
- Madhvani N, Longinetti E, Santacatterina M, Forsberg BC, & El-Khatib Z (2015). Correlates of mobile phone use in HIV care: Results from a cross-sectional study in South Africa. *Preventive Medicine Reports*, 2, 512–516. 10.1016/j.pmedr.2015.06.010 [PubMed: 26844111]
- Manders AJE, Banerjee A, van den Borne HW, Harries AD, Kok GJ, & Salaniponi FML (2001). Can guardians supervise TB treatment as well as health workers? A study on adherence during the intensive phase. *The International Journal of Tuberculosis and Lung Disease*, 5(9), 838–842. [PubMed: 11573895]
- McMahon JM, Chimenti R, Trabold N, Fedor T, Mittal M, & Tortu S (2015). Risk of Intimate Partner Violence and Relationship Conflict Following Couple-Based HIV Prevention Counseling: Results From the Harlem River Couples Project. *Journal of Interpersonal Violence*. 10.1177/0886260515600878
- Mohlala BKF, Boily M-C, & Gregson S (2011). The forgotten half of the equation: randomized controlled trial of a male invitation to attend couple voluntary counselling and testing. *AIDS (London, England)*, 25(12), 1535–1541. 10.1097/QAD.0b013e328348fb85
- Mphonda SM, Rosenberg NE, Kamanga E, Mofolo I, Mwale G, Boa E, ... Hosseinipour MC (2014). Assessment of Peer-Based and Structural Strategies for Increasing Male Participation in an Antenatal Setting in Lilongwe, Malawi. *African Journal of Reproductive Health*, 18(2), 97–104. [PubMed: 25022146]
- Mutumba M, Musiime V, Lepkewski JM, Harper GW, Snow RC, Resnicow K, & Bauermeister JA (2016). Examining the relationship between psychological distress and adherence to anti-retroviral therapy among Ugandan adolescents living with HIV. *AIDS Care*, 28(7), 807–815. 10.1080/09540121.2015.1131966 [PubMed: 27294696]
- Nachega JB, Hislop M, Dowdy DW, Chaisson RE, Regensberg L, & Maartens G (2007). Adherence to Nonnucleoside Reverse Transcriptase Inhibitor–Based HIV Therapy and Virologic Outcomes. *Annals of Internal Medicine*, 146(8), 564–573. 10.7326/0003-4819-146-8-200704170-00007 [PubMed: 17438315]
- Nachega JB, Uthman OA, Anderson J, Peltzer K, Wampold S, Cotton MF, ... Mofenson LM (2012). Adherence to antiretroviral therapy during and after pregnancy in low-income, middle-income, and high-income countries: a systematic review and meta-analysis. *AIDS (London, England)*, 26(16), 2039–2052. 10.1097/QAD.0b013e328359590f
- Plazy M, Orne-Gliemann J, Balestre E, Miric M, Darak S, Butsashvili M, ... Desgrées du Loû A (2013). [Enhanced prenatal HIV couple oriented counselling session and couple communication about HIV (ANRS 12127 Prenahtest Trial)]. *Revue D'épidémiologie Et De Santé Publique*, 61(4), 319–327. 10.1016/j.respe.2013.02.013
- Rosenberg NE, Mtande TK, Saidi F, Stanley C, Jere E, Paile L, ... Hosseinipour M (2015). Recruiting male partners for couple HIV testing and counselling in Malawi's option B+ programme: an unblinded randomised controlled trial. *The Lancet. HIV*, 2(11), e483–e491. 10.1016/S2352-3018(15)00182-4 [PubMed: 26520928]
- Schouten EJ, Jahn A, Midiani D, Makombe SD, Mnthambala A, Chirwa Z, ... Chimbwandira F (2011). Prevention of mother-to-child transmission of HIV and the health-related Millennium Development Goals: time for a public health approach. *Lancet (London, England)*, 378(9787), 282–284. 10.1016/S0140-6736(10)62303-3
- TENTHANI L, HAAS AD, TWEYA H, JAHN A, van OOSTERHOUT JJ, CHIMBWANDIRA F, ... KEISER O (2014). Retention in care under universal Antiretroviral Therapy for HIV Infected Pregnant and Breastfeeding Women ("Option B+") in Malawi. *AIDS (London, England)*, 28(4), 589–598. 10.1097/QAD.0000000000000143
- UNAIDS. (2014). 90–90–90 - An ambitious treatment target to help end the AIDS epidemic. Retrieved from http://www.unaids.org/sites/default/files/media_asset/90-90-90_en_0.pdf
- van Lettow M, Bedell R, Mayuni I, Mateyu G, Landes M, Chan AK, ... van Oosterhout JJ (2014). Towards elimination of mother-to-child transmission of HIV: performance of different models of care for initiating lifelong antiretroviral therapy for pregnant women in Malawi (Option B+). *Journal of the International AIDS Society*, 17(1). 10.7448/IAS.17.1.18994

WHO | Consolidated guidelines on HIV testing services. (n.d.). Retrieved May 24, 2016, from <http://www.who.int/entity/hiv/pub/guidelines/hiv-testing-services/en/index.html>

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Figure 1. Female Visit Flow Chart. Figure 1 shows the flow of enrolled women through the study visits and ART follow-up visit and accounts for the varying populations for different associations.

Figure 2.

Retention & adherence proportion by behaviour. Figure 2 shows the proportion of retention and adherence achieved within each behavior category. The proportion within the gray adherence bars reflect that of the total population, while the percentages above the gray bars represent the percentage that achieved 95% ART adherence amongst those who were retained. The percentages written above the black and gray bars roughly correspond to the latter two 90% UNAIDS targets.

Table 1.

Female Baseline Characteristics

	Reported for cHTC		Did Not Report for cHTC		P-value
	N=126	%	N=74	%	
Age					0.3
16–17	0	0%	2	3%	
18–25	55	44%	31	42%	
26–35	66	52%	38	51%	
36	5	4%	3	4%	
Education					0.5
Primary incomplete	50	40%	38	51%	
Primary completed	18	14%	12	16%	
Secondary incomplete	38	30%	14	19%	
Secondary completed	20	16%	10	14%	
Floor					0.5
Dirt/dung	30	24%	21	28%	
Cement/tile	96	76%	53	72%	
Hunger in the last month					0.5
No	108	86%	61	82%	
Yes	18	14%	13	18%	
Earns salary					0.8
No	118	94%	70	95%	
Yes	8	6%	4	5%	
Age Difference with Partner*					0.5
> 5 years younger	54	43%	31	42%	
5 yrs younger to 5 yrs older	69	55%	42	58%	
> 5 years older	2	2%	0	0%	

* Ages missing for two partners; the denominators are 125 and 73 respectively.

Table 1 shows baseline female characteristics for the 126 women who attended cHTC with their partners compared to the 74 who did not.

Table 2.

Associations with 95% Confidence Intervals.

	Retention					Adherence if Retained				
	Unadjusted		Adjusted			Unadjusted		Adjusted		
	Sample	RR	95% CI	p-value	RR	95% CI	p-value	RR	95% CI	p-value
cHTC During Study	200	1.35	1.12 – 1.61	0.001	1.33	1.12 – 1.59	0.001	1.04	0.82 – 1.31	0.8
Disclosed by Day 1	182 ^a	1.12	0.92 – 1.36	0.3	1.08	0.91 – 1.28	0.4	1.16	0.82 – 1.63	0.4
Partner ART Reminder	177 ^b	1.18	0.99 – 1.41	0.06	1.16	0.96 – 1.39	0.1	1.01	0.78 – 1.32	0.9

Table 2 shows unadjusted and adjusted risk ratios and confidence intervals between male partner involvement predictors and the outcomes of interest, retention and adherence. Sample sizes are less than 200 because:

- a)* 182 women came to the study follow-up visit and shared about disclosure timing
- b)* 177 women came to follow-up visit and responded to questions about partner ART reminders
- c)* 158 women came to their one-month ART refill visit within 31 days
- d)* 156 women came to their one-month ART refill visit within 31 days and shared about disclosure timing at the study follow-up visit, and
- e)* 152 women came to the one-month ART refill visit within 31 days and responded to questions about partner ART reminders at the study follow-up visit.