



Effects of economic empowerment and relationship strengthening intervention on financial behaviors among couples living with HIV: The *Mlambe* pilot trial in Malawi

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ABSTRACT

Introduction: Economic insecurity, relationship issues, and gender-based financial disparities pose significant challenges for couples living with HIV in sub-Saharan Africa, potentially undermining treatment adherence and health outcomes. We evaluated *Mlambe*, an integrated economic empowerment with relationship strengthening intervention for couples living with HIV.

Methods: We conducted a pilot randomized controlled trial in Zomba, Malawi with 78 married couples (156 individuals) living with HIV and reporting unhealthy alcohol use based on the AUDIT-C. Couples were recruited from HIV care clinics and randomized to either the *Mlambe* intervention (n = 39 couples) or enhanced usual care (EUC) control (n = 39 couples). The 10-month *Mlambe* intervention combined incentivized savings accounts, financial literacy education, relationship education, and couples' counseling. EUC included brief alcohol counseling. We used linear mixed-effects models to evaluate *Mlambe*'s impact on (i) confidence to save, (ii) attitudes towards savings, (iii) equitable financial decision-making.

Results: At 10 months follow-up, participants in the *Mlambe* intervention showed significantly higher confidence to save compared to EUC (coefficient = 0.18, 95% CI: 0.05, 0.32, p < 0.001), with women having greater improvements than men (p < 0.001). However, these effects were not sustained at 15 months. No significant differences were observed between arms in attitudes towards savings. Participants in the intervention showed greater equitable financial decision-making at 10 months (coefficient = 0.13, 95%CI: 0.11, 0.25; p = 0.03) compared to EUC, with effects sustained at 15-months (coefficient = 0.21, 95% CI: 0.11, 0.32, p < 0.001).

Conclusion: Our findings suggest that *Mlambe* intervention holds promise, underscoring the benefits of an integrated economic and relationship strengthening interventions among HIV-affected couples.

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1. Introduction

The global HIV epidemic continues to pose serious challenges, particularly in resource-limited settings. While access to antiretroviral therapy (ART) has expanded and new infection rates have declined, people living with HIV (PLWH) continue to face complex challenges that extend beyond the disease itself (Bekker et al., 2018). Multiple interconnected social and behavioral factors—including substance abuse, violence, and poverty—create a compounding effect that significantly

impacts health outcomes of PLWH (Singer et al., 2017). These overlapping conditions, known as syndemic factors, can adversely impact the overall health and well-being of PLWH (Singer et al., 2017). Research demonstrates that HIV-related expenses and alcohol consumption can deplete household resources, exacerbating poverty, and compromise ART adherence (Conroy et al., 2019; Pinto et al., 2013; Velloza et al., 2020). Moreover, economic stress strains family relationships that provide social support and contribute to overall poor health (Conger et al., 2010; Conroy et al., 2018; Viseu et al., 2018). Economic instability may

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also increase high-risk behaviors, including transactional sex or increased alcohol use, further complicating HIV management (Cust et al., 2021; Woolf-King & Maisto, 2011).

In recent years, there has been a growing recognition of the importance of addressing economic determinants of health along with biomedical or behavioral approaches to HIV prevention, care, and treatment (Cust et al., 2021; Wolfe, 2009). Many such interventions for PLWH have been tested in various sub-Saharan African contexts with adolescents and young women, with promising results. For instance, in Zimbabwe, the SHAZ (Shaping the Health of Adolescents in Zimbabwe)! intervention targeted adolescent female orphans aged 16–19, combining microfinance, life skills, vocational training, and social support (Dunbar et al., 2014). This intervention demonstrated significant improvements, including improved HIV knowledge, higher condom use, lower risk of transactional sex, and reduced food insecurity among participants. Similarly, the IMAGE study in South Africa found that combining microfinance with gender and HIV training led to reduced intimate partner violence and HIV risk behaviors, and increased uptake of voluntary counseling and testing for HIV (Knight et al., 2020; Pronyk et al., 2006, 2008). A cluster randomized control trial in Kazakhstan, which analyzed a combined microfinance intervention and a HIV risk reduction strategy decreased the odds of physical violence by past partners (Witte et al., 2023). Another economic-strengthening intervention, *Suubi* in Uganda, demonstrated beneficial effects on various outcomes among adolescents living with or at risk for HIV, including improved mental health, enhanced family cohesion, reduced sexual risk-taking behaviors, and increased rates of virologic suppression (Ssewamala et al., 2009). In Malawi, a cluster randomized trial investigated the impact of village savings and loan associations (VSLA) in a general population, not specifically targeting people living with HIV over a two-year period, and found significant positive effects on several outcomes, including increased daily meal consumption, improved household expenditure, and enhanced housing conditions. These improvements were attributed to increased savings and credit obtained through VSLAs, which facilitated greater agricultural investments and income from small businesses (Ksoll et al., 2016).

Research from Malawi and South Africa further emphasizes the importance of couple-based interventions in addressing the interplay between harmful alcohol use, ART adherence, and relationship dynamics among PLWH (Conroy et al., 2017, 2019; Conroy, Ruark, McKenna, et al., 2020; Woolf-King et al., 2019). Couple-based approaches to HIV interventions have shown promising results across various African contexts, however less research has focused on economic approaches with couples. Couples HIV testing and counseling (CHTC) has been widely implemented in sub-Saharan Africa and has demonstrated effectiveness in increasing HIV testing rates and facilitating mutual status disclosure among heterosexual partners (Becker et al., 2014; Darbes et al., 2014; Pettifor et al., 2014; Turan et al., 2018). These findings highlight the potential benefits of targeting couples rather than individuals in HIV prevention and treatment efforts.

The rationale for economic strengthening interventions with couples living with HIV is compelling. The association between economic stress, alcohol use, and depressive symptoms underscores the potential mental health benefits of economic empowerment (de Goeij et al., 2015; Lund et al., 2011, 2018; Patel et al., 2018; Tsai et al., 2022). By addressing these interconnected structural challenges, economic strengthening interventions can provide a holistic approach to HIV care that extends beyond ART. By improving financial stability, PLWH may be better positioned to prioritize and maintain their treatment regimens (Swann, 2018b). Prior reviews have highlighted the potential of economic interventions to enhance both HIV prevention and care outcomes. Specifically, savings-based interventions combined with financial literacy training present a sustainable option for breaking the cycle of poverty among PLWH by facilitating investments, building liquid assets, and imparting lifelong financial knowledge (Allen & Panetta, 2010; Swann, 2018a, 2018b). Further, couples can mutually reinforce positive

financial behaviors and collaborate on household economic decisions, potentially amplifying the intervention's impact. This approach aligns with the concept of "dyadic coping" where partners can work together to manage stressors, such as financial strain and HIV management (Bodenmann, 2005; Gamarel & Revenson, 2015).

Malawi's HIV response provides insights into both achievements and ongoing challenges of addressing HIV in resource-limited settings. The country has achieved significant milestones in its fight against HIV, including surpassing the 2030 viral load suppression target and making sizable strides toward UNAIDS 95-95-95 targets (Payne et al., 2023). These achievements showcase the country's capacity to implement effective strategies and evidence-informed interventions. However, challenges remain, particularly in HIV awareness among certain populations and in ensuring continued care and treatment adherence. Despite the promising evidence for economic strengthening interventions and couple-based approaches, few interventions have jointly addressed economic and relationship strengthening together. This gap offers an opportunity to build on existing successes and generate findings valuable not only for Malawi but also for other resource-limited settings facing similar HIV management challenges.

We designed and tested the *Mlambe* intervention to concurrently address multiple syndemic factors affecting HIV management, including economic instability, unhealthy alcohol use, and intimate partner violence. The intervention targeted Malawian couples with at least one partner on ART who reported heavy alcohol use (Conroy et al., 2023). Initial findings from the pilot that reported on feasibility, acceptability, and preliminary efficacy of *Mlambe* found that the intervention was highly feasible and showed promising trends in reducing alcohol use and improving HIV outcomes among couples in Malawi (Conroy, Hahn, et al., 2024). Another paper that examined the effects of *Mlambe* on intimate partner violence and relationship dynamics found that the intervention improved couple relationships and reduced intimate partner violence compared to enhanced usual care, with particularly strong effects among women (Conroy, Ruark, et al., 2024).

Given *Mlambe*'s significant economic strengthening component, we hypothesized that the intervention would also improve financial outcomes. This paper examined the impact of *Mlambe* on attitudes toward financial savings, confidence in couples' ability to save, and household financial decision-making. We also explored whether these effects varied by gender. By focusing on these outcomes, we sought to understand how economic empowerment interventions can address the complex needs of couples affected by HIV in high-prevalence settings.

1.1. Theoretical framework

The *Mlambe* intervention is grounded in asset theory within the unique socioeconomic setting of sub-Saharan Africa. Asset theory, developed by Sherraden, proposes that owning assets can yield a broad spectrum of benefits, including better expectations for future resources, a more optimistic outlook, increased feelings of security (Garnezy, 1985), and improved capacity for future planning (Sherraden, 1990, 2016). In sub-Saharan Africa, where both formal institutions (statutory laws and policies) and informal institutions (customary laws and social expectations) govern economic interactions, asset ownership becomes particularly crucial for marginalized populations, including those affected by HIV/AIDS (Kagotho, 2015).

Growing evidence in the context of HIV/AIDS posits that asset ownership plays a crucial role in alleviating poverty, fostering positive attitudes and behaviors, enhancing psychosocial functioning and stability, and increasing risk-averse behaviors (Jennings et al., 2016; Ssewamala et al., 2009, 2016). These benefits are especially significant given that individuals, especially women and children, affected by HIV often face economic disenfranchisement through the misappropriation and loss of household assets, particularly when customary and statutory laws misalign or are weakly enforced (Kagotho, 2015). These theoretical foundations offer a basis for the potential benefits of economic

interventions for individuals and communities affected by HIV/AIDS. The *Mlambe* intervention applies these principles by providing couples living with HIV opportunities for accumulating financial resources through incentivized savings accounts and financial literacy training. This financial strengthening approach aims to offer participants hope for better future through education and investment, thereby improving their overall well-being and HIV management. By combining economic strengthening with relationship skills education, *Mlambe* seeks to create a comprehensive intervention that addresses both the financial and psychosocial aspects of living with HIV, in line with the multifaceted benefits proposed by asset theory and the institutional environment in which these couples navigate their lives.

2. Methods

2.1. Intervention

The *Mlambe* intervention combined economic empowerment activities (incentivized savings accounts and financial literacy training) with relationship-strengthening components (relationship skills education and communication training) (Conroy et al., 2023; Conroy, Hahn, et al., 2024; Conroy, Ruark, et al., 2024). Economic strengthening activities were adapted from *Suubi* (meaning hope) in Uganda, which included incentivized, couple savings accounts, and financial literacy training (Jennings et al., 2016; Ssewamala et al., 2010, 2012). We posited that gaining relationship skills would help couples work together on financial goals and reduce alcohol use while increasing savings, and financial stability would alleviate stress on couples, encourage planning for the future, and reduce drinking, thereby enhancing couple functioning.

The *Mlambe* intervention consisted of 10 sessions, with session lengths ranging from 75 min to 235 min, averaging approximately 2 h and 15 min per session. Male-female facilitator pairs with backgrounds in education and counseling delivered the sessions at community-based locations or HIV clinics. The structured manual covered economic and relationship strengthening activities, including topics such as alcohol's impact on health and relationships, banking services, budgeting, savings, debt management, relationship quality, gender dynamics, and communication skills. Alcohol reduction themes were integrated throughout the sessions. Couples also negotiated and signed a couple financial agreement to document their agreement around who could make savings withdrawals and how communication would occur. Eight sessions were group-based, while two were individual couple counseling sessions focused on communication skills. At the intervention's outset, couples opened joint bank accounts and were eligible for a 1:1 match incentive for deposits up to \$10 per month. Savings could be accessed for medical expenses, school fees, or business costs. The final session included advice from community-based extension workers on family business goals such as animal husbandry or growing vegetables for a produce stand, with ongoing support provided. Upon completion of the savings period at 10 months, couples could access their remaining savings, and the matched funds if they attended at least eight out of ten sessions, for investment in income-generating activities (IGA). All couples started an IGA suited to their family needs, such as purchasing agricultural inputs to grow and sell produce or livestock raising. Couples had until the 15-month visit to use combined savings plus match to fund their IGAs. The intervention was developed using Malawi's cultural context, where traditional gender norms often limit women's financial autonomy within marriages. Our formative work revealed that while men traditionally held 'financial mastery' in families, there was community recognition of the need for greater women's involvement in financial decisions (Conroy et al., 2023). *Mlambe* was designed to address this cultural dynamic through a couple-based approach, which local stakeholders believed could 'encourage the wife or partner to start taking part in the finances in the home' (Conroy et al., 2023).

We randomized couples to either the *Mlambe* intervention or enhanced usual care (EUC). Participants in the EUC control arm received

standard care as defined by the Malawi Ministry of Health guidelines for adult HIV clinical management (Ministry of Health Malawi, 2018), supplemented with a 10–15 min brief alcohol counseling session based on the WHO brief intervention protocol (Babor et al., 2001). The standard care components as part of EUC control arm included routine monitoring of alcohol-related medication non-adherence, treatment failure, and hepatic complications. The brief alcohol counseling was integrated into this usual care framework. EUC took place immediately after randomization ceremony wherein couples assigned to EUC received the 10–15 alcohol counseling session.

To ensure balanced study arms, we used a computer-generated randomization process with randomly permuted block sizes. Seventy-eight couples were recruited in groups of 20, with three groups comprising couples from individual clinic sites and one group mixing couples from all sites. Within each group of 20, couples were randomized in smaller blocks (of sizes 2 or 4) to prevent prediction of assignments. After enrolling each group of 20 couples, we conducted a randomization ceremony where couples drew envelopes containing their group assignment from a box. Details on training and fidelity assessment for intervention activities have been reported elsewhere (Conroy, Hahn, et al., 2024).

2.1.1. Sample

For this pilot study, we targeted a sample size of 80 couples (40 per condition), primarily to assess feasibility and acceptability rather than for hypothesis testing or effect size estimation. This sample size was chosen based on practical considerations and the focus on the feasibility and acceptability of the intervention. Our a priori conceptual model hypothesized that the combined economic and relationship activities would directly improve relationship dynamics and IPV, subsequently leading to behavior changes in alcohol use and ART adherence (Conroy et al., 2023).

While pilot studies are not typically designed to test health effects due to the need for design adjustments to optimize recruitment, retention, and participation (Kraemer et al., 2006; Leon et al., 2011; Moore et al., 2011; Pilot Studies, n.d.; Thabane et al., 2010), we conducted an analysis to explore potential effects on attitudes towards savings, confidence in the ability to save, and equitable financial decision-making as precursors to alcohol reduction and improved ART adherence.

2.1.2. Measures

Data collection for this study spanned from June 2021 to July 2023. We assessed couples at three time points: baseline, 10 months post-intervention initiation, and 15 months post-intervention initiation. Trained, gender-matched interviewers administered questionnaires using REDCap forms programmed onto tablet devices. These questionnaires gathered information on socio-demographic characteristics, couple characteristics (e.g., relationship duration), and other themes such as savings behaviors, economic strengthening, and relationship dynamics. All measures were translated into Chichewa, back-translated to English to ensure correctness of translations, and pilot tested.

The outcomes of interest in this paper included.

- (i) Attitude towards saving was assessed by asking about the importance of savings for six goals relating to personal development (for self or child), family business, educational expenses (for family members), familial assistance, buying an animal for income generation, and moving into one's own home. Couples were asked to state the importance of each savings goal and how important it was for them to be able to save for each item using a five-point Likert scale (1 = not important at all; 5 = extremely important). For instance, "How important is it that you can save money for personal development such as vocational, technical, or job training for yourself or your child?" This scale has been previously validated for use among adolescents in sub-Saharan Africa (Jennings et al., 2016). A total attitudinal score was then

calculated based on the mean of responses for the 6 items (scores ranging from 1 to 5). Higher scores on the attitude toward savings indicated more positive attitudes toward savings. The reliability of the scale was 0.92 in this sample, suggesting high internal consistency.

- (ii) Confidence to save was assessed by asking participants to state how confident they were in their ability to save for six goals relating to personal development (for self or child), family business, educational expenses (for family members), familial assistance, buying an animal for income generation, and moving into one's own home. Participants were asked to state their level of confidence for each savings goal and how confident they were in their ability to save for each item using a five-point Likert scale (1 = not confident at all; 5 = extremely confident). For instance, "How confident are you that you can save money for personal development such as vocational, technical, or job training for yourself or your child?" This scale has been previously validated for use among adolescents in sub-Saharan Africa (Jennings et al., 2016). A total confidence score was then calculated based on the mean of responses for the 6 items (scores ranging from 1 to 5). Higher scores on the confidence to save indicated greater confidence in their ability to save. The reliability of the scale was 0.89 in this sample, suggesting high internal consistency.
- (iii) Equitable financial decision-making power among couples was assessed by asking four questions about who makes financial decisions related to how the money they earn will be used, how the money earned by their partner will be used, major household purchases, and everyday household needs. The response options included respondent, partner, and joint. We recoded the variable such that jointly made decisions were coded as 1, and 0 otherwise. A total score was then calculated based on the mean of responses for the 4 items (scores ranging from 0 to 1). Higher scores indicated greater joint ability to make decisions. The reliability of the scale was 0.68 in this sample, suggesting moderate internal consistency.

Ethical approval

This study received ethical approval from the Human Research Protection Program at the University of California San Francisco and the National Health Science Research Committee in Malawi. Both partners provided written informed consent and were consented in separate, private rooms. The study was registered at [ClinicalTrials.gov](https://clinicaltrials.gov) (NCT # 04906616).

2.1.3. Statistical analysis

We first computed descriptive statistics to characterize the sample, including measures of central tendency for continuous variables and proportions for binary variables at baseline and follow-up, stratified by treatment arm. To assess the effect of the *Mlambe* intervention on post-intervention outcomes, we utilized two-level, linear mixed-effects models. These models included treatment arm as a fixed effect and a random effect for the dyad to account for the nesting of individuals within couples. We also explored potential moderation of treatment effects by gender. For models with significant interaction terms, we created plots to visualize the interaction patterns with gender. All analyses followed an intent-to-treat approach, including every couple in their original randomization group. We assumed that participants with incomplete data (<5%) were missing completely at random. All statistical analyses were conducted in Stata 15 (Stata Statistical Software: Release 15, 2017).

3. Results

Sample characteristics are summarized in Table 1. We enrolled 78 couples (156 individuals) who were randomized to either *Mlambe* or EUC. The mean age of participants was 43.4 years (SD = 10.2), with no

Table 1

Baseline characteristics of the Mlambe study sample of couples by treatment arm.

Variable	Overall (N = 156)	<i>Mlambe</i> Arm (n = 78)	EUC Arm (n = 78)	Test statistic for difference between arms ^a	p- value
	% , Mean (SD)	% , Mean (SD)	%, Mean (SD)		
Age (years; range: 21–80)	43.4 (10.2)	43.2 (10.1)	43.7 (10.3)	−0.41	0.841
Primary school education or less	78.2	79.5	76.9	0.15	0.701
Severe food insecurity	57.1	53.9	60.3	−0.30	0.447
Relationship duration (years)	13.7 (10.7)	13.3 (9.17)	14.2 (12.1)	−0.93	0.695
Parity	4.6 (2.2)	4.2 (1.8)	5.1 (2.4)	0.14	0.756
Attitude towards saving (range: 3–5)	4.5 (0.5)	4.5 (0.5)	4.5 (0.5)	−0.02	0.764
Confidence in the ability to save (range: 2.8–5)	4.4 (0.6)	4.4 (0.6)	4.4 (0.6)	−0.07	0.437
Equitable financial decision- making (range: 0–1)	0.3 (0.3)	0.3 (0.3)	0.3 (0.3)	0.04	0.482

^a Baseline differences between variables was estimated using random effects models to account for the clustering of participants within dyads.

significant difference between arms. Most participants (78.2%) had primary school education or less, and over half (57.1%) reported severe food insecurity. The average relationship duration was 13.7 years (SD = 10.7), and mean parity was 4.6 (SD = 2.2). At baseline, most participants (87.2%) experienced some level of food insecurity with 57.1% reporting severe food insecurity. The *Mlambe* and EUC arms showed comparable financial attitudes. Both arms demonstrated high levels of confidence in saving for various purposes, with percentages ranging from 80.7% to 96.1% across categories. Similarly, attitudes towards saving were overwhelmingly positive, with over 90% of participants in both arms rating saving as extremely or very important for achieving financial goals. Over the 10-month savings period, couples in the *Mlambe* arm saved a total of \$57 USD (range: \$13 to \$137) on average. Including the matched component, couples accumulated \$106 USD (range: \$31–206) on average of personal savings plus the incentivized match.

In terms of equitable financial decision-making, 39.1% and 37.1% of participants jointly decided how the money the respondent earns, and their partner earns will be used, respectively. Less than a quarter (23.7%) of couples jointly decided about major household purchases and about 15% jointly decided about purchases for daily household needs. Of note, the *Mlambe* arm showed slightly higher percentages of joint decision-making for most of the indicators. Overall, the baseline data was generally well-balanced, with no statistically significant differences between the arms (Table 1).

3.1. Main effects on attitudes toward savings, confidence to save, and financial decision-making power within the couple

Table 2 presents between-arm differences in attitudes towards savings, confidence to save, and equitable financial decision-making power within the couple at baseline, 10 months, and 15 months. We did not observe any statistically significant differences between study arms at any time point for attitudes towards savings. Both arms showed a slight

Table 2

Between-arm differences in financial confidence and decision-making (N = 156 individuals; 78 couples).

Outcome variable	Mlambe arm	EUC arm	Coef.	95% CI	p
Attitude towards savings (range: 1–5)					
Baseline	4.47 (0.52)	4.50 (0.55)	−0.03	−0.14, 0.08	0.64
10-months	4.31 (0.41)	4.31 (0.37)	0.01	−0.12, 0.13	0.911
15-months	4.38 (0.46)	4.34 (0.48)	0.04	−0.11, 0.18	0.580
Confidence in the ability to save (range: 1–5)					
Baseline	4.40 (0.56)	4.47 (0.57)	−0.07	−0.22, 0.08	0.355
10-months	4.27 (0.43)	4.08 (0.47)	0.18	0.05, 0.32	<0.001
15-months	4.21 (0.65)	4.24 (0.50)	−0.02	−0.19, 0.14	0.736
Equitable financial decision-making (range: 0–1)					
Baseline	0.30 (0.33)	0.26 (0.35)	0.03	−0.06, 0.13	0.450
10-months	0.55 (0.35)	0.42 (0.37)	0.13	0.01, 0.25	0.030
15-months	0.73 (0.28)	0.51 (0.38)	0.21	0.11, 0.32	<0.001

decrease in attitudinal scores at 10 months, with a small rise at 15 months, but these changes were not significantly different between arms. From baseline to 15 months, both arms showed small decreases in attitudes towards savings (*Mlambe*: 0.09, *EUC*: 0.16), with the *Mlambe* arm showing a smaller decline (difference of 0.07).

In terms of confidence to save, the *Mlambe* arm showed significantly higher confidence in the ability to save compared to the *EUC* arm (coefficient = 0.18, 95% CI: 0.05, 0.32, $p < 0.001$) at 10 months. However, there were no significant differences between arms observed at 15 months. Confidence in the ability to save decreased in both arms (*Mlambe*: 0.19, *EUC*: 0.23), with the *Mlambe* arm showing a slightly smaller decrease (difference of 0.04).

Regarding equitable financial decision-making power within the couple, the *Mlambe* arm showed significantly higher equitable financial decision-making compared to the *EUC* arm (coefficient = 0.13, 95% CI: 0.01, 0.25; $p = 0.03$) at 10 months, and this was retained at 15 months. At 15 months, there was a statistically significant difference in equitable financial decision-making between the *Mlambe* and *EUC* arms (coefficient = 0.21, 95% CI: 0.11, 0.32, $p < 0.001$). From baseline to 15 months, the *Mlambe* arm showed greater improvements than *EUC* in equitable financial decision-making (increase of 0.43 vs increase of 0.25).

3.2. Moderation results for attitudes towards savings, confidence to save, and financial decision-making power by gender

We tested whether the effects of the intervention on financial outcomes differed by gender at 10 months and 15 months. The interaction term for gender and treatment arm were non-significant for all outcomes, including attitudes towards savings, confidence to save, and equitable financial decision-making power within the couples, except for confidence to save at 10-months ($p < 0.001$). Women in the *Mlambe* arm reported greater improvements in confidence to save as compared to those in *EUC*. The interaction is depicted in Fig. 1.

4. Discussion

This pilot trial evaluated the effects of the *Mlambe* intervention, a combined economic and relationship strengthening program, on attitudes towards savings, confidence to save, and financial decision-making power among couples living with HIV in Malawi. The *Mlambe* intervention significantly improved participants' confidence to save at 10 months, particularly among women. While this improvement was not maintained at the 15-month follow-up, this decline likely reflects the intended program trajectory where couples withdrew their combined savings and matching funds to invest in income-generating activities (IGAs) between the 10- and 15-month visits. The temporary decrease in savings confidence may thus represent a natural transition period as couples move from active savings to investments in their businesses. The intervention led to greater equity in financial decisions among couples at 10 months compared to *EUC*, and this effect not only persisted but was stronger at 15 months. While the intervention did not significantly affect overall attitudes towards savings, the improvement in confidence to save, especially among women, suggests that combined economic and relationship interventions may help address gender-based barriers to financial empowerment, aligning with calls for integrated approaches to address the intersections of economic vulnerability and HIV (Gupta et al., 2011).

The short-term improvement in confidence to save is a promising result. This aligns with previous research on economic strengthening interventions for vulnerable populations, such as the *Suubi-Maka* project in Uganda, which demonstrated positive impacts on savings behaviors and attitudes among AIDS-orphaned adolescents over a 24-month

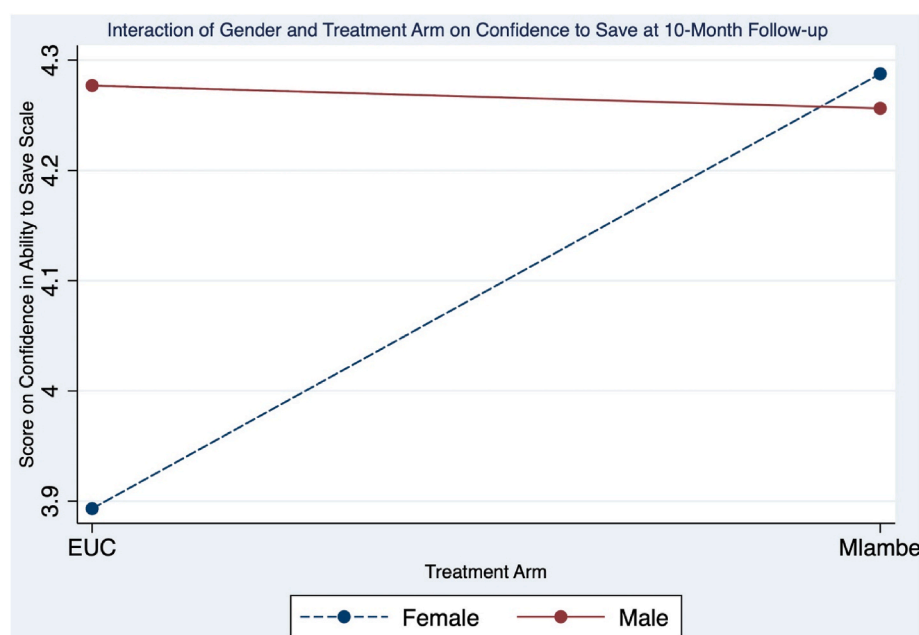


Fig. 1. Confidence to save at 10-month follow-up: Interactions with gender.

period (Jennings et al., 2016; Ssewamala et al., 2010). While *Suubi-Maka* showed longer-term effects on savings accumulation (92% of intervention youth had savings vs. 43% of controls at 24 months), their population and intervention design differed from *Mlambe*. *Suubi-Maka* targeted individual adolescents with ongoing savings opportunities, whereas *Mlambe* worked with couples and intentionally transitioned from savings to business investment at 10 months.

The gender difference in confidence to save at 10 months suggests that the *Mlambe* intervention may have had a particularly empowering effect on women's financial self-efficacy. This finding is noteworthy given that women often face greater economic vulnerabilities in the context of HIV (Gupta et al., 2011). Our results align with previous studies demonstrating that economic interventions for people living with HIV are more effective when they address both practical skills and underlying relationship dynamics that influence financial behaviors (Gibbs et al., 2012; Gupta et al., 2011).

However, it is important to note that this gender-differentiated effect was specific to savings' confidence, and did not extend to other financial outcomes or persist through the 15 months follow-up, suggesting the need for targeted strategies to sustain these initial gains in women's financial empowerment. This finding echoes challenges noted in other economic interventions for people living with HIV, where initial gains sometimes diminish over time (Swann, 2018a). The lack of sustained gender-differentiated effects should be understood within Malawi's cultural context. Our formative work revealed that while men traditionally held 'financial mastery' in families, there was community recognition of the need for greater women's involvement in financial decisions (Conroy et al., 2023). The attenuation of effects likely reflects two key mechanisms: first, the transition from active saving to business investment through IGAs represents a period where confidence may naturally decrease as savings are withdrawn for investment. Second, despite community support for couples 'working together' on finances, deeply entrenched gender norms and household power dynamics may reassert themselves once the active intervention period ends, potentially decreasing women's initial gains in financial confidence. Future iterations of the *Mlambe* intervention might consider incorporating strategically timed booster sessions or ongoing financial mentoring to help sustain improvements in savings confidence, especially as couples transition from initial business investment period.

We also found a significant and sustained improvement in equitable financial decision-making among couples in the *Mlambe* intervention both at 10 months and 15 months follow-up. This long-term impact on equitable decision-making is particularly important as it suggests the intervention likely addressed deeper relationship dynamics beyond just financial behaviors. Our finding of improved equitable financial decision-making aligns with emerging evidence from a complementary qualitative analysis, where couples described greater open communication and joint involvement in financial matters following the intervention (Gutin et al., 2023). This triangulation of quantitative and qualitative evidence strengthens confidence in the intervention's effects on couple-level financial behaviors. It also potentially shows that couples may have continued to develop and implement more equitable financial practices even after the formal intervention ended. This finding is critical in the context of HIV, where gender power imbalances in financial decisions can affect health outcomes and relationship quality (Conroy, 2020).

The absence of significant effects on attitudes towards savings was unexpected, given the intervention's focus on both economic and relationship strengthening. This could be due to a couple of factors. First, baseline attitudes towards savings were already highly positive in both arms, potentially creating a ceiling effect that limited room for improvement. Second, couples may have positive attitudes towards savings, but lower confidence to save in the absence of resources or skills.

Our study has several important limitations. First, the sample size (78 couples), while appropriate for a pilot study with a focus on

feasibility and acceptability (Conroy, Hahn, et al., 2024), may have limited our ability to detect smaller effects, particularly for secondary outcomes like equitable financial decision-making power. Second, our 15-month follow-up period was substantial compared to typical pilot studies, allowing us to observe both immediate post-intervention effects and initial evidence of sustainability. This timeframe captured important transitions as couples moved from completing the intervention to implementing financial strategies and investing in income-generating activities. However, economic behavior change can take multiple cycles of saving, investing, and realizing returns to become fully established. Longer follow-up periods of 24–36 months could provide insights into whether couples maintain their improved financial practices through multiple business cycles and economic fluctuations, particularly in contexts where seasonal variations may impact IGA (Gupta et al., 2011). Third, the high proportions of confidence to save and positive attitudes towards saving at baseline suggest some degree of social desirability bias. We implemented multiple strategies to minimize reporting bias, including careful interviewer training and private interviews. The observed effects on behavioral outcomes suggest meaningful engagement beyond socially desirable reporting. However, the high baseline scores may have created ceiling effects, making it more challenging to detect improvements in attitudinal measures. Fourth, while we collected dyadic data, we may not have fully captured the complex interpersonal dynamics that influence financial behaviors within couples living with HIV. Our qualitative analyses (reported separately) provide additional insights into these couple-level processes (Gutin et al., 2023). Finally, while our sample included couples from urban, peri-urban, and rural clinics, providing insights across different local contexts in Zomba district, our findings may not be generalizable to all couples living with HIV in Malawi. This is because participants were recruited from HIV care clinics in a single district and had to meet specific eligibility criteria, including reported unhealthy alcohol use. While our sample predominantly comprised low-income rural couples, which reflects the typical demographic in this region, caution should be exercised in generalizing these findings beyond this context.

Despite these limitations, our study has many strengths. Methodologically, we collected dyadic data from both partners, allowing us to examine financial dynamics within couples rather than relying on single-partner reports. We achieved high retention (96.8%, $n = 151$ participants) at both 10- and 15-month follow-up assessments, far exceeding our target retention of 75%. Retention was comparable between intervention (97.4%) and control (96.1%) arms at 15 months, with no evidence of differential attrition ($\chi^2 = 0.21$; $p = 0.64$). Our analytical approach using linear mixed-effects models appropriately handled the small amount of missing data (3.2% attrition) under the missing at random assumption, which is considered robust for longitudinal trials with such high retention rates. Our study intervention, which combined economic and relationship-strengthening components, aligns with recommendations for integrated approaches to address the intersections of HIV and economic vulnerability (Gupta et al., 2011). Our findings contribute to the growing body of evidence on integrated economic and relationship-strengthening interventions for PLWH. The *Mlambe* intervention's success in improving short-term savings confidence, particularly among women, suggests that combined economic and relationship-strengthening approaches have the potential to address the complex needs of couples living with HIV. However, the lack of sustained effects and limited impact on other outcomes highlight the need for further refinement of such interventions. The timing of our assessments was well-aligned with the intervention's implementation and expected effects. The 10-month assessment coincided with the completion of all intervention sessions, capturing the immediate post-intervention outcomes. The 15-month follow-up was strategically timed to assess longer-term effects, particularly as couples had opportunity to implement their learned financial strategies and invest in IGAs. This timing allowed us to observe both the immediate post-intervention effects at 10 months and the sustained impacts at 15 months,

particularly evident in the improvements in equitable financial decision-making. Rather than missing peak effects, our measurement schedule captured both the immediate post-intervention period and the phase when couples began realizing returns on their financial investments and behavioral changes.

Our research can inform future direction of this work and build upon these findings. First, studies should test strategies to maintain and extend the positive effects on savings confidence, particularly during key transition periods. Given that confidence may naturally decrease when savings are withdrawn for IGAs, booster sessions could be strategically timed to support couples during these transitions. Such sessions could help couples rebuild confidence as they move from active saving to business investment, and later as they begin generating revenue and rebuilding savings through their IGAs. Second, research should examine how to tailor the intervention for different subgroups, particularly considering variations in baseline economic status, geographic location (urban vs. rural), and relationship dynamics. Third, mixed methods research is needed to understand the mechanisms through which the intervention influences financial attitudes and behaviors, including how relationship dynamics mediate economic empowerment outcomes. Fourth, longitudinal studies should explore how improvements in savings confidence translate to actual savings behaviors, financial security, and ultimately to HIV-related outcomes such as treatment adherence and care engagement. Finally, future trials can incorporate objective measures of financial behaviors (e.g., bank account data, savings group records) alongside self-reported measures to better understand the intervention's impact on actual financial behaviors. These research directions would not only advance our understanding of integrated economic and HIV interventions but also inform the development of more effective, sustainable programs for couples living with HIV in resource-limited settings.

5. Conclusion

The *Mlambe* intervention showed promise in improving savings' confidence in the short term, particularly for women. The intervention also improved equitable financial decision-making among couples both in the short-term at 10-months and long-term at 15 months, though its impact on attitudes towards savings was limited. The gender-specific improvement in savings' confidence demonstrates the potential of concurrent economic and relationship strengthening approaches to address women's economic vulnerabilities in the context of HIV. However, the lack of sustained effects at 15 months of confidence to save and limited impact on attitudes towards savings underscores the complexity of addressing economic vulnerabilities among couples living with HIV, emphasizing prior research on the challenges of implementing sustainable economic interventions in HIV-affected populations (Gupta et al., 2011). Our findings suggest that while combined economic and relationship interventions hold promise, more intensive approaches may be needed to achieve lasting impact on financial behaviors within couples. Our findings highlight the need for continued innovation in designing and testing integrated economic and health interventions in resource-limited settings, particularly focusing on strategies to maintain intervention effects over time and address deeply rooted gender norms that influence financial dynamics within couples living with HIV.

CRedit authorship contribution statement

Lakshmi Gopalakrishnan: Writing – review & editing, Writing – original draft, Software, Formal analysis, Conceptualization. **Nancy Mulauzi:** Writing – review & editing, Project administration, Investigation, Conceptualization. **James Mkandawire:** Writing – review & editing, Project administration, Investigation, Funding acquisition, Conceptualization. **Fred M. Ssewamala:** Writing – review & editing, Methodology, Investigation, Conceptualization. **Scott Tebbetts:** Writing – review & editing, Project administration, Methodology,

Investigation. **Torsten B. Neilands:** Writing – review & editing, Methodology, Investigation, Formal analysis, Conceptualization. **Amy A. Conroy:** Writing – review & editing, Supervision, Methodology, Investigation, Funding acquisition, Conceptualization.

Ethical approval

This study received ethical approval from the Human Research Protection Program at the University of California San Francisco and the National Health Science Research Committee in Malawi. Both partners provided written informed consent and were consented in separate, private rooms. The study was registered at [ClinicalTrials.gov](https://clinicaltrials.gov) (NCT #04906616).

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Data availability

Data will be made available on request.

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