Published in final edited form as:
AIDS Care. 2010 September ; 22(9): 1093–1100. doi:10.1080/09540121003600352.

Mamekhaya: A pilot study combining a cognitive behavioral intervention and mentor mothers with PMTCT services in South Africa

Donna Futterman[a,*], **Jawaya Shea**[b], **Mitchell Besser**[c], **Stephen Stafford**[a], **Katherine Desmond**[d], **W. Scott Comulada**[d], and **Erin Greco**[d]

[a]Albert Einstein College of Medicine, Adolescent AIDS Program, Montefiore Medical Center, Bronx, NY, USA

[b]School of Child and Adolescent Health, University of Cape Town, Cape Town, South Africa

[c]Mothers2Mothers Program, Cape Town, South Africa

[d]Center for HIV Identification, Prevention, and Treatment Services, University of California, Los Angeles, CA, USA

Abstract

Nearly 30% of pregnant women in South Africa are estimated to be HIV seropositive, yet adherence to guidelines for the prevention of mother-to-child transmission of HIV (PMTCT) is often low. A pilot study was developed to see whether PMTCT services provided by the South African government could be enhanced by the Mamekhaya program, a combination of the mothers2mothers (M2M) peer-mentoring program and a culturally adapted cognitive-behavioral intervention (CBI) from the United States. Pregnant women attending two maternity clinics offering PMTCT in Gugulethu and Vanguard Townships, Cape Town, South Africa, were invited to participate in the study. Women at the intervention site (Gugulethu) received the support of a mentor mother and also attended an eight-session Mamekhaya CBI. At the control site (Vanguard), women received standard services provided by midwives and counselors. Baseline assessments were completed by all participants at enrollment (n = 160), and follow-ups were completed six months later by 44% of participants. Self-reports of adherence to PMTCT practices were high across both sites (90% or more engaging in the core practices). Women at the Mamekhaya site showed significantly greater improvement in establishing social support and reducing depression scores than women at the control site. Mamekhaya participants also showed trends for better attendance at follow-up medical visits, and greater improvements in positive coping. The greatest effect of the Mamekhaya program was to increase HIV knowledge scores, particularly with regard to understanding the meaning and importance of viral load and CD4 test results. Results from this pilot study show promise that augmenting basic PMTCT services with mentor mothers and a culturally adapted CBI can be effective in conveying information and in improving the emotional outlook and hopefulness of HIV-positive pregnant women in South Africa.

[*]Corresponding author. DFutterman@AdolescentAIDS.org.

Keywords

HIV; South Africa; intervention; mentor mothers; mother-to-child transmission

Introduction

It has been estimated that 28% of pregnant women attending antenatal clinics in South Africa are HIV-positive (South African Department of Health, 2008). Infected women can pass the virus on to their baby during pregnancy, childbirth, or breastfeeding, but programs for the prevention of mother-to-child transmission of HIV (PMTCT) have been proven effective if adhered to correctly (Coetzee et al., 2005; Sherman, Jones, Coovadia, Urban, & Bolton, 2004). In 2001, a program was started in South Africa to provide PMTCT at antenatal care centers (South African Department of Health, 2003). The medical recommendations for preventing transmission (use of antiretroviral medications [ARV] by the mother during late pregnancy and delivery, administering ARV to the baby after birth, exclusive breastfeeding or formula feeding for the first six months of life, testing the child for HIV), however, can be difficult to follow, especially in an environment where the health care system is overburdened (Chopra, Doherty, Jackson, & Ashworth, 2005; Jackson et al., 2007). Added to these challenges are the often difficult circumstances of the mother, who may be just finding out that she is HIV-positive (Simbayi et al., 2007).

Cognitive-behavioral interventions (CBIs) that were developed for people living with HIV in the United States have improved health behaviors and reduced mental health symptoms. CBIs often share common elements of providing information about medical care systems and helping participants learn how to identify problems, create and use social support systems, overcome environmental barriers, and acquire and maintain coping skills (Rotheram-Borus et al., 2009).

Mothers living with HIV (MLH) in South Africa are in need of education and psychosocial support. They must face the challenges of dealing with their diagnoses and following PMTCT programs that require practices counter to community norms (e.g., exclusive breast feeding). Health care providers are overextended and the needs of MLH, beyond PMTCT, are rarely addressed by the medical system (World Health Organization, 2003).

A local non-governmental organization, mothers2mothers (M2M), was established in 2001 to help reduce mother-to-child transmission of HIV, keep mothers healthy and alive to raise their children, reduce the stigma associated with HIV, and empower women. The M2M program provides individual and group information and psychosocial support to MLH, employing HIV-positive mentor mothers as positive role models. M2M works in health care facilities and collaborates with local health systems to complement the efforts of doctors, nurses, and counselors delivering PMTCT care. The program currently operates in over 500 communities in seven African nations, employing nearly 1500 HIV-positive women (Besser, 2006; Besser, personal communication, June 10, 2009).

The Mamekhaya (“respect for women” in the Xhosa language) program was created to pair the strengths of CBIs developed in the United States with the M2M model. The Mamekhaya

program took part in two phases. In the first phase, described by Futterman and colleagues (2006), the elements of effective CBIs were culturally adapted to be useful in the environment of South African perinatal care for HIV-positive women. In the second phase of the study, described here, a pilot evaluation of the Mamekhaya program was conducted at two different clinics. Participants at the control clinic received the standard care of the existing system, with support coming from nursing staff and counselors. The intervention clinic offered M2M and the Mamekhaya CBI as well. The purpose of this study is to examine the effectiveness of Mamekhaya as compared to existing PMTCT services.

Methods

All protocols were approved by the Montefiore Medical Center Institutional Review Board (Bronx, NY) and the University of Cape Town Ethics Committee. Recruitment took place at the Gugulethu Midwife Obstetric Unit and the Vanguard Community Health Center in Cape Town, Western Cape Province, during 2006 to 2007. Pregnant women attending the clinics who were diagnosed as HIV-positive were invited to participate in the study. Research staff approached the women at the first clinic visit in which they received their diagnosis. At both study sites, women were informed of a research study regarding the challenges of living with HIV and were asked whether they were willing to hear more about it. If a MLH agreed to participate, she was asked to sign an informed consent and was scheduled for the baseline interview. Mothers at both sites received standard PMTCT care from medical staff. In addition, MLH enrolled at the intervention site participated in the Mamekhaya program. Follow-up assessments were scheduled to be completed by participants in both arms of the study, six months after delivery.

Intervention

Mothers2Mothers—MLH were linked to mentor mothers who were also HIV-positive, had a child recently, had used PMTCT services, and were coping positively. Mentor mothers were trained to provide support through pregnancy and in the weeks following delivery. The training curriculum included knowledge of HIV/AIDS medical services, best infant feeding practices, safer sex, and strategies for disclosure, nutrition, and responding to stigma.

Cognitive Behavioral Intervention—MLH attended an eight-session small group CBI. Groups were conducted by two mentor mothers from the M2M program trained in CBI skills. This training included review of the intervention content, structure of the intervention modules, and pilot sessions. The eight sessions focused on four broad topics: 1. *Healthy Living* (staying in care, dealing with symptoms, learning about HIV and when to take ARVs, family planning, and condom use); 2. *Feeling Happy and Strong* (disclosure, dealing with stigma, finding support, feeling hope, avoiding negative emotions, dealing with domestic violence and substance abuse); 3. *Partnering and Preventing Transmission* (infant feeding practices, general HIV precautions, partner testing, disclosure, safer sex); and 4. *Parenting* (feeding choice, immunization of the baby, adherence to pre- and postnatal baby treatment, testing the baby, planning custody, forming an attachment to the baby). All sessions followed the same format, with each including a review of recent experiences; role plays; a

didactic component; paired conversations related to the current discussion topic; group discussion and brainstorming; music, meditation, and breathing exercises; and goal-setting.

Assessment

All measures were self-reported. Background characteristics were assessed at recruitment. Behavior during or subsequent to pregnancy (e.g., adherence to PMTCT guidelines) was assessed at follow-up. Information reflecting changes from before the intervention to afterwards (e.g., emotional well-being) was reported at both assessments. Outcome measures are indicated with italics.

MLH were asked their age, months pregnant, length of residence in the Cape Town area, type of housing, and the language spoken at home. MLH also reported their highest level of education completed, partnership status, and current employment status. In the follow-up assessment, MLH were asked about their PMTCT-related actions: use of *ARVs during pregnancy*, use of *ARVs during childbirth*, providing *ARVs for the newborn*, *testing the baby for HIV*, and using an *exclusive infant feeding method*. MLH were asked if they had had a post-delivery *follow-up visit*, whether their *partner had been tested for HIV*, whether they had *disclosed their HIV status to a partner or family member*, and whether they *practiced safe sex* (abstinence or 100% condom use).

At both baseline and follow-up, MLH were tested to assess their knowledge about HIV. They were asked to indicate whether they agreed, disagreed, did not know, or did not understand 14 statements such as: “Apart from the prevention of pregnancy and HIV infection, the condom prevents other sexually transmitted diseases.” Correct answers were summed to create an *HIV knowledge score*. In both assessments, MLH were given three hypothetical HIV-related scenarios, such as overhearing negative stereotypes. For each scenario, MLH were asked if they would feel no discomfort (1), some discomfort (2), or high discomfort (3). Responses were summed to create an *HIV discomfort scale*.

Two measures were employed from the Medical Outcomes Study social support survey (Sherbourne & Stewart, 1991). MLH were queried regarding 20 potential types of support. The *social support availability* scale summed ratings of whether support was available, and the *social support satisfaction* scale counted the number of items for which MLH indicated they were satisfied with the support. In this sample of MLH, Cronbach alphas for availability (0.90) and satisfaction (0.81) indicated good internal consistency.

The Center for Epidemiologic Studies Depression scale (*CES-D*; Radloff, 1977) has queries on 20 symptoms associated with depression (e.g., “I was bothered by things that don’t usually bother me”). A higher score reflects greater depression and a cutoff score of 16 or higher is commonly used to indicate clinical *depression*. Cronbach’s alpha in this sample was 0.82.

The brief COPE scale (Carver, 1997) is composed of 28 items that describe coping strategies (e.g., “I have been turning to work or other activities to take my mind off things”). We created a *positive coping* measure by summing items describing active coping, emotional

support, instrumental support, venting, positive reframing, planning, humor, acceptance, and religion. In this sample, Cronbach's alpha for the positive coping scale was 0.70.

Attitudes affecting *interaction and bonding* between mothers and babies were assessed by summing responses to nine items (e.g., "Babies are trying to communicate with their parents when they are crying"). Responses were scored so that a higher score reflects more positive feelings. Cronbach's alpha was 0.65 in this sample.

Statistical methods

The choice of two antenatal clinics within several kilometers of each other in peri-urban Cape Town was based upon their comparability in terms of populations served. To examine whether participants were in fact similar across sites, we compared background characteristics of MLH at the intervention site to those at the control site. To examine the impact of study drop-out (not completing a follow-up assessment), we compared background characteristics of MLH with a completed follow-up interview to those of women lost to follow-up. For comparisons across site and by participation, Chi-square tests and *t* tests were conducted for categorical and continuous measures, respectively.

The impact of the Mamekhaya intervention on outcomes assessed at follow-up only was evaluated by logistic regression (all outcome measures were dichotomous). Where possible, participant characteristics (education, employment, housing status, marital status) were controlled for. If there was insufficient variation in the outcome for the logistic regressions to converge, we performed Fisher's exact tests of the 2×2 table of outcome by intervention. The impact of the intervention on measures assessed at both baseline and follow-up was evaluated by random-intercept regression models. (A random intercept was included for each MLH to account for correlations between repeated assessments on the same mother.) We conducted intent-to-treat analyses where model covariates included an intercept, education, employment, housing status, marital status, a time point indicator, an intervention status indicator, and an interaction between the time point and intervention status indicators. The interaction measures the intervention effect (i.e., the relative change over time for the intervention condition as compared to the control condition).

Results

Baseline characteristics of all participants completing the initial assessment are shown in Table 1. The first half of the table shows MLH at the control site compared to those at the intervention site. Compared to MLH in the intervention, women in the control site were more than twice as likely to be employed (46% vs. 19%; $p < 0.001$). Availability to attend groups was required at the intervention site but not at the control site, perhaps leading to lower participation rates among employed women. No other statistically significant differences were detected.

Of the 160 eligible MLH completing an initial interview, 44% completed a follow-up interview (n = 71). The rate of completion was somewhat but not significantly higher for MLH in the intervention site (48% vs. 40% among controls; $p = 0.31$). The second half of Table 1 compares women completing a follow-up interview to women not completing a

follow-up interview. MLH lost to follow-up were less likely to be married or live with their partner (28% vs. 46%, $p = 0.016$). The partners of MLH dropping out were more likely to be boyfriends than husbands (72% of drop-outs vs. 49% of those who completed a follow-up; $p = 0.014$). Attendance at CBI sessions was better among MLH with follow-ups: 93% of intervention participants with follow-ups attended some or all sessions, as compared to 70% attendance among those without follow-ups ($p = 0.01$, not shown).

Background characteristics of the sample providing both baseline and follow-up data are shown in the “Completed” column in the lower half of Table 1. MLH were Xhosa-speaking, in their mid-20s (range = 16–42 years old), had lived in the Cape Town area for over 10 years (range = 0–41 years), and were six months pregnant at the time of recruitment (range = 1–8 months). Two-thirds (66%) lived in shacks rather than houses; 73% had 10 years of education or less; 34% were employed; and 47% were married or lived with a partner.

Results of analyses are presented in Table 2. Controlling where possible for participant characteristics, there were no statistically significant differences between control and intervention participants in PMTCT-related actions or other transmission risk behaviors. ARV use, testing the baby, and exclusive infant feeding were high in both groups (> 85%), as were disclosure to the partner (> 80%) and practicing safer sex (> 95%). There was a trend for more MLH in the control group to have the baby tested (97% in the control group vs. 85% in the intervention group; $p = 0.071$) and for more MLH in the intervention group to have check-ups after the baby was born (58% in the intervention group vs. 36% in the control group; $p = 0.097$).

The Mamekhaya program improved some measures of emotional well-being. MLH in Mamekhaya reported greater improvement in establishing sources of social support: availability scores increased 9.3 points more for the intervention as compared to the control group ($p = 0.01$). MLH in Mamekhaya started with higher CES-D scores and improved their scores significantly more than women in the control group (14.0 to 5.6 vs. 9.0 to 5.0; $p = 0.008$). There was little clinically meaningful depression except among intervention participants at baseline, 38% of whom had CES-D scores above the diagnostic cutoff of 16. The relatively greater decline in frequency of depression among intervention participants was not, however, statistically significant. There was little difference between groups or from baseline to follow-up in either group in positive coping, measures of HIV discomfort, satisfaction with sources of social support, or attitudes related to positive interaction and bonding.

The Mamekhaya intervention was successful in increasing knowledge about HIV/AIDS. At follow-up, control participants had improved from 7.9 to 9.4, while intervention participants improved from 9.0 to 13.9 (out of a possible 14 points) ($p = 0.001$). Controlling for participant characteristics, intervention participants improved 3.3 points more than controls ($p < 0.001$). Table 3 shows responses to individual HIV knowledge questions. As many of the questions had sparse cell counts for the incorrect category, significance testing was not carried out. MLH were the least knowledgeable and intervention participants showed the greatest improvement in their understanding of viral load, CD4 results, and the efficacy of ARVs. MLH in the intervention group were also better informed about healthy living and

the importance of self-care, as reflected in their responses to the questions regarding being HIV-positive but not having AIDS, living a prolonged and healthy life despite being infected, and the benefits of seeking health care when ill.

Discussion

This study was conducted in the Western Cape Province of South Africa, a region in which PMTCT services have been well managed. The results demonstrate that care at both study sites was effective in delivering the core PMTCT services of ARV use by mother and baby and use of exclusive infant feeding (reported by over 90% of MLH in both sites). More than 85% of women disclosed their HIV status to partners, and over 95% engaged in safer sex practices at follow-up. Not surprisingly, given the high levels of acceptance of PMTCT interventions in both study groups, there was little room for the Mamekhaya intervention to effect significant improvements. With regard to behaviors with lower adherence, there was no significant intervention effect on partner testing, which should be further explored. Follow-up visits trended towards significance: the rate of clinic visits among intervention participants (58%) was higher than among MLH in the control group (36%; $p = 0.097$).

Mamekhaya was successful in conveying information and improving participants' emotional outlook and hopefulness. MLH in the control arm of the study improved slightly over time in acquiring knowledge about HIV/AIDS, while MLH in Mamekhaya achieved near-perfect scores at follow-up. MLH acquired new information from mentor mothers and the Mamekhaya CBI, which could contribute to better uptake of and adherence to health-related behaviors. The improved emotional outlook of Mamekhaya participants could also benefit their health and ability to be good caregivers. Reaching out to social networks, experiencing less depression, and demonstrating more positive coping strategies can enhance the quality of life for MLH and their families. A further strength of Mamekhaya was that mentor mothers with little formal education or previous employment experience could be trained in the content and techniques of a CBI, allowing this type of program to be widely replicated.

Conducting research in crowded, under-resourced, understaffed, and space-restricted clinical settings presents many challenges. It was impractical to randomize to different arms of an intervention within a single site. Only employment was significantly different between MLH in the two sites; we controlled for employment status, as well as housing, education, and marital/partnership status in our analyses. However, the differences between intervention and control groups could be due to unmeasured differences in other aspects of treatment or environment between the two sites.

Loss to follow-up was also a problem; only 44% of the baseline sample completed the second assessment. Reassuringly, follow-up did not differ significantly by study arm, and there were few significant differences in the characteristics of those completing versus those lost to follow-up. The differences found were related to marital status, and may reflect greater residential stability among those located for the second assessment. Our analyses controlled for partnership as well as characteristics that showed non-significant differences between those who did and did not complete the second assessment. Nevertheless, the follow-up rate was low, and there is the possibility of bias in our findings to the extent that

those providing both assessments are more motivated and likely to change their behavior than those who could not be located for the follow-up.

The measures used in this study are all based on self-reports. Estimates of socially desirable behaviors may thus be biased upward. The significant impacts of the Mamekhaya intervention were, however, found in different areas that are less subject to this sort of bias (e.g., HIV knowledge, outlook). Finally, given the limitations of the study design, we are unable to fully understand the relative contributions of the mentor mothers versus the CBI.

This was a pilot study with a relatively small sample size. The results of the Mamekhaya program show promise for the ability of mentor mothers and CBIs to improve the well-being of HIV-positive pregnant women in South Africa, and they warrant further study.

Acknowledgments

The authors would like to thank the following people for their contributions to this study: first, the many HIV-positive mothers who courageously engaged in the study, often within days of receiving their HIV-positive diagnosis; the staff who conducted the groups and evaluations (Denise Manong, Noluphiwo Nogaga, Hilda Ntjana, and Masibulele Sishuba); Mary Jane Rotheram-Borus and Lee Klosinski from UCLA, who provided invaluable guidance in the adaptation of the groups and evaluations, the training of research staff, and the analysis of data; Des Michaels, Renee Brandt, Mark Tomlinson, and Virginia Casper, who provided important content for the evaluation and curriculum and the staff of both the mothers2mothers program; and the Gugulethu and Vanguard MOUs, who provided thoughtful insight and logistical support.

References

Besser M. Mothers 2 Mothers. South African Journal of Obstetrics and Gynecology. 2006; 12(3):122–128.

Carver CS. You want to measure coping but your protocol's too long: Consider the Brief COPE. International Journal of Behavioral Medicine. 1997; 4(1):92–101. [PubMed: 16250744]

Chopra M, Doherty T, Jackson D, Ashworth A. Preventing HIV transmission to children: Quality of counseling of mothers in South Africa. Acta Pædiatrica. 2005; 94:357–363.

Coetzee D, Hilderbrand K, Boulle A, Draper B, Abdullah F, Geomaere E. Effectiveness of the first district-wide programme for the prevention of mother-to-child transmission of HIV in South Africa. Bulletin of the World Health Organization. 2005; 83(7):489–494. [PubMed: 16175822]

Futterman, D.; Shea, J.; Besser, M.; Klosinski, L.; Stafford, S.; Rotheram-Borus, MJ. Mamekhaya: Enhancing South African PMTCT programs with culturally-adapted evidenced-based interventions [Abstract]. AIDS 2006 – XVI International AIDS Conference. 2006. Available at www.aegis.com/conferences/iac/2006/ThPE0300.pdf

Jackson DJ, Chopra M, Doherty TM, Colvin M, Levin JB, Willumsen JF, et al. Operational effectiveness and 36-week HIV-free survival in the South African programme to prevent mother-to-child transmission of HIV-1. AIDS. 2007; 21(4):509–516. [PubMed: 17301570]

Radloff LS. The CES-D Scale: A self-report depression scale for research in the general population. Applied Psychological Measurement. 1977; 1:385–401.

Rotheram-Borus MJ, Swendeman D, Flannery D, Rice E, Adamson D, Ingram B. Common factors in effective HIV prevention programs. AIDS Behavior. 2009; 13:399–408. [PubMed: 18830813]

Sherbourne CD, Stewart AL. The MOS social support survey. Social Science & Medicine. 1991; 32(6):705–714. [PubMed: 2035047]

Sherman GG, Jones SA, Coovadia AH, Urban MF, Bolton KD. PMTCT from research to reality – results from a routine service. South African Medical Journal. 2004; 94(4):289–292. [PubMed: 15150944]

Simbayi LC, Kalichman S, Strebel A, Cloete A, Henda N, Mqeketo A. Internalized stigma, discrimination, and depression among men and women living with HIV/AIDS in Cape Town, South Africa. Social Science & Medicine. 2007; 64:1823–1831. [PubMed: 17337318]

South African Department of Health. Tracking progress on the HIV and AIDS and STI strategic plan for South Africa. 2003. Retrieved May 27, 2009, from http://www.doh.gov.za/aids/docs/progress.html

South African Department of Health. The national HIV and syphilis prevalence survey South Africa. 2008. Retrieved May 26, 2009, from www.doh.gov.za/docs/reports/2007/antenatal/anatenatl_report.pdf

World Health Organization. HIV-infected women and their families: Psychosocial support and related issues, a literature review. Geneva, Switzerland: World Health Organization; 2003. (Reference no: WHO/HIV/2003.03)

Table 1

Characteristics of mothers living with HIV participating in the study.

	Characteristics of participants at the control and intervention sites		
	Control	**Intervention**	**Total**
Number of participants	77	83	160
Age, Mean (SD)	26.7 (5.0)	26.1 (5.7)	26.4 (5.4)
Months pregnant, Mean (SD)	6.6 (1.0)	6.4 (1.3)	6.5 (1.2)
Years lived in Cape Town, Mean (SD)	11.1 (9.7)	10.0 (9.4)	10.5 (9.5)
Housing, *N* (%)			
Shack	43 (56.6)	53 (66.3)	96 (61.5)
House	33 (43.4)	27 (33.8)	60 (38.5)
Language spoken at home, *N* (%)			
Xhosa	75 (98.7)	82 (98.8)	157 (98.7)
Other non-English	1 (1.3)	1 (1.2)	2 (1.3)
Highest level of education, *N* (%)			
Up to Grade 7	10 (13.0)	18 (21.7)	28 (17.5)
Up to Grade 10	44 (57.1)	49 (59.0)	93 (58.1)
Higher	23 (29.9)	16 (19.3)	39 (24.4)
Current employment status, *N* (%)			
Employed	35 (45.5)	16 (19.3)	51 (31.9)**
Unemployed/house wife/school	42 (54.5)	67 (80.7)	109 (68.1)
Marital status, *N* (%)			
Married/live with partner	27 (35.1)	31 (37.3)	58 (36.3)
Not	50 (64.9)	52 (62.7)	102 (63.8)
Type of romantic partner, *N* (%)			
Husband	27 (35.1)	27 (32.5)	54 (33.8)
Boyfriend	47 (61.0)	52 (62.7)	99 (61.9)
None	3 (3.9)	4 (4.8)	7 (4.4)

	Characteristics of participants who did and did not complete follow-ups		
	Did not complete	**Completed**	**Total**
Number of participants	89	71	160
Age, Mean (SD)	25.9 (5.6)	26.9 (5.0)	26.4 (5.4)
Months pregnant, Mean (SD)	6.6 (1.3)	6.4 (1.0)	6.5 (1.2)
Years lived in Cape Town, Mean (SD)	10.5 (9.2)	10.5 (9.9)	10.5 (9.5)
Housing, *N* (%)			
Shack	49 (57.6)	47 (66.2)	96 (61.5)
House	36 (42.4)	24 (33.8)	60 (38.5)
Language spoken at home, *N* (%)			
Xhosa	88 (98.9)	69 (98.6)	157 (98.7)
Other non-English	1 (1.1)	1 (1.4)	2 (1.3)
Highest level of education, *N* (%)			

	Characteristics of participants who did and did not complete follow-ups		
	Did not complete	**Completed**	**Total**
Up to Grade 7	18 (20.2)	10 (14.1)	28 (17.5)
UP to Grade 10	51 (57.3)	42 (59.2)	93 (58.1)
Higher	20 (22.5)	19 (26.8)	39 (24.4)
Current employment status, *N* (%)			
Employed	27 (30.3)	24 (33.8)	51 (31.9)
Unemployed/Housewife/School	62 (69.7)	47 (66.2)	109 (68.1)
Marital status, *N* (%)			
Married/live with partner	25 (28.1)	33 (46.5)	58 (36.3)*
Not	64 (71.9)	38 (53.5)	102 (63.8)
Type of romantic partner, *N* (%)			
Husband	22 (24.7)	32 (45.1)	54 (33.8)*
Boyfriend	64 (71.9)	35 (49.3)	99 (61.9)
None	3 (3.4)	4 (5.6)	7 (4.4)

* $p < 0.05$;

** $p < 0.001$.

Table 2

Risk behaviors, emotional functioning, and HIV knowledge; baseline and follow-up measures and estimates of the impact of the Mamekhaya intervention.

	Baseline		Follow-up		Model results		
	Control	Intervention	Control	Intervention	Model[a]	B[b]	SE
Number of participants	**31**	**40**	**31**	**40**			
Transmission risk behavior							
Used medication during pregnancy, *N* (%)			31 (100)	38 (95.0)	Fisher	–	–
Used medication during delivery, *N* (%)			30 (96.8)	37 (92.5)	Logit-NC	−0.89	1.18
Used medication for baby, *N* (%)			31 (100)	38 (95.0)	Fisher	–	–
Tested the baby for HIV, *N* (%)			30 (96.8)	34 (85.0)	Logit	−2.33	1.29
Exclusive breast or formula feeding, *N* (%) out 70[c]			28 (93.3)	39 (97.5)	Logit-NC	1.02	1.25
Went to clinic for follow-up, *N* (%)			11 (35.5)	23 (57.5)	Logit	0.95	0.57
Partner tested for HIV, *N* (%) out of 69			14 (45.2)	19 (50.0)	Logit	0.21	0.54
Disclosed HIV status to partner, *N* (%) out of 69			25 (83.3)	34 (87.2)	Logit	0.27	0.81
Abstinent or always uses condom, *N* (%) out of 70			30 (96.8)	38 (97.4)	Logit-NC	0.24	1.44
Emotional functioning							
HIV discomfort, Mean (SD)	7.6 (1.6)	7.4 (1.4)	6.9 (1.0)	6.3 (1.9)	RI-linear	−0.50	0.52
Social support scale (availability), Mean (SD)	69.4 (15.4)	71.0 (10.0)	65.3 (9.8)	76.2 (8.0)	RI-linear	9.32	3.53*
Social support scale (satisfaction), Mean (SD)	20.7 (1.3)	21.4 (2.8)	20.4 (1.0)	20.5 (1.5)	RI-linear	−0.62	0.6
CES-D, Mean (SD)	9.0 (6.4)	14.0 (6.6)	5.0 (4.0)	5.6 (4.9)	RI-linear	−4.43	1.62**
Depressed (CES-D ≥ 16), *N* (%)	3 (9.7)	15 (37.5)	1 (3.2)	2 (5.0)	RI-binary	−1.15	1.34
COPE scale – positive, Mean (SD)	44.8 (7.1)	47.1 (6.5)	44.2 (4.4)	48.9 (6.2)	RI-linear	2.50	1.38
Positive interaction and bonding, Mean (SD)	27.2 (5.1)	24.3 (2.4)	28.8 (2.4)	24.4 (2.9)	RI-linear	−1.46	1.00
HIV knowledge score (Max = 14), Mean (SD)	7.9 (3.4)	9.0 (3.1)	9.4 (2.4)	13.9 (0.5)	RI-linear	3.3	0.72***

* $p < 0.05$;

** $p < 0.01$;

*** $p < 0.001$.

[a] Except where noted, models control for housing, education, employment, and marital/living status.

[b] Estimated effect of intervention (intervention × follow-up interaction term).

[c] Descriptive statistics shown for 71 participants completing baseline and follow-up. Where noted, item non-response resulted in a slightly smaller sample size.

Note: *Logit* indicates logistic regression with the dichotomous outcome measured at follow-up; *Logit-NC* indicates logistic regression with the dichotomous outcome measured at follow-up, without the control variables in the model due to insufficient variation; *Fisher* indicates a Fisher's exact test of the 2×2 table of intervention status by dichotomous outcome, performed when logistic models would not converge due to insufficient variation; *RI-linear* indicates random intercept model for continuous outcomes measured at both assessments; and *RI-binary* indicates random intercept model for binary outcome measured at both assessments.

Table 3

Responses to HIV knowledge questions; percent answering correctly.

	Control		Intervention	
	Baseline (%)	**Follow-up (%)**	**Baseline (%)**	**Follow-up (%)**
Now that I have HIV, I'm going to die soon.	90	100	73	95
If both partners are HIV infected it is OK not to use a condom during sexual intercourse.	77	100	73	100
Apart from the prevention of pregnancy and HIV infection, the condom prevents other sexually transmitted diseases.	97	97	98	100
It is advisable that I use condoms during every sexual encounter especially during pregnancy.	81	100	98	100
A high viral load means my immune system is very weak.	13	3	23	95
A low CD4 count means my immune system is very weak.	23	36	40	98
A low viral load means my immune system is strong.	10	7	18	98
A high CD4 count means my immune system is strong.	32	45	43	100
ARV treatment and healthy living can improve my CD4 count and viral load results.	42	39	35	100
I can be HIV positive and not have AIDS.	61	77	65	100
I can live with HIV for a very long time and be healthy.	68	87	85	100
When I am HIV infected I could have a serious illness and get better if I receive proper care and treatment.	68	80	83	100
Because I am HIV positive, when I'm ill I should seek health care as soon as possible.	71	87	88	100
Participating in a support group is a good idea.	55	87	83	100