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Peer Group Intervention Reduces Personal HIV Risk for Malawian Health Workers

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Abstract

Purpose—To test a peer group intervention to address personal HIV prevention needs of rural health workers in Malawi.

Design—Using a quasi-experimental design, we compared district health workers in two districts of Malawi that were randomly assigned to either the intervention or delayed control condition. We used independent sample surveys at baseline, 15 months, and 30 months postintervention. Intervention district workers received a peer group intervention after the baseline; control district workers received the delayed intervention after final data collection.

Methods—The 10-session intervention for primary prevention of HIV infection was based on the primary healthcare model, behavioral change theory, and contextual tailoring based on formative evaluation. Differences in HIV-related knowledge, attitudes, self-efficacy, and behaviors were analyzed using *t* tests and multiple regression controlling for baseline differences.

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CLINICAL RESOURCES

- Global Health Workforce Alliance, documents and publications: http://www.who.int/workforcealliance/knowledge/publications/en/index.html
- International Council of Nurses, guidelines: http://www.icn.ch/guidelines.htm
- Joint United Nations Programme on HIV/AIDS, publications: http://www.unaids.org/en/KnowledgeCentre/Resources/Publications/

Findings—Health workers in the intervention district had higher general HIV knowledge, more positive attitudes about condoms, higher self-efficacy for safer sex, and more involvement in community HIV prevention at both the 15-month and 30-month postintervention survey. At 30 months, intervention district workers also reported less stigmatizing attitudes toward persons living with AIDS, more HIV tests, and lower risky sexual behaviors.

Conclusion—The intervention should be sustained in current sites and scaled up for health workers throughout Malawi as part of a multisectoral response to HIV prevention.

Clinical Relevance—Incorporating a peer group intervention focused on personal as well as work-related HIV prevention can reduce health workers' risky behaviors in their personal lives, potentially reducing morbidity and mortality and enhancing workforce retention. Reducing stigmatizing attitudes may also improve the quality of health services.

Keywords

Health workers; HIV prevention; Malawi; peer group intervention

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The purpose of this paper is to examine the impact of a peer group intervention on personal and community HIV prevention-related knowledge, attitudes, and behaviors for rural health workers in Malawi. Peer group interventions are a series of semistructured meetings focused on changing behaviors related to a specific issue based on social-cognitive learning theory (Bandura, 1982). Group sessions are facilitated by trained members of the target group. In addition to providing information, peer groups focus on skill building, social support, and role modeling to facilitate the development of positive attitudes, new group norms, and self-efficacy, which Bandura argues should lead to behavior change.

Health workers' high HIV-related morbidity and mortality is a serious burden for southern African healthcare systems, most of which already suffer from severe staff shortages (Dieleman et al., 2007; Shisana, Hall, Maluleke, Chauveau, & Schwabe, 2004). One study in South Africa found that 15.7% of health workers were living with HIV (Shisana et al.). African health workers face potential HIV infection from both job-related exposure and personal behaviors, and they express fear of HIV infection, job-related stress and demoralization (Dieleman et al.; Walusimbi & Okonsky, 2004). Most experts concur that health workers in southern Africa are at far greater risk for HIV infection from their personal risky sexual behaviors than from job-related exposure (Schmid et al., 2004). Studies in Malawi, Rwanda, and Zambia have identified risky personal behaviors by health workers, including multiple partners and low condom use rates (Kiragu et al., 2007; Rahlenbeck, 2004; Talashek et al., 2007).

To reduce African health workers' risky behaviors, barriers that need to be addressed include inadequate HIV prevention knowledge, stigmatizing attitudes toward persons living with HIV (PLWH), and cultural norms (Adebajo, Bamgbala, & Oyediran, 2003; Aisien & Shobowale, 2005; Chimbiri, 2007; Dieleman et al., 2007; Ezedinachi et al., 2002; Hesse, Adu-Aryee, Entsua-Mensah, & Wu, 2006; Rahlenbeck, 2004; Reis et al., 2005; Sadoh, Fawole, Sadoh, Oladimeji, & Sotiloye, 2006; Talashek et al., 2007; Tarwireyi & Majoko, 2003; Walusimbi et al., 2004). Fear of stigmatization by coworkers and the general public makes health workers reluctant to be tested, even after work-related exposure, or to disclose their serostatus (Dieleman et al.; Kiragu et al., 2007; Tarwireyi & Mojoko). African cultural norms discourage open discussion of sexuality, especially between adults and young people or between sexual partners (Talashek et al.; Uwakwe, 2000).

Previous HIV Prevention Interventions

Evidence-based interventions can lead to HIV risk reduction for a wide variety of outcomes and different groups at risk, including heterosexuals, women, and minority groups, as documented by the numerous meta-analyses recently reviewed by both Noar (2008) and Rotheram-Borus, Swendeman, and Chovnick (2009). The largest such meta-analysis included 194 studies; these interventions had positive overall effects, including increased knowledge, more positive attitudes toward condoms, behavioral skills such as condom negotiation with a partner, and increased condom use (Albarracin et al., 2005).

These meta-analyses also confirmed that interventions are more effective when based on behavioral change theory (Albarracin et al., 2005; Noar, 2008; Rotheram-Borus et al., 2009). Bandura's (1982) social-cognitive learning theory is one of the most widely used behavioral change theories. The theory identifies the performance of a behavior as a function of outcome expectancies (expectation of more positive than negative outcomes) and self-efficacy (confidence in the ability to perform the behavior). The focus on increasing knowledge, positive attitudes, and social norms supporting behavior change is common to many behavioral change theories, including the Theory of Reasoned Action (Fishbein & Ajzen, 1975) and Theory of Planned Behavior (Ajzen & Madden, 1986). The building of self-efficacy through rehearsal, role modeling, and support is the distinctive feature of social-cognitive learning theory. Social-cognitive learning is the basis for both peer group and peer leader interventions (Albarracin et al.). Peer leader interventions provide informal instruction and support, while peer group interventions have multiple structured small group sessions led by a peer.

Peer group interventions based on social-cognitive learning theory have been identified as highly successful HIV prevention interventions in many countries, including those in Africa (Ezedinachi et al., 2002; Medley, Kennedy, O'Reilly, Sweat, 2009). A recent meta-analysis of 30 peer-based interventions (about half peer groups) in developing countries, including 13 in sub-Saharan Africa, found that peer interventions significantly increased knowledge and condom use for diverse groups, including youth, prisoners, and miners (Medley et al.).

Support for the effectiveness of key elements of peer group interventions also comes from the recent meta-analyses discussed above that included interventions based on a variety of theories. Peer group elements associated with more effective interventions included skills training or active intervention elements, such as activities to build behavioral skills versus passive didactic interventions; small group format; culturally tailored content; and homogeneous groups in terms of gender and racial and ethnic composition (Albarracin et al., 2005; Noar, 2008).

This review of previous research provides strong evidence that peer group interventions based on social-cognitive learning theory have the potential to be effective in reducing personal risky behaviors for health workers. However, although many health facilities have provided some HIV training for workers, few programs have been formally evaluated or published. Two interventions in Nigeria using a didactic approach significantly improved health workers' HIV-related knowledge and attitudes (Ezedinachi et al., 2002; Uwakwe, 2000). Mental healthcare providers in South Africa had more knowledge and felt more comfortable about HIV care after a professionally assisted peer group intervention, but the intervention did not focus on personal behavior change (Collins, Mestry, Wainberg, Nzama, & Lindegger, 2006).

In summary, there is clear evidence that health workers need HIV prevention to address their need for personal HIV prevention and that peer group interventions have high potential effectiveness based on their previous success for other groups. However, there are few

previously published interventions for health workers. Moreover, none of the published interventions for health workers have explicitly addressed personal risk behaviors, and they have not been based on social-cognitive learning and active skill building, shown to be effective for HIV prevention among target groups.

Developing A Conceptually Based Intervention for Health Workers

To begin to address the lack of effective interventions for health workers, we developed and tested a peer group intervention that builds on our previous HIV prevention efforts in Africa (Kachingwe et al., 2005; Norr et al., 2006; Norr, Norr, McElmurry, Tlou, & Moeti, 2004). This primary prevention intervention was guided by an integrated conceptual framework based on social-cognitive learning theory, contextual tailoring, and the primary healthcare model (Norr et al., 2006). Because previous research has shown that peer groups based on social-cognitive learning theory are effective, this theory guides our intervention's content and learning activities. We explicitly include the elements of social-cognitive learning associated with efficacy in previous research, including active rather than passive learning, a small homogeneous group format, and cultural tailoring specific to the target group. Intervention content and activities were tailored to the specific cultural and social context of rural health workers based on our formative evaluation to identify health workers' HIV prevention needs (Talashek et al., 2007). For example, social learning content emphasizes rehearsal through role playing; the situations used for role playing were realistic because they were adapted from the situations health workers described in our formative evaluation focus group discussions.

A unique feature of this intervention is the use of the World Health Organization's primary healthcare model to guide intervention delivery. Primary health care uses community health worker collaboration to promote acceptable, accessible, sustainable, and cost-effective health promotion and health care (McElmurry & Keeney, 1999). We trained volunteer health workers as peer group leaders who facilitated the intervention sessions for their colleagues. Thus, unlike previously described interventions for health workers, we built on existing health system resources and systematically involved the health workers in implementation of the intervention. Previous publications reported that this intervention had positive impacts on rural health workers' workplace HIV prevention (Jere et al., 2010) and on urban hospital workers' personal and workplace HIV prevention (Chimango et al., 2009; Jere et al.; Kaponda et al., 2009).

This report examines the impact of our peer group intervention on personal HIV prevention among rural health workers. We hypothesized that, compared with a delayed-intervention control group, rural health workers exposed to the intervention will have higher HIV knowledge; more positive HIV-related attitudes, including less stigmatization, more positive attitudes about condoms, and higher self-efficacy for personal safer sex and for community prevention activities; and more favorable HIV-prevention behaviors, including more partner communication, fewer risky sexual behaviors, more abstaining, more condom use, more HIV testing, and more community prevention activities.

METHODS

Study Design

The research reported here is part of a larger project to mobilize rural health workers in Malawi to provide a peer group intervention for HIV prevention to their coworkers and the rural communities they serve (Norr et al., 2006). To avoid potential contamination of the control group, if workers in the same unit were in different groups, we used a two-group quasi-experimental design to test effects of the intervention rather than an experiment.

Setting

Each of Malawi's 28 districts has a district hospital, usually located in the main town. The district hospital management team oversees all district health services and health promotion efforts in both government and faith-based facilities in the entire district. The district hospital is also the referral center for the district's rural health centers and provides health care for town residents. We purposively selected two adjacent districts in the central region that were similar in size and economic activities but sufficiently distant to make contact unlikely. We assigned one district to the intervention condition and the other to the delayed-intervention control condition using a coin toss. In each district, the district hospital management team helped us select five rural health centers for the study. Health centers were selected to include diversity in size and access to a main road and to exclude areas where another HIV prevention program existed.

Sample

To evaluate the impact of the intervention on the rural healthcare workforce as a whole, not just program participants, we used independent samples of intervention and control district health workers at baseline and at 15 and 30 months. The timing of evaluation was based on stages of progress for the project as a whole rather than just the health workers. The midterm evaluation occurred at 15 months, after the intervention with rural adults was completed. The final evaluation occurred 30 months after the intervention with adolescents was completed. Because the intervention began with the health workers, they had the longest interval between receiving the intervention and the final evaluation.

Both clinical and nonclinical workers at each district hospital and at the five rural health centers were eligible to participate. At the rural health centers we interviewed all workers present on the day of the survey. At the larger district hospitals, each survey was a convenience sample stratified by type of unit and shift. We listed all units and randomly selected units and shifts. We went to the designated unit and invited all workers present at that time to participate. All those who consented were interviewed; none of the health workers declined to participate.

Intervention

The intervention addressed primary prevention of HIV infection for health workers in their personal lives as well as the workplace (work-related outcomes are reported in Jere et al., 2010). Ten sessions were required to provide the information and skills health workers needed based on our formative evaluation (Talashek et al., 2007). The first six sessions focused on HIV transmission, stigmatization, safer sex, and partner negotiation and were used for both health workers and community members. The remaining sessions addressed issues specific to health workers, such as use of universal precautions and teaching clients about HIV. Sessions lasted 90 to 120 min. Guided discussions, role playing, return demonstrations with corrective feedback, and skill-building assignments were integral components of each session.

Two cofacilitators offered the intervention to mixed-gender groups of 10 to 12 health workers. Groups were divided into clinical and nonclinical workers except at very small clinics. The number and composition of the groups and the times for meetings was set up at each facility in consultation with the facility administrator to minimize service disruptions and ensure coverage. The initial peer groups were offered by our project staff. Then some health workers volunteered to be cofacilitators. They received 2 weeks of training in the peer group content, learning activities, and group facilitation skills, with practice and corrective feedback. These volunteers, plus additional volunteers who received the intervention later,

offered the intervention to the rest of the health workers. They then facilitated sessions for community adults and adolescents, with help from additional community volunteers.

Measures

The concepts measured were HIV-related knowledge, attitude, and behavior outcomes that we expected the intervention to change based on our conceptual model and hypotheses. Operational measures were based on questions used in Malawi in our own prior work (Norr et al., 2007) and the Malawi Demographic and Health Survey (National Statistical Office, 2005). All measures were selected or developed to have high content validity based on qualitative formative evaluation (Kachingwe et al., 2005; McCreary et al., 2008; Talashek et al., 2007). Variables, items, scoring, and reliability coefficients for scales are summarized in Table S1 (supplementary material found at Wiley Library). Standard demographic questions included age, gender, education, tribal or ethnic identity, religion, and job level.

Knowledge—The HIV transmission knowledge index measured key facts and common myths related to transmission and prevention. However, this index had only moderate internal reliability ($\alpha = 0.68$), congruent with our formative evaluation, which found that health workers who answered transmission facts correctly continue to endorse myths (Talashek et al., 2007).

Attitudes—We expected the intervention to influence attitudes important for HIV prevention, including stigmatization, condoms, and self-efficacy for personal safer sex and community prevention. Stigmatization is important because it encourages silence, denial, and reluctance to be tested or change sexual risk behaviors. We used two measures of stigmatizing attitudes, blaming a PLWH for being infected and acceptance of casual contact (public participation and cooking a family meal) with PLWH. Like knowledge, stigmatizing attitudes are not necessarily related to each other (Talashek et al., 2007). These two stigma measures were not highly correlated, so these indicators were used separately. Attitudes toward condoms are important because condom use is an important safer sex strategy and attitudes about condoms in Malawi are highly negative (Chimbiri, 2007). Our 10-item attitudes about condoms scale appraised sexual pleasure, association with immoral behaviors, safety, and effectiveness (Cronbach's $\alpha = 0.78$).

Self-efficacy or confidence in one's ability to engage successfully in a specific behavior is identified as a key mediating factor in behavior change by social cognitive learning theory (Bandura, 1982). We adapted a six-item self-efficacy for safer sex scale from previous work with community women in the United States (Dancy, Marcantonio, & Norr, 2000), which had high internal consistency in this study ($\alpha = 0.79$). Unfortunately, we did not do so until after the baseline, when only one item (confidence to use condoms correctly) was included. Self-efficacy for community prevention was also important because the intervention was designed to promote engagement in community prevention. The self-efficacy for community prevention index included two items regarding confidence in discussing HIV and AIDS with friends or relatives and with their children, two prevention behaviors especially disapproved by Malawian culture norms (McCreary et al., 2008; Talashek et al., 2007).

Behaviors—The ultimate goal of our intervention is to change HIV prevention behaviors. Six variables assessed personal safer sex and community prevention behavior. Because partner communication is important when negotiating for safer sex, we asked whether the person discussed safer sex, unprotected sex, or condom use with partner in the past 2 months. Safer sex was measured using an index of risky behaviors in the past 2 months. We also examined separately two of these behaviors, abstaining and condom use (among sexually active persons only). HIV testing is important because a negative test can reaffirm

safer behaviors and a positive test is the gateway to treatment and secondary prevention. Because HIV testing opportunities remain limited in rural areas, we examined whether the person had an HIV test within the last 12 months. Engaging in HIV prevention activities in the community was an important outcome for the intervention because it breaks the silence about HIV and AIDS in Malawi. The community HIV prevention index was the number of the six activities, such as talking to neighbors or one's children, which a person engaged in over the last 2 months.

Procedure

We obtained ethical approval from the University of Illinois at Chicago and the University of Malawi College of Medicine Institutional Review Boards and permission to conduct the study from the District Commissioner and health management teams, rural health center teams, and traditional leaders for all communities. We then conducted the baseline survey. In the intervention district, we met with all workers at the district hospital and the five participating clinics to explain the project, and a total of 243 hospital workers and 93 rural health center workers participated in the intervention We then conducted the outcome surveys at 15 months and 30 months after health workers received the intervention. After the final evaluation we offered the intervention to control district workers.

Data Analysis

To evaluate study hypotheses, we first compared differences in each outcome variable (means or percent) between the intervention and control groups at the 15-month and 30-month postintervention evaluations. We used one-tailed *t* tests of independent samples because the hypotheses were all one-directional. To further appraise the robustness of intervention effects, we used multiple regression (ordinary least squares or logistic), controlling for demographic factors (age, gender, education, food security, and job category).

Results

Baseline

There were no differences between the intervention and control district health workers in age (mean age of about 37 years), gender (about half were male), or religion (about one fifth were Catholics; Table 1). The intervention district had slightly more workers with at least some secondary school, although only the differences at the 15-month survey were significant. Food security was better in the intervention district at both postintervention evaluations. At each survey, the intervention district was predominantly Ngoni, while the control district was predominately Chewa. We divided the health facility workers into three broad categories: doctors, nurses, and technicians; and clinical support workers with 6 months or less of training, such as auxiliary nurses, patient attendants, and community health workers. There were no significant differences in job categories (clinicians and technicians with a year or more of professional training, clinical support worker such as auxiliary nurses and patient attendants, and nonclinical workers such as administrators and laundry workers). We controlled for all of these demographic variables, which are related to some outcomes, in multiple regression analyses to assess intervention effects at 15 and 30 months postintervention.

Rural health workers in both control and intervention districts had fairly good knowledge of HIV transmission at baseline. On the six-item HIV knowledge index, health workers in both districts scored 84% correct at baseline. Results for the two stigma attitudes were contradictory. The intervention district health workers were less likely to hold that PLWH should be blamed for their past behaviors, but they also were less accepting of contact with

persons living with HIV. There was no significant difference between intervention and control districts on the condom attitude scale, but self-efficacy for condom use (the only item available at baseline from the self-efficacy for safer sex scale) was higher among intervention health workers. Only one of the six behavior measures had a significant difference at baseline: the community HIV prevention activities index was a little more than half an activity (out of six) higher for intervention health workers. Detailed baseline results are available in Table S2 (supplementary material found at Wiley Library).

15-Month Postintervention Evaluation

At the 15-month postintervention survey (Table 2), the intervention district HIV knowledge index was significantly higher than for the control district. The two groups differed in the predicted direction on the stigmatizing attitude of blaming PLWH for their condition, but the difference was not statistically significant. The intervention district health workers had significantly more favorable attitudes about condoms than health workers in the control district (79.6% versus 66.4% favorable). Self-efficacy for safer sex was considerably higher in the intervention district. Only two of the reported safer sex behaviors were significantly higher in the intervention district than in the control district at the 15-month survey: partner communication about safer sex and involvement in community HIV prevention activities. Personal sexual behaviors and having an HIV test did not show any differences between intervention and control districts. We used multiple regression to examine intervention effects controlling for age, gender, education, food security, and job category (last two columns of Table 2). For each outcome measure that had a statistically significant difference in the comparison of means or percent, the coefficient (B) for the intervention or control condition was in the predicted direction, and its *t* test result was significant.

30-Month Postintervention Evaluation

At the 30-month postintervention evaluation (see Table 1) the HIV knowledge index continued to be significantly higher in the intervention district. At 30 months, both stigmatizing attitude measures (blaming people with HIV and acceptance of casual contact) were significantly more favorable in the intervention district than the control district. Attitudes about condoms and self-efficacy for safer sex remained higher among the intervention district health workers at the 30-month survey. Three of the six behavior variables—risky sex behaviors scores, having an HIV test, and community HIV prevention activities—were more favorable in the intervention district at 30 months. The proportion abstaining in the intervention district was higher than in the control district, but the difference was not significant. Reported partner communication, which was significantly higher in the intervention district at 15 months, did not differ at 30 months. The proportion who reported ever using condoms in the last 2 months was higher in the control district. At the 30-month postintervention survey, the differences between intervention and control groups remained robust in multivariate analyses, as they did at the 15-month results. In each instance where there was a significant difference in the bivariate analysis, that regression coefficient (B) with controls also had a statistically significant t-test result.

Discussion

This study showed that rural health workers, like the general public, benefit from peer group interventions for HIV prevention. Workers who participated in a peer group intervention for HIV prevention had higher general HIV knowledge, more positive attitudes toward condom use, higher self-efficacy for safer sex, and more involvement in community HIV prevention than health workers in a control district at both the 15-month and the 30-month postintervention surveys. At 30 months, the intervention district health workers also had less stigmatizing attitudes toward persons living with AIDS and lower reported risky sexual

behaviors, and they were more likely to have had an HIV test in the past year. The intervention was not related to increases in condom use. This is one of the few studies in Africa to report sustained differences between an intervention and control group 30 months after intervention, and the relatively long follow-up is a strength of the study.

The intervention had nearly all of the characteristics associated with efficacy in previous meta-analyses, including skill building and active learning strategies, a small group format homogeneous in occupation, peer leaders similar to the participants, and contextual tailoring (Albarracin et al., 2005; Darbes et al., 2008; Medley et al., 2009[O9]; Noar, 2008; Rotheram-Borus et al., 2009). These studies also found single-gender groups were more effective. However, in this study intervention peer groups were mixed gender to be consistent with the Ministry of Health's gender equality policy and because rural clinics were too small to have same-gender groups. Health workers are used to discussing health-related issues across gender in the workplace, and mixed-gender groups did not appear to be distressing or to inhibit responses.

This study also validated the appropriateness of the primary healthcare model of health worker–community collaboration for delivery of HIV prevention interventions. Despite understaffing and high work-related stress, health workers demonstrated willingness to volunteer to be peer group facilitators for coworkers and the communities they serve, and they engaged in more community HIV prevention activities after the intervention. Using trained health worker volunteers lowers costs and creates a cadre of volunteers who can help to sustain the program.

These results need to be evaluated taking into consideration study limitations. The quasi-experimental design used to avoid potential contamination of the control group provides weaker causal inference than an experiment with random assignment of individuals. The independent-samples evaluation provides less power for a given sample size than a comparison of participants and nonparticipants. The use of only self-reported behaviors is another limitation. Studies using biological markers in Malawi have shown that self-reports underestimate socially disapproved behaviors (Smith & Watkins, 2005). However, previous methodological reviews have concluded that self-reported sexual behavior provides useful information despite systematic underreporting (Plummer et al, 2004; Ross et al., 2007).

Implications

This is one of the few HIV prevention programs with evidence of positive impacts on knowledge, attitudes, and behaviors for rural health workers in Malawi. The intervention should be scaled up for health workers throughout Malawi as part of a multisectoral response to HIV prevention. Reducing personal risk for HIV infection of health workers can contribute to a reduction in health worker morbidity and mortality, a benefit to the health system as well as workers and their families. Providing the intervention for health workers may also have positive indirect impacts on their interactions with clients, teaching, and capacity to be positive role models in their communities. The integration of the primary healthcare system and the community in the delivery of the intervention is consistent with the call for interventions that collaborate with communities for sustainable HIV prevention (Rotheram-Borus et al., 2009) and provides a model that can be adapted for other high-prevalence countries in Africa.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

30-month Postintervention Rural Health Workers' HIV Knowledge, Attitudes, and Behaviors

	Comparison of means or percents					Multiple regression (ols or logistic) coefficient for intervention-Control[a]	
		Control (*n*=196)	Intervention (*n*=221)	*t*	*df*	B	SE
HIV knowledge index	%	81.72	91.40	4.78**	306	7.85**	2.10
Stigma attitude—blame	Mean (*SD*)	1.23 (0.65)	1.05 (0.33)	3.54**	280	−0.16**	0.05
Stigma attitude—contactindex	Mean (*SD*)	2.79 (0.58)	2.99 (0.09)	4.92**	204	0.17**	0.04
Condom attitudes scale	%	68.47	80.29	5.16**	387	9.67**	2.33
Self-efficacy for community prevention	Mean (*SD*)	2.70 (0.45)	2.98 (0.12)	5.75**	338	0.29**	0.06
Self-efficacy for safer sex	Mean (*SD*)	2.70 (0.45)	2.86 (0.31)	4.13**	286	0.14**	0.04
Partner communication index	Mean (*SD*)	1.06 (0.77)	1.06 (0.77)	0.09	409	0.05	0.08
Risky sex behaviors index	Mean (*SD*)	0.97 (0.89)	0.80 (0.68)	−2.31**	414	−0.15*	0.08
Abstained last 2 months	%	23.47	28.96	1.27	414	0.30	0.26
Ever used condom last 2 months[b]	%	37.50	25.17	−2.29	286	−0.58	0.30
HIV test in last 12 months	%	29.90	39.73	2.10*	410	0.41*	0.24
Community HIV prevention index	Mean (*SD*)	3.63 (1.59)	3.94 (1.30)	2.16*	376	0.35**	0.15

Note. SE = standard error.

[a]Controlling for age, gender, education, tribe, religion, food security, and job category.

[b]Among sexually active only.

*p<.05, *t*-test of significance, one-tailed;

**p<.01, *t*-test of significance, one-tailed.

Table 2

15-month Postintervention Rural Health Workers' HIV Knowledge, Attitudes, and Behaviors

	Comparison of means or percents					Multiple regression (ols or logistic)coefficient for intervention-control[a]	
		Control (*n*=93)	Intervention (*n*=99)	*t*	*df*	B	SE
HIV knowledge index	%	84.59	91.75	3.00**	190	6.15*	2.64
Stigma attitude—blame	Mean (*SD*)	1.25 (0.65)	1.18 (0.58)	−0.74	190	−0.03	0.10
Stigma attitude—contact index	Mean (*SD*)	2.99 (0.15)	2.99 (0.10)	0.63	190	0.02	0.02
Condom attitudes scale	%	66.41	79.65	3.92**	175	10.83**	3.71
Self-efficacy for community prevention	Mean (*SD*)	2.82 (0.37)	2.90 (0.23)	1.92*	155	0.14	0.10
Self-efficacy for safer sex	Mean (*SD*)	2.57 (0.48)	2.89 (0.18)	6.16**	116	0.28**	0.05
Partner communication index	Mean (*SD*)	.99 (0.74)	1.26 (0.76)	2.51**	190	0.25*	0.12
Risky sex behaviors index	Mean (*SD*)	.82 (0.63)	0.74 (0.62)	−0.87	189	−0.10	0.10
Abstained last 2 months	%	31.52	31.31	−0.03	189	0.07	0.38
Ever used condom last 2 months[b]	%	20.63	25.37	0.64	128	0.48	0.49
HIV test in last 12 months	%	27.17	29.29	0.32	189	−0.07	0.38
Community HIV prevention index	Mean (*SD*)	3.46 (1.51)	4.10 (1.22)	3.20**	177	0.52**	0.22

Note. SE = standard error.

[a] Controlling for age, gender, education, tribe, religion, food security, and job category.

[b] Among sexually active only.

* $p<.05$, t-test of significance, one-tailed;

** $p<.01$, *t*-test of significance, one-tailed.