A Randomized Controlled Trial to Reduce HIV Transmission Risk Behaviors and Sexually Transmitted Diseases Among Women Living With HIV

The WiLLow Program

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Objective: To evaluate the efficacy of an intervention to reduce HIV transmission risk behaviors and sexually transmitted diseases (STDs) and enhance HIV-preventive psychosocial and structural factors among women living with HIV.

Design: A randomized controlled trial of 366 women living with HIV in Alabama and Georgia.

Intervention: The intervention emphasized gender pride, maintaining current and identifying new network members, HIV transmission knowledge, communication and condom use skills, and healthy relationships.

Primary Outcome: Unprotected vaginal intercourse.

Other Outcomes: Proportion never used condoms, incident STDs, psychosocial factors, and number of supportive network members.

Results: Over the 12-month follow-up, women in the WiLLOW intervention, relative to the comparison, reported fewer episodes of unprotected vaginal intercourse (1.8 vs. 2.5; \(P = 0.022\)); were less likely to report never using condoms (odds ratio [OR] = 0.27; \(P = 0.008\)); had a lower incidence of bacterial infections (Chlamydia and gonorrhea) (OR = 0.19; \(P = 0.006\)); reported greater HIV knowledge and condom use self-efficacy, more network members, fewer beliefs that condoms interfere with sex, and fewer partner-related barriers to condom use; and demonstrated greater skill in using condoms.

Conclusion: This is the first trial to demonstrate reductions in risky sexual behavior and incident bacterial STDs and to enhance HIV-preventive psychosocial and structural factors among women living with HIV.

Key Words: intervention, HIV transmission risk behaviors, sexually transmitted diseases, women, structural factors

T he impact of the HIV/AIDS epidemic is increasingly more pronounced among women. In 1986, women in the United States represented 7% of AIDS cases; women currently account for 26% of new AIDS cases and 30% of new HIV infections.1,2 Women also represent an increasing proportion of people estimated to be living with HIV/AIDS. According to the Centers for Disease Control and Prevention (CDC), the number of women living with HIV/AIDS almost tripled between 1993 and 2002 compared with slightly less than doubling of the number of men living with AIDS over the same period.1,2 Recently, federal agencies have increased financial support for the development of prevention programs for persons living with HIV.3 Given the potential public health impact of reducing transmission risk behaviors among women living with HIV, prevention programs are urgently needed.3

Although there are several compelling clinical and public health reasons to design and implement prevention pro-
grams for HIV-positive individuals, there are few programs with demonstrated evidence of efficacy. The absence of efficacious prevention interventions for HIV-positive people is particularly concerning because recent estimates indicate that as many as a third of HIV-infected people continue to practice unprotected intercourse after learning their HIV-positive serostatus. Moreover, a high prevalence and incidence of sexually transmitted diseases (STDs) has been observed among people living with HIV.10,11

Traditionally, efforts to reduce risk behaviors associated with HIV transmission have focused on providing HIV antibody testing and counseling. These programs have produced only modest reductions in sexual risk behaviors among people living with HIV. A side from these studies, there have been few sexual risk reduction interventions tailored for HIV-positive individuals in the highly active antiretroviral therapy (HAART) era; most samples have been predominantly men who have sex with men (MSM), and none were designed specifically for ethnic minority women.14–17

Although these results are encouraging, this small set of studies is limited by the duration of follow-up and the inconsistency of intervention effects. Moreover, caution is warranted in generalizing the intervention effects from these studies to women living with HIV in the United States, particularly when most women living with HIV are black and acquired their infection via heterosexual contact.

The present study evaluated the efficacy of a sexual risk reduction and social network intervention to reduce HIV sexual transmission risk behaviors and STDs and to enhance psychosocial mediators and structural factors associated with preventive behaviors over a 1-year period among a sample of predominantly black women living with HIV.

**METHODS**

**Participants**

From September 1997 through December 2000, project staff recruited participants from 7 of the largest clinics and health departments providing medical care to women living with HIV/AIDS in Georgia and Alabama. Participants were recruited from 3 clinics in Birmingham, including the 1917 AIDS Clinic at the University of Alabama at Birmingham, St. George’s Clinic at the Cooper Green Hospital, and the Family Clinic at Children’s Hospital of the University of Alabama at Birmingham and its branch in Montgomery. Participants were also recruited from the Montgomery AIDS Outreach Clinic and the AIDS Services Center in Anniston, Alabama. All participants from Georgia were recruited from 2 clinics in Atlanta: the Ponce DeLeon Clinic affiliated with Grady Hospital and the Fulton County Department of Health and Wellness HIV Clinic.

After receiving care from their HIV/AIDS clinic providers, women were referred to project recruiters who screened the women to assess their eligibility. Of those women screened, 415 (266 from Alabama and 149 from Georgia) met eligibility criteria. Women were eligible if they were between the ages of 18 and 50 years, sought medical care for HIV/AIDS at a study recruitment site, were sexually active in the previous 6 months, and provided written informed consent. Of the eli-

![Diagram](image_url)
gible women, 391 (94.2%) were enrolled and subsequently completed baseline assessments. Of those completing baseline assessments, 366 (93.6%) were randomized to study conditions (Fig. 1). Eligible participants were transported to and from education sessions and were compensated $50 for their time to attend each education session, for childcare, and for completing baseline and follow-up assessments. The Institutional Review Boards at the University of Alabama at Birmingham and Emory University approved the study protocol.

**Study Procedures**

The study design was a randomized controlled trial. Allocation to study conditions was conducted subsequent to participants completing their baseline assessment using concealment of allocation procedures defined by protocol and compliant with published recommendations. Before enrollment, an investigator used a random numbers table to generate the allocation sequence. Participants completed baseline assessments, sealed opaque envelopes were used to execute the assignments. Participants were randomly assigned to 1 of 2 study conditions: the sexual risk reduction and social network intervention or the health promotion comparison. The intervention was known as WIROSS, an acronym created by women living with HIV, which means “women involved in life learning from other women.”

**Intervention Methods**

To design the study interventions, the research team collaborated with an advisory board composed of women living with HIV, physicians, and mental health specialists providing care for HIV-positive women. The WIROSS intervention consisted of 4 4-hour interactive group sessions that were implemented over consecutive weeks. Each session included 8 to 10 participants, was implemented by a trained female health educator, and was cofacilitated by an HIV-positive female peer educator. To reduce the likelihood that the effects of the intervention could be attributed to group interaction or Hawthorne effects, participants randomized to the health promotion condition also received 4 4-hour interactive group sessions administered over consecutive weeks. These sessions addressed medication adherence, nutrition, and provider interaction skills. Before implementing the main trial, both conditions were field tested with women living with HIV and modified based on participant feedback.

The social cognitive theory and the theory of gender and power were used as theoretic frameworks for the development and implementation of the WIROSS intervention. The emphasis on enhancing participants’ knowledge, attitudes, self-efficacy, and skills regarding safer sex was informed by the social cognitive theory. The theory of gender and power, a social structural framework, addressed how societal expectations of women’s role as caregivers constrain their ability to seek new network members or ask existing network members for support. Moreover, in dyadic relationships, women tend to provide more social support than men. This “support gap” can be demoralizing and can lead to depression. For women living with HIV, whose quality of life may already be compromised, enhancing the number of supportive network members from whom they could receive social support was viewed as critical for promoting and sustaining safer sex behaviors. In addition to the theoretic contributions, our previous research designing effective sexual risk reduction interventions for women assisted in conceptualizing the intervention content.

Session 1 emphasized gender pride by discussing the joys and challenges of being a woman and by acknowledging the accomplishments of women in society. This session also sought to assist women in identifying people in their social network who have provided social support and in recognizing the essential qualities of supportive network members. Session 2 discussed ways of maintaining supportive network members, encouraged women to seek new network members, and informed participants about how to disengage from network members who were not supportive of healthy behaviors. Peer educators emphasized that social support could be requested without having to disclose serostatus. Session 3 enhanced awareness of HIV transmission risk behaviors and debunked common myths regarding HIV prevention for people living with HIV (e.g., “If both partners are HIV-positive, it is okay to have unprotected sex”). This session also taught participants communication skills for negotiating safer sex and reinforced the benefits of using condoms consistently, and peer educators modeled proper condom use skills. Session 4 taught women to distinguish between healthy and unhealthy relationships, discussed the impact of abusive partners on safer sex, and informed women of local shelters for women in abusive relationships.

**Facilitators**

A trained female health educator and a trained HIV-positive female peer educator cofacilitated each condition. Peer educators were selected based on interviews and recommendations from the Community Advisory Board. Two peer educators cofacilitated implementing the WIROSS intervention, and 2 cofacilitated implementing the comparison condition.

**Data Collection**

Data collection occurred at baseline and at 6 and 12 months of follow-up. At each assessment, data were obtained from 4 sources. First, trained female interviewers administered a face-to-face interview. The interview assessed sociodemographic characteristics, the length of time women had been living with HIV, and mediators and network influences associated with HIV transmission risk behaviors. After the interview, interviewers assessed participants’ ability to apply condoms correctly. Subsequently, the participants provided self-collected vaginal swab specimens that were assayed for STDs.
Finally, participants were asked to provide a urine specimen that was analyzed for drug use. Several measures were taken to enhance the validity of participants’ self-reported sexual behaviors. Participants were asked to report their behaviors over 1 month to enhance accurate recall and were provided calendars specifying the reporting intervals of interest. To enhance confidentiality, interviewers reassured participants that codes rather than names would be used on all records. Assurances of confidentiality have been shown to enhance participants’ candor reporting of sensitive behaviors. To minimize potential interviewer bias, data collection was conducted by interviewers who were blinded to participants’ condition assignment. Additionally, the data analysts were blinded to participants’ condition assignment.

Primary Outcome
Self-reported frequency of unprotected vaginal intercourse, the primary outcome, was calculated by subtracting the number of times participants reported having vaginal intercourse from the number of times participants reported using condoms during vaginal intercourse in the 30 days and 6 months preceding the 6- and 12-month assessments. Unprotected vaginal intercourse was selected as the primary outcome based on its association with HIV infection. Mathematical modeling studies have demonstrated that for sexual risk reduction interventions, change in unprotected vaginal sex is a marker of HIV risk.

Other Sexual Behaviors
Other self-reported sexual behaviors assessed included the proportion of participants who reported never using condoms in the 30 days preceding the 6- and 12-month assessments.

Psychosocial Mediators
Psychosocial mediators were derived from the underlying theoretic frameworks and a review of the empiric literature. Scales with satisfactory psychometric properties that had been previously used with women assessed theoretically important constructs. HIV transmission risk knowledge was measured using an 11-item scale ($\alpha = 0.60$). Partner communication was assessed with a 3-item index ($\alpha = 0.81$). Perceived partner-related barriers to condom use were measured using a 6-item scale that assessed attitudes impeding participants’ ability to use condoms effectively ($\alpha = 0.92$). Beliefs that condoms interfere with sex were assessed using an 8-item scale that assessed negative attitudes associated with using condoms ($\alpha = 0.91$). Condom use self-efficacy was measured using a 9-item scale that assessed participants’ confidence in their ability to use condoms properly ($\alpha = 0.90$).

Structural Factors
The number of network members, biologically related kin or nonkin who provided practical, informational, or emotional social support, was assessed using 3 items. Number of network members providing practical support was defined as the number of people loaning money, taking care of the participant, or providing help in an emergency. Number of network members providing informational support was defined as the number of network members who expressed empathy, were able to share their feelings, and were supportive with respect to participants’ problems. Participants’ responses to these 3 items were summed, yielding a total number of network members providing practical, informational, or emotional support.

Sexually Transmitted Disease Status
The proportion of participants with an incident bacterial (Chlamydia or gonorrhea) infection over the entire 12-month follow-up period was a biologic outcome variable. Given the low prevalence and incidence of gonorrhea, we hypothesized that intervention effects would be difficult to assess for each bacterial infection; thus, testing positive for Chlamydia or gonorrhea over the 12-month follow-up period formed an index of bacterial infections for the participants. The proportion of participants with an incident protozoan (Trichomonas) infection over the entire 12-month follow-up period served as a second biologic outcome.

Participants provided 2 vaginal swabs. One swab was evaluated for Neisseria gonorrhoeae and Chlamydia trachomatis using the Abbott LCx Probe System. A second swab was evaluated for Trichomonas vaginalis using the InPouch TV test. Assays were conducted at the University of Alabama at Birmingham Division of Infectious Diseases STD Research Laboratory and Emory University Molecular Diagnostics Laboratory. Women identified with an STD were provided directly observable single-dose STD treatment, received appropriate risk reduction counseling per CDC recommendations, and were encouraged to refer sex partners for treatment. The appropriate county health departments were notified of reportable STDs.

STATISTICAL METHODS
Sample size calculations were based on preliminary research with this population. We estimated a moderate effect size, a 35% difference between the study conditions in the number of unprotected vaginal sex acts in the 30 days preceding assessment. Estimating 20% attrition over the 12-month follow-up period and setting the type I error rate at 0.05 for a 2-tailed test (power = 0.80) required a total sample of 185 participants in each study condition to detect the specified effect size.

Analyses were performed only on prespecified hypotheses using an intention-to-treat protocol in which participants were analyzed in their original assigned treatment conditions irrespective of the number of treatment sessions attended.
At baseline, descriptive statistics were calculated to summarize the prevalence of sociodemographic variables, theoretic mediators, structural factors, sexual behaviors, and STDs between study conditions. Differences between conditions were assessed using Student t tests for continuous variables and χ² analyses for categoric variables. Differences that approached statistical significance (P ≤ 0.15) and that were theoretically or empirically identified as potential confounders were included as covariates in longitudinal analyses.

The efficacy of the WiLLOW intervention was analyzed over the entire 12-month period (from baseline to the 12-month assessment). Effectiveness was also investigated for the 2 6-month periods: from the baseline to the 6-month assessment and from the 6-month assessment to the 12-month assessment. The analyses for each 6-month assessment period used logistic regression to compute the adjusted odds ratio (OR) for dichotomous outcomes and linear regression to compute the adjusted mean and mean difference (D) for continuous outcomes. Each of these approaches included the baseline measure for the corresponding outcome as a covariate in the analysis.

To assess intervention effects for the entire 12-month follow-up period, logistic and linear generalized estimating equation (GEE) regression models were constructed to control for repeated within-subject measurements. These models included a time-independent variable (study condition) and time-dependent variables (covariates and outcomes). The models were adjusted for the corresponding baseline measure for each outcome, and the other covariates were used to obtain adjusted mean differences. Fitted GEE parameters can be interpreted as the odds (in logistic models) or mean difference (in linear regression models) over the entire 12-month period for an “average” participant. To obtain adjusted means and mean differences, models were repeatedly estimated from bootstrap samples, where samples were drawn with replacement at the level of the participants. For each model result, adjusted means were calculated and standard errors were then calculated from the collection of bootstrap results. The 95% confidence interval around the adjusted OR and adjusted mean difference and the corresponding P value were also computed. Percent relative change for continuous variables was computed as the difference between the adjusted mean for each condition (D) divided by the adjusted mean for the comparison condition. The percent relative change is independent of the different study scales and provides a common metric for measuring the magnitude of change across scales relative to the baseline measure.

RESULTS

Baseline Analyses

Baseline descriptive analyses demonstrate that women had been living with HIV for an average of 5 years (SD = 3.8), had a mean age of 34.7 years (SD = 7.6), and were predominantly black (84.2%). Although 63.7% had completed high school, 70.2% did not work and 83.3% of participants had 1 or more children. Of the 366 participants, 190 were randomized to the WiLLOW intervention and 176 to the comparison condition (see Fig. 1). At baseline, we assessed the comparability of the study conditions and observed differences on several variables previously associated with HIV transmission risk behaviors (Table 1). These variables were included as covariates in subsequent analyses.

Quality Assurance

Trained monitors attended all study sessions and rated the fidelity of implementation to assess quality assurance. Nearly 97% of the activities in each study condition were implemented with fidelity. Participants’ attendance at the study sessions was also recorded. Attendance in each condition was high. Of the 190 participants in the WiLLOW intervention, 181 (95.2%) completed all 4 sessions, and of the 176 participants in the comparison condition, 172 (97.7%) completed all 4 sessions.

Attrition

Of the 190 participants in the WiLLOW intervention, 176 (92.6%) completed the 6-month assessment and 162 (85.2%) completed the 12-month assessment. Of the 176 participants in the comparison condition, 165 (93.8%) completed the 6-month assessment and 159 (90.3%) completed the 12-month assessment (see Fig. 1). No differences in attrition were observed between study conditions at the 6-month (P = 0.67) or 12-month (P = 0.14) assessment. Several differences were observed on baseline sociodemographic characteristics for participants retained in the trial compared with those unavailable for follow-up. Participants in the WiLLOW intervention who were lost to follow-up were less likely to have health insurance (P = 0.04) and were less likely to be black (P = 0.02). No differences were observed in the comparison condition on baseline sociodemographic characteristics for participants retained in the trial compared with those unavailable for follow-up.

Effect of the Intervention on Sexual Behaviors

Effects of the intervention on the primary outcome, unprotected vaginal intercourse, are presented in Table 2 and schematically presented in Figure 2. Compared with participants in the comparison condition, participants in the WiLLOW intervention had a significantly lower adjusted mean number of unprotected vaginal intercourse acts in the 30 days preceding the 6-month assessment (1.3 vs. 1.8; P = 0.037) and the 12-month assessment (1.6 vs. 2.9; P = 0.029) as well as over the entire 12-month period (1.8 vs. 2.5; P = 0.022). Additionally, women in the WiLLOW intervention were significantly less likely to report never using condoms in the 30 days...
Effect of the Intervention on Incident Sexually Transmitted Disease Infections

Results of the STD analyses illustrate that relative to the comparison condition, participants in the WiLLOW intervention were not significantly less likely to have an incident bacterial infection of Chlamydia or gonorrhea at the 6-month assessment (OR = 0.30; P = 0.11; see Table 2). Participants in the WiLLOW intervention were significantly less likely to have an incident bacterial STD at the 12-month assessment (OR = 0.10; P = 0.023) and over the entire 12-month period (OR = 0.20; P = 0.006). No differences were observed for incident Trichomonas infections at the 6-month assessment, the 12-month assessment, or over the entire 12-month period.

Effect of the Intervention on Psychosocial Mediators and Structural Factors

The effects of the WiLLOW intervention on empirically and theoretically derived psychosocial mediators and structural factors are presented in Table 3. Over the 12-month follow-up period, GEE analyses revealed that compared with participants in the comparison, participants in the WiLLOW intervention reported a significantly lower adjusted mean number of perceived partner barriers to using condoms (11.7 vs. 12.1; P = 0.004), had fewer beliefs that condoms interfere with sex (16.3 vs. 16.9; P = 0.01), had higher condom use self-efficacy (13.6 vs. 12.6; P = 0.001), were more knowledgeable about HIV transmission risk behaviors (9.8 vs. 9.4; P =...
0.0001), demonstrated greater skill in using condoms (5.4 vs. 4.7; *P* = 0.0001), and reported having more network members who provided social support (15.2 vs. 13.6; *P* = 0.02).

**DISCUSSION**

This is the first trial to demonstrate that an intervention can reduce HIV transmission risk behaviors and enhance psychosocial mediators and structural factors associated with HIV-preventive behaviors among women living with HIV. Moreover, this trial observed an intervention effect on the reduction of incident bacterial STDs among these women. Because STDs facilitate HIV transmission,45,46 small reductions in incident STDs could yield substantial reductions in HIV morbidity and its associated treatment costs.47

The efficacy of the intervention may have resulted from the emphasis on psychosocial mediators derived from the social marketing approach yet demonstrated a change in actual behaviors (5.4 vs. 4.7; *P* = 0.0001).

**TABLE 2. Effect of the WiLLOW Intervention on Sexual Behaviors and Incident STDs**

<table>
<thead>
<tr>
<th>Variables</th>
<th>6-Month Assessment</th>
<th>12-Month Assessment</th>
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<tbody>
<tr>
<td></td>
<td>Effect Size</td>
<td>Effect Size</td>
</tr>
<tr>
<td></td>
<td>Odds Ratio (OR)*</td>
<td>Odds Ratio (OR)*</td>
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<tr>
<td></td>
<td>or Mean Difference</td>
<td>or Mean Difference</td>
</tr>
<tr>
<td></td>
<td>(D)†</td>
<td>(D)†</td>
</tr>
<tr>
<td># acts unprotected vaginal sex, past 30 days§</td>
<td>−0.5</td>
<td>1.3</td>
</tr>
<tr>
<td>Proportion never used condoms, past 30 days§</td>
<td>0.3</td>
<td>na</td>
</tr>
<tr>
<td>Incident GC/CT #,**</td>
<td>0.3</td>
<td>na</td>
</tr>
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### GEE Model (Baseline to 12 Months)

<table>
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<th>Variables</th>
<th>Effect Size</th>
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<tbody>
<tr>
<td></td>
<td>Odds Ratio (OR)*</td>
</tr>
<tr>
<td></td>
<td>Mean Difference (D)†</td>
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<tr>
<td># acts unprotected vaginal sex, past 30 days§</td>
<td>−0.7</td>
</tr>
<tr>
<td>Proportion never used condoms, past 30 days§</td>
<td>0.3</td>
</tr>
<tr>
<td>Incident GC/CT #,**</td>
<td>0.2</td>
</tr>
</tbody>
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* Adjusted odds ratio calculated with the comparison condition as the referent (OR = 1.0).
† Adjusted Mean Difference (D) and 95% Confidence Interval around the adjusted mean or around the adjusted odds ratio.
‡ Adjusted mean for the WiLLOW Intervention.
§ Adjusted mean for the Health Promotion Comparison.
% Relative Change (RC) = [D/C × 100%] and 95% Confidence Interval around the relative change.
¶ Adjusted by covariates: corresponding baseline variable, having a steady partner, physical abuse, alcohol use, years living with HIV and communication self-efficacy.
# Adjusted by covariates: corresponding baseline variable, prior STD treatment, prior STD symptoms.
** Unadjusted STD results demonstrate that over the 12-month follow-up, the comparison condition experienced 18 incident CT/GC infection versus 7 infections in the intervention.

![Figure 2](image_url)
cial cognitive theory. Women in the intervention reported greater knowledge of HIV transmission risk behaviors and fewer partner-related barriers to using condoms, had higher condom use self-efficacy, and demonstrated greater skill in using condoms. The efficacy may also be partly attributable to the gender-tailored framework that addressed how women’s limited social networks may constrain their ability to obtain healthy social support and promote risk behaviors. Thus, building social support networks among women living with HIV is critical, particularly given the often limited number of AIDS service organizations available for women. Furthermore, HIV-positive women may be less likely to access social support from existing network members. This may be partly attributed to women’s fear of being stigmatized, because women living with HIV are stigmatized differently than men with this condition. Women living with HIV may encounter stigmas associated with their being perceived as sexually promiscuous or as vectors for HIV transmission. Our gender-

### TABLE 3. Effect of the WILLOW Intervention on Psychosocial Mediators and Structural Factors

| Variables                                | 6-Month Assessment |                                            | 12-Month Assessment |                                            |  |
|------------------------------------------|-------------------|---------------------------------------------|---------------------|---------------------------------------------|  |
|                                          | I*                | C†                                          | D‡ (95% CI)         | % RC§ (95% CI)                              | P |
| HIV transmission knowledge†             | 10.0              | 9.4                                         | 0.6 (0.4, 1.0)      | 6.6 (3.7, 11.2)                             | 0.002 |
| Condom use self-efficacy§               | 13.8              | 12.7                                        | −1.1 (0.1, 1.8)     | 8.6 (0.9, 15.3)                             | 0.001 |
| Beliefs that condoms interfere with sex³ | 15.6              | 16.6                                        | −0.1 (−1.9, −0.1)   | −5.9 (−11.5, −0.7)                         | 0.06 |
| Partner barriers to condom use³         | 11.2              | 12.0                                        | −0.8 (−1.6, 0.9)    | −6.5 (−12.6, −1.0)                         | 0.11 |
| Condom use skill³                       | 5.5               | 4.8                                         | 0.7 (0.5, 0.9)      | 14.1 (10.0, 19.3)                          | 0.00001 |
| Number of social network members¶      | 15.0              | 11.7                                        | 3.3 (1.3, 5.5)      | 28.0 (12.5, 54.0)                         | 0.04 |

| Variables                                | GEE Model (Baseline to 12 Months) |                                            |                                   |                                            |  |
|------------------------------------------|-----------------------------------|---------------------------------------------|---------------------------------------|---------------------------------------------|  |
|                                          | I                  | C              | D‡ (95% CI)                              | % RC§ (95% CI)                          | P |
| HIV transmission knowledge†             | 9.8                 | 9.4            | 0.3 (0.1, 0.6)                           | 3.6 (1.1, 6.1)                          | 0.0001 |
| Condom use self-efficacy§               | 13.6                | 12.6           | −0.6 (0.2, 1.9)                          | −3.3 (1.1, 15.0)                        | 0.001 |
| Beliefs that condoms interfere with sex³ | 16.3                | 16.9           | −0.4 (−1.3, −0.2)                       | −3.4 (−7.4, −0.8)                       | 0.01 |
| Partner barriers to condom use³         | 11.7                | 12.1           | −0.9 (−0.9, −0.8)                       | −3.4 (−7.3, 0.6)                        | 0.004 |
| Condom use skill³                       | 5.4                 | 4.7            | 0.7 (0.5, 0.9)                           | 14.9 (10.3, 19.4)                       | 0.0001 |
| Number of social network members¶      | 15.2                | 13.6           | 1.6 (0.4, 3.2)                           | 12.0 (0.5, 23.4)                        | 0.02 |

*Adjusted mean for the WILLOW intervention (I).
†Adjusted mean for the health promotion comparison (C).
‡Adjusted D and 95% confidence interval (CI) around the adjusted mean or around the adjusted OR.
§% relative change (RC) = [D/C × 100%] and 95% CI around the relative change.
³Adjusted by covariates: corresponding baseline variable, having a steady partner, physical abuse, alcohol use, years living with HIV, and communication self-efficacy.
¶Adjusted by covariates: disclosed HIV status to family, partner, and employers.
tailored framework encouraged using supportive and nonjudgmental network members to provide support. Further, the use of HIV-positive female peer educators and the small size of the educational groups may have created an atmosphere that encouraged the adoption of safer sex practices.

This study is not without limitation. First, the study may not be applicable to women with different risk profiles, such as injection drug users, because they were not represented in our study. Additionally, the findings may not be generalizable to nonminority women, because approximately 85% of participants were black. Finally, although the measurement of STDs represents a methodologic improvement, the statistical power and precision of the effect estimates may be limited. Future studies using STDs, particularly as the primary outcome, require larger samples, longer follow-up, or samples that have a higher incidence of infections.

In conclusion, prevention interventions with HIV-positive people should be tailored to their unique needs. Programs designed for women must be easily accessible, because, relative to HIV-positive men, HIV-positive women are more likely to have children, are more likely to cite transportation as a barrier to seeking HIV services, are more likely to be unemployed, have less education, and are less likely to have private insurance. Furthermore, to be optimally effective, interventions for women should be gender tailored, theoretically derived, and benefit from the active and sustained involvement of women living with HIV in the design and implementation of the program. In response to the growing number of women living with HIV, there is a clear and compelling urgency to develop and implement prevention programs for this vulnerable and often neglected population.

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