

Efficacy of a Savings-Led Microfinance Intervention to Reduce Sexual Risk for HIV Among Women Engaged in Sex Work: A Randomized Clinical Trial

Susan S. Witte, PhD, Toivgoog Aira, PhD, Laura Tsai, PhD, Marion Riedel, PhD, Reid Offringa, PhD, Mingway Chang, PhD, Nabila El-Bassel, PhD, and Fred Ssewamala, PhD

Poverty, gender inequity, and violence are some of the social determinants—complex, integrated, and overlapping social structures and economic systems—that are responsible for most health inequities. These determinants may also include the social environment, physical environment, health services, and structural and societal factors.¹ Growing awareness that individually focused HIV interventions for women are severely limited by such social and structural determinants has led to an increase in interventions that attempt to address such features.² For women engaged in sex work as a primary source of income, for example, reliance on sexual behavior as a means of economic support may compromise ability to be concerned with the longer term health consequences associated with risk taking. In such cases, alternative income sources reducing economic incentive for risk behaviors may be needed.²⁻⁶

Mongolia currently has an HIV prevalence rate of less than 0.1%.⁷ In 2012, 127 registered people were infected with HIV. Men constitute 81% of HIV cases, most of whom are men who have sex with men. Half of the women with HIV infection are sex workers.⁸ Yet, as a country in economic and political transition, Mongolia is considered highly vulnerable to the spread of HIV/AIDS. Vulnerability includes high rates of sexually transmitted infections (STIs) and alcohol dependence, both critical cofactors associated with emerging HIV epidemics in other parts of the world,^{9,10} as well as high rates of poverty, unemployment,^{11,12} and disproportionate unemployment among women,¹¹ which has led to an increase in women engaging in sex work for survival, the clients of whom represent a key bridge population to a more generalized epidemic.^{9,10} A systematic review of the HIV burden among women engaged in sex work in 50 low- and middle-income countries found that women engaged in sex work had an overall

Objectives. We tested whether a structural intervention combining savings-led microfinance and HIV prevention components would achieve enhanced reductions in sexual risk among women engaging in street-based sex work in Ulaanbaatar, Mongolia, compared with an HIV prevention intervention alone.

Methods. Between November 2011 and August 2012, we randomized 107 eligible women who completed baseline assessments to either a 4-session HIV sexual risk reduction intervention (HIVSRR) alone (n = 50) or a 34-session HIVSRR plus a savings-led microfinance intervention (n = 57). At 3- and 6-month follow-up assessments, participants reported unprotected acts of vaginal intercourse with paying partners and number of paying partners with whom they engaged in sexual intercourse in the previous 90 days. Using Poisson and zero-inflated Poisson model regressions, we examined the effects of assignment to treatment versus control condition on outcomes.

Results. At 6-month follow-up, the HIVSRR plus microfinance participants reported significantly fewer paying sexual partners and were more likely to report zero unprotected vaginal sex acts with paying sexual partners.

Conclusions. Findings advance the HIV prevention repertoire for women, demonstrating that risk reduction may be achieved through a structural intervention that relies on asset building, including savings, and alternatives to income from sex work. (*Am J Public Health*. Published online ahead of print January 20, 2015; e1–e8. doi:10.2105/AJPH.2014.302291)

increased odds of HIV infection relative to the general female population, with the highest odds observed in Asia.¹³ As a low- to middle-income country in economic transition, Mongolia is a particularly important location in which to test health-related interventions that may offer the secondary benefit of increasing sources of income for women, which may also help expand the economy.

Microfinance programs constitute one of the fastest growing strategies to address poverty in developing countries.^{14,15} In this study, we define *microfinance* broadly as financial information and services provided to low-income individuals. More specifically, *microloans* or *microcredit* refer to small loans given to people who are otherwise unable to borrow money. *Microenterprise* refers to the building of a small business, in this case begun with a microloan or microfinance. Microsavings initiatives, for

example, allow low-income clients to create and maintain a savings account by reducing minimum opening amounts and required balances.¹⁶ Although some controversy remains regarding how successful microfinance has been at reducing poverty among some groups and in some regions,¹⁷ a systematic review of combination microfinance and HIV prevention programs has shown that income-generating interventions may lead to reductions in sexual and drug risk behaviors among women engaged in sex work.¹⁸

One hundred women engaged in sex work who participated in a randomized clinical trial in India in which they were taught HIV prevention plus tailoring skills (vocational training) demonstrated a decrease in paying partners compared with those who received HIV prevention plus English language skills.¹⁹ Another randomized trial among sex workers in Kenya

receiving microenterprise services (microloans) to begin a business yielded reductions in the number of sex partners and higher consistency in condom use compared with controls,²⁰ and a randomized trial among 843 poor women in South Africa demonstrated that the addition of microloans to HIV prevention curricula improved HIV-related communication, increased voluntary counseling and testing, and decreased unprotected sex.^{21,22}

Microcredit and microloan programs pose important limitations, however, to poor women who experience intersectional marginalization because of their sex work, alcohol or drug use, and associated stigma.²³ Microloans by themselves, whether they are usurious loans from money lenders or subsidized microcredit loans by nongovernmental organizations, represent “saving down,” which may keep women in debt and a vicious cycle of poverty, making it impossible for them to reduce their reliance on sex work, further exposing them to HIV/STI risks. Given the role of gender inequality as a structural driver in health inequities, it is also important that micro-savings be established in women’s own names, giving them control over this economic resource.²⁴

We designed this study to test a savings-led microfinance approach to HIV prevention, building on extant literature and pilot research completed in Mongolia over 5 years with women engaged in street-based sex work.^{25,26} Participants in a previous trial testing an individual-level HIV risk reduction program indicated that although they benefited from risk reduction skills and safety components, they were often offered more money for unprotected sex, and their goals included transitioning out of sex work to alternative forms of employment.^{26,27} This study builds on this work by testing a combination microfinance and HIV risk reduction intervention. This intervention is novel in that it incorporates a savings-based approach to microfinance, enabling participants to build assets faster and pay for life-cycle events without accumulating debt or fostering an over-reliance on microloans.²⁸ Moreover, savings accounts and matched savings accounts are established in the woman’s name to give her control over accessible economic resources. We hypothesized that increasing financial literacy, business development knowledge and skills, and personal savings would lead to more significant reductions in sexual risk behaviors than a sexual risk reduction intervention alone.

METHODS

Using a group randomized clinical trial, we tested the feasibility and preliminary efficacy of a combined 4-session HIV sexual risk reduction (HIVSRR) plus microfinance intervention (including 34 training sessions and matched savings) to reduce the number of unprotected vaginal sex acts with and number of paying partners among women engaged in sex work in Ulaanbaatar, Mongolia (see the supplemental figure that appears with the online version of this article at <http://www.ajph.org>).

Participants

To improve generalizability of findings to all street-based sex workers in Ulaanbaatar, we used a targeted sampling strategy in both Ulaanbaatar and the periurban ger district. (A ger is a circular residence that is constructed with wooden frames and felt walls. Gers have traditionally been used as the dwelling place of nomadic peoples in Mongolia. In urban Ulaanbaatar, residents construct gers in congregated areas called *ger districts*.) As suggested by Peterson et al.,²⁹ we first developed a list of street-based venues informed by participants in previous studies²⁷ and community advisory board members. After compiling a list of sites, the study team conducted observations over several weeks at varying times of day to monitor how many women were soliciting at each site. We developed a proportional sampling strategy on the basis of these observations.

Outreach workers approached women at target sites, described the study to interested participants, and completed brief screening interviews, for which they obtained verbal consent. Eligible women were aged at least 18 years; reported having engaged in vaginal or anal sexual intercourse in the past 90 days in exchange for money, alcohol, or other goods; reported having engaged in unprotected vaginal or anal sex in the past 90 days with a paying sexual partner; and responded affirmatively when asked whether they were interested in learning how to develop a small business. After screening, eligible women completed informed consent for study participation and a computer-based, interviewer-administered baseline assessment ($n = 204$) and were invited to the next scheduled group start-up session.

Group randomization was more efficient than attempting to accrue enough women in a short enough period of time to individually randomize to 2 conditions at once. For this reason, we used a group randomization schema implemented successfully with the target population in a previous trial.²⁷ When 10 eligible women were accrued, we used a random-number generator to randomly assign each new group of participants to either the HIVSRR plus microfinance intervention (treatment) or HIVSRR alone (control). Using the generator, we sought to balance group assignments evenly across a total estimated number of groups needed to provide intervention to all participants.

Intervention

Control condition. The Women’s Wellness HIVSRR is a 4-session intervention successfully adapted and tested in a previous study among 166 women engaged in sex work.^{9,25} Sessions were delivered twice a week for 2 weeks. The intervention’s core components are based on social cognitive theory and a relationship-oriented ecological perspective. Skills are targeted to increasing self-efficacy and outcome expectancies for risk reduction, including how best women may protect themselves and how best to enlist paying partners in risk reduction safely. The 4 HIVSRR sessions focused on building knowledge and skills such as identifying safety risks, negotiating safer sex, and avoiding unsafe situations.²⁷

Treatment condition. The Undarga Program is the HIVSRR intervention enhanced with a microfinance component that was tested in this study. In Mongolian, undarga means “natural spring, outflow, geyser, fountain.”

The intervention integrates social cognitive and asset theories and was pilot tested with promising results before this study.²⁶ Social cognitive theory is applied in this intervention to build self-efficacy and outcome expectancies for financial literacy and business development skills. Asset theory posits that asset accumulation resulting from participation in a microfinance intervention can include both monetary and sustainable, noneconomic psychological, behavioral, and social benefits. In this study, women’s increased capacity for employment in another vocation, through completion of the microfinance intervention, may reduce the number of paying partners or episodes of

unprotected sex, both of which may formerly have been required to have enough income to survive. Additionally, according to asset theory, for example, women may place a high value on the noneconomic benefits obtained through an enhanced ability to earn income outside of sex work (as stigma is reduced, e.g.) in addition to the direct financial benefits. The accumulation of monetary assets and associated positive psychological and behavioral changes reinforce each other in a mutual manner.

The Undarga Program begins with the HIVSRR sessions.²⁷ These sessions are followed by 12 financial literacy sessions, led 3 times per week by trained research assistants. Sessions focus on banking services, savings, budgeting, debt management, and financial negotiation. We adapted the Global Financial Education Program³⁰ by Microfinance Opportunities (Washington, DC), which had already been translated into Mongolian. Financial literacy sessions were followed by 12 sessions of business development trainings provided 3 times per week by a trained research assistant. We adapted the Gender and Entrepreneurship Together^{5,31} curriculum, which has been implemented throughout Asia, the Middle East, and Africa with demonstrated effectiveness in improving business development skills and knowledge^{5,31} and had already been translated into Mongolian. Designed by the International Labour Organization, Gender and Entrepreneurship Together teaches business planning, entrepreneurship, and social networking skills while giving specific consideration to the gender-based issues that affect women's access to financial support and business opportunities. The final training component was small-group mentorship meetings cofacilitated by research team staff and an industry mentor twice a week. The goal of these sessions was to enact business plans developed during the earlier financial literacy and business development sessions. Although the industry focus of the groups varied, the standardized structure included (1) discussion of business development activities and the vocational training plan, (2) goal setting and progress review on business development, (3) provision of industry-specific technical skills by mentor, and (4) brainstorming the next steps.

We adapted the financial literacy and business development sessions by adding goal-setting activities (ensuring skills-based rehearsal consistent with social cognitive theory) as well as

a session-by-session safety check-in and safety planning, in the event that women's participation increased exposure to violence in any way.

Women engaged in sex work in Mongolia experience high rates of paying and intimate partner violence,³² and a recent systematic review has documented that women's employment and economic empowerment can be associated with an increase in intimate partner violence.³³

An innovative microfinance component of the Undarga Program was the inclusion of matched savings, an evidence-based intervention that promotes asset building in support of education, HIV risk reduction, and microfinance^{14,34-36} but that has not yet been tested for efficacy with women engaged in sex work. During financial literacy sessions, each woman opened her own savings account. Concurrently, each woman in the intervention received an economic self-sufficiency account that was opened in her name but maintained by the study team. As women made deposits to their own personal savings account, the amount in the economic self-sufficiency account was matched 2-to-1 weekly as an incentive to continue contributions and build up savings totals. The match cap (the maximum amount of individual contribution to be matched by the intervention program) was the equivalent of US \$40 per month for 4 months or a total of US \$160. Matches up to the total of US \$160 continued until the end of the intervention period (last small-group mentorship meeting). To maintain the matched savings, the women needed to attend 9 of 12 financial literacy training sessions, 9 of 12 business development training sessions, and 6 of 10 mentorship sessions. Matched savings were disbursed through the study team to the women for 2 specified purposes: (1) purchase of materials to start a small business (e.g., sewing, laundry, or small vendorship) or (2) to pay for a job or vocational training program.

Assessment

Participants completed computer-based assessments administered by trained interviewers at 4 time points: at baseline, immediately after the HIVSRR sessions, at 3 months, and at 6 months after completion of the Undarga Program intervention. Because both conditions began with the 4-session HIVSRR, we incorporated the immediate, postintervention assessment into the design to measure

short-term impact of the HIVSRR on sexual risk outcomes only. The time frame for this assessment, 2 weeks postintervention, however, was inconsistent with the past-90-days time frame for the baseline and longer term assessments. Three- and 6-month assessments measured all variables from the baseline assessment and with the same time frame. For this reason, we dropped the immediate postintervention assessment from the final analyses.

Assessments were conducted between November 2011 and July 2013. Outcome measures had been translated, back-translated, and implemented with good reliability in a previous study in Mongolia.²⁷ Sociodemographic variables included age, education, employment status, income, marital status, having a trust partner (defined as an intimate partner other than a paying partner, which may include a spouse, boyfriend, or lover), current housing situation, and whether exchanging sex for money was the primary source of income. Participants provided self-reported data on the number of paying partners and the number of times they had engaged in unprotected vaginal and anal sex with paying partners in the prior 90 days. Sample questions included "In the past 90 days, how many times did you have vaginal sex with paying partners?" and "In the past 90 days, how many times did you use a male condom when having vaginal sex with paying partners?" We assessed harmful alcohol use using the Alcohol Use Disorders Identification Test, which was implemented during screening and then again at 3 and 6 months postintervention. This test is a 10-item scale that ranks a respondent's self-reported alcohol use from 0 to 40, with 40 being the most harmful.³⁷ Cronbach's α with this population falls between 0.88 and 0.90. The time frame for the Alcohol Use Disorders Identification Test was the past 90 days, to be consistent with reports of sexual risk.

Compensation

Participants were compensated financially for their time with small sums so as not to be coercive. For example, women received Mongolian tugrik (MNT) 6000 for each intervention session (approximately US \$4.62; at the time of this study, the conversion rate between the MNT and the US dollar was roughly MNT 1,300 per US \$1.00. Because of rapid inflation in Mongolia, the conversion rate changed throughout the

project.) To guard against women engaging in sex work to accumulate savings, incentives offered for participation were comparable with the total amount that would be matched each week by the research team. In other words, at \$5 per session, over the course of the intervention with 100% attendance women were able to accumulate a total of US \$190 (38 sessions × US \$5), just above the match cap, or the total amount possible for women to have matched in their economic self-sufficiency accounts.

Data Analysis

Using an intention-to-treat approach, we compared the outcomes of participants in the Undarga Program group with those of the HIVSRR-alone group. Intention-to-treat analyses included all participants who were randomized, including those unavailable for follow-up. We conducted a generalized Poisson regression for the outcome number of paying partners and a zero-inflated Poisson regression model for the number of unprotected vaginal sex acts with a paying partner. We chose a zero-inflated model to examine the number of unprotected sex acts because of a relatively high number of zero scores at follow-up.

For both models, we accounted for repeated measurements with a subject-level random intercept, along with a time variable that included 3 levels (baseline, 3 months, and 6 months).^{38,39} This allowed us to examine the dependent variable at different points in time. In both analyses, our primary independent variable was the microfinance intervention, which was dummy-coded (microfinance = 1; control = 0). We also used contrast coding to examine the effect of the microfinance intervention at different points in time. To account for potential cluster effects resulting from group randomization, we calculated the intraclass correlations among women assigned to the same intervention groups. We found these to be extremely small (<.01), so we did not include group as a random effect. Analyses were conducted using SAS version 9.4 (SAS Institute, Cary, NC).

RESULTS

Among the 107 women, 57 were in the Undarga Program treatment group and 50 were in the HIVSRR-alone group. Most women participated in at least some sessions and almost

all of the follow-up interviews. Women in the Undarga Program group attended an average of 6.49 (54%) financial literacy, 5.33 (44%) business development, and 3.73 (37%) mentorship sessions. The retention rates at each follow-up were 84% or higher (Figure 1). Six-month attrition rates did not significantly differ by condition ($\chi^2(1, n = 107) = 0.097; P = .755$).

Demographic Information and Baseline Risk Behavior

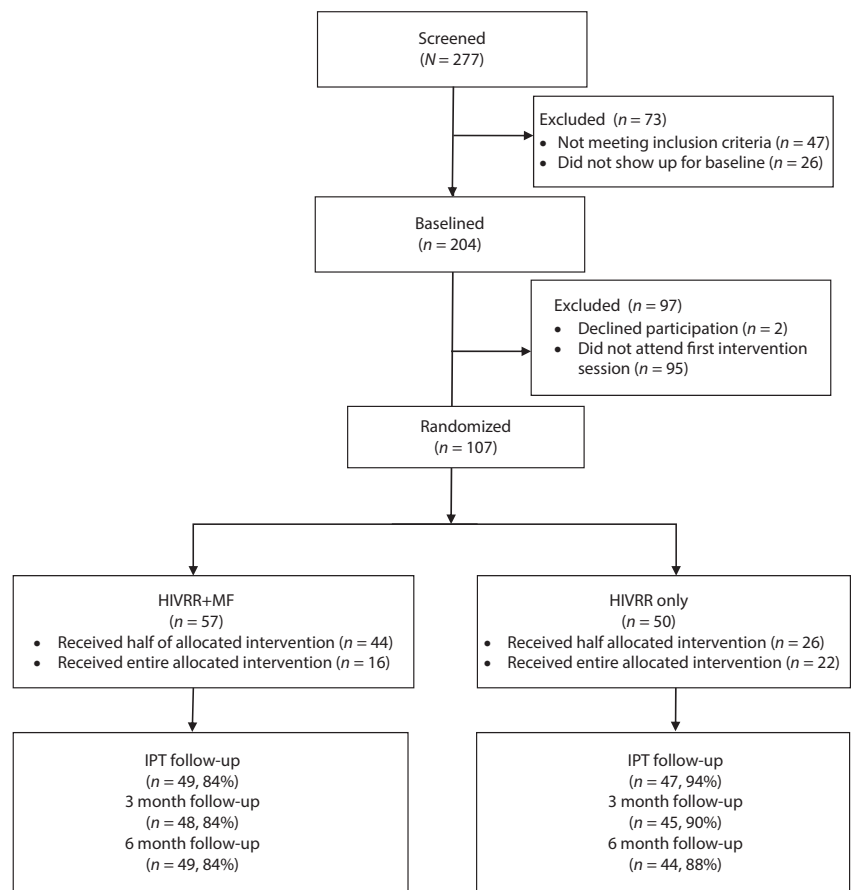
Table 1 presents the women’s demographic characteristics and data on key risk behaviors at baseline by treatment condition. The average age of participants was 36, and most had at least a high school degree and were divorced, widowed, or separated. Differences in demographic characteristics or baseline

values of the sexual risk outcomes did not differ by condition.

Sexual Risk Outcomes

Figure 2 illustrates the mean unprotected sexual acts and paying partners at baseline and 3- and 6-month follow-up for each condition. Trends demonstrate that both groups reduced risk; however, at 6 months the Undarga Program group decreased risks to a greater extent.

Table 2 shows the estimates of the effect of having been randomized to the Undarga Program group. Although participants randomized to both conditions demonstrated decreases in risk behavior over time, those randomized to the Undarga Program condition demonstrated significant reductions over and above the HIVSRR-alone condition.



Note. HIVSRR = HIV sexual risk reduction; IPT = immediate posttest; MF = microfinance intervention.

FIGURE 1—Consort diagram: Ulaanbaatar, Mongolia, November 2011–July 2013.

TABLE 1—Demographic Characteristics at Study Baseline (n = 107): Ulaanbaatar, Mongolia, November 2011–July 2013

Characteristic	HIVSRR Alone (n = 50), No (%) or Mean \pm SD	HIVSRR + Microfinance (n = 57), No. (%) or Mean \pm SD
Age	37.70 \pm 9.25	35.68 \pm 9.32
\geq secondary school	45 (90.0)	54 (94.74)
Divorced, widowed, or separated	30 (60.00)	27 (47.37)
Has trust partner ^a	21 (42.0)	28 (49.12)
Monthly income \leq 100 000 tugriks	7 (15)	6 (10.5)
Duration of sex work, y	5.73 (4.7)	6.92 (5.6)
No. dependents	2.26 \pm 1.76	2.37 \pm 2.14
Primary income earner in household	39 (78.0)	43 (75.44)

Note. HIVSRR = HIV sexual risk reduction; MF = microfinance intervention.

^aDefined as an intimate partner other than a paying partner, which may include a spouse, boyfriend, or lover.

A significant main effect of time indicated that all participants exhibited a 31% decrease in the number of paying sexual partners at each time point. However, a significant group \times time interaction indicated that participants in the Undarga Program group exhibited a 22% greater decrease than those in HIVSRR-alone group for each time point (Table 2). Furthermore, contrasts within specific time points indicated that participants in the Undarga Program group reported 50% fewer paying sexual partners at the 6-month time point (Table 3).

A significant main effect of time indicated that all participants exhibited a 39% decrease in the number of unprotected vaginal sex acts with paying partners at each time point. We did not find a main effect of the Undarga Program group, nor did we find a significant group \times time interaction ($P > .05$; Table 2). However, contrasts within specific time points indicated that participants in the Undarga Program group were 3.72 times more likely to report no unprotected vaginal sex acts at the 6-month time point (Table 3).

DISCUSSION

This study was the first test of a savings-led microfinance intervention in support of HIV prevention among women engaged in sex work. We found that women who were assigned to the microfinance condition demonstrated significantly greater reductions in the number of paying sexual partners, as well as fewer sexual partners at the 6-month follow-up.

Furthermore, women in the Undarga Program condition were more likely to report zero unprotected vaginal sex acts over the past 3 months at the 6-month follow-up. Findings are consistent with those of others who tested combination microfinance interventions targeting women engaged in sex work in Chennai, India,¹⁹ and Nairobi, Kenya.²⁰

Unique to this study, however, is the demonstration that a matched savings program for asset building, paired with financial literacy and small business development, achieved reductions in sexual risk. Achieving these outcomes without the incorporation of a microloan component is an important finding. Given the marginalization and stigma women engaged in sex work already experience, until and unless there is increased regulation or oversight of microlending to build in more protections for more vulnerable or stigmatized populations, there should be more attention paid to income enhancement approaches that do not put individuals at more potential adversity and risk. Moreover, we demonstrated that a savings-led approach can be safely incorporated with women engaged in sex work. No adverse events were reported during the study related to increases in violence associated with an accumulation of assets or participation in a microfinance program.

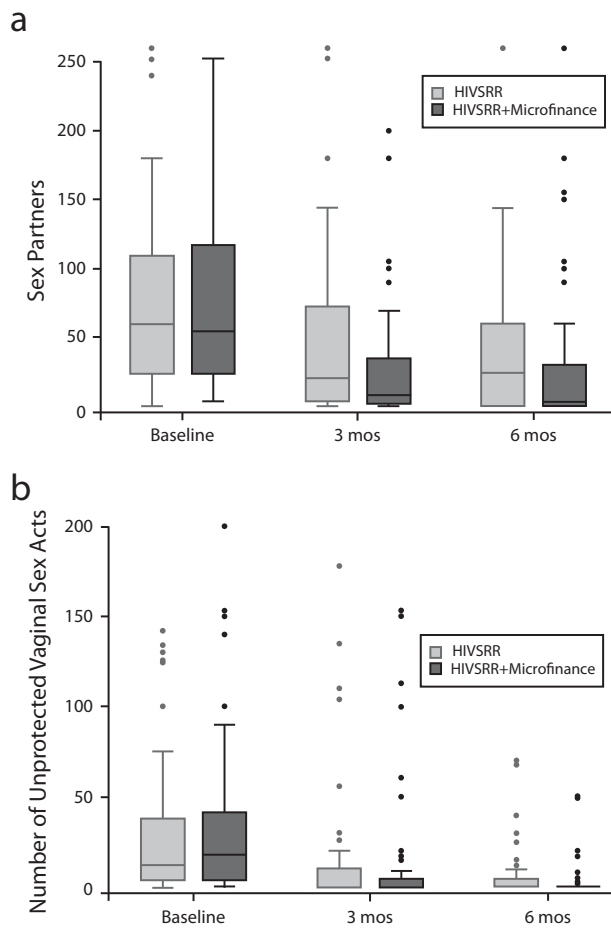
We achieved these results despite low session attendance, suggesting that session materials or presentations may be better consolidated emphasizing the more active ingredients identified. As both primary caregivers and the

primary income source for their families,⁴⁰ women reported missing sessions because of family emergencies, their poor health or that of their children or parents, or alcohol use. Such daily challenges may not be surmountable, but methods to consolidate the intervention to fewer sessions or to offer weekend workshop formats or use of technology such as mobile phones to deliver session content could be tested as more manageable alternatives. More challenging in such reduced models is how best to support asset accumulation.

Furthermore, developing and sustaining a small business is a tremendous challenge in the best of circumstances. Although not a study outcome, a number of women reported attempting to start a small business at 6-month follow-up. Many, however, also indicated that a more stable form of employment preparation—vocational training, for example—may be preferable to trying to develop a small business. Vocational training programs are structured courses often reimbursed through local or national governments and may offer more sustainable income production for women. In addition, the types of business women chose to start up—for example, sewing of traditional costumes, selling goods at a small vendorship on the street, raising pigs—may be considered more traditional female-dominated and low-paying businesses. Vocational training or programs to prepare women to participate in more traditionally male-dominated businesses might be more empowering for women and provide a more competitive income alternative to sex work.

Strengths and Limitations

Findings need to be interpreted in light of study strengths and limitations. Strengths of the study are that it is a randomized controlled trial with prospectively defined outcomes and 6-month follow-up. Limitations include the study's relatively small sample size; small amounts of missing data; and self-report of assessments, which can be subject to social desirability bias, and a 90-day time period, which may be subject to poor participant recall. The study did not include biological outcomes on STIs. We did not address sexual risk presented by intimate partners, which has also been shown to contribute to HIV/STI risk among women engaged in sex work. Attendance or dose of intervention was low overall.



Note. HIVSRR = HIV sexual risk reduction. Observed values and estimates were derived from generalized Poisson regression, by group and assessment.

FIGURE 2—Among women engaged in sex work, the (a) number of paying vaginal sex partners over time and (b) number of unprotected vaginal sex acts with paying partners: Ulaanbaatar, Mongolia, November 2011–July 2013.

Finally, because this project was a test of feasibility for the combination intervention, findings may be influenced by the difference in the number of sessions (3/4) offered to women in the

Undarga Program condition versus only 4 for women in the HIVSRR-alone condition.

We recognize that women’s decision to enter sex work is often a personal choice and

a rational strategy in the face of structural inequities.⁴ Efforts to promote women’s risk reduction through structural interventions have been called for by the international community.⁴¹ Although the intervention tested here targets risk reduction and shifting women’s income from sex work to alternative income generation, it is intended to be implemented with women interested in making such a transition because they believe that such a transition may reduce their risk for HIV and other STIs. It is in no way meant to be a reflection of any political position regarding women’s engagement in sex work.

Implications

Testing structural interventions that combine elements that may simultaneously improve health outcomes while enhancing choices for income generation or employment, particularly in low- to middle-income countries where resources may be scarcer, is a global public health imperative. High-impact interventions that may achieve such multiple outcomes should be developed, implemented, and widely disseminated. This project describes beginning efforts at combining health-related risk reduction with savings-led microfinance programming. Future research in this area should expand to incorporate other vulnerable populations responsive to microfinance interventions, including poor women; strengthen research designs with the addition of biological measures of new STI incidence; and increase the sample size and length of follow-up to increase rigor and confidence in the generalizability of findings. Future research may also consider how best to position efficacy and effectiveness testing for intervention scaling by engaging the cooperation and support of local,

TABLE 2—Estimate of Effects of Assignment to the Undarga Program: Ulaanbaatar, Mongolia, November 2011–July 2013

Effect	Vaginal Sex Partners Poisson, IRR (95% CI)	No. Unprotected Vaginal Sex Acts for Pay Poisson, IRR (95% CI)	Zero-Inflated Odds of Reporting Zero Unprotected Vaginal Sex Acts for Pay, Odds (95% CI)
Microfinance intervention	1.01 (0.63, 1.60)	1.08 (0.45, 1.72)	0.73 (-0.64, 2.09)
Time	0.69** (0.76, 0.82)	0.61** (0.57, 0.66)	3.81** (1.61, 6.02)
Time × microfinance intervention	0.78** (0.67, 0.71)	1.01 (0.92, 1.09)	1.72 (0.32, 3.13)

Note. CI = confidence interval; IRR = incidence rate ratio. Details of main outcome analysis, explained using IRR and odds increases in the specified variable. **P ≤ .001.

TABLE 3—Effect of HIV Sexual Risk Reduction Plus Microfinance Interventions at 3- and 6-Month Follow-Up: Ulaanbaatar, Mongolia, November 2011–July 2013

Effect	Vaginal Sex Partners Poisson, IRR (95% CI)	No. Unprotected Vaginal Sex Acts for Pay Poisson, IRR (95% CI)	Zero-Inflated Odds of Reporting Zero Unprotected Vaginal Sex Acts for Pay, Odds (95% CI)
HIVSRR + microfinance intervention at 3 mo	0.80 (0.50, 1.26)	1.11 (0.47, 1.74)	2.16 (0.41, 3.89)
HIVSRR + microfinance intervention at 6 mo	0.50 (0.31, 0.78)	1.12 (0.46, 1.78)	3.72* (-0.37, 7.80)

Note. CI = confidence interval; HIVSRR = HIV sexual risk reduction; IRR = incidence rate ratio. Contrasts illustrating the effect of the microfinance intervention within specified time points. * $P < .05$.

state, and national governments or global health organizations. ■

About the Authors

Susan Witte, Laura Tsai, Marion Riedel, Reid Offringa, Mingway Chang, Nabila El-Bassel, and Fred Ssewamala are with the School of Social Work, Columbia University, New York, NY. Susan Witte, Nabila El-Bassel, and Mingway Chang are also with the Global Health Research Center of Central Asia, Columbia University, New York. Toivgo Aira is with Wellspring, Ulaanbaatar, Mongolia, and the Global Health Research Center of Central Asia, Columbia University, New York.

Correspondence should be sent to Susan Witte, Associate Professor, Columbia University School of Social Work, 1255 Amsterdam Avenue, New York, NY (e-mail: ssw12@columbia.edu). Reprints can be ordered at <http://www.ajph.org> by clicking the "Reprints" link.

This article was accepted August 19, 2014.

Contributors

S. Witte conceptualized, designed, and supervised implementation of the study, including the original study proposal. T. Aira contributed to the design of the study and protocols and provided all onsite supervision, logistical planning, and project task implementation. L. Tsai and M. Riedel participated in design and implementation, specifically the development of intervention protocols; provided ongoing feedback on project logistics; and collaborated on the writing. R. Offringa conducted the data analysis under the direction of M. Chang. N. El-Bassel and F. Ssewamala contributed to the original proposal development and provided consultation on assessment and intervention protocols and article preparation.

Acknowledgments

This study was made possible through funding from the National Institute of Mental Health (R34MH093227; S. W., principal investigator).

We acknowledge the contributions of all participants, without whom this study would not have been possible.

Human Participant Protection

The National University of Mongolia's institutional review board and the Columbia University institutional review board approved this study.

References

- Marmot M, Friel S, Bell R, Houweling TA, Taylor S. Closing the gap in a generation: health equity through action on the social determinants of health. *Lancet*. 2008;372(9650):1661–1669.
- Dworkin SL, Ehrhardt AA. Going beyond "ABC" to include "GEM": critical reflections on progress in the HIV/AIDS epidemic. *Am J Public Health*. 2007;97(1):13–18.
- Dworkin SL, Blankenship K. Microfinance and HIV/AIDS prevention: assessing its promise and limitations. *AIDS Behav*. 2009;13(3):462–469.
- Shannon K, Kerr T, Allinott S, Chettiar J, Shoveller J, Tyndall MW. Social and structural violence and power relations in mitigating HIV risk of drug-using women in survival sex work. *Soc Sci Med*. 2008;66(4):911–921.
- Stratford D, Mizuno Y, Williams K, Courtenay-Quirk C, O'Leary A. Addressing poverty as risk for disease: recommendations from CDC's consultation on micro-enterprise as HIV prevention. *Public Health Rep*. 2008;123(1):9–20.
- Mbonye M, Nalukenge W, Nakamanya S, et al. Gender inequity in the lives of women involved in sex work in Kampala, Uganda. *J Int AIDS Soc*. 2012;15(suppl 1):1–19.
- Joint United Nations Programme on HIV/AIDS. *Global Report: UNAIDS Report on the Global AIDS Epidemic: 2012*. Geneva, Switzerland: Joint United Nations Programme on HIV/AIDS; 2012.
- United Nations Development Program. UNDP millennium development goals: 6, combat HIV/AIDS, malaria and other diseases—where we are. Available at: <http://www.mn.undp.org/content/mongolia/en/home/mdgoverview/overview/mdg6/>. Accessed May 25 2014.
- United Nations General Assembly Special Session. *UNGASS Country Progress Report: Mongolia*. New York, NY: United Nations General Assembly; 2010.
- National Committee on HIV/AIDS. *Mongolian National Strategic Plan on HIV, AIDS and STIs 2010–2015*. Ulaanbaatar, Mongolia: National Committee on AIDS; 2010.
- Skapa B. Mongolian women and poverty during the transition. In: Griffin K, ed. *Poverty and the Transition to a Market Economy in Mongolia*. New York, NY: St. Martin's Press; 1995.
- Skapa B, Benwell AF. Women and poverty during the transition. In: Bruun O, Odgaard O, eds. *Mongolia in Transition*. Richmond, England: Nordic Institute of Asian Studies; 1996.
- Baral S, Sifakis F, Cleghorn F, Beyrer C. Elevated risk for HIV infection among men who have sex with men in low- and middle-income countries 2000–2006: a systematic review. *PLoS Med*. 2007;4(12):e339.
- Ssewamala FM, Sherraden M. Integrating saving into microenterprise programs for the poor: do institutions matter? *Soc Serv Rev*. 2004;78(3):404–428.
- United Nations Capital Development Fund. *Report From the Field: Microfinance Plays Strong Role in Mongolia's Poverty Reduction Strategy*. New York, NY: United Nations Capital Development Fund; 2005.
- Armendáriz B, Morduch J. *The Economics of Microfinance*. Boston, MA: MIT Press; 2010.
- Duflo E, Banerjee AV, Glennerster R, Kinnan CG. *The Miracle of Microfinance? Evidence From a Randomized Evaluation*. Cambridge, MA: National Bureau of Economic Research; 2013. NBER working paper 18950.
- Cui RR, Lee R, Thirumurthy H, Muessig KE, Tucker JD. Microenterprise development interventions for sexual risk reduction: a systematic review. *AIDS Behav*. 2013;17(9):2864–2877.
- Sherman SG, Srikrishnan AK, Rivett KA, Liu SH, Solomon S, Celentano DD. Acceptability of a microenterprise intervention among female sex workers in Chennai, India. *AIDS Behav*. 2010;14(3):649–657.
- Odek WO, Busza J, Morris CN, Cleland J, Ngugi EN, Ferguson AG. Effects of micro-enterprise services on HIV risk behavior among female sex workers in Kenya's urban slums. *AIDS Behav*. 2009;13(3):449–461.
- Pronyk PM, Kim JC, Abramsky T, et al. A combined microfinance and training intervention can reduce HIV risk behavior in young female participants. *AIDS*. 2008;22(13):1659–1665.
- Kim J, Pronyk P, Barnett T, Watts C. Exploring the role of economic empowerment in HIV prevention. *AIDS*. 2008;22(suppl 4):S57–S71.
- Mayoux L. Questioning virtuous spirals: microfinance and women's empowerment in Africa. *J Int Dev*. 1999;11(7):957–984.
- Parker RG, Easton D, Klein CH. Structural barriers and facilitators in HIV prevention: a review of international research. *AIDS*. 2000;14(suppl 1):S22–S32.
- Witte SS, Batsukh A, Chang M. Sexual risk behaviors, alcohol abuse, and intimate partner violence among sex workers in Mongolia: implications for HIV prevention

- intervention development. *J Prev Interv Community*. 2010;38(2):89–103.
26. Tsai LC, Witte SS, Aira T, Altantssetseg B, Riedel M. Piloting a savings-led microfinance intervention with women engaging in sex work in Mongolia: further innovation for HIV risk reduction. *Open Womens Health J*. 2011;5:26–32.
27. Witte SS, Altantssetseg B, Aira T, et al. Reducing sexual HIV/STI risk and harmful alcohol use among female sex workers in Mongolia: a randomized clinical trial. *AIDS Behav*. 2011;15(8):1785–1794.
28. Sherraden M. *Assets and the Poor: A New American Welfare Policy*. Armonk, NY: ME Sharpe; 1991.
29. Peterson JA, Reisinger HS, Schwartz RP, et al. Targeted sampling in drug abuse research: a review and case study. *Field Methods*. 2008;20(2):155–170.
30. Microfinance Opportunities. *Global Financial Education Program*. Washington, DC: Microfinance Opportunities; 2002.
31. International Labor Organization. *Impact Assessment: Gender and Entrepreneurship Together Training Implementation*. Geneva, Switzerland: International Labor Organization; 2008.
32. Carlson CE, Chen J, Chang M, et al. Reducing intimate and paying partner violence against women who exchange sex in Mongolia: results from a randomized clinical trial. *J Interpers Violence*. 2012;27(10):1911–1931.
33. Vyas S, Watts C. How does economic empowerment affect women's risk of intimate partner violence in low and middle income countries? A systematic review of published evidence. *J Int Dev*. 2009;21(5):577–602.
34. Ssewamala FM, Chang-Keun H, Neilands T. Asset ownership and health and mental health functioning among AIDS-orphaned adolescents: findings from a randomized clinical trial in rural Uganda. *Soc Sci Med*. 2009;69(2):191–198.
35. Ssewamala FM, Ismayilova L. Integrating children's savings accounts in the care and support of orphaned adolescents in rural Uganda. *Soc Serv Rev*. 2009;83(3):453–472.
36. Ssewamala FM, Sperber E, Zimmerman JM, Karimli L. The potential of asset-based development strategies for poverty alleviation in sub-Saharan Africa. *Int J Soc Welf*. 2010;19(4):433–443.
37. Saunders JB, Aasland OG, Babor TF, de la Fuente JR, Grant M. Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO Collaborative Project on Early Detection of Persons with Harmful Alcohol Consumption II. *Addiction*. 1993;88(6):791–804.
38. Hall DB. Zero-inflated Poisson and binomial regression with random effects: a case study. *Biometrics*. 2000;56(4):1030–1039.
39. Rotheram-Borus MJ, Desmond K, Comulada WS, Arnold EM, Johnson M, and the Healthy Living Trial Group. Reducing risky sexual behavior and substance use among currently and formerly homeless adults living with HIV. *Am J Public Health*. 2009;99(6):1100–1107.
40. Tsai LC, Witte S, Aira T, Riedel M, Hwang H, Ssewamala FM. "There is no other option; we have to feed our families... who else would do it?": the financial lives of women engaging in sex work in Ulaanbaatar, Mongolia. *Glob J Health Sci*. 2013;5(5):41–50.
41. Shannon K, Montaner JS. The politics and policies of HIV prevention in sex work. *Lancet Infect Dis*. 2012;12(7):500–502.