Promoting Female Condoms in the Sex Industry in Four Towns of Southern China: Context Matters

Li Nie, M.S.,
Department of Epidemiology and Bio-statistics, Institute of Basic Medical Sciences, Chinese Academy of Medical Sciences/ Peking Union Medical College, Beijing, China, 86-10-69156973 (office), 86-10-65225752 (Fax), nie.li@hotmail.com

Susu Liao, M.D., Ph.D.[*],
Department of Epidemiology and Bio-statistics, Institute of Basic Medical Sciences, Chinese Academy of Medical Sciences/ Peking Union Medical College, 5 Dong Dan San Tiao, Beijing, China, 86-10-69156971 (office), 86-10-65225752 (Fax), susuliao@mx.cei.gov.cn

Margaret R. Weeks, Ph.D.,
Institute for Community Research, 2 Hartford Sq. W., Ste. 100, Hartford, CT USA, 860-278-2044 (office), 860-278-2141 (fax), mweeks@icrweb.org

Yanhong Wang, Ph.D.,
Department of Epidemiology and Bio-statistics, Institute of Basic Medical Sciences, Chinese Academy of Medical Sciences/ Peking Union Medical College, Beijing, China, wyhong826@gmail.com

Jingmei Jiang, Ph.D.,
Department of Epidemiology and Bio-statistics, Institute of Basic Medical Sciences, Chinese Academy of Medical Sciences/ Peking Union Medical College, Beijing, China, jingmeijiang238@hotmail.com

Qingning Zhang, Ph.D.,
Department of Epidemiology and Bio-statistics, Institute of Basic Medical Sciences, Chinese Academy of Medical Sciences/ Peking Union Medical College, Beijing, China, qingning80@126.com

Yuejiao Zhou,
Guangxi Center for Disease Prevention and Control, Nanning, Guangxi, China, gxcdcj@yahoo.com.cn

Bin He, MPH,
Hainan Center for Disease Prevention and Control, Haikou, Hainan, China, binhe898@yahoo.cn

Jianghong Li, M.D., M.S., and
Institute for Community Research, Hartford, Connecticut, jianghong.li@icrweb.org

Jennifer Dunn, M.A.
Institute for Community Research, Hartford, Connecticut, jennifer.dunn@icrweb.org

[*]Correspondence author. Tel.:+86 10 69156971 ; fax: +86 10 65225752, susuliao@mx.cei.gov.cn.

Conflicts of Interest No conflicts of interests are involved in this study.

Abstract

Background—The female condom (FC) is an effective tool for dual protection, but it remains underused. Individual as well as contextual reasons need to be explored.

Objective—To compare individual and contextual characteristics of FC multi-time users, one-time users and non-users among women in the sex industry of four study sites in China.

Methods—A standardized one-year FC intervention along with male condoms was implemented through outreach to sex establishments. Three serial cross-sectional surveys were conducted at baseline and after each of two six-month intervention phases.

Results—A total of 445, 437 and 290 eligible women were interviewed at three cross-sectional surveys, respectively. At the first and second post-intervention surveys, 83.3% and 81.7% of women reported knowing about FC, and 28.8% and 36.6% had used FC at least once. Women who used FC multiple times reported less unprotected sex than non-users in the last 30 days (3.0% vs. 17.2% at first and 3.2% vs. 16.8% at second post-intervention survey, p<0.01). Polytomous logistic regression showed that both one-time and multi-time users were more likely to come from one particular site (about 3 times more than the reference site). Higher intervention scores (adjusted OR 1.8–4.0) and working in boarding houses (adjusted OR 3.4) were associated with FC use.

Conclusions—Adding FC into male-condom-only intervention may reduce unprotected sex among women in sex establishments in rural and small urban areas of China. Adoption of FC may be related not only to intervention exposure, but also to contextual factors associated with study site and type of sex establishments.

Keywords

female condom; sex workers; China; HIV/STI prevention; community intervention

INTRODUCTION

China has experienced a drastic change in attitude towards sex in the past three decades. Concurrently, sex-related health issues, especially sexually transmitted infections (STI) including HIV/AIDS, have become public health problems in China. Female sex workers (FSW) should be considered a priority for prevention of HIV/STI.[1]

Multipurpose barrier methods have been the most effective preventive devices to date, and the most well-known of them is the male condom (MC). However, MC may not be suitable or usable in many circumstances, especially for FSW.[2] Though MC has been promoted among FSW for more than a decade in China, there remains much room for further improving their protected sex. Data from Chinese national HIV surveillance indicated the median proportion of self-reported 100% MC use with clients in the last 30 days was approximately 60% to 74% from 2004 to 2008 among FSW across 15 surveillance sites.[3] Thus, MC-only intervention is insufficient for HIV/STI prevention.

Another barrier technology for dual protection, the female condom (FC), now with several products available with similar efficacy to MC,[4, 5] should be given greater consideration. Numerous clinical trials have shown that FC was effective in increasing protected sex acts and decreasing STI incidence among women;[6] however, FC is still underused in the real world nearly two decades after first introducing the product into the market.[5, 7] Though FC education, skills training and counseling, accompanied with supply, are primary strategies used in FC promotion,[8, 9] these strategies produced very different acceptability and use in different settings. For instance, acceptability studies in family planning and STI clinic

settings have reported high rates of using FC at least once, ranging from 39% to 78%, and their results suggested that FC adoption was associated with individual-level characteristics, such as age, education and sexual relationship.[10–13] However, these studies might be insufficient to understand FC use in natural settings, because they did not analyze the contextual factors that might impact on FC promotion. The exploration of these factors could help improve program development for FC interventions in the real world and lead to further success in increasing protection during sexual activities.

Very few FC studies have been conducted in China. An early intervention study with 330 FSW revealed that as many as 94% of participants liked FC very much.[14] Previously we reported on FC acceptability identified in the first three sites of our study,[15] and on preliminary analysis of factors related to FC adoption in the first two study sites.[16] Here we will further explore the individual and contextual factors related to FC use in all four study sites of the project.

MATERIALS AND METHODS

Settings of study sites

Our project[17] was conducted sequentially in four study sites in southern China, first in two rural towns within the same county in Hainan, then in a small urban center in Guangxi, and finally in a mid-sized city in Hainan, which are referred to in this paper as FS, YF, PX and QH, respectively.

These sites were selected primarily because they have had a well-established sex industry for about two decades, and sex establishments there are typical of the sex industry in rural and small urban areas in China. Generally, the five types of sex establishments in these sites are as follows: (1) roadside brothels (also referred to as roadside restaurants),[15, 16, 18] which were found only in FS and QH and provide only sex services, (2) hairdressers/massage parlors, (3) boarding houses, (4) hotel-based massage, beauty and sauna parlors, where the women might pick up clients by calling hotel guests, which were only found in PX, and (5) nightclubs, only in QH, where entertainment such as karaoke was offered, often accompanied with alcohol. The size of establishments varied within and across different types in the four sites. For example, the number of women in hairdressers/massage parlors varied from a handful in some towns to 30–50 women in one parlor in QH. Nightclubs were also large venues with 20–50 women. Of the five types of venues, all but boarding houses were operated with bosses or managers. Women in boarding houses do freelance business.

The HIV/AIDS epidemic and history of previous prevention projects were very different among these sites. The first HIV/AIDS case was discovered among injecting drug users in PX in 1996. Since then, 499 cumulative cases have been identified there through 2009. In recent years, about 60-70% of new HIV cases were contracted through heterosexual contact.[19] HIV prevalence was relatively low in Hainan Province, though other STI are of public health concern. For instance, only 24 HIV/AIDS cases have been detected in QH since the late 1990s; however, reported syphilis prevalence was 8% among FSW during 2005 to 2007.[20] In the county where FS and YF are located, a handful of HIV/AIDS cases were reported, but none of them were from these towns.

Our project worked with different local organizations in the four sites. In the rural towns, we worked with the township hospitals. In the two urban sites, we collaborated with the municipal CDC in PX and a public clinic specializing in STI in QH. Compared with the other three collaborating organizations, PX CDC had significantly more experience with HIV/STI prevention projects for FSW, drug users and HIV infected people since the late 1990s. Though prevention projects for FSW in FS also started in the mid-1990s, the local

township hospital had changed its staff, organizational duties and administration when our project started. Relatively few projects have been conducted in YF and QH. In particular, local QH staff had had very little outreach experience at the beginning of our project.

No FC had been introduced and no women reported having used it in the four sites before our project started, though a few women had heard of FC by name.

Design of the Project

The FC intervention was designed as a two-phase program with a first 6-month phase of intensive intervention and a second 6-month phase of maintenance. Before the intervention, 4–6 months of formative ethnographic research, then a baseline survey were carried out. Another two cross-sectional surveys were conducted after each intervention phase. The project followed this timeline in the first three study sites (FS, YF and PX). But in QH, it took much longer for the ethnographers and local staff to build rapport with women in the sex venues to conduct formative research and the baseline survey. Therefore, we only completed the first phase of intervention and one post-intervention survey there in the 18 months.

The intervention was conducted according to a standard protocol mainly through outreach to establishments by trained local staff. This protocol required outreach staff to teach and demonstrate FC use in the establishments, often using a flip chart and a plastic vagina-uterus model as aids, then to provide four free FC to all women and replenish their supply on the basis of need. In the first three sites, the project provided women with the first generation of FC produced by the Female Health Company (FC1), but the second generation of FC by the same company (i.e., FC2) was provided in QH. We will not distinguish them in this paper because the two products have the same design and similar properties. Other relevant information on HIV/STI prevention and free MC were also delivered during outreach intervention.

Based on ethnographic mapping of sex establishments, there were approximately 100 FSW in each of FS and YF, 200 in PX, and 800 in QH. Due to the limited local staff in QH, the project selected two areas in the vicinity of the local collaborative clinic as the intervention target neighborhoods, which included the full array of sex establishments, a total of 18 establishments with 200–250 women.

All cross-sectional surveys were designed to recruit 70% to 80% of the total estimated women working in the targeted sex establishments. The number of participants from each venue type was roughly proportional to the estimated number of women in the different types of establishments at each study site.

Women working in the targeted establishments who were 16 years or older and sexually active in the prior 30 days were eligible for the survey at any time point. Women were also eligible in both post-intervention surveys if they could show a project card with a unique personal ID code that was written by an interviewer from a previous survey. Recruitment was conducted by local staff. Eligible women were invited to a private room where formal informed consent was completed before administering a face-to-face interview using a structured, anonymous questionnaire. Survey participants received a non-cash gift worth about RMB80 yuan (about U.S. $13). The protocols for this study received full review and approval by Institutional Review Boards at both the Chinese and the U.S. research nstitutions.

Measures

In this paper, the primary comparison was conducted between women who used or never used FC after intervention in each of the two post-intervention surveys. Therefore, we only included study participants who had heard of FC at those two time points. For these analyses, in each post-intervention survey, eligible women were categorized into three groups of FC use according to self-reported number of times they had ever used FC. "Non-users" referred to the women who had heard of FC but never used it; "one-time users" were defined as the women who reported having used FC only once; and "multi-time users" were those who reported using FC twice or more times.

The following domains were also measured: demographics, reproductive history, sexual relationships and activities in the last 30 days, attitudes about FC and HIV/STI risk, and indications of prior research participation and intervention exposure. Sexual relationships were categorized into three types according to whether the participant had a primary or paying male partner(s) or both. The proportion of protected sex was calculated as the number of sexual acts using MC or FC divided by the total number of sexual acts in the last 30 days. Attitude measures included willingness to use FC, a 17-item FC beliefs and attitudes scale measuring responses to perceived FC characteristics (range 1–4, higher score is more positive attitudes, negative items reverse coded; Cronbach's $\alpha = 0.77$),[21] and worried about HIV/STI infection (range 0–2). An FC intervention exposure score was constructed to measure involvement in our intervention. The participant would get one point on this score for each of the following four items to which she answered yes: (a) knew the project by name, (b) recognized the flip chart used during the intervention to illustrate FC use, (c) learned FC insertion in a vaginal model, which healthcare workers encouraged the women to do during outreach, and (d) practiced FC insertion by herself.

Statistical Analysis

Participant baseline characteristics were described by study site. Then women's characteristics and intervention exposure were compared among the three subgroups of FC users from all study sites combined, i.e., "non-users," "one-time users" and "multi-time users" at each of the two post-intervention surveys. Next, two polytomous logistic regression models were used to assess the independent contributions of study site, establishment types and other individual factors to FC one-time use or to FC multi-time use, both with non-use as the reference group, for both the first and second post-intervention surveys. The models, both using the same group of explanatory variables, were built based on theoretical considerations regardless of the degree of bivariate association. Three dummy variables of study sites were entered into the model with YF (a small sized site with less experienced staff) as the reference group. A dichotomous variable of boarding house vs. non-boarding house was used as the type of establishment, which generally distinguished freelance women from non-freelancers. Age was dichotomized into women 30 and women younger than 30, since older women were more likely to be married, have children, and work in the boarding houses. To understand the relation of MC use to FC use, a dichotomous variable of MC use in the previous 30 days was included in the model. Since the median proportion of sex protected by MC was 87% in the first post-intervention and 94% in the second post-intervention survey, we use 80% as the cut-off point for this variable. Finally, the 4-point exposure score was included as a continuous variable.

It should be noted that analysis of the second post-intervention survey included only data from three sites, because only the first post-intervention survey was completed in QH. All statistical tests were only done across subgroups within each cross-sectional survey with conventional statistical tests. We did not do statistical comparisons across surveys because approximately 40% to 60% of the women reported participating in a previous survey, which

made cross-survey samples related to each other. Statistical significance was accepted at p<0.05. All analyses were conducted using SAS9.2 software (SAS Institute, Cary, NC, USA).

RESULTS

At the three cross-sectional surveys, we interviewed 445, 437 and 290 women. A handful of participants had heard of FC by name, but no one had ever seen or used it at baseline. At the first and second post-intervention surveys, 364 (83.3%) and 237 (81.7%) reported knowing about FC, respectively, and 126 (28.8%) and 106 (36.6%) had used FC at least once.

In addition to all 445 baseline surveys, we include in post-intervention analysis only the women who reported knowing about FC, i.e., 364 first post-intervention surveys and 237 second post-intervention surveys from all study sites. Table 1 shows the study site and establishment characteristics of the three samples included in our analysis.

Baseline Characteristics of the Women by Study Site

The demographic characteristics, reproductive history and sex activities at baseline survey by study site are shown in Table 2. Women from PX were much older, more likely to be married with more complex reproductive experience in general than women in the other study sites.

A large variation in proportion of protected sex was identified across the four sites at baseline. Women from FS and PX had significantly more 100% protected sex and less nil protected sex than women from YF and QH.

Characteristics of Three Levels of FC Users at the Post-intervention Surveys

Table 3 compares demographics, reproductive history, attitudes and sexual activities among FC non-users, one-time users and multi-time users. The two types of FC users were on average older and more likely to be from PX than non-users. Multi-time users were more likely to have used FC in the prior 30 days than one-time users, and they reported significantly less unprotected sex than non-users in the last 30 days (3.0% vs. 17.2% at first and 3.2% vs. 16.8% at second post-intervention survey, p<0.01).

Multi-time users were more worried about getting infected with HIV than the others and had more positive attitudes towards FC. Approximately 84% of them were willing to use FC for prevention of HIV/STI in the future at both post-intervention surveys, which was significantly higher than those proportions among the non-users and one-time users.

Intervention Participation and its Association with FC Use

Staff conducted nearly 800 outreach encounters to more than 100 establishments in the four sites during the 12 months of two intervention phases (only about 6 months in QH). More than 3,000 FC and 38,000 MC were delivered. Self-reported participation in project activities is shown in Table 4. Multi-time users were more likely to report having participated in previous surveys, indicating they had stayed in the study site longer and were more involved in the intervention than non-users. Intervention score was correlated with self-reported times participated in FC education (Spearman correlation coefficient r=0.59 at first and r=0.62 at second post-intervention survey, p<0.01).

Results of polytomous logistic regression of variables associated with FC use levels are shown in Table 5. Better participation in the intervention was consistently associated with being any type of FC user in both surveys, controlling for study site, establishment and other

individual factors in the model. In comparison with non-users, multi-time users were three times more likely to be from PX than from YF, and 3 times more likely to be from boarding houses than from other types of establishments. Using FC was not associated with the level of MC use in the prior 30 days.

DISCUSSION

After conducting six months of intervention to promote FC along with MC among women working in sex establishments in our four study sites, about 29% of participants reported using FC either once or multiple times. At the second post-intervention survey, this proportion increased to about 37%. In comparing three levels of FC use, we found that participation in the intervention, being from PX and working in a boarding house were three consistent independent contributors to use of FC at both post-intervention cross-sectional surveys, controlling for the effects of age and level of MC use in the prior 30 days.

FSW are an important group for prevention of sex-related ill-health consequences. Though MC use has improved to different degrees in our study sites,[22–24] sexual transmission of HIV/STI continue to grow. This calls for further efforts to increase protected sex among women. This project started with an average of 40% of baseline participants reporting 100% MC use and a median proportion of protected sex of 76% in the previous 30 days. Adding FC achieved a significant reduction in the proportion of nil protection comparing multi-time FC users to non-users, though increases in proportions of protected sex were not as significant across the three levels of FC users. This result is consistent with other studies[6] and our previous analysis for the first two of four study sites (FS and YF).[16]

A standard intervention protocol was used in all sites; however, levels of FC uptake were different across sites. This effect was independent of type of establishments as well as individual factors such as age and level of recent MC use. Our previous publications reported that FC users were more likely to be from boarding houses and level of FC use was higher in PX than in FS and YF,[15, 16] but relatively few study sites and small sample size prohibited us from exploration of independent contributions of study site to key outcomes. This finding revealed that an intervention protocol standardized in terms of core content of education, method of delivery and timeline interacted with the diverse contexts of the four study sites and women in different types of establishments, producing a different level of FC adoption.[17]

Though systematic exploration of the role of site and establishment types based on our quantitative data is beyond the scope of this paper, several explanations may add deeper understanding of the implications of intervention contexts. The most obvious and important differences among the four study sites included differences in the prevalence of HIV/STI and past experience with prevention projects (which represents difference in capacity of outreach workers), in addition to scale and types of sex venues and features of the women. Since the outbreak of the HIV epidemic in PX in the mid-1990s, quite a few HIV prevention programs have been conducted successively with the local CDC as the primary implementation organization. The PX CDC maintained a relatively stable staff team that gained a wealth of experience in intervention implementation and fostered a trusting rapport with women in sex venues. By comparison, outreach workers in the other three study sites were inexperienced, and many of them had never worked with women in sex-establishments prior to this project. At least one implication of this is that when we translate an effective intervention such as the FC promotion program into the real settings of diverse communities, we must recognize that community interventions are complex interactions that act on different individual potential users but also in diverse micro- and macro-settings, such as sex venues and communities.[25] We need to tailor the intervention protocol and address

community capacity building and supervision to fit each unique community system in order to achieve optimal impact.

A higher level of FC acceptability among women from boarding houses may have two explanations. One is individual characteristics of freelancers from boarding houses. As our univariate analysis showed, FC users were more likely to be older and married with children, which was similar to characteristics of women from boarding houses. These women had more sex acts and fewer 100% protected sex in the last 30 days, and they charged less for each sex act but bore greater obligation to their families. They were also more worried about getting infected with HIV, which indicates their significant need of FC in reality. Though the dichotomous age group was not independently associated with level of FC use, we would say it is worth further exploration whether age and other factors related to age, such as reproductive history, sexual relationships and sexual activities, facilitate intervention and how. The other was the micro-context of boarding houses in which freelancers worked and the nature of freelance sex work. Our outreach workers reported that FC education and delivery were conducted more effectively in boarding houses than in other types of establishments, because women there could arrange their time more freely and liked to share their experience of FC use with each other during the intervention. Mechanisms of how individual-level and micro-setting level factors affect intervention implementation should also be further analyzed with our qualitative data, or explored in future studies. In particular, we could not explain the difference in FC attitudes scores across three groups in our two surveys. Understanding mechanisms of change at multiple levels would be very valuable for improving intervention design and conduct.

Several limitations should be kept in mind when interpreting the findings of this study. First, the types of sex establishments of the four study sites were generally similar to the sex industry in rural and small- to middle-sized urban settings in China, and we recruited about 70–80% of women working in the sex industry in our study sites or sampled study districts in the mid-sized city. But the details of features of the same type of sex venues (e.g., massage parlors) as well as other contextual factors that affect intervention implementation and outcomes might be different from other communities. Second, the level of lifetime FC use was measured in this paper, but some explanatory factors were measured in the prior 30 days. Therefore, the results should be interpreted with care. Third, free FC provision might inflate the initial acceptability; however, providing free product might always be the first step to introduce a new product. Finally, sex workers' mobility undermined our attempts to track individual women and only allowed us to compare different groups in each of the cross-sectional surveys, which limited our ability to accurately explore causal relationships regarding FC use.

Though our study suggests that adding FC into MC-only intervention can reduce unprotected sex among women working in the sex industry in the relatively natural setting of communities, our findings may uncover more complications of combing FC into existing MC intervention. This supports the perspective that the scientific paradigm for community intervention should be collaborative, multilevel and culturally situated, [25] and reaffirms the call for interdisciplinary and system sciences to improve population health.[26]

Acknowledgments

References

1. Li X, Hong Y, Poston D. Preventing HIV in women: a top priority in China's efforts in fighting AIDS. AIDS Care. 2011; 23(Suppl 1):1–4. [PubMed: 21660746]

2. Huang YY, Henderson GE, Pan SM, et al. HIV/AIDS Risk Among Brothel-Based Female Sex Workers in China: Assessing the Terms, Content, and Knowledge of Sex Work. Sexually Transmitted Diseases. 2004; 31:695–700. [PubMed: 15502679]

3. Wang L, Ding ZW, Ding GW, et al. Data analysis of national HIV comprehensive surveillance sites among female sex workers from 2004 to 2008. Zhonghua Yu Fang Yi Xue Za Zhi. 2009; 43:1009–1015. [PubMed: 20137527]

4. Macaluso M, Blackwell R, Jamieson DJ, et al. Efficacy of the male latex condom and of the female polyurethane condom as barriers to semen during intercourse: a randomized clinical trial. Am J Epidemiol. 2007; 166:88–96. [PubMed: 17420182]

5. Gallo MF, Kilbourne-Brook M, Coffey PS. A review of the effectiveness and acceptability of the female condom for dual protection. Sex Health. 2012; 9:18–26. [PubMed: 22348629]

6. Vijayakumar G, Mabude Z, Smit J, et al. A review of female-condom effectiveness: patterns of use and impact on protected sex acts and STI incidence. Int J STD AIDS. 2006; 17:652–659. [PubMed: 17059633]

7. The female condom: still an underused prevention tool. Lancet Infect Dis. 2008; 8:343. [PubMed: 18501845]

8. Choi KH, Hoff C, Gregorich SE, et al. The efficacy of female condom skills training in HIV risk reduction among women: a randomized controlled trial. Am J Public Health. 2008; 98:1841–1848. [PubMed: 18703460]

9. Latka M, Gollub E, French P, et al. Male-condom and female-condom use among women after counseling in a risk-reduction hierarchy for STD prevention. Sex Transm Dis. 2000; 27:431–437. [PubMed: 10987447]

10. Rasch V, Yambesi F, Kipingili R. Acceptance and use of the female condom among women with incomplete abortion in rural Tanzania. Contraception. 2007; 75:66–70. [PubMed: 17161127]

11. Vieira EM, Machado AA, Duarte G, et al. The use of the female condom by women in Brazil participating in HIV prevention education sessions. Rev Panam Salud Publica. 2004; 15:373–379. [PubMed: 15272983]

12. Napierala S, Kang MS, Chipato T, et al. Female condom uptake and acceptability in Zimbabwe. AIDS Educ Prev. 2008; 20:121–134. [PubMed: 18433318]

13. Lara DK, Grossman DA, Munoz JE, et al. Acceptability and use of the female condom and diaphragm among sex workers in Dominican Republic: results from a prospective study. AIDS Educ Prev. 2009; 21:538–551. [PubMed: 20030498]

14. Yimin C, Zhaohui L, Xianmi W, et al. Introductory study on female condom use among sex workers in China. Contraception. 2002; 66:179–185. [PubMed: 12384207]

15. Liao SS, Weeks MR, Wang YH, et al. Inclusion of the female condom in a male condom-only intervention in the sex industry in China: a cross-sectional analysis of pre- and post-intervention surveys in three study sites. Public Health. 2011; 125:283–292. [PubMed: 21513961]

16. Liao SS, Weeks MR, Wang YH, et al. Female condom use in the rural sex industry in China: analysis of users and non-users at post-intervention surveys. AIDS Care. 2011; 23(Suppl 1):66–74. [PubMed: 21660752]

17. Weeks MR, Liao S, Li F, et al. Challenges, strategies, and lessons learned from a participatory community intervention study to promote female condoms among rural sex workers in Southern China. AIDS Educ Prev. 2010; 22:252–271. [PubMed: 20528132]

18. Wang Y, Liao SS, Weeks MR, et al. Acceptability of hypothetical microbicides among women in sex establishments in rural areas in Southern China. Sex Transm Dis. 2008; 35:102–110. [PubMed: 17767093]

19. Nong LP, He B, Li WL, et al. Epidemic characteristic and trend of AIDS in Pingxiang, 1996-2009. Journal of Preventive Medicine Information. 2011; 27:3.

20. Xu HW, Pei DN, Zhong N, et al. Analysis of infectious status of syphilis in special population in Qionghai City, Hainan. CHINA TROPICAL MEDICINE. 2008; 8:2.

21. Neilands TB, Choi KH. A validation and reduced form of the Female Condom Attitudes Scale. AIDS Educ Prev. 2002; 14:158–171. [PubMed: 12000233]

22. Liao SS, Schensul J, Wolffers I. Sex-related health risks and implications for interventions with hospitality women in Hainan, China. AIDS Educ Prev. 2003; 15:109–121. [PubMed: 12739788]

23. Liao SS, He QY, Choi KH, et al. Working to prevent HIV/STIs among women in the sex industry in a rural town of Hainan, China. AIDS Behav. 2006; 10:S35–S45. [PubMed: 16823627]

24. Nong LP, Nie L, He B, et al. Condom use among female sex workers in Pingxiang city of Guangxi Zhuang Autonomous Region. Chinese Journal of AIDS & STD. 2011; 17:4.

25. Trickett EJ, Beehler S, Deutsch C, et al. Advancing the science of community-level interventions. Am J Public Health. 2011; 101:1410–1419. [PubMed: 21680923]

26. Mabry PL, Olster DH, Morgan GD, et al. Interdisciplinarity and systems science to improve population health: a view from the NIH Office of Behavioral and Social Sciences Research. Am J Prev Med. 2008; 35:S211–S224. [PubMed: 18619402]

Table 1

Sample Composition of Study Site and Type of Establishments at the Three Surveys

	Baseline survey (N=445)	First post-intervention survey[*] (N=364)	Second post-intervention survey[*] (N=237)
Study sites, n(%)			
FS	73(16.4)	60(16.5)	60(25.3)
YF	78(17.5)	53(14.6)	51(21.5)
PX	152(34.2)	120(33.0)	126(53.2)
QH	142(31.9)	131(36.0)	N.A.
Type of establishments, n(%)			
Roadside brothels	24(5.4)	29(8.0)	7(3.0)
Hairdressers/massage parlors	168(37.8)	126(34.6)	96(40.9)
Boarding houses	152(34.2)	153(42.0)	99(41.8)
Hotel-based massage, beauty and sauna parlors	66(14.8)	37(10.2)	35(14.8)
Nightclubs	35(7.9)	19(5.2)	N.A.

[*] Only women who reported knowing about FC are included in post-intervention samples.

Table 2

Demographic Characteristics, Reproductive History and Sex Activities at Baseline Survey by Study Sites

	FS(N=73)	YF(N=78)	PX(N=152)	QH(N=142)
Mean age [**](median)	26.5(25.0)	27.4(25.0)	32.8(32.0)	27.6(26.0)
Age range	16.0–50.0	18.0–42.0	17.0–55.0	17.0–56.0
Never married, [**]n(%)	41(56.2)	48(61.5)	28(18.4)	80(56.3)
Education above primary school, [**]n(%)	46(63.0)	37(47.4)	110(72.4)	102(71.8)
Ethnic minority, [**]n(%)	33(45.2)	47(60.3)	18(11.8)	49(34.5)
From boarding houses, n(%)	25(34.3)	37(47.4)	55(36.2)	35(24.7)
Reproductive history and sex activities:				
Never pregnant, [**]n(%)	25(34.3)	25(32.1)	9(5.9)	31(21.8)
Ever had an abortion, [*]n(%)	34(46.6)	36(46.2)	95(62.5)	88(62.0)
Never had a child, [**]n(%)	45(61.6)	51(65.4)	35(23.0)	83(58.5)
Ever used a male condom, [*]n(%)	71(97.3)	68(87.2)	145(95.4)	129(90.9)
Sterilized, n(%)	14(19.2)	14(18.0)	30(19.7)	14(9.9)
Ever used IUD, [**]n(%)	24(32.9)	23(29.5)	94(61.8)	51(35.9)
Sexual relationship in the last 30 days? [**]n(%)				
Only had a primary partner	11(15.1)	30(38.5)	42(27.6)	67(47.2)
Only had a paying partner(s)	37(50.7)	25(32.1)	53(34.9)	33(23.2)
Had both paying and primary partners	25(34.3)	23(29.5)	57(37.5)	42(29.6)
Mean sex acts in the last 30 days [**](median)	19.3(8.0)	8.9(6.0)	19.0(12.0)	28.4(6.0)
Mean proportion of protected sex in the last 30 days [**](median)	0.77(1.00)	0.53(0.59)	0.68(0.93)	0.53(0.60)
Women with 100% protected sex in the last 30 days, [**]n(%)	40(54.8)	28(35.9)	72(47.4)	36(25.4)
Women with Nil protected sex in the last 30 days, [*]n(%)	6(8.2)	25(32.1)	30(19.7)	42(29.6)
Willing to use FC for prevention in the future, n(%)	57(78.1)	56(71.8)	115(75.7)	111(78.2)

[**]P<0.01

[*]P<0.05

Table 3

Characteristics of Female Condom Non-users, One-time Users and Multi-time Users at First and Second Post-intervention Surveys

	Baseline Survey (N=445)	First post-intervention survey(N=364)			Second post-intervention survey(N=237)		
		Non-users (N=238)	One-time Users (N=59)	Multi-time users (N=67)	Non-users (N=131)	One-time Users (N=44)	Multi-time users (N=62)
Mean age *** §§ (median)	29.2(27.0)	29.7(28.0)	30.8(30.0)	33.4(36.0)	30.2(29.0)	31.7(31.0)	34.5(36.0)
Age range	16.0–56.0	17.0–52.0	18.0–53.0	17.0–50.0	17.0–48.0	17.0–48.0	17.0–54.0
Never married, ** §§ ,n(%)	197(44.3)	108(45.4)	18(30.5)	16(23.9)	56(42.8)	12(27.3)	11(17.7)
Education above primary school, n(%)	295(66.3)	155(65.1)	37(62.7)	48(71.6)	98(74.8)	30(68.2)	41(66.1)
Ethnic minority, n(%)	147(33.0)	81(34.0)	12(20.3)	24(35.8)	43(32.8)	10(22.7)	19(30.7)
From boarding houses, ** §§ n(%)	152(34.2)	86(36.1)	27(45.8)	40(59.7)	45(34.4)	15(34.1)	39(62.9)
From study site, §§ n(%)							
FS	73(16.4)	40(16.8)	9(15.3)	11(16.4)	41(31.3)	9(20.5)	10(16.1)
YF	78(17.5)	38(16.0)	6(10.2)	9(13.4)	36(27.5)	6(13.6)	9(14.5)
PX	152(34.2)	70(29.4)	22(37.3)	28(41.8)	54(41.2)	29(65.9)	43(69.4)
QH	142(31.9)	90(37.8)	22(37.3)	19(28.4)	N.A.	N.A	N.A.
Reproductive history and sexual activities:							
Never pregnant, n(%)	90(20.2)	51(21.4)	13(22.0)	7(10.5)	23(17.6)	5(11.4)	5(8.1)
Ever had an abortion, n(%)	253(56.9)	135(56.7)	29(49.2)	42(62.7)	76(58.0)	27(61.4)	37(59.7)
Never had a child, * §§ n(%)	214(48.1)	110(46.2)	22(37.3)	18(26.9)	60(45.8)	16(36.4)	12(19.4)
Sterilized, n(%)	72(16.2)	38(16.0)	10(17.0)	17(25.4)	16(12.2)	10(22.7)	14(22.6)
Ever used IUD, ** §§ n(%)	192(43.2)	94(39.5)	32(54.2)	40(59.7)	58(44.3)	22(50.0)	41(66.1)
Sexual relationship in the last 30 days, *, n(%)							
Only had a primary partner	150(33.7)	75(31.5)	12(20.3)	10(14.9)	33(25.2)	12(27.3)	11(17.7)
Only had a paying partner(s)	148(33.3)	101(42.4)	23(39.0)	34(50.8)	58(44.3)	16(36.4)	28(45.2)
Had both paying and primary partners	147(33.0)	62(26.1)	24(40.7)	23(34.3)	40(30.5)	16(36.4)	23(37.1)
Mean sex acts in the last 30 days * (median)	20.3(8.0)	28.5(11.0)	43.2(20.0)	33.8(17.0)	17.7(10.0)	22.1(16.5)	22.4(12.0)
Mean proportion of sex with male condom in the last 30 days(median)	0.62(0.76)	0.68(0.90)	.0.77(0.88)	0.69(0.83)	0.74(1.00)	0.73(0.97)	0.71(0.80)
Mean proportion of protected sex in the last 30 days(median)	0.62(0.76)	0.68(0.90)	0.79(0.90)	0.83(1.00)	0.74(1.00)	0.73(0.97)	0.80(1.00)

	Baseline Survey (N=445)	First post-intervention survey (N=364)			Second post-intervention survey (N=237)		
		Non-users (N=238)	One-time Users (N=59)	Multi-time users (N=67)	Non-users (N=131)	One-time Users (N=44)	Multi-time users (N=62)
Women with 100% protected sex in the last 30 days, n(%)	176(39.6)	105(44.1)	24(40.7)	35(52.2)	72(55.0)	22(50.0)	33(53.2)
Women with nil protected sex in the last 30 days, $**§§$n(%)	103(23.2)	41(17.2)	4(6.8)	2(3.0)	22(16.8)	7(15.9)	2(3.2)
Women using FC in the last 30 days, $**§§$n(%)	N.A.	N.A.	10(17.0)	30(44.8)	N.A.	3(6.8)	23(37.1)
Attitudes :							
Mean score of FC attitudes scale(SD) $**§§$	47.3(4.6)	45.5(5.4)	44.2(6.2)	48.9(5.9)	44.9(4.7)	44.5(5.7)	47.9(6.3)
Willing to use FC for prevention in the future, $**§§$n(%)	339(76.2)	130(54.8)	31(52.5)	56(83.6)	59(45.0)	20(45.5)	52(83.9)
Worried about HIV infection, $*§§$n(%)							
worried a little	205(46.1)	93(39.1)	27(45.8)	28(41.8)	65(49.6)	16(36.4)	26(41.9)
worried very much	120(27.0)	70(29.4)	15(25.4)	29(43.3)	30(22.9)	14(31.8)	29(46.8)
Worried about STIs infection, n(%)							
worried a little	208(46.7)	92(38.7)	24(40.7)	25(37.3)	57(43.5)	15(34.1)	22(35.5)
worried very much	91(20.4)	59(24.8)	15(25.4)	11(16.4)	28(21.4)	12(27.3)	10(16.1)

$**$ P<0.01 and

$*$ P<0.05 at first post-intervention survey

$§§$ P<0.01 and

$§$§P<0.05 at second post-intervention survey

Table 4

Intervention Exposure of Female Condom Non-users, One-time Users and Multi-time Users at First and Second Post-intervention Surveys

	First post-intervention survey(N=364)			Second post-intervention survey(N=237)		
	Non-users (N=238)	One-time Users (N=59)	Multi-time Users (N=67)	Non-users (N=131)	One-time Users (N=44)	Multi-time Users (N=62)
Participated in previous survey, **§§n(%)	99(41.6)	27(45.8)	51(76.1)	82(62.6)	34(77.3)	54(87.1)
Knew the project by name, ** n(%)	110(46.2)	40(67.8)	49(73.1)	77(58.8)	27(61.4)	40(64.5)
Recognized the intervention flip chart, **§§n(%)	87(36.6)	38(64.4)	51(76.1)	57(43.5)	31(70.5)	48(77.4)
Learned FC insertion in a vaginal model, **§§n(%)	48(20.2)	35(59.3)	47(70.2)	30(22.9)	25(56.8)	41(66.1)
Practiced FC insertion, **§§n(%)	22(9.2)	26(44.1)	43(64.2)	18(13.7)	18(40.9)	42(67.7)
Never participated in FC education by the outreach team, **§§n(%)	77(32.4)	3(5.1)	3(4.5)	56(42.8)	4(9.1)	5(8.1)
Median times participated in FC education **§§(range)	1.0(0.0–24.0)	2.0(0.0–10.0)	3.0(0.0–15.0)	1.0(0–10.0)	2.0(0.0–10.0)	3.0(0.0–15.0)
Mean score of intervention exposure **§§(median)	1.1(1.0)	2.4(2.0)	2.8(3.0)	1.4(1.0)	2.3(2.0)	2.8(3.0)

**
P<0.01 and

*P<0.05 at first post-intervention survey

§§P<0.01 and

§P<0.05 at second post-intervention survey

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

Table 5

Results of Univariate and Multivariate Regression for Two Levels of FC Use at Post-intervention Surveys

	Use Level*	First post-intervention survey		Second post-intervention survey	
		Crude OR(95% CI)	Adjusted OR(95% CI)	Crude OR(95% CI)	Adjusted OR(95% CI)
Study site(YF as reference group)					
FS	Multi-time	1.16(0.43–3.11)	1.25(0.38–4.13)	0.98(0.36–2.67)	1.21(0.38–3.87)
	One-time	1.43(0.46–4.39)	1.43(0.41–4.94)	1.32(0.43–4.06)	1.38(0.42–4.51)
PX	Multi-time	1.69(0.72–3.95)	3.17(1.03–9.69)	3.19(1.39–7.33)	4.20(1.50–11.72)
	One-time	1.99(0.74–5.33)	3.24(1.02–10.28)	3.22(1.22–8.54)	2.94(1.00–8.67)
QH	Multi-time	0.89(0.37–2.15)	2.76(0.93–8.19)	N.A.	N.A.
	One-time	1.55(0.58–4.12)	3.54(1.17–10.73)	N.A.	N.A.
From boarding house(from non-boarding house as reference group)	Multi-time	2.62(1.50–4.56)	1.94(0.85–4.47)	3.24(1.73–6.08)	3.37(1.35–8.42)
	One-time	1.49(0.84–2.65)	1.22(0.55–2.71)	0.99(0.48–2.03)	0.94(0.37–2.41)
Age 30 or older(younger than 30 years old as reference group)	Multi-time	2.19(1.25–3.84)	1.03(0.43–2.43)	3.20(1.65–6.22)	1.14(0.45–2.89)
	One-time	1.45(0.82–2.57)	1.02(0.46–2.27)	1.61(0.81–3.21)	1.20(0.49–2.95)
Score of intervention exposure	Multi-time	3.75(2.76–5.09)	3.97(2.85–5.52)	2.66(1.96–3.60)	2.57(1.86–3.56)
	One-time	2.58(1.95–3.41)	2.88(2.12–3.90)	1.89(1.39–2.55)	1.82(1.34–2.49)
>80% sex acts with male condom use in last 30 days	Multi-time	0.81(0.47–1.40)	0.92(0.47–1.78)	0.52(0.28–0.97)	0.79(0.37–1.69)
	One-time	1.07(0.60–1.91)	1.11(0.59–2.11)	0.76(0.38–1.52)	0.82(0.37–1.82)

*
Non-user as the reference group