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Acceptability of Hypothetical Microbicides among Women in Sex Establishments in Rural Areas in Southern China

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Abstract

Objectives and Goal—The objectives of this study were to measure the potential acceptability of a hypothetical microbicide among women in sex establishments in rural areas of Southern China, and demographic, behavioral and social context factors likely to affect microbicide acceptability.

Study Design—This was a cross-sectional survey, using a quota sampling, among 300 women from sex establishments in three rural towns. An interviewer-administered standardized questionnaire was used to measure the acceptability score of hypothetical microbicides' characteristics, as well as sexual relationships and behaviors, and other contextual factors.

Results—Findings showed a generally positive response to microbicides, indicated by an acceptability index score of 2.89 (SD, 0.56, scale of 1–4) in the overall sample. Multivariate analysis shows the acceptability score varied significantly by study sites, type of sex-work establishments,

marital status, sex partner type, vaginal product experience, locus of control by partners and locus of control by chance.

Conclusions—Microbicides may be acceptable among sex workers in rural settings in China; however, contextual factors should be carefully considered in education and promotion of microbicides in the future.

Keywords

HIV/AIDS; microbicide; acceptability; sex worker; China

The HIV/AIDS epidemic has shown a disproportionate impact on women worldwide, which has become a serious concern for public health. The overall proportion of HIV-positive women has steadily increased in recent years. In 1997, women were 41% of the people living with HIV; however, this figure rose to almost 50% by 2005.[1] Heterosexual activity is the most frequent mode of transmission for HIV infection among women.[2]

HIV/AIDS has become a widespread epidemic in China, and HIV infections among women have been rising in recent years. As of October 31, 2006, the cumulative reported HIV/AIDS cases were 183,733 in China.[3] The estimated number of HIV cases was 650,000, corresponding to a total prevalence rate of 0.07%.[4] The main HIV transmission route of reported cases remains through injecting drug use in China, but the proportions of sexually transmitted HIV infections and mother-to-child transmission are increasing. The proportion of reported HIV-positive women has also increased. Women were 15.3% of the report cases in 1998, and 39.0% by the end of the September in 2004.[5] The main reason is the increase in HIV cases reported among former blood and plasma donors through mass HIV screening in the central area of China.

Meanwhile higher numbers of HIV cases found among sex workers also contribute to the change.[5] According to data from 52 national sentinel surveillance sites in 2004, the average HIV prevalence rate among female sex workers (FSWs) is 1.0 percent.[5] Since the early 1980s when commercial sex reemerged in mainland China after two decades of virtual extinction, prostitution has developed into a widespread industry, although commercial sex is still illegal in China.[6] In 2003, the number of women engaging in commercial sex in mainland China was estimated to range from 4 to 10 million.[7] Like in many countries, establishment-based commercial sex is common in China. Many FSW encounter their clients in service sectors or entertainment establishments such as restaurants, barbershops, massage and sauna parlors, hair parlors, dancing halls, karaoke halls, bars, hotels, and guest houses. Most female sex workers are young, in their teens or early 20s, with only a primary or junior high school education.[8] [9] Behavioral surveys showed that unprotected sex is still common among this group. The proportion of sex workers not using condoms decreased from 24.5% in 2002 to 20.5% in 2003, but the proportion claiming 100% condom use is only 19% (an improvement from 16% in 2002).[5] Furthermore, the rate of condom use varies by areas and types of sex work. Thus, interventions have been shown to be insufficient to effectively promote and sustain condom use among sex workers. In addition, sexually transmitted infections (STIs) among female sex workers are very high. A 6-month follow-up study among 343 female sex workers in Xichang, Sichuan Province, in 2004–2005 showed that the syphilis incidence appeared to be 6.23 per 100 person-years.[10] The rapid growth of the sex industry and increasing rates of HIV/STI among female sex workers have raised concerns that HIV/AIDS may further spread to the general population, possibly accelerating the growth of the HIV/AIDS epidemic.[11]

‘ABC’ (abstain, be faithful, use condoms) promotion strategies have long been considered a core in the prevention of heterosexual transmission. Male condom promotion has been central in many behavioral interventions for vulnerable or high-risk women. However, for many

women and girls, this approach is of limited value. They are unable to be abstinent from sex, and they cannot insist on their partners' use of condoms. Modifying the gender-based realities and equalizing power between men and women is essential to contain the HIV/STI epidemics in women in the long term. In the short term, however, recognizing that women and men have different needs in prevention is very important to confront the risk and vulnerability of women. [12] Female-controlled prevention tools, such as female condoms and topical microbicides, might better address women's specific prevention needs.

Topical microbicides, several of which are currently being tested in clinical trials, include a variety of substances applied in the vagina or rectum that can significantly reduce sexual transmission of HIV and/or other pathogens. Women can apply a microbicide before initiating sexual activity. Like all products or medicines for human use, microbicide effectiveness is inextricably bound to use, and, therefore, the needs and preferences of women and men who will be potential consumers must be considered at every step of development. There is an implicit assumption that acceptability serves as a proxy for use and that achievement of a high level of acceptability translates into maximal use. Consequently, before launching an effective intervention to promote a new microbicide, factors related to acceptability and use need to be identified. The concept of acceptability, which is shaped by user perspectives, method characteristics, availability (service delivery and marketing), partner choice, and relationship dynamics, as well as the social and cultural context in which individuals make their choices, has been evaluated in several distinct ways: hypothetical acceptability (before use), product choice, and satisfaction after use.[13][14] Studies on acceptability of actual and hypothetical microbicides among men and women have been conducted with a variety of populations,[15] such as US and/or European populations, sub-Saharan Africa populations and Asian populations, but no study has been done in China. Of these previous studies, more than half assessed acceptability based primarily on the description of a hypothetical microbicide, or with the demonstration of a spermicide or lubricant.[15] Physical characteristics of microbicidal products, their effects after insertion, and their effects on sensation during intercourse (for both partners) were the dimensions most frequently assessed. However, attention to the social context of use has been inadequate.[16] Few studies have addressed cultural context regarding intravaginal practices; for instance, vaginal cleanliness and its symbolic significance may differ across cultures. The relationship between use of vaginal products and experience with tampons, the diaphragm, finger-cleaning and wiping, and comfort with touching the genitalia remains unknown.[16][19] Also, few studies have addressed partnership characteristics on the use of microbicides.[20]

To reduce this knowledge gap, we conducted a study of potential microbicide acceptability among female sex workers in three towns in southern China. We explored the relationships between microbicide acceptability, measured as a scale of preference of hypothetical microbicides characteristics, and demographic, behavioral and social context factors.

Methods

Study Site

Our study sites include two rural towns in Hainan Province, which is an island in the South China Sea, and a small city within a rural county in Guangxi Province neighboring Vietnam. To protect the confidentiality of our study sites and participants, we will refer to these sites as Town A (Hainan Province), Town B (Hainan Province) and City C (Guangxi Province). Town A and B are located in the northern part of Hainan, each with a population of about 20,000 people. Both lie along major highways to the provincial capital city of Haikou. City C, located in the southwest part of Guangxi with a population of 100,000, is a gateway city from China to Vietnam.

Generally the venues of the sex industry in these three sites can be categorized into four types. The first is roadside restaurants. This type was only found in Town A. Roadside restaurants were built along the highway to provide food for the men who came to pick up women in the 1990's[21]. However, food was no longer served by the time we conducted our surveys. These establishments have simply become places to seek women for sex. The female sex workers are relatively younger in roadside restaurants than in the other venues. The second type of sex work venue is street-side massage, beauty and hair parlors, where women offer hair washes and cuts or massage as well as sex. Currently this is the most common type of sex establishment in China. It was present in all three study sites. The third type of venue is hotel-based massage, beauty, and sauna parlors. Sex workers in these venues usually make phone-calls to guests in the hotels, then provide a variety of services, including sex if the guests request it. Usually the charge for sexual services with this group of women is the highest of the four types of sex workers. The fourth type of sex work venue is boarding houses. These hold rooms rented monthly at a low rate for sex working women who are usually middle aged.

Since the late 1990's, HIV/STI prevention projects have been conducted among sex workers in these three sites. Through these intervention activities, the reported use of male condoms has increased among sex workers. [22][23] [24] Additionally, local health workers who conducted outreach in these sex work venues have established positive rapport with sex workers in these study sites. Local health workers counted the number of sex work establishments and sex workers every year in these towns for the purpose of intervention planning. All these numeration data were anonymous and were used only by the local health department to track trends in the size and characteristics of the sex industry. These data showed that the sex industry in these three towns has changed in terms of the number of sex work establishments as well as in sex workers. In the period from the late 1990's to early 2001, the number of venues varied around 16–32 venues with an estimated 150–200 women in Town A, more than 30 venues in Town B comprised of about 200 women, and 40–60 venues with an estimated 400–500 women in downtown of City C.[22][24] During the period of the survey, the number of sex establishments was 16 in Town A, 22 in Town B and 27 in downtown of City C where we conducted our survey. The numbers of sex workers in each town was estimated to be about 140, 130 and 260, respectively.

Study Population and Recruitment

Our study targeted those women who were working in sex-work establishments. We used a quota sampling strategy to sample 100 women in each site. We stratified women based on types of sex establishments (roadside-restaurants, massage/hair parlors, hotel-based venues and boarding houses). The quota of each stratum was in proportion to the percentage of women in each subgroup of each study site, as estimated through the above mentioned numeration data. We used a convenience sampling approach to recruit women from each stratum.

Our outreach workers contacted owners of the establishments and explained the purposes of the study to get their support for it. Then, for the women who were interested in our study, we further screened them in a private space for eligibility based on two criteria: (1) if they were sexually active within the prior 30 days before entering the study, and (2) if they were at least 16 years of age, which is the age of legal independence. When a woman was identified as eligible for the study, the outreach workers would explain the purposes of the study and invite her to participate. If she verbally accepted our interview, the outreach workers would bring her to a separate interview location in the town. A formal informed consent process was completed before conducting the interview. Only when women gave their informed consent were they interviewed by our field workers. No identifying information was documented. Each participant was asked to draw a cross on the informed consent form, instead of writing her signature, to show that she agreed voluntarily to participate in the study. All study protocols

received full review and approval by Institutional Review Boards at both the Chinese and U.S. research institutions.

Interview

Upon recruitment, women were interviewed face-to-face in a separate room. The questionnaire was adapted from the microbicide acceptability study among high-risk women in Hartford, Connecticut, USA.[25] It includes sociodemographic characteristics, drug use and sexual practices, current HIV risks associated with drug use and sex, perceived risks, STI and other health history, reproductive history and intentions, partner and sexual relationship factors, psychological factors, and measures of hypothetical microbicide acceptability. Participants in the survey received an incentive of a small gift package of health and beauty products and male condoms for completing the survey, valued at 20 Chinese yuan (approximately \$3 US).

Measures

Microbicide acceptability—Potential microbicide acceptability was measured through a scale that included 19 items on the relative acceptability of certain characteristics of microbicides, with a response range from 1 to 4 (1=very unacceptable, 2=unacceptable, 3=acceptable, 4=very acceptable). These characteristics included formulation preferences (4 items), odor (2 items), consistency (2 items), leakage (2 items), applicator mode (2 items), side effects (4 items), timing of insertion (1 item), covert use (1 item) and bi-directional protection (1 item). The Cronbach's alpha for this scale was 0.88. A composite score was obtained by the mean of all scores on the 19-item acceptability scale with higher composite scores indicating higher levels of acceptability. Before asking women the questions in the scale, the interviewer would give a brief introduction to microbicides, saying "Microbicides are a kind of medicine that are still under scientists' study. They will be developed for women to use in the vagina to prevent HIV. I'm going to list possible characteristics of the microbicides. Please consider how acceptable or unacceptable to you is each of these characteristics of microbicides." Further explanation would be provided if the participant had any questions.

Condom Use—The variables of condom use included the following: (1) the proportion of sexual acts using a condom with a primary partner, paying partners or other partners in the last 30 days; these proportions are calculated as the number of sexual acts using a condom with each type of partner in the last 30 days divided by the total number of sexual acts with that type of partner during the same time frame; (2) the proportions of female sex workers using condoms in every sexual encounter with primary, paying, or other partners in the last 30 days; and (3) the proportions of female sex workers who asked the primary, paying, or other partners to use condoms in the last 30 days.

Other self-reported variable domains. These included the following measures—(1) History of STI/HIV, e.g. self-reported diagnosis with an STI ever (including Gonorrhea, Syphilis, Chlamydia, Pelvic Inflammatory Disease, Genital Herpes, Candidiasis, Genital Warts, Trichomoniasis) and in the last 6 months; having at least one STI symptom (unusual vaginal discharge, irritation in the vaginal area or pain during sex, burning sensation when urinating, ulcers or open sores in the vaginal area, any bleeding after sex that is not associated with menstruation) in the last 6 months; experience with gynecological exams; and having ever had an HIV test; (2) Vaginal product usage; e.g., experience with ever using contraceptive or vaginal products, including experience using tampons or vaginal anti-inflammatory suppositories; (3) vaginal douching practice; (4) attitudes towards preventing HIV/STIs, including two questions of concern about becoming infected with an STI or HIV, and a 8-item measure of locus of control to prevent STI. The locus of control measure included three sub-scales of (1) internal locus of control, composed of 4 items regarding the degree to which the woman believed that STI infection is in the control of her own behavior; (2) locus of control

by partners, including 2 items regarding the degree to which the woman believed that STI infection is in the control of her partners; and (3) locus of control by chance, composed of 2 items regarding the degree to which the woman believed that luck or fate controls the risk of her STI infection. These 8 items had response options from 1 to 4 (1=strongly disagree, 2=disagree, 3=agree, 4=strongly agree). Three composite scores were obtained by the mean of all scores on the 4 internal items, 2 partner items and 2 chance items, with higher composite scores indicating higher levels of internal locus of control, locus of control by partners and locus of control by chance, respectively.

Statistical Analysis

The data were entered into SPSS 11.0. Descriptive statistics were used to summarize microbicide acceptability, socio-demographic variables, condom use, STI/HIV status, and experience using vaginal products. Differences among these three study sites were assessed using analyses of variance for continuous variables because these variables were normally distributed, and χ^2 analyses for categorical variables. Microbicide acceptability was measured as the mean of all scores on the 19-item acceptability scale. Mean microbicide acceptability differences by demographic factors were analyzed using analyses of variance and t-tests because the mean microbicide acceptability scores were normally distributed. To assess the relationship between condom use and microbicide acceptability, we used Spearman's rank correlation because the proportion of sex acts using a condom with a primary partner or with paying partners were not normally distributed. To assess microbicide acceptability within the sample, we used hierarchical regression analyses to determine the extent to which HIV risk and psychological variables explained a significant portion of the variance after controlling for the main effects of study site, age group, ethnicity, marital status, recruitment place (i.e. type of sex-work establishment), and education.

The selection of variables for the hierarchical regression model was based on theoretical considerations, regardless of the degree of association at the bivariate level. The regression model consisted of 3 blocks. The first block contained those variables for which we wanted to control. These variables include study site, age group, recruitment place, ethnicity, marital status and education level. The second block contained personal and relational characteristics of the participants. These variables include current types of sex partnership, STI symptoms in the last 6 months (dichotomized as yes/no), vaginal product experience (dichotomized as any vaginal product use /never use) and douching (dichotomized as yes/no). Condom use should have been put into this block. However, in our study we did not use a general condom use variable; instead, we measured the proportions of sexual acts using condoms with primary partners, paying partners, or other partners in the last 30 days. Since participants had different partner types, we could not combine the three specific condom use measures into one. Our sample size was too small to allow us to include three measures of condom use in this block. For this reason, we used partner type, which is highly correlated with proportion of condom use, as a surrogate. The final block contained attitudinal variables and was used to assess whether these variables would account for a significant amount of variance above and beyond what was accounted for by the demographic and relationship variables in the other two blocks of the model. These variables include (1) mean score of woman's STI internal locus of control (measured as the mean of the scores on the 4 items), mean score of STI locus of control by partners (measured as the mean of the scores on the 2 items), mean score of STI locus of control by chance (measured as the mean of the scores on the 2 items), whether worried about getting infected with HIV, and whether worried about getting an STI.

Results

Demographic Characteristics

A total of 300 women completed the survey. The outreach workers did not encounter refusal from the women contacted because we used a convenience sampling strategy in which the outreach workers would approach the establishment owner or a woman who was known by outreach workers, and ask them to help recruiting. According to the estimated numbers of sex workers in each town, the survey covered more than two thirds or three quarters of the sex workers in Town A and Town B, though the coverage in the City C was less than 40%.

The characteristics of the participants by study site are shown in Table 1. In comparison to the women in Town B and City C, the women from Town A were much younger and more likely to be single. Nearly half of the women from Town A and Town B were Li, which is an ethnic minority group living only in Hainan Province. While Hainan is an island province, except for the Li women, a large percentage of the women sex workers in Towns A and B were from the mainland China. However, in general, women from City C were more likely to have come from a different province and to have lived in more places.

The general patterns of the women's relationships were not similar in the three towns. Most women reported having a primary partner in Town B and City C, while only about half of the women in Town A reported so. Also, more than one third of the women did not report currently having a paying partner in Town B. Though we recruited participants from venues providing sex, some of the women refer to their partners as boyfriends and indicated that they only engaged in massage or hair care services in the establishment.

Self-reported History of STI/HIV, Contraceptive Product Use, Genital Hygienic Practices and Attitudes toward Preventing HIV/STI

The results of self-reported history of STI/HIV, contraceptive product use, genital hygienic practices and attitudes toward preventing HIV/STI among these women are shown in Table 2. Among 70 women who had ever been diagnosed with STI, 30 (42.9%) had been diagnosed within the last 6 months. More than 40% of the women either had never had a gynecological exam or had it at least 3 years ago; this proportion was particularly high for the women in Town A and B. Participant reports of vaginal product use indicated very limited experience with vaginal contraceptive products, but quite a high proportion of the women reported vaginal use of self-administered medication either for treatment of STI symptoms or simply for general prevention. Vaginal douching also was common among the women. However, the frequency of douching seems to be different in the three study sites; it was most popular among women in Town A. More than three-fourths of the women who had douched believed douching is a healthy practice and douching makes women feel clean after sex. Nearly 70% of the women believed douching might prevent infections. Most of them reported they used a Chinese herbal lotion to douche. Some said they used toothpaste or a salt solution.

Microbicide Acceptability

The mean score on the microbicide acceptability scale for the total sample was 2.89 (SD, 0.56; scale of 1–4), which indicates a generally positive response to microbicides across all hypothetical characteristics. The results of univariate analyses of microbicide acceptability are shown in Table 3. The microbicide acceptability score varied by age group ($P<0.01$). Post-hoc analyses revealed that the women aged 16–25 years old had significantly lower scores than the women aged 26–35 years old ($P=0.002$) and the women aged 35 or over ($P=0.004$). None of the other age groups were significantly different from one another. The microbicide acceptability score also varied by recruitment sites. The lowest mean score was found among women in hotel-based venues. It was significantly lower than the score of women who were

recruited from roadside restaurants and boarding houses ($P<0.01$). The mean score of microbicide acceptability had a slightly but statistically significant negative correlation with the proportion of sex acts using a condom, either with a steady partner ($r=-0.191$, $P<0.05$) or with paying partners ($r=-0.213$, $P<0.01$), indicating that women who used condoms less were more inclined to like microbicides.

The mean microbicide acceptability score also varied by the marital status ($P<0.01$). Post-hoc analyses revealed that single women had significantly lower scores than currently married women ($P=0.001$) and currently divorced, separated, or widowed women ($P=0.007$). None of the other marital status groups were significantly different from one another.

Hierarchical regression analyses results are shown in Table 4. After controlling for the effects of study site, age group, recruitment place, marital status, ethnicity and education level (block 1), microbicide acceptability scores were related to partner type and experience using vaginal products (block 2), and with STI locus of control by partners and with STI locus of control by chance (block 3). Both changes in explained variance (R^2) between variables of blocks 1 and 2, and between blocks 2 and 3 were statistically significant.

Discussion

In this study we assessed acceptability of hypothetical microbicides among female sex workers in three rural towns in southern China, and we explored relationships among demographic, behavioral and social context factors and microbicide acceptability. Our findings suggest that acceptability of microbicides varies across patterns of partnerships of the women, their use of condoms with those partner types, and venues of sex work. Also, acceptability is associated with the women's marital status, the women's prior experience with vaginal products (including vaginally used contraceptives and other medicines), STI locus of control by partners and STI locus of control by chance.

Three patterns of partnerships were reported by the participants in our study, i.e. having paying partners only, having a primary/steady partner only, and having both paying and steady partners. Our results showed that women having both a primary partner and paying partners and the women having paying partners only reported a higher microbicide acceptability score than the women having a primary/steady partner only. When other demographic variables and potential confounders were controlled in the hierarchical model, having both primary and paying partners was still a positive contributor to a higher acceptability score. This may indicate that having a more complex partner situation might drive women's needs for more protection options. Other research on female sex workers has shown that they are usually less likely to use condoms with their primary partners than with their paying partners, even if they know their steady partners are having sex with other people.[26] For these women, refusal of condom use is on the basis of emotional ties rather than an assessment of the risk to which they might be exposed. So the women having only a primary partner had relatively lower microbicide acceptability scores. It is possible they would rather believe that a steady/primary partner would not put them at high risk and they would prefer not to pay the emotional cost. A number of studies report that women would prefer to tell their partners they were using the product both during the study and in post-trial real-world use, to preclude their partner thinking they were unfaithful.[27][28][29] The women having only paying partners had a relatively higher rate of condom use; they would not feel the need for another preventive option because they believe in the effectiveness of condoms and are able to negotiate their use. An acceptability study of a true candidate microbicide suggested that some women who have multiple partners may selectively use the study gel, i.e., they will use condoms only with clients, and they will use gel only with steady partners.[30] The women having both a primary partner and paying partners had contradictory protection practices partly to distinguish their private from their

professional lives. Microbicides may be a suitable option for them because they may be able to use a microbicide without the partner's awareness if they desire.

When the hypothetical microbicides were introduced to the women and they were asked about the acceptability of this type of product, the women would make a judgment by comparing it with what they already knew and had used, such as male condoms. Because male condom promotion has been carried out in these study sites for several years and male condom use has increased,[21][22][23][24] it appears that in this study a higher mean acceptability score was related to a situation or a condition in which condom use is relatively lower. For instance, higher scores were found in women who were older (>35 years old), recruited from boarding houses, or divorced/separate/widowed. These women in general were less likely to use condoms. This may be because they have poor capacity to negotiate condom use. Microbicides will be a good complement for these women who lack the power to control their sexual behaviors. This study finding may help microbicide promotion in the future. At this time, commercial sex in China is mainly establishment-based; many interventions are also conducted in the establishments. Through our study, we were able to indicate which women in what type of establishment or having what characteristics need microbicides most which will allow us target microbicide promotion more specifically.

It may be significant for education and promotion of microbicides in the future that reported microbicide acceptability is associated with women's prior experience with vaginal products, which primarily included anti-inflammatory medicine for treatment or prevention of reproductive tract infections (see Table 2), rather than vaginal contraceptives, which are less promoted and used in rural China. Vaginal douching, another popular hygienic practice among sex workers, also shows a positive albeit not statistically significant association with microbicide acceptability scores. All of these may suggest that microbicides are more acceptable for those women who are not afraid to touch their genitalia. In our qualitative data we also found that though few women are using vaginal contraceptives, their use of douches with applicators and antibiotic suppositories for STI prevention suggests readiness for a vaginally inserted product used to prevent HIV.[25] However, this also raises some concerns about educating women about microbicides in the future. Because these vaginal hygienic practices and products popular among sex workers in China[7] might be more harmful than healthy, it will be necessary to carefully frame messages in order to distinguish a scientifically-proven microbicidal product from harmful vaginal products and practices.

We also found that two attitudinal subscales of locus of control by partners and locus of control by chance were related to microbicide acceptability. This indicated that the women who tend to believe that their partners were in control of their STI risks were more likely to accept microbicides on the one hand. However, on the other hand, the women who believed that chance had something to do with their STI risks were less likely to accept microbicides. It is commonly understood that the rationale for female-controlled prevention tools is to empower the women who are unable to negotiate abstinence from sex, or to insist that their partners to use condoms. Our results showed that the women who have lesser power to control their sexual behaviors had higher acceptability attitude toward microbicides. Use of these products may help them to avoid negotiating with the partners who take control of sexual behaviors.[31] The women who trust their luck or believe in chance may not trust microbicides anyway, or may not feel the need to take steps to change their fate. Locus of control by partners and locus of control by chance may be important indicators of microbicide use. This suggests that in the promotion of microbicides, we must recognize that a change of attitudes may mediate microbicide use.

Though the selection of variables for the hierarchical regression model was based on theoretical considerations, we found the variation in these variables only accounted for 27.9% of the

overall variation in microbicide acceptability scores. Many of the factors that might affect microbicide acceptability scores are still unknown. This also suggests that the concept of ‘acceptability’ that reflects people’s attitudes toward hypothetical microbicides is not easily quantifiable. Thus, we can get some meaningful results through mathematical modeling, but these are limited. For this reason, we designed the study to use qualitative and quantitative methods to measure microbicide acceptability. The qualitative data, which focused on the contexts of use of various prevention options, complemented the quantitative and addressed some of the shortcomings of those data.[25] Scientists have increasingly called for a better incorporation of social science into biomedical research processes.[32][33] There are many challenges to expanding the role of behavior and social science research within microbicide research, but it is important for successful microbicide clinical trials and to promote microbicial products, because the character and the context of the regions and people at risk for HIV continue to change.[30]

This study had several limitations. First, although the sex establishments of these three sites are typical in rural areas and small cities in China, HIV/STI intervention has been conducted in these three sites for years, and male condom use was relatively high. So the representation of sex workers in rural areas can be challenged. Secondly, we used quota sampling to obtain different types of sex workers, but we could only recruit voluntary participants from each venue. This convenience sample may represent the women who were more cooperative or more careful about their health. Thirdly, because we lacked a true microbicial product for women to view, responses to the microbicide acceptability questions were based on women’s perceived preferences for hypothetical characteristics. The results depended on the experiences of the women using analogous products in the past. So our data are only able to suggest these women’s likely interest in an actual microbicide. However, the results from acceptability studies in clinical trials depend on the women’s experiences using the product in the trial. It is better to know how gender relations, power and other factors affect microbicide acceptability in actuality. Therefore, it is necessary to carry out acceptability studies in clinical trials with these women to gain a more accurate understanding of their attitudes toward microbicides and their willingness to use them. The women’s thoughts on actual microbicides were not reflected in these hypothetical microbicide acceptability studies, but it is useful to explore attitudes toward possible physical attributes of a new product and how and when such a product might be used in order to inform product development and introduction. Fourthly, condom use was not put into the hierarchical regression model because in our study we did not use a general condom use variable proper for all participants. Though we can make some inference on relationship of condom use and acceptability of microbicides through a variety of mediating variables such as partner type, age groups, marital status and venue type, etc., which are correlated with proportion of condom use, we cannot quantify the relationship between condom use and microbicide acceptability.

The advent of female-controlled prevention approaches gives vulnerable women an alternative choice to protect them from infection with STIs and HIV. Our study indicates microbicides may be acceptable among sex workers in rural settings in China. But it also suggests that the promotion of microbicides is not a simple technical issue. Education and promotion must be based on the thorough understanding of the context of sex work and the diverse needs of different population groups. Furthermore, how to integrate this product into the array of HIV/STI prevention choices is also a problem to be solved in future studies. It is clear that first-generation microbicides are not going to be as effective as condoms; therefore, condom promotion is still the best prevention strategy against sexually transmitted HIV. Microbicide promotion must proceed with this recognition and acknowledgement to ensure women’s greatest potential for full protection.

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TABLE 1

Characteristics of Female Sex Workers by Study Sites

	Town A (N=100)	Town B (N=100&)	City C (N=100)	Total (N=300&)
Age** (year) (M±SD)	21.0±5.7 range, 16–40	26.4±7.1 range, 17–48	28.7±6.8 range, 17–49	25.4±7.3 range, 16–49
Age group**				
-- 16–25	83(83.0%)	58(58.0%)	35(35.0%)	176(58.7%)
-- 26–35	13(13.0%)	30(30.0%)	49(49.0%)	92(30.7%)
-- >35	4(4.0%)	12(12.0%)	16(16.0%)	32(10.7%)
Recruitment place**				
-- Roadside restaurant	69(69.0%)	0	0	69(23.0%)
-- Street-based massage/Beauty/Hair Parlor	16(16.0%)	45(45.0%)	20(20.0%)	81(27.0%)
-- Boarding House/Lodge	15(15%)	42(42.0%)	30(30.0%)	87(29.0%)
-- Hotel-based massage/beauty/ sauna parlor	0	12(12.0%)	50(50.0%)	62(20.7%)
Ethnicity**				
-- Han	52(52.0%)	63(63.0%)	90(90.0%)	205(68.3%)
-- Li	41(41.0%)	35(35.0%)	0	76(25.3%)
-- Other	7(7.0%)	2(2.0%)	10(10.0%)	19(6.3%)
Marital status**				
-- Single	81(81.0%)	61(61.0%)	29(29.0%)	171(57.0%)
-- Currently married	13(13.0%)	36(36.0%)	48(48.0%)	97(32.3%)
-- Currently divorced/separated/ widowed	6(6.0%)	3(3.0%)	23(23.0%)	32(10.7%)
Education				
-- No schooling	6(6.0%)	3(3.0%)	1(1.0%)	10(3.3%)
-- Primary	43(43.0%)	36(36.0%)	31(31.0%)	110(36.7%)
-- Junior high	46(46.0%)	56(56.0%)	55(55.0%)	157(52.3%)
-- Senior high/vocational/ technical school	5(5.0%)	5(5.0%)	13(13.0%)	23(7.7%)
The women whose hometown is in the same province*	50(50.0%)	61(61.0%)	10(10.0%)	121(40.3%)
Mean number of the towns where the women lived more than 1 month	2.5(SD, 1.3)	2.1(SD, 0.6)	2.8(SD, 1.0)	2.5(SD, 1.0)
Currently has primary partner [#]	49(49.0%)	83(83.0%)	83(83.0%)	215(71.7%)
Currently has paying partner [✕]	97(97.0%)	62(62.0%)	90(90.0%)	249(83.0%)
Currently has other partner [§]	4(4.0%)	4(4.0%)	11(11.0%)	19(6.3%)
Average percentage of sexual acts using condom in the last 30 days				
-- With primary partner	37.2	35.6	33.6	35.3
-- With paying partner	80.2	76.3	80.5	79.3
-- With other partner	25.0	95.0	41.4	49.2
Those using condoms in every sexual				

	Town A (N=100)	Town B (N=100^{&})	City C (N=100)	Total (N=300^{&})
encounter in the last 30 days				
-- With the primary partner	8(26.7%)	15(25.9%)	10(24.4%)	33(25.6%)
-- With the paying partner	57(58.8%)	33(53.2%)	51(56.7%)	141(56.6%)
-- With the other partner	1(25.0%)	3(75.0%)	3(27.3%)	7(36.8%)
Those having asked the partner to use condom in the last 30 days				
-- Primary partner	15(50.0%)	25(43.1%)	23(56.1%)	63(48.8%)
-- Paying partner	94(96.9%)	54(87.1%)	86(95.6%)	234(94.0%)
-- Other partner	3(75.0%)	4(100.0%)	5(45.5%)	12(63.2%)

[&] Entries may not add up to 100 or 300 because for some characteristics, a possible response was “uncertain” or “refuse”.

[#] The primary partner is the person to whom the woman feels closest or whom she cares about the most.

[✕] Paying partners are the people with whom the women have sex only for money.

[§] Other partners are any other persons with whom the women may have sex, excluding her primary partner and paying partners.

* P<0.05,

** P<0.01.

TABLE 2

Self-reported History of STI/HIV, Contraceptive Product Use, Genital Hygienic Practices and Attitudes toward Preventing HIV/STI by Study Sites

	Town A (N=100 [#])	Town B (N=100)	City C (N=100)	Total (N=300 [#])
History of STI infection				
-- Those having ever been diagnosed with an STI	12(12.0%)	19(19.0%)	39(39.0%)	70(23.3%)
-- Those who had at least one STI symptom in the last 6 months	63(63.0%)	40(40.0%)	63(63.0%)	166(55.3%)
-- Having had a test for HIV	22(22.0%)	30(30.0%)	38(38.4%)	90(30.1%)
Gynecological examination				
-- In the last year	43(43.0%)	38(38.0%)	58(58.0%)	139(46.3%)
-- 1–2 years ago	10(10.0%)	14(14.0%)	12(12.0%)	36(12.0%)
-- 3–5 years ago	1(1.0%)	8(8.0%)	6(6.0%)	15(5.0%)
-- More than 5 years ago	2(2.0%)	8(8.0%)	17(17.0%)	27(9.0%)
-- Never	42(42.0%)	32(32.0%)	7(7.0%)	81(27.0%)
Experience with contraceptive or vaginal products				
-- Male condom	98(98.0%)	85(85.0%)	96(96.0%)	279(93.0%)
-- Oral contraceptive pill	31(31.0%)	39(39.0%)	46(46.0%)	116(38.7%)
-- IUD	26(26.0%)	32(32.0%)	52(52.0%)	110(36.7%)
--Contraceptive cream/foam/film/gel/sponge	16(16.0%)	10(10.0%)	13(13.0%)	39(13.0%)
-- Contraceptive shot	6(6.0%)	6(6.0%)	7(7.0%)	19(6.3%)
-- Female condom	2(2.0%)	1(1.0%)	0	3(1.0%)
-- Diaphragm	0	2(2.0%)	0	2(0.7%)
-- Tampon	3(3.0%)	2(2.0%)	10(10.0%)	15(5.0%)
-- Vaginal anti-inflammatory pill/suppository	62(62.0%)	46(46.0%)	60(60.0%)	168(56.0%)
Douching				
-- Never	12(12.0%)	52(52.0%)	19(19.0%)	83(27.7%)
-- No more than once a week	9(9.0%)	21(21.0%)	22(22.0%)	52(17.3%)
-- At least once a week, but not every day	38(38.0%)	20(20.0%)	33(33.0%)	91(30.3%)
-- Every day	41(41.0%)	7(7.0%)	26(26.0%)	74(24.7%)
Woman's STI internal locus of control	2.84±0.36 range, 2.25– 3.75	2.85±0.38 range, 1.67– 3.75	2.89±0.36 range, 2.00– 3.75	2.85±0.37 range, 1.67– 3.75
Woman's STI locus of control by partners	2.28±0.59 range, 1.00– 3.50	2.51±0.53 range, 1.00– 4.00	2.47±0.60 range, 1.00– 4.00	2.42±0.58 range, 1.00– 4.00
Woman's STI locus of control by chance	2.07±0.63 range, 1.00– 3.50	2.38±0.52 range, 1.00– 3.50	2.18±0.61 range, 1.00– 4.00	2.21±0.60 range, 1.00– 4.00
Worried about getting HIV				
-- Not worried at all	12(12.0%)	18(18.2%)	23(23.0%)	53(17.7%)
-- A little worried	43(43.0%)	40(40.4%)	48(48.0%)	131(43.8%)
-- Very worried	45(45.0%)	41(41.4%)	29(29.0%)	115(38.5%)
Worried about getting STI				

	Town A (N=100[#])	Town B (N=100)	City C (N=100)	Total (N=300[#])
-- Not worried at all	4(4.0%)	13(13.1%)	19(19.0%)	36(12.0%)
-- A little worried	31(31.0%)	37(37.4%)	45(45.0%)	113(37.8%)
-- Very worried	65(65.0%)	49(49.5%)	36(36.0%)	150(50.2%)

[#] Entries may not add up to 100 or 300 because for some characteristics, a possible response was "I don't know".

TABLE 3

Univariate Analyses of Microbicide Acceptability by Demographic Characteristics, Partner Types, Genital Hygienic Practices and Attitudes

	N	Mean score of microbicide acceptability	P
Study site			
-- Town A	100	2.91(SD,0.50)	0.201
-- Town B	100	2.82(SD,0.64)	
-- City C	100	2.95(SD,0.53)	
Age group			
-- 16–25	176	2.79(SD,0.53)	0.001
-- 26–35	92	3.02(SD,0.58)	
-- >35	32	3.10(SD,0.55)	
Recruitment places			
-- Roadside restaurant	69	2.98(SD,0.45)	0.002
-- Street-based massage/beauty/hair parlor	81	2.83(SD,0.59)	
-- Boarding house/lodge	87	3.03(SD,0.62)	
-- Hotel-based venues	62	2.70(SD,0.47)	
Ethnicity			
-- Han	205	2.93(SD,0.55)	0.223
-- Li	76	2.80(SD,0.55)	
-- Other	19	2.85(SD,0.68)	
Marital status			
-- Single	171	2.79(SD,0.53)	0.000
-- Married	97	3.03(SD,0.58)	
-- Divorced/separated/widowed	32	3.07(SD,0.53)	
Education			
-- No formal schooling	10	2.52(SD,0.80)	0.009
-- Primary	110	3.00(SD,0.56)	
-- Junior high	157	2.83(SD,0.54)	
-- Senior high/vocational/technical school	23	3.02(SD,0.51)	
Partner types			
-- Only has primary partner	50	2.63(SD,0.54)	0.001
-- Has a primary partner and paying partners	79	2.98(SD,0.49)	
-- Only has paying partners	170	2.93(SD,0.58)	
Had at least one STI symptom in the last 6 months			
-- Yes	166	2.92(SD,0.50)	0.388
-- No	134	2.86(SD,0.63)	
Vaginal product experience			
-- Yes	175	3.00(SD,0.51)	0.000
-- No	125	2.75(SD,0.60)	
Douching			
-- Never	83	2.80(SD,0.63)	0.015

	N	Mean score of microbicide acceptability	P
-- No more than once a week	52	2.86(SD,0.57)	
-- At least once a week, but not every day	91	2.85(SD,0.52)	
-- Every day	74	3.07(SD,0.50)	
Worried about getting infected with HIV			
-- Not worried at all	53	2.80(SD,0.54)	
-- A little worried	131	2.88(SD,0.53)	0.242
-- Very worried	115	2.95(SD,0.61)	
Worried about getting an STI			
-- Not worried at all	36	2.84(SD,0.53)	
-- A little worried	113	2.78(SD,0.57)	0.005
-- Very worried	150	3.00(SD,0.55)	

TABLE 4

Summary of Hierarchical Regression Analyses for Variables Predicting Microbicide Acceptability (N=297)

	B	SE B	Standardized B	P
Block 1				
Study site (<i>Town A, reference group</i>):				
<i>Town B</i>	0.290	0.119	0.242	0.02
<i>City C</i>	0.305	0.118	0.257	0.01
Age group	−0.018	0.083	−0.021	0.83
Recruitment place(<i>hotel-based massage/beauty/sauna parlor, reference group</i>):				
<i>Roadside restaurant</i>	0.644	0.144	0.485	0.00
<i>Street-based massage/beauty/hair parlor</i>	0.373	0.098	0.296	0.00
<i>Boarding house/lodge</i>	0.267	0.116	0.215	0.02
Ethnicity (<i>Han, reference group</i>):				
<i>Li</i>	0.014	0.086	0.011	0.87
<i>Other</i>	−0.111	0.125	−0.048	0.38
Marital status (<i>single, reference group</i>):				
<i>Married</i>	0.323	0.115	0.268	0.01
<i>Divorced/separated/widowed</i>	0.352	0.143	0.195	0.01
Education (<i>no formal schooling, reference group</i>):				
<i>Primary</i>	0.373	0.181	0.320	0.04
<i>Junior high</i>	0.190	0.185	0.169	0.31
<i>Senior high/Vocational/ technical school</i>	0.274	0.216	0.131	0.21
Block 2				
Partner types (<i>Only having a primary partner, reference group</i>):				
<i>Having a primary partner and paying partners</i>	0.305	0.107	0.239	0.01
<i>Having paying partners only</i>	0.235	0.097	0.207	0.02
Having at least one STI symptom in the last 6 months	0.039	0.067	0.034	0.56
Vaginal product experience	0.143	0.069	0.126	0.04
Douching	0.069	0.076	0.055	0.37
Block 3				
Woman's STI internal locus of control	0.143	0.085	0.093	0.09
Woman's STI locus of control by partners	0.158	0.056	0.164	0.01
Woman's STI locus of control by chance	−0.115	0.054	−0.123	0.03
Worried about getting infected with HIV	−0.023	0.052	−0.029	0.66
Worried about getting an STI	0.083	0.057	0.102	0.15

$R^2=0.162$ for block 1; $R^2=0.223$ for block 2; $R^2=0.279$ for block 3.

adj $R^2=0.124$ for block 1; adj $R^2=0.173$ for block 2; adj $R^2=0.218$ for block 3.

Change in R^2 from block 1 to block 2 = 0.061**.

Change in R^2 from block 2 to block 3 = 0.055**.

**
P<0.01.