

Social Cohesion, Social Participation, and HIV Related Risk among Female Sex Workers in Swaziland

Virginia A. Fonner^{1*}, Deanna Kerrigan², Zandile Mnisi³, Sosthenes Ketende⁴, Caitlin E. Kennedy¹, Stefan Baral⁴

1 Johns Hopkins Bloomberg School of Public Health, Department of International Health, Baltimore, Maryland, United States of America, **2** Johns Hopkins Bloomberg School of Public Health, Department of Health, Behavior, and Society, Baltimore, Maryland, United States of America, **3** Swaziland National AIDS Program, Mbabane, Swaziland, **4** Johns Hopkins Bloomberg School of Public Health, Department of Epidemiology, Baltimore, Maryland, United States of America

Abstract

Social capital is important to disadvantaged groups, such as sex workers, as a means of facilitating internal group-related mutual aid and support as well as access to broader social and material resources. Studies among sex workers have linked higher social capital with protective HIV-related behaviors; however, few studies have examined social capital among sex workers in sub-Saharan Africa. This cross-sectional study examined relationships between two key social capital constructs, social cohesion among sex workers and social participation of sex workers in the larger community, and HIV-related risk in Swaziland using respondent-driven sampling. Relationships between social cohesion, social participation, and HIV-related risk factors were assessed using logistic regression. HIV prevalence among the sample was 70.4% (223/317). Social cohesion was associated with consistent condom use in the past week (adjusted odds ratio [AOR] = 2.25, 95% confidence interval [CI]: 1.30–3.90) and was associated with fewer reports of social discrimination, including denial of police protection. Social participation was associated with HIV testing (AOR = 2.39, 95% CI: 1.36–4.03) and using condoms with non-paying partners (AOR = 1.99, 95% CI: 1.13–3.51), and was inversely associated with reported verbal or physical harassment as a result of selling sex (AOR = 0.55, 95% CI: 0.33–0.91). Both social capital constructs were significantly associated with collective action, which involved participating in meetings to promote sex worker rights or attending HIV-related meetings/ talks with other sex workers. Social- and structural-level interventions focused on building social cohesion and social participation among sex workers could provide significant protection from HIV infection for female sex workers in Swaziland.

Citation: Fonner VA, Kerrigan D, Mnisi Z, Ketende S, Kennedy CE, et al. (2014) Social Cohesion, Social Participation, and HIV Related Risk among Female Sex Workers in Swaziland. PLoS ONE 9(1): e87527. doi:10.1371/journal.pone.0087527

Editor: Cédric Sueur, Institut Pluridisciplinaire Hubert Curien, France

Received: April 8, 2013; **Accepted:** December 29, 2013; **Published:** January 31, 2014

Copyright: © 2014 Fonner et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Funding: The study was implemented by USAID/Project SEARCH, Task Order No.2, which is funded by the U.S. Agency for International Development under Contract No. GHH-I 00-07-00032-00, beginning September 30, 2008, and supported by the President's Emergency Plan for AIDS Relief. The Research to Prevention (R2P) Project is led by the Johns Hopkins Center for Global Health and managed by the Johns Hopkins Bloomberg School of Public Health Center for Communication Programs (CCP). The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Competing Interests: The authors have declared that no competing interests exist.

* E-mail: vtedrow@jhsph.edu

Introduction

In sub-Saharan Africa, female sex workers have a 12-fold increase in odds of being HIV infected as compared to all women of reproductive age [1]. Sex workers face heightened behavioral risk for HIV infection due to high numbers of sex partners and frequent sexual encounters. This risk is exacerbated by social and structural factors, including stigma, poverty, sexual and physical violence [2–4], as well as inequitable laws and policies, police brutality, and lack of non-discriminatory healthcare services [5,6].

In part due to the high HIV burden experienced by sex workers, recent mathematical models suggest that scaling up comprehensive community-based empowerment interventions among sex workers could avert significant numbers of new HIV infections not only among sex worker populations, but also among other reproductive-aged populations [7]. Evidence from HIV prevention interventions among sex workers in India [8–15], Brazil [16,17], and the Dominican Republic [18] suggests that community empowerment can be an effective tool for reducing HIV-related risk and enacting social- and structural-level changes that alter HIV-related risk environments [19]. For example, the Avahan

Initiative in India included interventions such as drop-in centers, peer education, sex-worker friendly health services, stakeholder advocacy, and formation of organizations led by and with sex workers to facilitate program ownership [20]. Avahan promoted social cohesion among sex workers, creating the potential for collective action, and worked to increase the acceptance of sex workers in the general community by facilitating social participation [21] through activities such as workshops bringing together police and sex workers [22].

Embedded within community empowerment models is the concept of social capital. Social capital concerns the connectedness of individuals between and within groups [23]. It encompasses the inherent value of social relationships and the material and social resources these relationships bring [23]. Robert Putnam, a prominent social capital theorist, has defined social capital as "the networks, norms, and social trust that facilitate co-operation for mutual benefit" [24]. According to Putnam, there are two main types of social capital: bonding, which refers to intra-group relationships, and bridging, which refers to inter-group interactions [24]. Although the current study involves two social capital constructs—social cohesion and social participation—we use the

term social capital with caution as definitions vary and can be conceptually different [25]. In this study, social cohesion refers to mutual aid, trust, and solidarity present among sex workers and reflects bonding social capital. Social participation, which aligns with bridging social capital, refers to involvement in community groups outside of sex worker relationships, reflecting their inclusion in the larger society. A theoretical framework of social capital and HIV-related risk among sex workers is presented in Figure 1.

Extensive research has examined relationships between social capital and health [26-29], and social capital has been identified as a social-level factor influencing HIV vulnerability [30]. In general, public health outcomes tend to improve when social capital measures are high [31]. However, findings show these relationships are complex, especially in regards to HIV. For example, studies have found that HIV-associated risks can be positively or negatively associated with social capital, depending on the age and gender of the individual and the types of social ties maintained [32,33]. Social capital may be especially important to disadvantaged groups, such as sex workers, because it increases access to material and social resources that would otherwise be denied to this socially excluded population [34]. However, little research has been conducted on social capital and HIV-related risk among female sex workers in sub-Saharan Africa [32].

HIV and Sex Work in Swaziland

Swaziland has the world’s highest HIV prevalence with an estimated 26% of adults aged 15–49 living with HIV [35]. The 2009 Modes of Transmission Study reports that heterosexual

transmission accounts for the majority of HIV infections in Swaziland and sex work is a minor driver of the epidemic; however, it also acknowledges that little information is known about this hidden population [36]. A literature review revealed only two peer-reviewed studies conducted on sex workers in Swaziland [37,38]. Although sex work is not criminalized in Swaziland, activities related to sex work, such as the solicitation and procurement of sex in public, are illegal [39], which makes conducting research among this population difficult yet essential to understanding factors shaping their HIV-related risk.

A situational analysis of sex work in Swaziland conducted in 2007 found that the majority of sex workers were young (below age 30) and most reported engaging in sex work due to poverty and lack of economic opportunities. Sex workers in Swaziland also reported experiencing high levels of violence, including violence perpetrated by clients and police, and lacked access to non-discriminatory health services, such as family planning services and testing for HIV and sexually transmitted infections [40]. Another study characterized both rural and urban sex work in Swaziland, highlighting that many sex workers are migratory and follow clients to “hot spots” depending on the season or time of month [41]. Sex workers in Swaziland are not brothel-based and obtain clients directly, either on the street or by being “on call” [41]. Street-based sex workers face heightened vulnerability to violence as the location of sex varies by client and includes isolated places where sex workers can be beaten, gang raped, or robbed [4]. Cohesion among street-based sex workers could help prevent violence and encourage behavior change, such as through

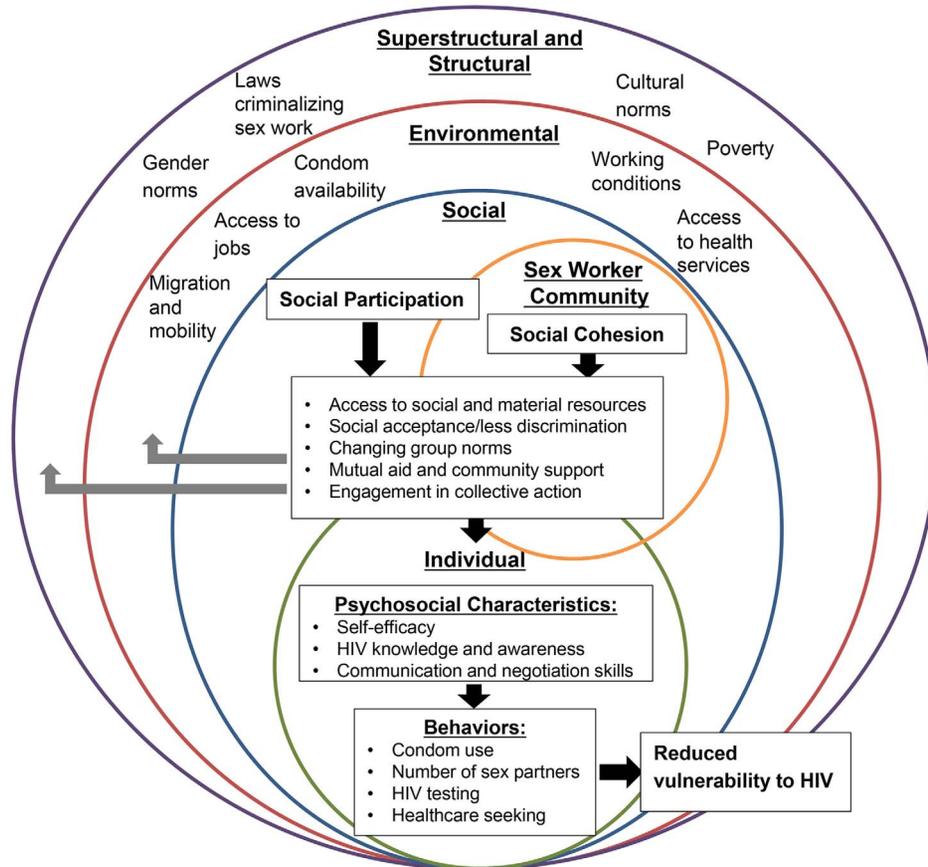


Figure 1. Theoretical framework of social capital and HIV-related risk among female sex workers in Swaziland.
doi:10.1371/journal.pone.0087527.g001

collective agreements that no one will service a client without condoms. However, literature relating to the social context of sex work in Swaziland, including the social relationships that sex workers have with each other, is scarce. Given the potential importance of social factors, such as social cohesion and social participation, in reducing HIV-related risk and supporting community empowerment, this is a critically understudied area. Therefore, the aim of this study was to examine the relationship between social capital constructs, including social cohesion and social participation, and HIV-related risk among female sex workers in Swaziland.

Methods

Setting, study design, and participants

Women in Swaziland aged 18 years or older who reported exchanging sex for money, favors, or goods in the past twelve months were eligible to participate in the study. All participants provided informed consent prior to completing the questionnaire and serological testing. Oral consent scripts were used in lieu of signed consent forms to further ensure anonymity, protection of confidentiality, and security of participants. This ensured that in case consent forms were lost, no personal information or disclosure of sex work would take place. The study was implemented as a joint effort between the Swaziland government, Johns Hopkins University, and PSI Swaziland. Ethical approval for this study was granted by the Swaziland Scientific and Ethics Committee and the Johns Hopkins Bloomberg School of Public Health Institutional Review Board.

The sample size ($n = 324$) was calculated based on the ability to detect significant differences in HIV prevalence among participants with higher reported protective behaviors related to HIV, such as consistent condom use with paying partners ($\alpha = 0.05$, power = 0.80).

Participants were recruited using respondent-driven sampling (RDS), which is a peer-driven chain referral sampling technique that approximates a random sample by mathematically controlling for inherent biases, including network size and homophily (the tendency of participants to recruit individuals who are similar to themselves) [42,43]. To initiate the chain referral process, “seeds” were identified during formative research. Seeds were members of the sex worker community with diverse socio-demographic characteristics who were motivated to participate in the study and willing to recruit others in their social network. Three seeds were selected to begin the referral process and additional pre-selected seeds were brought into the study when accrual slowed. Each seed, and each subsequent participant who agreed to recruit other participants, was given referral cards with a 2-week expiration date to distribute to eligible members of their social network. Each recruiter could recruit a maximum of three participants. Upon survey completion, each participant was reimbursed for their time and travel to the study site, ranging from the equivalent of US\$7–\$23. Recruiters were also provided the equivalent of US\$2.50 for every eligible participant who participated in the study. Recruiter-recruit relationships were tracked using linked card numbers.

Data collection and survey measures

Data collection took place from July–November 2011. All participants completed a structured survey administered by a trained interviewer lasting approximately 1 hour in a private office setting. The survey could be completed in English or siSwati depending on the participant’s preference. Participants were asked questions relating to their social network (ascertained by asking

how many different people a participant knew personally who were sex workers); socio-demographics; exposure to human rights violations; HIV-related knowledge, attitudes, and risk behaviors; condom negotiation skills; reproductive healthcare; and aspects of social capital, including social cohesion and social participation. Following completion of the survey, participants were tested for HIV by trained nurse counselors using rapid tests conducted on blood samples obtained via finger stick after providing informed consent. Unigold™ (Trinity Biotech) and Determine HIV 1® (Inverness Medical) were used as the preliminary screening and confirmatory HIV tests, respectively. Those who tested positive for HIV were given referrals to seek additional care and treatment through local health facilities.

Social capital

Social cohesion was measured using a scale developed by Lippman, Kerrigan, and colleagues for use among sex worker populations in Brazil [17,44]. Items comprising the scale were pilot-tested in Swaziland prior to survey implementation but required little change as questions asked about social situations, such as relying on colleagues for money or a ride to the hospital, that are applicable across populations. Participants were asked to rate their agreement or disagreement with statements relating to mutual aid, support, and trust among sex workers. Exploratory factor analysis (EFA) using polychoric correlations was used to determine unidimensionality within the social cohesion scale, and Cronbach’s alpha was used to assess the internal consistency [45]. Two of the 11 items were removed from the scale due to exhibiting low correlations with the other items and low factor loadings (below 0.3) in EFA. The remaining 9 items exhibited acceptable internal consistency ($\alpha = 0.76$) and are listed in Table 1. For analysis the items were summed to create a scale with scores ranging from 0 to 27; scores were dichotomized at the median (16) for ease of interpretation, with 0–16 signaling low social cohesion and 16.1–27 signaling high social cohesion. Dichotomizing social capital scales is a technique previously employed by researchers examining associations between HIV and social capital [32].

Social participation was measured by asking participants about their involvement in groups outside their sex worker network, including church or religious groups, clubs (e.g., sports, student groups, women’s clubs), cultural activities (e.g., dance, music), and community activities. Participants were scored based on the intensity of their involvement (0 = do not participate, 1 = member, 2 = active member, and 3 = group leader). This assessment is similar to the method for measuring structural social capital in the World Bank’s Social Capital Tool [46], which has also been used to measure social participation among sex worker populations in Brazil [17,44]. Categories of social participation were adapted to the Swazi context prior to implementation. Due to the skewed distribution of data for this construct (mean score = 1.6 on a 16-point scale), a social participation index was generated by summing participants’ involvement across the various groups (“0” for no involvement and “1” for any involvement) for analysis. Scores on the social participation index could range from 0 (no social participation) to 4 (participation in all types of social involvement). The median score on the social participation index was 1, and scores were dichotomized at the median (0 = score of 0 or 1; 1 = score >1) for ease of interpretation and due to the skewed distribution of the data.

Collective action, which is defined as any action aiming to improve a group’s condition [47], has been described as both an output measure of social capital and an important proxy for assessing social capital itself [48]. In this study, collective action was treated as an outcome variable as it was hypothesized that

Table 1. Measurement of social capital constructs and outcome variables.

Items in scale/index	Properties	
	Mean (sd)	Alpha
Exposure Variables		
Social Cohesion (scale)	16.0 (5.2)	0.76
You can count on your sex worker colleagues if you need to borrow money.		
You can count on your sex worker colleagues to accompany you to the doctor or hospital.		
You can count on your sex worker colleagues if you need to talk about your problems.		
You can count on your sex worker colleagues if you need somewhere to stay.		
You can count on your sex worker colleagues to help deal with violent or difficult client.		
You can count on your sex worker colleagues to help you find other clients.		
You can count on your sex worker colleagues to support the use of condoms.		
The group of sex workers with whom you work is an integrated group.		
You can trust the majority of other sex workers working in your area.		
<i>(Response Choices: strongly agree, mostly agree, mostly disagree, or strongly disagree)</i>		
Social Participation (index)	1.4 (1.1)	n/a
Participation in the following groups:		
1. Affiliations with church or religious groups		
2. Affiliations with clubs		
3. Cultural activities		
4. Community activities		
<i>Participation was coded as "0" for no involvement and "1" for any involvement (being a member, active member, or leader of a specific social group)</i>		
Outcome Variables		
Consistent condom use	Consistency defined by having the number of reported protected sex acts (condom worn for entire duration of sex) equal to the number of all sex acts in the past week for all sex partners (vaginal or anal sex)	
"Always" condom use	Reported separately for: a) new clients, b) regular clients, and c) non-paying partners during vaginal sex. "Always" condom use vs. condom use reported never, rarely, sometimes, most of the time, or "don't know"	
HIV testing	Have you been tested for HIV in the last 12 months?	
HIV prevalence	HIV testing was offered to all study participants during data collection	
Social discrimination	Have you ever felt rejected by your friends as a result of you selling sex?	
	Have you ever felt afraid to seek healthcare services as a result of you selling sex?	
	Have you ever felt that the police refused protection as a result of you selling sex?	
	Have you ever felt any verbal and physical harassment as a result of you selling sex?	
	Have you ever been beaten up as a result of you selling sex?	
Collective action	In the past 12 months, have you participated in: 1) A meeting, march, rally, or gathering to promote the rights of sex workers? Or 2) Any talks or meetings related to HIV/AIDS with other sex workers?	

doi:10.1371/journal.pone.0087527.t001

having high social cohesion and/or social participation could lead to collective action, including engagement in activities related to HIV prevention. Collective action was measured through two questions asking about participation within the past 12 months in: 1) meetings, marches, rallies, or gatherings to promote the rights of sex workers, or 2) talks or meetings related to HIV/AIDS with other sex workers.

HIV-related risk

Behavioral HIV-related risk was measured by asking participants about condom use during vaginal and anal sex with different partner types, including new clients, regular clients, and non-paying partners. New clients were defined as paying clients with whom participants had had sex once or twice. Regular clients were defined as those with whom participants had had sex at least three times and who pay for sex. Non-paying partners included sexual

partners of participants, such as husbands and boyfriends, who do not pay for sex.

For purposes of this study, consistent condom use was defined as reporting condom use in all sex acts in the past week with all partners, which was measured by constructing a ratio of the reported number of protected sex acts to all sex acts reported in the previous week. "Always" condom use in the past 30 days versus some or no condom use was also measured for new clients, regular clients, and non-paying partners. Although this study measured "always" condom use in both anal and vaginal sex, results in this analysis were restricted to condom use during vaginal sex as approximately 65% of the study population reported no engagement in anal sex. Prior HIV testing was measured by asking participants whether they had received an HIV test in the past 12 months.

Additionally, several factors relating to violence and social discrimination were included as outcome variables since previous

research has shown that violence, including physical, sexual, and emotional violence, is associated with elevated HIV risk, especially among female sex workers [49,50]. Social discrimination outcomes included reported rejection by friends, reported refusal of protection from police, feeling afraid to seek health services, reported verbal or physical abuse, and having been beaten up due to sex work. All exposure and outcome variables are defined in Table 1.

Analysis

All analyses were conducted using Stata version 11. Cross-sectional data were used to assess the relationship between HIV-related outcomes and social capital constructs, including social cohesion and social participation. Chi square tests were performed to assess differences in the dichotomized social cohesion and social participation scores across socio-demographic characteristics.

To account for biases inherent in RDS data collection, including recruiting patterns and network size, data were weighted based on population estimates of the outcome variable in all analyses. Univariate logistic regression analyses were performed on HIV-related outcome variables to assess associations with social cohesion and social participation. For analyses where either social cohesion or social participation were associated with the outcome at $p \leq 0.1$, multivariate regressions were conducted to assess the impact of the relationship when controlling for age, income, education, marital status, and geographic region of residence in addition to the RDS weights, which were identified *a priori* as potential confounders between social capital and HIV-related variables.

However, there is no consensus in the field about how RDS data should be treated in multivariate analysis [51], particularly because traditional weighing methods can produce incorrect standard errors [52]. Therefore, sensitivity analyses were performed in which data were left completely unadjusted and then adjusted using network size as a confounding variable, which is a technique previously used for conducting multivariate logistic regression analyses with RDS data [53]. As the sensitivity analyses showed no significant difference in associations, analyses using weighted RDS data were employed for all subsequent analyses. Additionally, analyses were performed with and without “seed” data because seeds were non-randomly selected. As no significant differences in associations were detected, data from seeds remained in the analysis.

Results

Study population

Data were collected from 325 female sex workers, including data from nine non-randomly selected seeds. The median age of participants was 25 (inter-quartile range [IQR] 21–30). About half of participants ($n = 175$) had completed some secondary or high school. Out of 317 participants with a confirmed HIV test result, 70.6% (223/317) tested HIV positive. Over 54% of participants (176/322) reported being told they were HIV positive by a healthcare provider sometime before participating in the study. Most participants were single and had never been married (285/321). Table 2 contains socio-demographic characteristics of the sample. Marital status was associated with social cohesion in that participants who had ever cohabitated with a sexual partner (e.g., married, widowed, or divorced) experienced lower levels of social cohesion compared to participants who were single/never married ($p = 0.05$).

Social capital among sex workers

Social cohesion scores among sex workers were relatively high. On a 27 point scale, the mean and median score was 16 (range 0–27). Over 60% of sex workers agreed or strongly agreed they could turn to sex workers with whom they work if they needed money, a ride to the hospital, someone to discuss their problems with, or help with a difficult client. However, only 37% of participants (120/321) agreed with statement, “You can trust the majority of other sex workers working in your area.”

Social participation was generally low. On a four point scale, the median score was 1 (range 0–4). No social participation was reported by 21% of participants (67/318). Affiliation with a church or religious group was the most commonly reported form of social participation with 61% reporting such involvement (197/323).

Regarding collective action, 54% (172/320) reported attending a talk or meeting relating to HIV with other sex workers in the past 12 months, but only 34% (111/324) reported attending a meeting, march, rally, or gathering in the past 12 months to promote the rights of sex workers.

Associations between social cohesion and HIV-related risk

Table 3 presents results from logistic regression analyses examining social cohesion and HIV-related behaviors and risk factors. In univariate and multivariate analysis, social cohesion was significantly associated with consistent condom use in the past week with all partners (adjusted odds ratio [AOR] = 2.25, 95% confidence interval [CI]: 1.30–3.90). However, there were no associations found between social cohesion and “always” condom use with new partners, regular partners, or non-paying partners. Social cohesion was also associated with fewer reports of social discrimination, including reported refusal of police protection (AOR = 0.53, 95% CI: 0.31–0.90) and reported rejection by friends due to sex work (AOR = 0.52, 95% CI: 0.32–0.84). Social cohesion also trended towards being inversely associated with feeling afraid to seek services due to selling sex (AOR = 0.67, 95% CI: 0.41–1.08, $p = 0.10$), but results were not significant. Having high levels of social cohesion was significantly associated with one measure of collective action: participating in meetings to promote sex worker rights (AOR = 2.33, 95% CI: 1.37–3.94).

Associations between social participation and HIV-related risk

Associations between social participation and HIV-related behaviors and risk factors are presented in Table 4. In both univariate and multivariate regressions, being tested for HIV in the previous 12 months was significantly associated with having high levels of social participation (AOR = 2.39, 95% CI: 1.36–4.02). When the analysis excluded HIV-infected participants who did not test for HIV in the past 12 months but had previously been told by a healthcare provider that they were HIV infected ($n = 27$), the association between social participation and prior testing remained significant (AOR = 1.99, 95% CI: 1.02–3.86, $p = 0.04$). Additionally, reporting “always” condom use with non-paying partners was associated with social participation (AOR = 1.99, 95% CI = 1.13–3.51), although social participation was not significantly associated with any other condom use measure. Participants with high levels of social participation had a 45% reduction in odds of reporting experiencing verbal or physical harassment as a result of selling sex compared to those with low levels of participation (AOR = 0.55, 95% CI: 0.33–0.91). Social participation, like social cohesion, was significantly associated with collective action. Compared to participants with low levels of

Table 2. Socio-demographic characteristics of the sample by levels of social cohesion and social participation.

Demographic characteristic	N (%)	Social Cohesion		Social Participation	
		High N	Low N	High N	Low N
Study Population (total)	325	142	159		
Age (in years)				0.96	0.43
<21	64 (19.7)	30	30	31	30
21–24	82 (25.2)	35	39	37	45
25–29	91 (28.0)	39	47	45	44
30+	88 (27.1)	38	43	34	52
Education				0.89	0.22
Primary or lower	106 (32.6)	45	51	44	60
Some secondary	175 (53.9)	79	85	87	85
Completed secondary or higher	44 (13.5)	18	23	16	26
Marital Status				0.05	0.10
Ever cohabited	36 (11.2)	11	24	12	24
Single/Never married	285 (88.8)	129	135	133	145
Region of residence				0.68	0.19
Hhohho	102 (31.4)	40	53	49	48
Manzini	159 (48.9)	71	77	64	95
Shiwelweni	57 (17.5)	28	25	31	25
Lubombo	6 (1.8)	3	3	2	3
Income (in Emalangeni)				0.09	0.08
0–450	85 (26.2)	32	46	43	39
451–800	93 (28.6)	45	38	46	46
801–1300	63 (19.4)	33	26	30	32
1300+	84 (25.8)	32	49	28	54
HIV status				0.56	0.60
Uninfected	94 (29.7)	30	49	45	47
Infected	223 (70.3)	99	107	100	119

doi:10.1371/journal.pone.0087527.t002

social participation, participants with high levels of social participation had over twice the odds of participating in meetings to promote sex worker rights (AOR = 2.26, 95% CI: 1.35–3.78).

Discussion

Given the HIV prevalence among this sample of female sex workers was almost three times the general population prevalence in Swaziland, developing HIV prevention activities for this population is critical. Associations between social capital constructs and HIV-related risk factors found in this study demonstrate that including social capital enhancement in HIV prevention interventions for sex workers in Swaziland could be beneficial. For example, we found that having high levels of social cohesion was associated with increased consistent condom use among sex workers and their sexual partners and was negatively associated with certain aspects of social discrimination. Having high levels of social participation was associated with consistent condom use between sex workers and their non-paying partners and with being tested for HIV in the previous year, and was associated with fewer reports of verbal or physical harassment. Both social cohesion and social participation were associated with participating in collective action with other sex workers.

Interestingly, on the social cohesion scale, reported trust among sex workers in a particular area was relatively low while feelings of mutual aid were generally high. This difference could be a consequence of question wording (as the “trust” question asked about “sex workers working in your area” and the “mutual aid” questions asked about “sex workers with whom you work”), but it could also provide insight into the nature of sex work in Swaziland. Research among sex workers in South Africa similarly found limited trust between sex workers due to circumstances such as competition for clients, but acts of support, such as visiting each other in the hospital or borrowing money, were common [54]. Other studies among sex workers have found that building cohesion can be challenging not only due to lack of trust but also due to heterogeneity between sex workers [55], lack of common identity [56], frequent migration and high turn-over rates [57], and not wanting to be openly identify as a sex worker [55]. Despite these challenges, interventions aiming to improve cohesion found that over time, cohesion was built by allowing sex workers the space and time to come together to share problems and develop collective solutions [56] and by having sex workers advise on intervention development and implementation to develop a sense of community and ownership [21,58].

The association between high levels of social cohesion and consistent condom use found in this study is consistent with

Table 3. Associations of social cohesion and HIV-related outcomes.

Outcome variable	n	Social Cohesion n(%)		Unadjusted ^a		Adjusted ^b	
		High	Low	OR (95% CI)	P value	AOR (95% CI)	P value
Behavioral							
Consistent condom use- all partners	278	99/135 (73.3)	80/143 (55.9)	2.17 (1.30–3.60)	0.003	2.25 (1.30–3.90)	0.004
“Always” condom use- new clients	280	101/133 (75.9)	106/147 (72.1)	1.22 (0.71–2.09)	0.47	-----	
“Always” condom use- regular clients	291	68/138 (49.3)	70/153 (45.8)	1.15 (0.72–1.83)	0.55	-----	
“Always” condom use- non-paying partners	267	42/127 (33.1)	44/140 (31.4)	1.08 (0.64–1.81)	0.76	-----	
Tested for HIV in previous year	300	108/142 (76.1)	114/158 (72.2)	1.23 (0.73–2.07)	0.44	-----	
Biological							
HIV-infected	294	99/138 (71.7)	107/156 (68.6)	1.16 (0.70–1.93)	0.56	-----	
Social Discrimination/Violence							
Afraid to seek health services	301	56/142 (34.4)	78/159 (49.1)	0.67 (0.43–1.07)	0.10	0.67 (0.41–1.08)	0.10
Felt rejected by friends	318	63/142 (44.4)	97/159 (61.0)	0.51 (0.32–0.81)	0.004	0.52 (0.32–0.84)	0.008
Was refused police protection	300	59/141 (41.8)	91/159 (57.2)	0.54 (0.34–0.85)	0.009	0.53 (0.31–0.90)	0.02
Verbal/physical harassment	301	84/142 (59.2)	102/159 (64.2)	0.81 (0.51–1.29)	0.36	-----	
Beaten up due to selling sex	299	49/140 (35.0)	65/159 (26.4)	0.78 (0.49–1.25)	0.30	-----	
Collective Action							
Participated in meeting to promote sex worker rights	301	59/142 (41.6)	42/159 (26.4)	1.98 (1.22–3.23)	0.006	2.33 (1.37–3.94)	0.006
Participated in meeting about HIV/AIDS with other sex workers	314	87/142 (61.3)	77/157 (49.0)	1.64 (1.03–2.61)	0.04	1.61 (0.96–2.68)	0.07

^aUnivariate analyses adjusted for RDS weights based on estimated population proportions of outcome variable.

^bAdjusted for age, income, education, marital status, and region in addition to RDS weights.

doi:10.1371/journal.pone.0087527.t003

Table 4. Associations of social participation and HIV-related outcomes.

Outcome variable	n	Social Participation n(%)		Unadjusted ^a		Adjusted ^b	
		High	Low	OR (95% CI)	P value	AOR (95% CI)	P value
Behavioral							
Consistent condom use- all partners	294	86/135 (63.7)	103/159 (64.8)	0.95 (0.60–1.54)	0.85	-----	
“Always” condom use- new clients	294	101/133 (75.94)	117/161 (72.7)	1.19 (0.70–2.02)	0.53	-----	
“Always” condom use- regular clients	306	70/142 (49.3)	78/164 (47.6)	1.07 (0.68–1.68)	0.76	-----	
“Always” condom use- non-paying partners	279	53/132 (40.2)	41/147 (27.9)	1.73 (1.05–2.87)	0.03	1.99 (1.13–3.51)	0.04
Tested for HIV in previous year	317	121/147 (82.3)	117/170 (68.8)	2.11 (1.23–3.61)	0.007	2.39 (1.36–4.02)	0.003
Biological							
HIV-infected	311	100/145 (70.0)	119/166 (71.7)	0.88 (0.54–1.43)	0.60	-----	
Social Discrimination/Violence							
Afraid to seek health services	318	63/147 (42.9)	78/171 (45.6)	0.89 (0.57–1.40)	0.62	-----	
Felt rejected by friends	318	78/147 (53.1)	89/171 (52.1)	1.04 (0.67–1.62)	0.86	-----	
Was refused police protection	317	67/146 (45.9)	91/171 (53.2)	0.75 (0.48–1.16)	0.20	-----	
Verbal/physical harassment	318	79/147 (53.7)	115/171 (67.2)	0.57 (0.36–0.89)	0.02	0.55 (0.33–0.91)	0.02
Beaten up due to selling sex	315	51/146 (34.9)	73/169 (43.2)	0.71 (0.45–1.12)	0.14	-----	
Collective Action							
Participated in meeting to promote sex worker rights	318	64/147 (43.5)	46/171 (26.9)	2.09 (1.31–3.36)	0.002	2.26 (1.35–3.78)	0.002
Participated in meeting about HIV/AIDS with other sex workers	314	85/145 (58.6)	83/169 (49.1)	1.47 (0.94–2.30)	0.09	1.31 (0.79–2.17)	0.30

^aUnivariate analyses adjusted for RDS weights based on estimated population proportions of outcome variable.

^bAdjusted for age, income, education, marital status, and region in addition to RDS weights.

doi:10.1371/journal.pone.0087527.t004

previous research that has examined these variables longitudinally. The Sonagachi Project from Kolkata, India, which sought to reduce HIV risk for sex workers through promoting group solidarity, fostering empowerment, and increasing access to social and material resources, has led to significant increases in condom use among sex workers [10]. However, social cohesion was not directly measured in the Sonagachi Project. A replication of this intervention in West Bengal also led to increases in consistent condom use [59], as have several other interventions focusing on community mobilization and collectivization of sex workers in India [9,60] and on community solidarity in the Dominican Republic [18] and Brazil [17]. The negative association of social cohesion and refusal of police protection found in this study is consistent with results from interventions in India, such as the Avahan initiative, which demonstrated that groups of sex workers can collectively confront and change police practices towards sex workers, resulting in safer and healthier work environments [22,61].

The association between social participation and “always” condom use with non-paying partners is noteworthy as condom use among sex workers has been found to be lower in partnerships with high relationship intimacy and trust [62]. Having sexual relationships with non-paying partners is linked to social participation in that both involve making connections with the larger community beyond the world of sex work, which could explain why social participation was related to condom use with non-paying partners but not with new or regular clients in this study. The significant association between social participation and previous HIV testing has not been reported in other studies with sex workers, but research with other high risk populations has found that acceptability of HIV testing was associated with having prosocial network characteristics [63], and that having a small social network was associated with not being tested for HIV [64]. As global testing rates remain low, further research about the influence of social networks and social participation on HIV testing could generate important insights for increasing uptake of HIV testing, particularly among population groups at heightened risk for HIV infection.

Other research has demonstrated that the type of social participation influences the relationship to HIV risk. For example, a study from South Africa found that participation in savings clubs was associated with risky sexual behavior among female members and with being HIV infected among male members [33]. Prior research has shown that the value of participating in certain social groups is dependent on characteristics of the group, such as how well the group functions, relationships among group members, and the group’s purpose, which could all contribute to how protective or harmful group membership is in relation to HIV [65]. In this study, social participation was examined collectively, but in further research it would be beneficial to look at associations by participation in different group types and their function. The IMAGE study, which involved microfinance and group health education components for women in South Africa, provides an innovative model for interventions striving to improve economic opportunities for disadvantaged groups while simultaneously creating channels for social participation and fostering social cohesion [32].

Limitations

This study has several limitations. Firstly, since this is a cross-sectional study, causation and temporality between exposure and outcomes cannot be determined. Additionally, this study utilized respondent-driven sampling methods. While RDS has led to important breakthroughs for sampling hard to reach populations,

questions remain about biases introduced by purposeful seed selection and preferential referral patterns of subsequent recruits [66]. There is also a lack of consensus about how to treat RDS data in multivariate regression analysis [51]. It is possible that using RDS led to a more homogeneous population of sex workers than currently exists in Swaziland. For example, previous research suggests that transactional sex is common in rural areas of Swaziland, but that the nature of the exchange is based more on “neighborliness” (i.e., helping out a neighbor in need of money or food by exchanging sex) than sex work [41]. This study focused more on “open” sex workers operating in urban and peri-urban areas.

Most questions analyzed in this study came from self-reported behaviors, such as condom use, which introduces social desirability and reporting bias. Additionally, this study measured complex social capital constructs with a social cohesion scale and a social participation index that have not undergone extensive reliability and validity testing and may not be applicable to other populations. Social capital is a social phenomenon and is therefore a characteristic of a group and not just a single individual [67]; however, in this study social capital was measured on an individual basis. Although this is a common way to measure social capital, there are debates in the field about the utility of using individual measurement as a proxy for this ecological concept [68]. Additionally this study focused on social participation and social cohesion as exogenous exposure variables and did not explore the personal and environmental factors that may facilitate or hinder an individual’s propensity for social engagement.

Conclusion

Few studies have examined the social context of sex work in sub-Saharan Africa, and we identified only two HIV prevention interventions targeting sex workers in this region that sought to address social and structural factors related to HIV [69,70]. Most research on social capital- and community empowerment-based interventions for sex workers has been conducted in areas of the world, such as South Asia, where sex work is largely establishment-based. This feature may facilitate interventions aimed at increasing social cohesion and participation as establishments may be easy ways to bring together sex workers into functioning groups. Sex work in sub-Saharan Africa often involves non-establishment based sex work [71], presenting an additional challenge for implementing HIV prevention interventions for sex workers in these settings.

Results from this study demonstrate that the social context of sex work matters. Findings suggest that higher levels of social cohesion and social participation are associated with protective behaviors, including condom use and HIV testing, and are inversely associated with HIV-related risk factors, such as experiencing social discrimination and violence. However, more needs to be understood about the social context of female sex workers in Swaziland, such as the extent to which sex workers are willing and able to collectivize and advocate for rights and how sex workers are portrayed and treated by the larger community. Answering these questions is critical to understanding how community-based empowerment interventions, which could include components related to building social capital among sex workers and between sex workers and the larger community, can be implemented in this setting. Given recent evidence that scaling-up comprehensive community-based empowerment interventions is a cost-effective way to prevent a substantial number of new infections, especially in places with high rates of HIV infection [7],

a better understanding of these relationships is important not only for the sex worker community, but also for the general population.

Acknowledgments

We thank all staff members, Community Advisory Board members, government officials, and participants for their hard work and involvement in the project. We would also like to thank the project coordinators, Darrin

Adams and Rebecca Fielding-Miller, and the non-governmental organization, Lidwala Lelitsemba, for all of their efforts and dedication.

Author Contributions

Conceived and designed the experiments: VF DK ZM CK SB. Performed the experiments: VF DK CK SB ZM. Analyzed the data: VF SK. Contributed reagents/materials/analysis tools: VF DK SB SK ZM. Wrote the paper: VF DK CK SK.

References

- Baral S, Beyrer C, Muessig K, Poteat T, Wirtz AL, et al. (2012) Burden of HIV among female sex workers in low-income and middle-income countries: a systematic review and meta-analysis. *The Lancet Infectious Diseases* 12: 538–549.
- Elmore-Meegan M, Conroy RM, Agala CB (2004) Sex Workers in Kenya, Numbers of Clients and Associated Risks: An Exploratory Survey. *Reproductive Health Matters* 12: 50–57.
- Okal J, Chersich MF, Tsui S, Sutherland E, Temmerman M, et al. (2011) Sexual and physical violence against female sex workers in Kenya: a qualitative enquiry. *AIDS Care* 23: 612–618.
- Wojcicki JM, Malala J (2001) Condom use, power and HIV/AIDS risk: sex-workers bargain for survival in Hillbrow/Joubert Park/Berea, Johannesburg. *Social Science & Medicine* 53: 99–121.
- Agha S, Nchima MC (2004) Life-Circumstances, Working Conditions and HIV Risk among Street and Nightclub-Based Sex Workers in Lusaka, Zambia. *Culture, Health & Sexuality* 6: 283–299.
- Pettifor AE, Beksinka ME, Rees HV (2000) High Knowledge and High Risk Behaviour: A Profile of Hotel-Based Sex Workers in Inner-City Johannesburg. *African Journal of Reproductive Health/La Revue Africaine de la Santé Reproductive* 4: 35–43.
- Kerrigan D, Wirtz A, Baral S, Decker M, Murray L, et al. (2013) The Global HIV Epidemics among Sex Workers. Washington, DC: World Bank.
- Blanchard A, Mohan HL, Shahmanesh M, Prakash R, Isac S, et al. (2013) Community mobilization, empowerment and HIV prevention among female sex workers in south India. *BMC Public Health* 13: 234.
- Blankenship KM, West BS, Kershaw TS, Biradavolu MR (2008) Power, community mobilization, and condom use practices among female sex workers in Andhra Pradesh, India. *AIDS (London, England)* 22 Suppl 5: S109–116.
- Jana S, Basu I, Rotheram-Borus MJ, Newman PA (2004) The Sonagachi Project: A sustainable community intervention program. *AIDS Education and Prevention* 16: 405–414.
- Mainkar MM, Pardeshi DB, Dale J, Deshpande S, Khazi S, et al. (2011) Targeted interventions of the Avahan program and their association with intermediate outcomes among female sex workers in Maharashtra, India. *BMC Public Health* 11 Suppl 6: S2.
- Rachakulla HK, Kodavalla V, Rajkumar H, Prasad S, Kallam S, et al. (2011) Condom use and prevalence of syphilis and HIV among female sex workers in Andhra Pradesh, India - following a large-scale HIV prevention intervention. *BMC public health* 11: S1.
- Ramesh BM, Beattie TSH, Shajy I, Washington R, Jagannathan L, et al. (2010) Changes in risk behaviours and prevalence of sexually transmitted infections following HIV preventive interventions among female sex workers in five districts in Karnataka state, south India. *Sexually Transmitted Infections* 86: i17–i24.
- Reza-Paul S, Beattie T, Syed HUR, Venukumar KT, Venugopal MS, et al. (2008) Declines in risk behaviour and sexually transmitted infection prevalence following a community-led HIV preventive intervention among female sex workers in Mysore, India. *AIDS* 22: S91–S100.
- Thilakavathi S, Boopathi K, Girish Kumar C, Santhakumar A, Senthilkumar R, et al. (2011) Assessment of the scale, coverage and outcomes of the Avahan HIV prevention program for female sex workers in Tamil Nadu, India: is there evidence of an effect? *BMC public health* 11: S3.
- Lippman SA, Chinaglia M, Donini AA, Diaz J, Reingold A, et al. (2012) Findings From Encontros: A Multilevel STI/HIV Intervention to Increase Condom Use, Reduce STI, and Change the Social Environment Among Sex Workers in Brazil. *Sexually Transmitted Diseases* 39: 209–216.
- Lippman SA, Donini A, Diaz J, Chinaglia M, Reingold A, et al. (2010) Social-environmental factors and protective sexual behavior among sex workers: the Encontros intervention in Brazil. *Am J Public Health* 100 Suppl 1: S216–223.
- Kerrigan D, Moreno L, Rosario S, Gomez B, Jerez H, et al. (2006) Environmental-structural interventions to reduce HIV/STI risk among female sex workers in the Dominican Republic. *American Journal of Public Health* 96: 120–125.
- Kerrigan D, Fonner V, Stromdahl S, Kennedy C (2013) Community empowerment among female sex workers is an effective HIV prevention intervention: A systematic review of the peer-reviewed evidence from low and middle-income countries. *AIDS and Behavior*.
- Bill and Melinda Gates Foundation (2010) Avahan Common Minimum Program for HIV Prevention in India. New Delhi, India.
- Laga M, Galavotti C, Sundaramon S (2010) The importance of sex-worker interventions: The case of Avahan in India. *Sexually Transmitted Infections* 86: i6–i7.
- Biradavolu MR, Burris S, George A, Jena A, Blankenship KM (2009) Can sex workers regulate police? Learning from an HIV prevention project for sex workers in southern India. *Social Science & Medicine* 68: 1541–1547.
- Hawe P, Shiell A (2000) Social capital and health promotion: a review. *Soc Sci Med* 51: 871–885.
- Putnam R (2000) *Bowling Alone: the collapse and revival of American community*. New York: Simon & Schuster.
- Moore S, Shiell A, Hawe P, Haines VA (2005) The privileging of communitarian ideas: citation practices and the translation of social capital into public health research. *Am J Public Health* 95: 1330–1337.
- Beaudoin CE (2009) Bonding and bridging neighborliness: an individual-level study in the context of health. *Soc Sci Med* 68: 2129–2136.
- Cattell V (2001) Poor people, poor places, and poor health: the mediating role of social networks and social capital. *Soc Sci Med* 52: 1501–1516.
- Kawachi I, Kennedy BP, Glass R (1999) Social capital and self-rated health: a contextual analysis. *Am J Public Health* 89: 1187–1193.
- Kawachi I, Kennedy BP, Lochner K, Prothrow-Stith D (1997) Social capital, income inequality, and mortality. *Am J Public Health* 87: 1491–1498.
- Poundstone KE, Strathdee SA, Celentano DD (2004) The social epidemiology of human immunodeficiency virus/acquired immunodeficiency syndrome. *Epidemiol Rev* 26: 22–35.
- Holtgrave DR, Crosby RA (2003) Social capital, poverty, and income inequality as predictors of gonorrhoea, syphilis, chlamydia and AIDS case rates in the United States. *Sex Transm Infect* 79: 62–64.
- Pronyk PM, Harpham T, Morison LA, Hargreaves JR, Kim JC, et al. (2008) Is social capital associated with HIV risk in rural South Africa? *Social Science & Medicine* 66: 1999–2010.
- Campbell C, Williams B, Gilgen D (2002) Is social capital a useful conceptual tool for exploring community level influences on HIV infection? An exploratory case study from South Africa. *AIDS Care* 14: 41–54.
- Wakefield SE, Poland B (2005) Family, friend or foe? Critical reflections on the relevance and role of social capital in health promotion and community development. *Soc Sci Med* 60: 2819–2832.
- UNAIDS (2010) Global report on the AIDS epidemic. Geneva, Switzerland: Joint United Nations Programme on HIV/AIDS; 2010.
- NERCHA (2009) HIV Prevention Response and Modes of Transmission Analysis. Mbabane, Swaziland: World Bank.
- Chipamaunga S, Muula AS, Mataya R (2010) An assessment of sex work in Swaziland: barriers to and opportunities for HIV prevention among sex workers. *SAHARA J* 7: 44–50.
- Mathenjwa T, Maharaj P (2012) 'Female condoms give women greater control': A qualitative assessment of the experiences of commercial sex workers in Swaziland. *The European Journal of Contraception and Reproductive Health Care* 17: 383–392.
- Ngugi EN, Roth E, Mastin T, Nderitu MG, Yasmin S (2012) Female sex workers in Africa: Epidemiology overview, data gaps, ways forward. *SAHARA-J: Journal of Social Aspects of HIV/AIDS* 9: 148–153.
- NERCHA U, UNAIDS (2007) Situation Analysis on Commercial Sex Work in Swaziland. Mbabane, Swaziland: Ministry of Health and Social Welfare.
- Mandla M (2007) *Commercial Sex Work in Swaziland: A Baseline Study*. Mbabane, Swaziland: University of Swaziland.
- Heckathorn DD (1997) Respondent-driven sampling: A new approach to the study of hidden populations. *Social Problems* 44: 174–199.
- Heckathorn DD, Semaan S, Broadhead RS, Hughes JJ (2002) Extensions of respondent-driven sampling: a new approach to the study of injection drug users aged 18–25. *AIDS and Behavior* 6: 55–67.
- Kerrigan D, Telles P, Torres H, Overs C, Castle C (2008) Community development and HIV/STI-related vulnerability among female sex workers in Rio de Janeiro, Brazil. *Health Education Research* 23: 137–145.
- Cronbach LJ (1951) COEFFICIENT ALPHA AND THE INTERNAL STRUCTURE OF TESTS. *Psychometrika* 16: 297–334.
- Grootaert C, Narayan D, Jones VN, Woolcock M (2003) *Integrated questionnaire for the measurement of social capital (SC-IQ)*. Washington, DC: World Bank Social Capital Thematic Group.
- Wright SC, Taylor DM, Moghaddam FM (1990) Responding to membership in a disadvantaged group: From acceptance to collective protest. *Journal of Personality and Social Psychology* 58: 994–1003.

48. Grootaert C, van Bastelaer T (2001) Understanding and Measuring Social Capital: A Synthesis of Findings and Recommendations from the Social Capital Initiative.
49. Ulibarri M, Strathdee S, Ulloa E, Lozada R, Fraga M, et al. (2011) Injection Drug Use as a Mediator Between Client-perpetrated Abuse and HIV Status Among Female Sex Workers in Two Mexico-US Border Cities. *AIDS and Behavior* 15: 179–185.
50. Dunkle KL, Decker MR (2012) Gender-Based Violence and HIV: Reviewing the Evidence for Links and Causal Pathways in the General Population and High-risk Groups. *American Journal of Reproductive Immunology*: n/a-n/a.
51. Malekinejad M, Johnston L, Kendall C, Kerr L, Rifkin M, et al. (2008) Using Respondent-Driven Sampling Methodology for HIV Biological and Behavioral Surveillance in International Settings: A Systematic Review. *AIDS and Behavior* 12: 105–130.
52. Gelman A (2007) Struggles with survey weighting and regression modeling. *Statistical Science* 22: 153–164.
53. Berry M, Wirtz AL, Janayeva A, Ragoza V, Terlikbayeva A, et al. (2012) Risk factors for HIV and unprotected anal intercourse among men who have sex with men (MSM) in Almaty, Kazakhstan. *PLoS One* 7: e43071.
54. Campbell C, Mzaidume Z (2001) Grassroots participation, peer education, and HIV prevention by sex workers in South Africa. *Am J Public Health* 91: 1978–1986.
55. Asthana S, Oostvogels R (1996) Community participation in HIV prevention: Problems and prospects for community-based strategies among female sex workers in Madras. *Social Science & Medicine* 43: 133–148.
56. Busza J (2004) Participatory Research in Constrained Settings. *Sharing Challenges from Cambodia*. *Action Research* 2: 191–208.
57. Busza J (2006) Having the rug pulled from under your feet: one project's experience of the US policy reversal on sex work. *Health Policy and Planning* 21: 329–332.
58. NSWP (2011) Female, Male and Transgender Sex Workers' Perspectives on HIV & STI Prevention and Treatment Services: a global sex worker consultation.
59. Basu I, Jana S, Rotheram-Borus MJ, Swendeman D, Lee SJ, et al. (2004) HIV prevention among sex workers in India. *Journal of Acquired Immune Deficiency Syndromes* 36: 845–852.
60. Halli SS, Ramesh BM, O'Neil J, Moses S, Blanchard JF (2006) The role of collectives in STI and HIV/AIDS prevention among female sex workers in Karnataka, India. *AIDS Care* 18: 739–749.
61. Argento E, Reza-Paul S, Lorway R, Jain J, Bhagya M, et al. (2011) Confronting structural violence in sex work: lessons from a community-led HIV prevention project in Mysore, India. *AIDS Care* 23: 69–74.
62. Murray L, Moreno L, Rosario S, Ellen J, Sweat M, et al. (2007) The Role of Relationship Intimacy in Consistent Condom Use Among Female Sex Workers and Their Regular Paying Partners in the Dominican Republic. *AIDS and Behavior* 11: 463–470.
63. Schneider J, Kumar R, Dandona R, Kumar P, Kumar A, et al. (2012) Social network and risk-taking behavior most associated with rapid HIV testing, circumcision, and preexposure prophylaxis acceptability among high-risk Indian men. *AIDS Patient Care STDS* 26: 631–640.
64. Huang ZJ, He N, Nehl E, Zheng T, Smith B, et al. (2012) Social Network and Other Correlates of HIV Testing: Findings from Male Sex Workers and Other MSM in Shanghai, China. *AIDS and Behavior* 16: 858–871.
65. Gregson S, Terceira N, Mushati P, Nyamukapa C, Campbell C (2004) Community group participation: can it help young women to avoid HIV? An exploratory study of social capital and school education in rural Zimbabwe. *Soc Sci Med* 58: 2119–2132.
66. Gile KJ, Handcock MS (2010) 7. Respondent-Driven Sampling: An Assessment of Current Methodology. *Sociological Methodology* 40: 285–327.
67. Berkman LF, Kawachi I (2000) *Social epidemiology*. New York :: Oxford University Press.
68. Giordano GN, Ohlsson H, Lindstrom M (2011) Social capital and health—purely a question of context? *Health Place* 17: 946–953.
69. Odek W, Busza J, Morris C, Cleland J, Ngugi E, et al. (2009) Effects of Micro-Enterprise Services on HIV Risk Behaviour Among Female Sex Workers in Kenya's Urban Slums. *AIDS and Behavior* 13: 449–461.
70. Luchters S, Chersich MF, Rinyiru A, Barasa MS, King'ola N, et al. (2008) Impact of five years of peer-mediated interventions on sexual behavior and sexually transmitted infections among female sex workers in Mombasa, Kenya. *BMC Public Health* 8: 143.
71. Vandepitte J, Lyaerla R, Dallabetta G, Crabbé F, Alary M, et al. (2006) Estimates of the number of female sex workers in different regions of the world. *Sexually Transmitted Infections* 82: iii18–iii25.