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Findings from *Encontros*: a multi-level STI/HIV intervention to increase condom use, reduce STI, and change the social environment among sex workers in Brazil

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Abstract

Background—Sexually transmitted infection (STI)/HIV prevention programs which do not modify social-structural contexts that contribute to risk of STI/HIV may fail to bring about improvements in health, particularly among groups who experience discrimination and exclusion from public life. We conducted a multi-level intervention with sex workers, including improved clinical care and community mobilizing strategies to modify social-structural factors that shape sexual behavior, in order to improve condom use and reduce incident STI.

Methods—We followed 420 sex workers participating in the *Encontros* intervention in Corumbá, Brazil from 2003-2005. We estimated the effect of the intervention on incident chlamydia and gonorrhea infections and condom use using generalized estimating equations and inverse probability weighting by comparing those who actively engaged in the intervention activities (exposed) to those who were less engaged (unexposed). We also determined the association of participation on reported social cohesion and participation in networks.

Results—Exposed participants had significantly higher odds of reporting consistent condom use with regular clients (OR:1.9, 95%CI:1.1-3.3) and non-significantly increased odds with both new clients (OR:1.6, 0.9-2.8) and nonpaying partners (OR:1.5, 0.9-1.5). The odds of an incident STI were non-significantly reduced for exposed participants compared to unexposed (OR:0.46, 0.2-1.3). Participation was significantly associated with increased perceived cohesion and participation in networks.

Conclusion—This prospective study provides evidence that multi-level interventions with mobilizing strategies to modify aspects of the social environment can improve condom use, reduce STIs, and increase social cohesion and participation in networks among sex workers.

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No conflict of interest exists.

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Introduction

Despite billions of research dollars dedicated to prevention of sexually acquired HIV and other STI since HIV/AIDS first appeared, STI prevalence continues to increase in most developing countries.¹ Prevention programs have historically focused on changing individual behaviors, while social, economic, and political environments in which populations negotiate condom use remained unchanged. There is growing consensus that STI/HIV prevention programs need to address the social-structural context that influence an individual's behavior in order to bring about sustained behavior change.²⁻⁴ Addressing the larger social-structural context surrounding STI/HIV is of particular importance among groups who experience inequality, discrimination and exclusion from public life. For these groups, social change interventions have sought to create social cohesion and extend social networks, ensure community participation, challenge inequitable gender dynamics, promote humane policy, improve health services access, and otherwise encourage community mobilization for prevention.⁵⁻⁷

Sex workers have long been the focus of STI/HIV prevention efforts. Across cultures they experience extreme social exclusion and discrimination; are often mobile or transient; confront unfavorable power dynamics; are deprived of health services and public social benefits; are prosecuted and imprisoned; and are denied basic rights of safety and respect.⁸ For this reason, the WHO has recommended strategies that aim to empower sex workers in addressing STI/HIV prevention, including participatory planning and community mobilization.⁹ Community mobilization efforts among sex workers in Sonagachi, India provide the most compelling evidence to date that social-structural change can improve health outcomes.¹⁰⁻¹² Interim analyses from the more recent Avahan initiative in India have yielded promising results as well.^{13, 14} Outside of India, there have been only a handful of studies with mobilizing or social change intervention components for STI/ HIV prevention with sex workers,¹⁵⁻¹⁸ however the data supporting these efforts to date are not decisive. Almost none of the interventions to date prospectively measured the social-structural factors the interventions sought to change, leaving a gap in understanding the mechanisms through which these social change interventions work.

We conducted a multi-level combined social-structural and clinical STI/HIV prevention intervention with sex workers in Brazil. Key intervention components included expanded clinical care for sexual health and strategies to create social cohesion, expand social networks and community partnerships, reduce stigma and stimulate community mobilization. Using a prospective cohort design, we sought to determine whether the multi-component *Encontros* intervention would decrease incidence of chlamydia and gonorrhea and improve condom use. We also examine whether participation in the intervention resulted in a more enabling social environment (increased cohesion and involvement in community life) for sex workers to practice safer sex.

Materials and Methods

Study procedures

The study took place in Corumbá, on Brazil's Western border with Bolivia. Home to 100,000 permanent inhabitants, Corumbá attracts approximately 75,000 fishing and eco-tourists annually, giving rise to sex commerce catering to tourists and local residents alike. The *Encontros* intervention was designed to simultaneously fill the programmatic gaps for sex workers in Corumbá and modify the social environment around sex work and STI/HIV prevention in the community, creating a space for sex workers to access services and adopt safer sex behaviors.

Participants included 420 men, women, and transvestites who were 18 years or older, self-identifying sex workers, who spoke Portuguese or Spanish, and who did not plan on leaving the study area permanently in the month following recruitment. We used both convenience and snow ball sampling to reach as many sex workers in the area as possible. Sex worker peer educators recruited participants from local brothels, bars, motels, and other sex work establishments; they were instructed to approach all potential sex workers in each establishment. Additionally, sex workers were asked to tell their friends about the project. As a result a number of participants presented spontaneously for participation. Participants received free transportation to the study site as well as condoms and small gifts at each visit.

Participation included an enrollment visit, four scheduled follow-up visits approximately 3, 6, 9 and 12 months subsequent to enrollment, and post-test counseling visits, approximately 1 month following enrollment and follow-up visits. Enrollment and follow-up visits included administration of a structured, interviewer-administered questionnaire, STI/HIV prevention counseling, a clinical exam, and collection of urine and blood samples for STI testing. Testing for chlamydia and gonorrhea was performed on urine specimens with PCR Cobas Amplicor technology by Roche™. Specimens were frozen and stored at -20°C at the study clinic before transport on dry ice to a Ministry of Health reference laboratory for processing according to manufacturer's instructions. During the clinical exam specimens were collected for pap smears (if indicated) as well as wet mount. STI treatment was administered during clinical exams based on wet mount and syndromic management; PCR-diagnosed infections were treated at post-test counseling visits. In this analysis we report on chlamydia and gonorrhea (PCR) results only.

The Intervention

Intervention design was informed by review of international best practices and extensive formative research, including mapping sex work venues, stakeholder interviewers (brothel/bar owners, moto-taxi drivers, public health officials), focus groups with sex workers in a variety of venues, and in-depth-interviews with sex workers and clients. We also developed the intervention using the ecological model,^{19, 20} combining strategies to engage sex workers on an individual level through participation in STI/HIV testing experiences, on an inter-personal level through peer-education and counseling, and on a community level through outreach, workshops, and social activities. At the same time we worked with city health officials to improve quality of and access to sexual health services. All project activities adhered to a human rights framework, aiming to reinforce the Brazilian national strategy of conducting HIV prevention with messages that de-stigmatize sex work and emphasize quality provision of services to all who seek care.²¹ Intervention activities based at the study clinic included extending clinic hours to provide expanded, holistic services for STI/HIV prevention, diagnosis, and treatment, as well as reproductive health services and intensive training to create a sex worker friendly environment. Educators conducted outreach and distribution of condoms and educational materials designed by the Ministry of Health to reduce sex work-associated stigma.

Project activities in the community were designed with project participants to extend and strengthen collegial relationships through providing sex workers opportunities to engage in dialogue around sex work, discrimination, human rights, and prevention, specifically through workshops, trainings, and events. For example, sex workers participated in workshops from soap, candle, and chocolate making to theater and fashion design, all of which offered the sex workers an opportunity to talk about their work and themselves and strengthen their relationships. Once the workshops were underway, the sex workers requested a venue to showcase their new skills. As a result, the project sponsored "hot pink" parties, which were essentially cultural showcases for the sex workers that occurred at the city's cultural center, a public space where those attending included the general public,

public officials, family members, and university students. While the project staff ensured that performance messages focused on HIV prevention and stigma reduction, it was hypothesized that the experience of celebrating culture and performance in a public space in and of itself would facilitate integration, social cohesion, and reduces stigma and discrimination. The project also sought to forge broad partnerships and links to the community to stimulate community recognition of sex workers as partners in health and human rights and strengthen sex workers' community identity.²² [Panel 1] All participants were invited to participate in project sponsored events and encouraged to come to the project office any time to talk to a counselor.

The research was approved by the Ethics Committee in Mato Grosso do Sul, Brazil, the Brazilian National Committee of Ethics in Research, the Institutional Review Board at the Population Council, and by the Committee for the Protection of Human Subjects at the University of California, Berkeley.

Measures

Participation in the intervention was assessed by interviewer-administered questionnaire, including information regarding contact with peer educators and counselors; contact with project campaign and educational materials; participation in community cultural or social events; participation in project-sponsored workshops, educational activities, and organizations or associations; and adherence to scheduled visits. The 20 questionnaire items collectively measuring project participation were analyzed and pooled into scores using item response modeling (IRM), which provides a weighted ranking of items and participants.^{23,24} The IRM reliability estimate, which is akin to Cronbach's alpha, was 0.86, demonstrating good reliability. Continuous participation scores or ranks were then dichotomized into no/low or high participation at each visit, reflecting the overall level of participation in project activities in the preceding three month interval, using an a priori theoretical cutpoint. . No/low participation (herein called *unexposed*) describes those who attended scheduled appointments and who may have reported contact with an educator, but who participated very little or not at all in individual or community focused project activities. The high participation group (referred to herein as *exposed*) attended scheduled appointments, sought additional contact with educators or counselors, and participated in project events, workshops, meetings or organizations.

Study outcomes included diagnosis of incident chlamydia and/or gonorrhea and reported condom use in the 3-month interval following reported intervention exposure. Study participants responded to questions about condom use during vaginal and anal sex acts with their most recent new client, regular client, and non-paying partner in the last 30 days. A summary variable for consistent condom use (condom use all of the time) during penetrative sex (vaginal and anal) with each partner type was created. We also measured social environmental factors hypothesized to enable protective behaviors, including perception of mutual aid, trust, and support among sex workers (social cohesion); participation in social networks; and access to and management of social and material resources (including purchasing of household and personal goods and access to services, such as banking and health insurance). Individual scale items (published elsewhere²²) were summed into scores and then standardized.

Analysis

We hypothesized that exposure to intervention activities would increase condom use and reduce incident STI as well as enhance perceptions of social cohesion, participation in social networks, access to social and material resources, and stigma reduction. We determined the odds of incident STI (Chlamydia and/or Gonorrhea) and consistent condom use by

comparing the exposed to the unexposed study population. In previous analysis using only STI data from this data set, we examined the association of reported exposures at the end of 3 month intervals and infection status at the end of the same interval.²⁵ In this analysis, we ensure time ordering of exposure and outcomes and thus a causal interpretation by using exposure data from the 3-month interval prior to that in which outcome measures were diagnosed or reported, in other words, participant outcomes in interval n were linked to exposure status in interval $n-1$. This approach limited our sample to those observations with complete exposure data from two consecutive follow-up visits. Overall there were 424 complete exposure and outcome data points (or observation pairs with complete exposure data at $n-1$ and STI/condom use outcomes at n).

Because exposure was not randomly assigned and because a sizeable proportion of the cohort was lost to follow-up (censored) or interrupted participation prior to study conclusion, selection bias needs to be accounted for. We utilized inverse probability weighting techniques^{26, 27} to account for potential biases, as described in detail in a tutorial paper on inverse probability weighting in this journal.²⁵ The premise of treatment weights and generally the class of techniques called “marginal structural models” is to mimic randomization by using covariate information to weight each observation.²⁷ Hypothetically speaking, to guarantee no selection bias or confounding in this design, one would need to randomly assign sex workers to exposed or unexposed status (or participation level) at every visit to ensure that the distribution of confounders between the two exposure groups is balanced at each visit. Using inverse probability weighting for exposure, we attempt to simulate this repeat randomization by multiplying each observation by the inverse probability of being in the reported exposure group, based on values of covariates, and past outcomes and exposures. We used this approach for both exposure and censoring weights, which were estimated using an automated model selection algorithm called DSA in the program R.²⁸ Using weighted data, the effect of the intervention on all outcomes was estimated using generalized estimating equations (GEE) with robust standard errors to provide a marginal estimate of intervention effect while accounting for the non-independence of repeated measures on individuals.²⁹ The resulting odds ratios are interpreted as the average intervention effect across the entire study population, as if all participants were exposed compared to the counterfactual of having all participants unexposed.

We also determined the relationship of intervention exposure to reported levels of social environmental factors, including social cohesion, participation in networks, and access to resources, to assess whether participation had an impact on resulting perceptions of the social environment. Because participants reporting higher levels of social environmental factors (e.g. social cohesion) at enrollment had less opportunity to raise their reported social cohesion level compared to participants who began the intervention with lower reported cohesion, we also assessed the relationship of the intervention to cohesion and other social environmental measures among those with baseline values below the median. These analyses were performed using the same weighting approach as in the main analysis.

Results

Of 474 potential participants screened for enrollment, 51 were ineligible and three chose not to participate. In total, 420 sex workers were enrolled in the study, including 385 (91.7%) women, 19 (4.5%) men, and 16 (3.8%) transvestites. [Table I] This gender distribution matches projections made during formative research, placing the proportion of females in the sex work population at approximately 90%. Most participants were Brazilian, with only 15 (3.6%) participants being Bolivian or Paraguayan. Mean age and years of schooling were 26.0 and 6.3, respectively, and over 50% of the cohort had initiated sex work before the age

of 19 years. At enrollment, participants had a mean of six new clients, four regular clients, and one non-paying partner per month, respectively. Eighteen percent of the cohort had a prevalent gonorrhea or chlamydia infection at enrollment and 73%, 53% and 26% of participants were using condoms with their most recent new client, regular client, and non-paying partner respectively. Study subjects who were ever classified as exposed were more likely to be male or transvestite, Brazilian, work outside of the brothels, and to live with a family member as compared to study subjects always classified as unexposed. [Table I] Additionally, ever exposed participants reported fewer new clients and more regular clients than unexposed participants at enrollment.

Three hundred and twenty-nine participants (79%) returned for at least one follow-up visit following enrollment and baseline data collection. Over sixty percent remained through the third visit, but only 45% of the overall cohort completed all 5 visits. Reasons for loss to follow-up included leaving the practice of sex work (39%), leaving the study area (22%), withdraw of consent (4%), and the remaining 35% were lost-to-follow-up with no recorded reason. Adherence was close to that expected given the extreme mobility of this population (particularly, mobility associated with the seasonal nature of this touristic area), and the frequent change of profession: over 60% of the participants who did not complete the study left the cohort due to a documented change in profession or residence (both of which were eligibility criteria). Those who were lost-to-follow-up were more likely to be younger, from outside of the study area, and work at a brothel (the brothel based population tended to be younger and from outside of the area). Condom use and prevalent STI at baseline were not different for those who were lost-to-follow-up and those who remained in the study.

Overall, results indicate that exposure to the intervention was protective against incident STI and resulted in increased reporting of consistent condom use. [Table II] Inverse probability weighted estimates indicate that participation in the intervention was associated with a higher odds of consistent condom use with new clients (OR:1.6, 95%CI: 0.9-2.8), regular clients (OR:1.9, 95%CI:1.1-3.3), and nonpaying partners (OR:1.5, 95%CI:0.9-1.5). Only the association with regular clients was significant at alpha .05. The odds of an incident STI were reduced for the exposed group compared to unexposed participants (OR:0.46, 95%CI: 0.2-1.3); this finding did not reach statistical significance despite a strong effect estimate.

As hypothesized, project exposure was associated with a significant increase (of 0.3 standard deviations) in participation in networks, both in the entire cohort and among those reporting below median participation in networks at enrollment. [Table III] Additionally, participants reported a significant increase in perceived social cohesion as compared to non-participants among study subjects reporting below median perceived social cohesion at enrollment. There was no relationship between participation and access to social and material resources.

Discussion

We found evidence that the *Encontros* intervention may be a successful intervention model, with all effect estimates going in the hypothesized direction. Sex workers exposed to the *Encontros* intervention were significantly more likely to use condoms consistently with regular clients. Analysis of condom use with new clients and non-paying partners also demonstrated protective effects, significant at $p=0.1$. Consistent condom use at enrollment with new clients was quite high (close to 80% in the ever-exposed group), making it more difficult to detect a difference due to the intervention. Odds of an incident STI was approximately two times lower among exposed participants compared to unexposed, though this association was not significant.

This analysis adds to some the growing body of evidence generated in India and the Dominican Republic that multi-level interventions combining provision of services with community-based strategies to change the social-structural context and mobilize sex workers can improve condom use and reduce STIs among sex workers, a population which almost universally experiences extreme social exclusion, poverty, and unfavorable gender power dynamics. To date, the Sonagachi project in Calcutta, which included training peer outreach workers, formation of broad community partnerships, founding of literacy and loan service programs, and the establishment of a collective organization, has been held up as the best evidence to date that community organizing efforts and sex worker cohesion and empowerment are important factors in HIV prevention.^{10, 11} Following successes of Sonagachi the Gates Foundation funded the Avahan project across six states in India to increase intervention coverage for most at risk populations, including a community-led structural intervention approach.³⁰ While evaluation of the program is still ongoing, initial analyses have noted a reduction in STI or HIV and increased condom use with clients.^{13, 14} An environmental-structural intervention that stimulated community-based solidarity for HIV/STI prevention and shifts in government regulation conducted among female sex workers in the Dominican Republic demonstrated significant reductions in STIs and increases in consistent condom use using a pre-post design.¹⁵ What these successful projects all had in common was a commitment not only to *involve* community by including a peer outreach component or enhancing services, but to truly *engage* community in collective spaces, collective activities, collective planning (which necessitates flexibility), developing equitable partnerships (without which one mobilizing effort in South Africa failed),¹⁸ and often supporting organizational development for sex workers.

What previous studies with sex workers have largely failed to do is to pay adequate attention to pathway variables or community change mechanisms; to date almost no studies have prospectively monitored and measured change in social contextual factors that the social-structural interventions aim to modify, including measurement of collective empowerment or mobilization. Effective prevention requires an understanding of mediation and pathways of effect – including empirical examination of the effects of social-environmental change or mobilization on subsequent behaviors and infections. Processes of empowerment and social change are assumed to have taken place in the Sonagachi and Avahan interventions, and likely did, but remain unmeasured and unconfirmed. In this study, we found evidence that the intervention successfully led to a more supportive social environment. Increases in reported levels of perceived social cohesion and reported participation in networks among exposed participants has also been found in the two projects with sex workers that quantitatively measured change in social contextual factors.^{15, 16} The IMAGE study among low income South African women also provided evidence that multi-component HIV prevention projects can improve reported levels of social cohesion and social capital.³¹ Other studies have found associations with social factors, such as collective efficacy, and condom use behaviors when assessed cross-sectionally among sex workers.^{22, 32} Analysis to determine the extent to which social environmental factors are on the causal pathway from participation to improved outcomes will be the subject of future research and should be a priority in future mobilizing interventions.

This research was conducted using a prospective cohort. The ideal design to evaluate an intervention aiming to change community structures and environments would be a randomized community trial, which is generally prohibitively expensive and best reserved for interventions that first demonstrate positive results in an observational study. Randomizing individuals (or brothels/bars) to the study condition was not feasible in this context: social and community structures could not be selectively modified for some sex workers (or sex work establishments) and not others in the same community. As a result, we choose to follow a cohort in a single community with an internal comparison group,

comparing the “less exposed” population in our cohort to the “more exposed” population. Notably, behavioral interventions are more commonly evaluated using comparison communities; however, evaluation of multi-level and social interventions may be less amenable to that study design, which would require a comparison community that is exchangeable or similar to the intervention community not only in terms of population characteristics but also in the social and structural factors that the intervention seeks to modify. Instead, the internal comparison ensures that subjects being compared experience the same community structure and environment and it permits observation of how change unfolds over time. However, this design is particularly susceptible to selection bias and complex confounding. To address this issue, investigators in the area of AIDS treatment pioneered the weighting methods we use in this paper (causal inference methods).^{33, 34} These methods are now becoming standard in the epidemiological literature and represent a cost-effective and valuable tool to improve utilization of observational data in STI/HIV prevention research.²⁵

Limitations include a loss of power due to substantial attrition. The risk profile (condom use, STI at baseline) did not differ by attrition status. Over half of study subjects lost-to-follow-up early in the study were brothel-based sex workers, who were generally not from the study area, in town only during the fishing tourism season and unlikely to leave the brothel to participate in community events. The mobile nature of the sex work profession presents a major challenge to prevention programming, particularly interventions seeking long term social change, as meaningful change in social relationships, social norms, and community partnerships do not occur over night, much less changes in rates of HIV infection. In this study we did observe improvements in behaviors, social relationships, and STI infections despite the short time frame and adherence rate, which we attribute to the intensive combination and implementation of activities. We addressed potential bias due to attrition (and mobility) using the causal inference methods described above and our results remain promising, however these effects may be attenuated outside of a well-run research study. Furthermore, the loss-to-follow-up also resulted in decreased power to detect intervention effects. The study was originally powered to detect an effect of the intervention when associating three month intervals of project participation with new STIs at the end of the same interval. This “same interval” analysis included a larger sample size and demonstrated a statistically significant reduced odds of STI infection among participants (OR: .49, 95% CI: 0.25-.98).²⁵ However, this “same interval” estimate mixes cross-sectional and causal (longitudinal) effects, as an infection could have been acquired any time during the three months of reported participation. We used a time-lag approach in the current analysis to ensure time ordering and a causal interpretation, which resulted in a larger effect estimate, but less power to detect an effect. Among the strengths of this intervention research, the strategies included project activities aimed at enabling positive change on an individual, peer, and community level, including modification of the social environment, which was measured at repeated intervals. Study findings include both biological and behavioral endpoints and we used statistical modeling to address potential confounding and biases due to self-selection and attrition. Finally, the intervention was implemented by a well-trained and engaged field team and supervised by a multi-disciplinary advisory committee and included active participation of local sex workers and national sex worker advocates, the Brazilian Ministry of Health, local government, and partner NGOs.

Our findings add to the growing literature demonstrating that combined clinical and social interventions aiming to improve care and modify the social environment can impact biomedical and behavioral outcomes and indeed can change the social environment for vulnerable populations. Given the current state of the evidence, replicating this approach in additional geographic contexts beyond India and potentially in a gold-standard community randomized trial is warranted to provide robust evidence of intervention efficacy.

Furthermore, deeper investigation regarding the pathways of effect – how participation changes the social environment to improve health – will improve our understanding of the community-level processes that shape behavior and inform future interventions.

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TABLE 1**Multilevel Intervention Strategies**

Individual and interpersonal level
Increased provision of sexual and reproductive health services
Enhanced access to STI/HIV prevention, testing and treatment
Counseling—reinforcing protective behaviors and destigmatization of sex workers
Provision of free condoms (at the clinic, during peer educator outreach, at public events)
Peer education and outreach
Community level
Forging of government/community partnerships, both within Corumbá and beyond the city's borders
Collective activities, events, workshops to encourage stigma reduction and facilitate sex workers' participation in public life (i.e., promote social integration of sex workers in the general community)
Mobilization efforts to engage sex workers and the community on issues around sex work, citizenship, and human rights (i.e., encourage dialogue)
Support for the formation of an association of sex workers
Distribution of materials destigmatizing sex workers

TABLE 2

Sociodemographic and Clinical Characteristics of the Encontros Cohort at Enrollment, Overall and by Participation Status (Ever Exposed vs. Unexposed)

Cohort Characteristics	Total N = 420	Ever Exposed n = 134 (32%)	Unexposed n = 286 (68%)			
Sociodemographic variables	n	%	n	%		
Age (mean, SE)	26.0	0.34	27.0	0.65*	25.6	0.40
Age (yr)						
18–24	219	52.1	62	46.3	157	54.9
25–30	112	26.7	40	29.8	72	25.2
31–35	43	10.2	15	11.2	28	9.8
<35	46	11.0	17	12.7	29	10.1
Gender						
Female	385	91.7	116	86.6 [†]	269	94.1
Male	19	4.5	9	6.7	10	3.5
Transvestite	16	3.8	9	6.7	7	2.4
Years of school (mean, SE)	6.3	0.13	6.6	0.22	6.2	0.17
Years of school						
[mt]4	52	12.4	12	9.0	40	14.0
4–7	226	53.8	74	55.2	152	53.1
8–10	99	23.6	35	26.1	64	22.4
11	43	10.2	13	9.7	30	10.5
Monthly income in USD [‡]						
Lowest tertile	145	34.5	40	29.9	105	36.7
Middle tertile	140	33.3	53	39.5	87	30.4
Highest tertile	135	32.1	41	30.6	94	32.9
Partnership status						
Married/cohabitating	60	14.3	24	17.9	36	12.6
Has partner	172	40.9	57	42.5	115	40.2
Single	188	44.8	53	39.6	135	47.2
Nationality						

Cohort Characteristics		Total N = 420		Ever Exposed n = 134 (32%)		Unexposed n = 286 (68%)	
Sociodemographic variables		n	%	n	%	n	%
Brazilian		405	96.4	134	100 [†]	274	95.8
Bolivian/Paraguayan		15	3.6	0	0	12	4.2
Lives with family							
Yes		284	67.6	99	73.9	185	64.7
No		136	32.4	35	26.1 [*]	101	35.3
Occupational variables							
Primary workplace							
Brothel		92	21.9	20	14.9 [†]	72	25.2
Bar		207	49.3	63	47.0	144	50.4
Street		51	12.1	21	15.7	30	10.5
Motel/hotel		28	6.7	13	9.7	15	5.2
Phone/other [§]		42	10.0	17	12.7	25	8.7
Age began sex work (yr)							
[mt]18		178	42.4	57	42.5	121	42.3
18		242	57.6	77	57.5	165	57.7
Sexual health and behavior							
No. new clients in past 30 d (median, IQR)				4	2-7	3	1-5 [†] 4 2-8
No. regular clients in past 30 d (median, IQR)				3	2-5	3	2-5 3 2-5
No. nonpaying partners in past 30 d (median, IQR)				1	0-1	1	0-1 1 0-1
Using condoms consistently in the last 30 d with [¶]							
New clients							
Yes				266	73.3	89	79.5 177 70.5
No				97	26.7	23	20.5 74 29.5
Regular clients							

Sexual health and behavior

Yes	198	52.8	65	52.8	133	52.8
No	177	47.2	58	47.2	119	47.2
Nonpaying partners						
Yes	69	25.6	25	29.4	44	23.8
No	201	74.4	60	70.6	141	76.2
Prevalent chlamydia or gonorrhea at enrollment						
Yes	73	17.6	19	14.4	54	19.2
No	342	82.4	113	85.6	228	80.8
HIV tested previously						
Yes	276	65.7	96	71.6*	180	62.9
No	144	34.3	38	28.4	106	37.1

* $P < 0.10$ and

[†] $P < 0.05$; significance tests include χ^2 for categorical variables; t test for comparison of means; rank sum for comparison of non-normal distributions.

[‡] 1 Real ≈ \$0.48 US; low, mid, high tertiles with median incomes of 260, 600, and 1300, respectively.

[§] Category includes sex workers whose clients reach them by phone to arrange meetings at their residence or an agent's house as well as sex workers who are hired for private parties.

[¶] Among participants with each partner type in last 30 days.

SE indicates standard error; IQR, interquartile range.

TABLE 3

Adjusted Odds Ratios (OR) * and 95% Confidence Intervals (95% CI) for Consistent Condom Use (CCU) in the Last 30 Days and Incident Infection With STI (Gonorrhea or Chlamydia) by Project Exposure

Project Participation	CCU: New Clients OR (95% CI)	CCU: Regular Clients OR (95% CI)	CCU: Nonpaying OR (95% CI)	STI OR (95% CI)
High exposure to intervention	1.6 (0.9, 2.8)	1.9 (1.1, 3.3)	1.5 (0.9, 2.5)	0.46 (0.2, 1.3)

* All adjusted estimates incorporate exposure and censoring weights and robust confidence intervals.

TABLE 4

Adjusted Beta Coefficients* and 95% Confidence Intervals (95% CI) for Social Cohesion, Participation in Networks, and Access to Resources Scores by Project Exposure

Project Participation	Social Cohesion [†] Beta (95% CI)	Participation in Networks [†] Beta (95% CI)	Access to Resources [†] Beta (95% CI)
Among full cohort	0.1 (-0.1, 0.24)	0.3 (0.1, 0.5)	-0.1 (-0.3, 0.1)
Among those reporting below median values at enrollment	0.3 (0.1, 0.5)	0.3 (0.0, 0.5)	-0.0 (-0.2, 0.1)

* Adjusted estimates incorporate exposure and censoring weights and robust confidence intervals.

[†] In standard deviations.