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## THE RELATIONSHIP BETWEEN SOCIAL, POLICY AND PHYSICAL VENUE FEATURES AND SOCIAL COHESION ON CONDOM USE FOR PREGNANCY PREVENTION AMONG SEX WORKERS: A SAFER INDOOR WORK ENVIRONMENT SCALE

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### Abstract

**Background**—This study aims to: report on a newly developed ‘*Safer Indoor Work Environment Scale*’ that characterizes the social, policy and physical features of indoor venues and social cohesion; and using this scale, longitudinally evaluate the association between these features on sex workers’ (SWs’) condom use for pregnancy prevention.

**Methods**—Drawing on a prospective open cohort of female SWs working in indoor venues, a newly-developed ‘*Safer Indoor Work Environment Scale*’ was used to build six multivariable models with generalized estimating equations (GEE), to determine the independent effects of social, policy and venue-based features and social cohesion on condom use.

**Results**—Of 588 indoor SWs, 63.6% used condoms for pregnancy prevention in the last month. In multivariable GEE analysis, the following venue-based features were significantly correlated with barrier contraceptive use for pregnancy prevention: managerial practices and venue safety policies (Adjusted Odds Ratio (AOR)=1.09; 95% Confidence Interval (95%CI) 1.01–1.17) access

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to sexual and reproductive health services/supplies (AOR=1.10; 95%CI 1.00–1.20) access to drug harm reduction (AOR=1.13; 95%CI 1.01–1.28), and social cohesion among workers (AOR=1.05; 95%CI 1.03–1.07). Access to security features was marginally associated with condom use (AOR=1.13; 95%CI 0.99–1.29).

**Conclusion**—The findings of the current study highlight how work environment and social cohesion among SWs are related to improved condom use. Given global calls for the decriminalization of sex work, and potential legislative reforms in Canada, this study points to the critical need for new institutional arrangements (e.g., legal and regulatory frameworks; labour standards) to support safer sex workplaces.

### Keywords

Sex work; structural intervention; work environment; condom; social cohesion

## INTRODUCTION

There is a growing body of evidence globally of high levels of unmet reproductive and sexual health needs among women sex workers (SWs). (1–3) Emerging research from low- and middle-income countries (LMIC) has demonstrated high rates of unintended pregnancies and poor access to contraceptives and other reproductive health services. (4–7) The data from higher income settings is sparse, however, recent research from Canada found similarly low rates of access to sexual and reproductive health services, including among pregnant and parenting SWs, high rates of unintended pregnancies alongside poor access to barrier and non-barrier contraceptives for pregnancy prevention. (8)

There is increasing global recognition of sexual and reproductive health inequities experienced by SWs. (1,9,10) Barriers to safely negotiating and using condoms reflects an important feature of those inequities and are largely attributed to structural factors, particularly violence and threats of violence, criminalization and stigmatization of sex work. (11) Increasingly, socio-ecological and structural determinants frameworks are being used to map how SWs' ability to negotiate health risks and protections are affected by structure, including: (a) macro-structural factors (e.g., laws, policies); (b) community organization (e.g., sex work organizing, community empowerment, social cohesion); and (c) work environment features (e.g., physical features, venue-based policies, managerial practices). (12–14) Concomitantly, there has been a shift towards complementing existing biomedical and behavioural approaches with structural and community-led interventions that account for both proximal and distal structural determinants in shaping SWs' health outcomes. (15,16) Though previous research on structural determinants has focused on venue and community empowerment interventions, (17,18) this has been almost exclusively drawn from LMIC and to our knowledge, only a handful of studies have examined the multiple influences of supportive workplace models and social cohesion on barrier contraceptives usage. (14,19,20)

In Vancouver, Canada, despite the criminalization of sex work, unsanctioned indoor sex work venues have long existed, both as formal/'in-call' sex work establishments (e.g., licensed massage parlours, beauty parlours, micro-brothels), and informal or 'out-call'

indoor venues (e.g., bars, hotels, saunas). Emerging qualitative and ethnographic studies in high-income settings have demonstrated that both social, policy and physical features of indoor venues and social cohesion among SWs may promote reduced violence and increase control over condom negotiation and use with clients. (21–23)

While a handful of studies in LMIC have examined social, policy and physical features of indoor venues, these have almost exclusively focused on HIV-prevention-related features and policies (e.g., workplace condom rules, manager support for condom use, price of condoms) on HIV risk (14,19,20,24) There remains a gap in the epidemiological literature on the influence of a broader range of workplace features, including: broader health care services access (e.g., drug harm reduction, sexual and reproductive health services), violence prevention measures and policies, (25) as well as their intersections, on SWs' sexual and reproductive health practices. Given the absence of quantitative data on the influence of workplace models and social cohesion on SWs' condom use for pregnancy prevention, particularly in high income settings, this study aimed to: 1) catalogue social, policy, and physical features of indoor venues to develop a safer work environment scale; 2) to longitudinally evaluate the relationship between higher scores on the safer indoor work environment scale and social cohesion on SWs' (male and female) condom use for pregnancy prevention in a prospective cohort of SWs in Vancouver, Canada.

## METHODS

### Study Design

Data from January 2010 to February 2013 were drawn from a longitudinal cohort known as An Evaluation of Sex Workers' Health Access (AESHA), developed based on and monitored by a Community Advisory Board of over 15 community and sex work agencies. Eligibility includes cisgender and transgender women that exchanged sex for money within the last 30 days in street, indoor and online venues. As described previously, (26) time-location sampling was used for recruitment through day and late night outreach to outdoor locations (i.e., streets, alleys), indoor venues (e.g., formal/'in-call' sex work establishments, e.g., massage parlours, micro-brothels; and informal or 'out-call' venues, e.g., bars, hotels, saunas) and self-advertising spaces (e.g., online, newspapers) across Metro Vancouver. Sex work venues were identified through community mapping conducted with current/former SWs and are updated regularly by the outreach team. A combination of outreach methods, and contact by mobile phone and internet were used for follow-up. Consenting SWs completed an interview-administered questionnaire by a trained interviewer at baseline and semi-annual follow-up, together with an interviewer-administered nursing questionnaire on health and social supports.

The main interview questionnaire asks about individual, interpersonal and sex work patterns (e.g., condom negotiation, number and characteristics of clients, fees/types of sexual services), work environment features (e.g., management policies, contraceptives access, policing, intimate partner and workplace violence) and macro-structural factors (e.g., changes in polices and laws, migration, stigma experiences). The nursing questionnaire asks about experiences, access and barriers to health and social supports, including sexual and reproductive health. All participants receive an honorarium of \$40 CAD at each bi-annual

visit for their time, expertise and travel. The study holds ethical approval from the Providence Health Care/University of British Columbia Research Ethics Board.

**Outcomes**—Given previous research from this cohort documenting low use of modern contraceptives (i.e., birth control pill, IUD, injectable hormones, rings and diaphragms, (8) this study focused on condom use for pregnancy prevention. The primary outcome was based on a “yes” response to “male condom” and/or “female condom” to the question “what type of contraceptives have you used for pregnancy prevention in the past month?” Participants were asked list all contraceptives used in the last month which also included: birth control pills, depo-provera, IUD, vaginal rings, diaphragm, spermicides, emergency contraceptives or permanent contraceptives. This outcome was time-updated at every 6-month follow-up.

### **Primary Exposure Variable: Scale Development and Internal Validity**

Early formative and qualitative research with SWs (21,22) led to the inclusion of a diverse set of questions on the social, policy and physical features of indoor work environments (e.g., in and out-call venues) within the AESHA questionnaire which were then catalogued to develop the *Safer Indoor Work Environment Scale* (See Table 2 for the list of venue features). To make use of longitudinal data, all factors were considered as time-updated variables at every six-month interview, over the three-year follow-up period. Based on the overwhelming distribution of responses to all questions favouring “always” or “never”, item responses were dichotomized (i.e., “always”, “usually”, “occasionally” and “sometimes” vs. “never”). Consistent with a structural determinants framework, following factor analysis, the indoor work environment features were grouped as follows: 1) social and policy venue-based features which included supportive venue-based policies and managerial practices; 2) physical venue-based features included: access to sexual and reproductive health services/supplies; access to drug harm reduction services/supplies; and access to physical security features, where relevant).

Scale items were assigned scores based on a review of the literature from LMIC, in-depth qualitative research conducted with AESHA participants, (21,22) and consultations with the AESHA staff and community partners. Work environment features found to be ‘supportive’ of condom use was given a score of 1 vs. 0. The descriptive statistics for each item, including their distributions were examined. Exploratory factor analysis using varimax rotation was used to determine the number of factors present among the items, using a maximum likelihood method. Factors were retained that: had Eigenvalues of greater than one; collectively accounted for 70–80% of the variance; and preceded the elbow in a Scree plot. Factor loadings were used to determine the number of items included within each factor. Additionally, Tucker and Lewis’ Reliability coefficient yielded a score of close to one (0.924). Finally, Latent class analysis (specifying one class), Cronbach’s alpha and Kuder-Richardson scores (for dichotomous variables) were used to assess internal consistency within each subscale. The final scale consisted of 19 venue-based items and is composed of five subscales (including the social cohesion scale):

Social and Policy Venue-Based Subscale-SWs were asked if their indoor workplace had in place policies and managerial practices to support SWs' safety and control in negotiation transactions with clients, displayed in Table 2.

Physical Venue-Based Subscale—Physical venue-based subscale reflects three components: a) *Access to Sexual/Reproductive Health Services and Supplies*; b) *Access to Drug Harm Reduction Services and Supplies*; and c) *Access to Physical Security Features*. (See Table 2)

**Community Organization and Empowerment Subscale: Lippman, Kerrigan and colleagues' Social Cohesion Scale (27)**—was used to score the level of social cohesion among workers (e.g., perceptions of peer supportiveness, trust and mutual aid), based on responses ranging from “strongly agree” to “strongly disagree”. Lippman, Kerrigan and colleagues' social cohesion scale is described in detail elsewhere (27), and has been previously adapted and validated with SWs in LMIC (28).

Similar to work in LMIC, (27,28) item responses to the presence of each indoor feature (1 vs. 0) were summed for bivariate and multivariable longitudinal analyses. A combined score for all venue sub-scales was created, giving equal weight to each sub-scale. The primary exposure variables (The *Safer Indoor Work Environment Scale* and its subcomponents) were time-updated at every six-month follow-up to account for changing work environments over time and their association with condom use for pregnancy prevention (in the last month).

**Longitudinal Regression Analyses**—Due to low levels of missingness (<5%) a listwise deletion approach was taken for missing data. To determine if workplace features and community organization were independently correlated with SWs' condom use longitudinally, multivariable analyses using generalized estimating equations (GEE) were conducted. A working correlation matrix was also used to help account for repeated measures by the same respondent over three years of follow-up.

A series of confounding models were constructed (one for each subscale, and another for the combined scale) using an approach described by Rothman and Greenland, (29) for a total of six models. Confounders were chosen based on *a priori* knowledge of associations with condom use for pregnancy prevention, and a statistically significant bivariate GEE correlation with our outcome ( $p < 0.20$ ). In addition, variables were also considered confounders if they altered the association of interest by 10%. All potential confounders were included in a full model. Backwards elimination was used to arrive at the final model. SAS statistical software package version 9.3 was used for all data analyses (SAS Institute, Cary, NC, USA).

## RESULTS

### Sample characteristics

Of a total of 646 SWs enrolled in AESHA, this analysis was restricted to 588 (86.1%) SWs who had worked in indoor venues over the three-year follow-up. As the primary outcome was condom use for pregnancy prevention, sex workers reporting sterilization were excluded. The median age of the sample was 35.1 (Interquartile range IQR: 28.0–42.0), over

one-third (37.9%, n=223) of women were of Aboriginal ancestry and 23.6% (n=139) were immigrant/new migrant SWs, primarily from Asia. Overall, 66.0% were visible minorities and 34.0% Caucasian, with approximately half (48.6%) of the participants having completed high school or some form of higher education. While 45.5% of the sample intended on becoming pregnant, over half also reported condom use for pregnancy prevention (63.6%). At baseline, among the 374 women who used condoms, all reported male condom use and 12 (2%) reported using female condoms as well (See Table 1 for details). All participants had complete data on work environment features, and 1.02% (n=6) were missing among the outcome, though this did not vary between exposure and non-exposure groups.

Table 2 describes the properties of the subscales of the *Safer Indoor Work Environment Scale* which had satisfactory Cronbach and Kuder-Richardson scores. All subscales had Cronbach's alphas scores of > 0.85, indicating a high level of internal consistency. There was one exception-the physical security features component of the Physical Venue-Based Subscale had a Cronbach alpha of 0.698. The Cronbach alpha for the combined scale was 0.914.

### Work environment scores and condom use for pregnancy prevention

In multivariable GEE analyses, increasing scores for all but one of the work environments were significantly independently correlated with increased odds of condom use for pregnancy prevention. With every one-point increase on the combined scale, there was a 2% increased odds of condom use (AOR=1.02; 95% Confidence Interval (CI): 1.01–1.04). As displayed in Table 3, the adjusted odds ratios aligned with increasing scores for each work environment sub-scale, as follows: Managerial Practices & Venue Safety Policies (AOR=1.09; 95% CI 1.01–1.17); Access to Sexual and Reproductive Health Services and Supplies (AOR=1.10; 95% CI 1.00–1.20); Access to Drug Harm Reduction Services and Supplies (AOR=1.13; 95% CI 1.01–1.28); as well as Lippman, Kerrigan and colleagues' Social Cohesion Scale (AOR=1.05; 95% CI 1.03–1.07). Access to Physical Security Features was marginally associated (AOR=1.13; 95% CI 0.99–1.29).

## DISCUSSION

This study quantifies the relationship between intersecting social, policy and physical venue-based features and social cohesion on SWs' condom use for pregnancy prevention. The findings point to the role of venue and social cohesion in affecting SWs' sexual and reproductive health. It also offers a multi-component *Safer Indoor Work Environment Scale* that can be used to measure the degree to which social cohesion combined with a broad range of venue features can create 'supportive' or enabling environments conducive to SWs' health and safety. This *Safer Indoor Work Environment Scale* also has the potential to inform the development of workplace models that better support safer, more supportive sex work models. Only a handful of studies have examined the more complex and intersecting influences of structural factors on SWs' condom use. In particular, studies from the Dominican Republic, Brazil, China and the Philippines have shown how workplace models that support HIV prevention, including venue-based sexual health policies, managerial practices (e.g., managerial support for condom use), and physical layout (e.g., access to

condoms; health and social supports) shape negotiation of HIV risk. (19,24,27,30) Using the *Safer Indoor Work Environment Scale*, our study builds on these studies and demonstrates that, alongside HIV prevention venue features and practices, a combination of social, policy and physical features that support broader sexual and reproductive health, drug harm reduction and safety, combined with higher levels of social cohesion among workers, may increase SWs' condom use.

The implementation of venue-level managerial practices and safety policies were independently correlated with SWs' condom use. Every one-point increase in the social and policy venue-based subscale corresponded with a 9% increased odds of condom use. Similarly, increased access to physical security features also enhanced condom use. These findings likely reflect SWs' improved control over transactions, reduced fear of violence, and enhanced ability to negotiate for condoms by clients in venues that prevent violence through safety features, policies and practices. Results from the current study also confirm findings from earlier qualitative research in this setting, both in unsanctioned indoor venues within supportive women-only housing, (22) and licensed health enhancement and massage parlour venues. (21)

Physical access to sexual and reproductive health services and supplies at a venue level was also directly correlated with SWs' condom use over a three-year period. Other studies also have found evidence linking access to HIV prevention services and supplies and services to consistent condom use. (31–34) Our research adds to this by demonstrating that it is the synergy of social, policy and physical features at venues that promote SWs' condom use over time. Physical access to relevant services and supplies also may reflect important features of venue-level social relations whereby SWs, managers, and peers collectively support and facilitate condom use. (19,30) Qualitative studies on sex work policies and management in India, China and brothels in Nevada also have reported that managers may represent important 'nodes' for STI information, and provide protection from violence, contributing to increased condom use. (23,35,36)

At the community level, increasing scores for social cohesion among SWs (27) were positively correlated with increased condom use. Social cohesion has been described as a 'structural component' of community empowerment, (37) which captures trust, mutual aid, and solidarity among SWs. The role of community empowerment and social cohesion on SWs' condom use has been well documented globally, including in World Health Organization (WHO) guidelines. However these data are almost exclusively drawn from LMIC, such as Brazil, Dominican Republic and India. These are settings where there has been significant investment in resources to support these features amongst SW communities. (24,31,35) Such investments have not been nearly as prevalent in higher-income settings (including Canadian communities) and point to an area where evidence-informed investment in novel actions and supports for SW communities could be beneficial from a health and safety perspective. Only a handful of other studies have measured specific and intersecting facets of community empowerment, most notably data from Brazil and Dominican Republic, (24,28) and more recently Swaziland. (38) Moreover, our results longitudinally demonstrate how a combination of social, policy and physical venue-based and community organization

characteristics (specifically, social cohesion) can promote SWs' sexual and reproductive health.

Finally, increased access to drug harm reduction services and supplies was also associated with increased odds of condom use. Previous research has shown that among SWs who use drugs, increased control over drug preparation reduces SWs' risk of violence (or threat of violence) at the time of drug use and increases control over negotiation of both sexual and drug risks. (45) While substance use among street-based SWs and its association with inconsistent condom use have been documented, (40,41) our findings help to address an evidence gap regarding the potentially positive effects of drug harm reduction interventions on SWs' sexual and reproductive health. Drug harm reduction interventions and their apparent capacity to offer positive, value-added effects on the sexual and reproductive health outcomes of SWs is a promising area of research and practice.

### Limitations

As with all research with stigmatized and criminalized populations, the clandestine nature of sex work makes identifying a sampling frame, and randomly selecting a sample of representative participants challenging. To address this limitation, time-location sampling and social mapping with team members (with previous or current experience in sex work) were used that systematically sample SWs at times and venues where they work. (42) Additionally, we did not measure consistency/frequency of condom use, and therefore cannot extrapolate these findings to hypothesize their effect on pregnancy outcomes or HIV transmission rates. We were unable to assess SWs' relationships with their managers (e.g., support and trust), which has been documented as a key social and venue feature in other studies. (14,24,30,43) Additionally, we were unable to measure the influence of economic venue-based features (e.g., service fees, payment structure, income) on condom use. Together, these features represent areas for research in future iterations of the scale.

As our analysis was focused on condom use for pregnancy prevention, our outcome may not capture SWs who consider condoms solely as a HIV prevention practice rather than pregnancy prevention method. Contraceptives and pregnancy can be a sensitive topic for already stigmatized populations and thus as with all self-reported data, responses may be subject to social desirability bias. There is a possibility of over-reporting of condom use among sex workers in venues that encourage condom use with clients (and conversely under-reporting in environments unsupportive of condom use), which may bias our results. However, given the study's protocols to ensure patient confidentiality, and interviewers' good rapport with participants, this bias is expected to be minimal. The interviewers also have strong community linkages, with some having sex work experience themselves. As well, our study findings are specific to SWs in a higher income setting, but they underrepresent higher income SWs in our setting (e.g., escort and independent workers). Therefore, our study findings should be interpreted cautiously across sex work contexts.

### Conclusions

This study is among the first to examine the longitudinal relationship of safer indoor work environments and social cohesion on SWs' condom use, in a high-income setting. The

results provide key implications for future sexual and reproductive health policy and programming, including HIV/STI prevention. Specifically, this research highlights the role of venue-based policies and managerial practices, as well as access to health and social supports, on SWs' condom use for pregnancy prevention. Substantial evidence exists in Canada and globally that criminalization and unsafe work environments reduce SWs' ability to safely negotiate condom use due to fear of violence and arrest. Safer indoor venues with supportive policies and practices, together with strong policy support for SWs to work collectively, represent structural avenues through which to promote and protect SWs' safety and health. Furthermore, these results suggest that even within contexts that feature substantial barriers for SWs' to access health care, (44) supportive sex workplaces may also help by providing such services themselves or by facilitating better access to appropriate supplies, services and programs, including condoms.

The WHO/UN is calling for decriminalization of sex work globally. (45) In 2013, the Supreme Court of Canada struck down sex work laws that prohibited (among other things) working in indoor settings, or the hiring or accessing of managers and others third parties, such as security. This study indicates that safer workplace models that include supportive venue and management practices (e.g., security and access to other health resources and services) are key to SWs' health and safety. The evidence documented in the current study provides crucial insights to inform a new legal/policy framework. Furthermore, the findings shed light on how safer workplace models and the ability of SWs to work together remains a critical conduit to promoting SWs' condom use.

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## References

1. UNAIDS. UNAIDS guidance note on HIV and sex work. 2009.
2. Overs C, Hawkins K. Can rights stop the wrongs? Exploring the connections between framings of sex workers' rights and sexual and reproductive health. *BMC Int Health Hum Rights* [Internet]. 2011 Dec 16.11(Suppl 3 Suppl 3):S6. Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3287462&tool=pmcentrez&rendertype=abstract>.
3. Morrison, JS.; Fleischman, J. Integrating Reproductive Health and HIV/AIDS Programs Strategic Opportunities for PEPFAR: A Report of the CSIS Task Force on HIV/AIDS. 2006.
4. Feldblum PJ, Nasution MD, Hoke TH, Van Damme K, Turner AN, Gmach R, et al. Pregnancy among sex workers participating in a condom intervention trial highlights the need for dual protection. *Contraception*. 2007; 76(2):105–10. 2007/07/28 ed. [PubMed: 17656179]
5. Delvaux T, Crabbé F, Seng S, Laga M. The need for family planning and safe abortion services among women sex workers seeking STI care in Cambodia. *Reprod Health Matters* [Internet]. 2003

- May; 11(21):88–95. Available from: <http://www.ncbi.nlm.nih.gov.ezproxy.library.ubc.ca/pubmed/12800706>.
6. Elmore-Meegan M, Conroy RM, Agala CB. Sex Workers in Kenya, Numbers of Clients and Associated Risks: An Exploratory Survey. *Reprod Health Matters* [Internet]. 2004 May; 12(23):7. Available from: <http://www.sciencedirect.com.ezproxy.library.ubc.ca/science/article/B73FJ-4CDJK54-6/2/e2c07c85645bb2701b5b5941845b268e>.
  7. Bautista CT, Mejia A, Leal L, Ayala C, Sanchez JL, Montano SM. Prevalence of lifetime abortion and methods of contraception among female sex workers in Bogota, Colombia. *Contraception*. 2008; 77(3):209–13. 2008/02/19 ed. [PubMed: 18279693]
  8. Duff P, Shoveller J, Zhang R, Alexson D, Montaner JS, Shannon K. High Lifetime Pregnancy and Low Contraceptive Usage Among Sex Workers Who Use Drugs-An Unmet Reproductive Health Need. *BMC Pregnancy Childbirth*. 2011; 11(1):61. 2011/08/20 ed. [PubMed: 21851622]
  9. Becker, M.; Ramanaik, S.; Halli, S.; Blanchard, JF.; Raghavendra, T.; Bhattacharjee, P., et al. The Intersection between Sex Work and Reproductive Health in Northern Karnataka, India: Identifying Gaps and Opportunities in the Context of HIV Prevention. *AIDS Res Treat* [Internet]. 2012 Jan. [cited 2013 Aug 29];2012:842576. Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3546443&tool=pmcentrez&rendertype=abstract>
  10. Decker MR, Yam EA, Wirtz AL, Baral SD, Peryshkina A, Mogilnyi V, et al. Induced abortion, contraceptive use, and dual protection among female sex workers in Moscow, Russia. *Int J Gynaecol Obstet* [Internet]. 2013 Jan; 120(1):27–31. cited 2013 Oct 17. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/23083495>.
  11. Bungay V, Halpin M, Atchison C. *Culture, Health & Sexuality: An International Journal for Research, Intervention and Care* Structure and agency: reflections from an exploratory study of Vancouver indoor sex workers. 2011:37–41. October 2012.
  12. Shannon K, Strathdee S, Goldenberg S, Duff P, Mwangi M, Rusakova M, et al. The Global Epidemiology of HIV among Female Sex Workers: Structural Determinants. *Lancet Ser HIV Sex Work*. 2014
  13. Shannon K, Goldenberg S, Deering K, Strathdee S. HIV Infection among Female Sex Workers in Concentrated and High Prevalence Epidemics: Why a Structural Determinants Framework is Needed. *Curr Opin HIV/AIDS*. 2014
  14. Urada LA, Morisky DE, Pimentel-Simbulan N, Silverman JG, Strathdee SA. Condom negotiations among female sex workers in the Philippines: environmental influences. *PLoS One* [Internet]. 2012 Jan.7(3):e33282. cited 2013 Nov 23. Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3308968&tool=pmcentrez&rendertype=abstract>.
  15. Blankenship KM, Friedman SR, Dworkin S, Mantell JE. Structural interventions: concepts, challenges and opportunities for research. *J Urban Heal* [Internet]. 2006 Jan; 83(1):59–72. 2006/06/01 ed. cited 2012 Mar 18. Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1473169&tool=pmcentrez&rendertype=abstract>.
  16. Werb D, Debeck K, Kerr T, Li K, Montaner J, Wood E. Modelling crack cocaine use trends over 10 years in a Canadian setting. *Drug Alcohol Rev* [Internet]. 2010 May; 29(3):271–7. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/20565519>.
  17. Chen X-S, Liang G-J, Wang Q-Q, Yin Y-P, Jiang N, Zhou Y-J, et al. HIV prevalence varies between female sex workers from different types of venues in southern China. *Sex Transm Dis* [Internet]. 2012 Nov; 39(11):868–70. cited 2014 Jan 11. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/23064536>.
  18. Jain AK, Saggurti N. The Extent and Nature of Fluidity in Typologies of Female Sex Work in Southern India: Implications for HIV Prevention Programs. *J HIV AIDS Soc Serv* [Internet]. 2012 Apr; 11(2):169–91. cited 2014 Jan 11. Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3379737&tool=pmcentrez&rendertype=abstract>.
  19. Urada LA, Morisky DE, Hernandez LI, Strathdee SA. Social and structural factors associated with consistent condom use among female entertainment workers trading sex in the Philippines. *AIDS Behav* [Internet]. 2013 Feb; 17(2):523–35. cited 2013 Nov 7. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/22223297>.

20. Lippman SA, Chinaglia M, Donini AA, Freitas GB, Guerra K, Kassir MS, et al. Findings From Encontros: A Multilevel STI/HIV Intervention to Increase Condom Use, Reduce STI, and Change the Social Environment Among Sex Workers in Brazil. 2012; 39(3):15–8.
21. Anderson S, Jia Xi, Krusi J, Allan A, Shannon SK. Violence Prevention and Municipal licensing of indoor sex work venues in the Greater Vancouver Area: Narratives of Migrant Sex Workers, Managers and Business Owners. *Health & Place*. 2014
22. Krüsi A, Chettiar J, Ridgway A, Abbott J, Strathdee Sa, Shannon K. Negotiating safety and sexual risk reduction with clients in unsanctioned safer indoor sex work environments: a qualitative study. *Am J Public Health [Internet]*. 2012 Jun; 102(6):1154–9. cited 2012 Jul 15. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/22571708>.
23. Brents BG, Hausbeck K. Violence and legalized brothel prostitution in Nevada: examining safety, risk, and prostitution policy. *J Interpers Violence [Internet]*. 2005 Mar; 20(3):270–95. cited 2012 Nov 6. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/15684138>.
24. Kerrigan D, Moreno L, Rosario S, Gomez B, Jerez H, Barrington C, et al. Environmental-structural interventions to reduce HIV/STI risk among female sex workers in the Dominican Republic. *Am J Public Health [Internet]*. 2006 Jan; 96(1):120–5. cited 2012 Oct 30. Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1470438&tool=pmcentrez&rendertype=abstract>.
25. Deering KN, Amin A, Shoveller J, Nesbitt A, Garcia-Moreno C, Duff P, et al. A systematic review of the correlates of violence against sex workers. *Am J Public Health [Internet]*. 2014 May; 104(5):e42–54. cited 2014 Oct 6. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/24625169>.
26. Shannon Bright V, Parsad D, Alexson D, Allinott S, Gibson K, Tyndall MWK, Shannon K, Bright V, Allinott S, Alexson D, Gibson K, et al. Community-based HIV prevention research among substance-using women in survival sex work: the Maka Project Partnership. *Harm Reduct J [Internet]*. 2007 Jan.4(1):20. cited 2011 Oct 31. Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2248179&tool=pmcentrez&rendertype=abstract>.
27. Lippman, Sa; Donini, A.; Díaz, J.; Chinaglia, M.; Reingold, A.; Kerrigan, D. Social-environmental factors and protective sexual behavior among sex workers: the Encontros intervention in Brazil. *Am J Public Health [Internet]*. 2010 Apr 1; 100(Suppl):S216–23. cited 2012 Nov 6. Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2837432&tool=pmcentrez&rendertype=abstract>.
28. Kerrigan D, Telles P, Torres H, Overs C, Castle C. Community development and HIV/STI-related vulnerability among female sex workers in Rio de Janeiro, Brazil. *Health Educ Res [Internet]*. 2008 Mar; 23(1):137–45. cited 2011 Oct 31. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/17363361>.
29. Rothman, K.; Greenland, S. *Modern Epidemiology*. 2. Philadelphia: Lippincott Williams & Wilkins; 1998.
30. Hong Y, Fang X, Li X, Liu Y, Li M. Environmental support and HIV prevention behaviors among female sex workers in China. *Sex Transm Dis [Internet]*. 2008 Jul; 35(7):662–7. cited 2013 Mar 19. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/18418288>.
31. Thilakavathi, S.; Boopathi, K.; Girish Kumar, CP.; Santhakumar, a; Senthilkumar, R.; Eswaramurthy, C., et al. *BMC Public Health [Internet]*. Vol. 11. BioMed Central Ltd; 2011 Jan. 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?; p. S3 cited 2013 Oct 18 Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3287556&tool=pmcentrez&rendertype=abstract>
32. Deering KN, Boily M, Lowndes CM, Shoveller J, Tyndall MW, Vickerman P, et al. A dose-response relationship between exposure to a large-scale HIV preventive intervention and consistent condom use with different sexual partners of female sex workers in southern India. *BMC Public Health [Internet] BioMed Central Ltd*. 2011; 11(Suppl 6):S8. Available from: <http://www.biomedcentral.com/1471-2458/11/S6/S8>.
33. Shi, Y.; Guo, S.; Bo, F.; Zhang, X.; Cao, W.; Wang, P. *Int J Infect Dis [Internet]*. Vol. 17. International Society for Infectious Diseases; 2013 Jan. Impact evaluation of a sexually

- transmitted disease preventive intervention among female sex workers in Hohhot, China; p. e59-64. cited 2013 Oct 18 Available from: <http://www.ncbi.nlm.nih.gov/pubmed/23154177>
34. Liao M, Bi Z, Liu X, Kang D, Fu J, Song Q, et al. Condom use, intervention service utilization and HIV knowledge among female sex workers in China: results of three consecutive cross-sectional surveys in Shandong Province with historically low HIV prevalence. *Int J STD AIDS* [Internet]. 2012 Mar; 23(3):e23–9. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/22581891>.
  35. Ghose T, Swendeman DT, George SM. The role of brothels in reducing HIV risk in Sonagachi, India. *Qual Health Res* [Internet]. 2011 May; 21(5):587–600. cited 2012 Nov 6. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/21266706>.
  36. Yi H, Zheng T, Wan Y, Mantell JE, Park M, Csete J. Global Public Health: An International Journal for Research, Policy and Practice Occupational safety and HIV risk among female sex workers in China: A mixed-methods analysis of sex-work harms and mummies 2012. Mar.2013 : 840–55.
  37. Kerrigan D, Kennedy CE, Morgan-Thomas R, et al. A community empowerment approach to the HIV response among sex workers: effectiveness, challenges, and considerations for implementation and scale-up. *Lancet*. 2014; 6736:1–14.
  38. Fonner V, Kerrigan D, Mnisi Z, Ketende S, Kennedy C, Baral S. Social Cohesion, Social Participation, and HIV Related Risk among Female Sex Workers in Swaziland. *PLoS One*. 2014; 9(1):e87527. [PubMed: 24498125]
  39. Fairbairn N, Small W, Shannon K, Wood E, Kerr T. Seeking refuge from violence in street-based drug scenes: Women’s experiences in North America’s first supervised injection facility. *Soc Sci Med*. 2008; 67(5):817–23. [PubMed: 18562065]
  40. Gu J, Chen H, Chen X, Lau JTF, Wang R. Severity of drug dependence, economic pressure and HIV-related risk behaviors among non-institutionalized female injecting drug users who are also sex workers in China. 2008; 97:257–67.
  41. Strathdee SA. Correlates of injection drug use among female sex workers in two Mexico-US border cities. *Drug Alcohol Depend*. 2008; 92:132–40. [PubMed: 17714888]
  42. Stueve A, O’Donnell LN, Duran R, San Doval A, Blome J. Time-space sampling in minority communities: results with young Latino men who have sex with men. *Am J Public Heal*. 2001; 91(6):922–6. 2001/06/08 ed.
  43. Urada, La; Malow, RM.; Santos, NC.; Morisky, DE. Age Differences among Female Sex Workers in the Philippines: Sexual Risk Negotiations and Perceived Manager Advice. *AIDS Res Treat* [Internet]. 2012 Jan.2012 cited 2013 Apr 23. Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3405561&tool=pmcentrez&rendertype=abstract>.
  44. Lazarus L, Deering KN, Nabess R, Gibson K, Tyndall MW, Shannon K. Occupational stigma as a primary barrier to health care for street-based sex workers in Canada. *Heal (San Fr)*. 2011; 00(0):1–12.
  45. UNAIDS. Prevention and treatment of HIV and other sexually transmitted infections for sex workers in low-and middle-income countries. 2012.

**What is already known on this subject**

- Structural interventions (e.g., supportive work environments and community empowerment) that extend beyond solely biomedical and/or behavioural interventions have been identified as a cornerstone for HIV prevention, including contraceptive use, among sex workers.
- Qualitative research among sex workers has highlighted the important role that venue-level social and structural interventions play (e.g. supportive policies, management and services) on barrier contraception negotiation and use.
- Quantitative evidence from high-income settings that disentangle the independent effects of various venue-level environments and sex worker cohesion on broader reproductive health of sex workers, including condom use for pregnancy prevention is lacking.

**What this study adds**

- This study offers a novel '*Safer Indoor Work Environment Scale*' that catalogues a range of venue-level work environment factors and examines their relationship with sex workers' condom use.
- Study findings highlight the importance of structural venue-based (e.g., supportive management and policies, onsite access to sexual and reproductive health services) and social cohesion among workers in promoting condom use among sex workers.
- This study supports global calls for decriminalization to support the ability of sex workers to more formally collectivize and ensure access to safer work environment models that are essential in promoting condom use.

**Table 1**

Baseline Characteristics of 588 Female Sex Workers who Worked in Indoor Settings, Stratified by Condom Use for Pregnancy Prevention

	<i>Condom Use for Pregnancy Prevention</i>		<i>p-value</i>
	<i>Yes</i>	<i>No</i>	
<b>Baseline Sample Characteristics (n=588)</b>	<b>374 (63.6%)</b>	<b>214 (36.4%)</b>	
<b><i>Individual Factors</i></b>			
Age (mean, median (IQR) (35.1, 34.5 (28.0–42.0))	34.0, 33 (27.5–41.0) 37.1, 37.0	(29.5–44.0)	<0.001
Aboriginal Ancestry	130 (34.8) 244 (65.2)	93(43.5) 121(56.5)	0.642
Injection drug use* <i>Yes</i>	142 (38.0)	99 (46.3)	0.403
<i>No</i>	232 (62.0)	115 (53.7)	
Non injection drug use* <i>Yes</i>	258 (69.0)	167(78.0)	0.144
<i>No</i>	116 (31.0)	47(22.0)	
Intend to become pregnant*	170 (45.5)	46 (21.5)	<0.001
No intentions to become pregnant*	204 (54.5)	168 (78.5)	
<b><i>Interpersonal Factors</i></b>			
Have intimate partners* - <i>Yes</i>	216 (57.8)	118 (55.1)	0.058
Have intimate partner* - <i>No</i>	158 (42.2)	96 (44.9)	
Inconsistent condom use with clients*	60 (16.0)	37 (17.3)	0.462
Consistent condom use with clients*	314 (84.0)	177(82.7)	
<b><i>Macro-structural Factors</i></b>			
Education			
High school graduate	193 (51.6)	109 (50.9)	0.444
Less than high school graduate	181 (48.4)	105(49.1)	
Migrant	103 (29.6)	36 (16.8)	<0.001
Non-migrant	271 (70.5)	178 (83.2)	
Homelessness* - <i>Yes</i>	104 (27.8)	70 (32.7)	0.526
Homelessness* - <i>No</i>	270 (72.2)	144(67.3)	
Unstable housing* - <i>Yes</i>	309 (82.6)	182 (85.1)	0.774
Unstable housing* - <i>No</i>	65(17.4)	32 (14.9)	

\* Last 6 months

**Table 2**  
**Safer Indoor Work Environment Scale**

Sub-Scale Properties of Social, Policy and Physical Venue-Based Features and Social Cohesion among 588 Sex Workers in the AESHA Cohort in Metro Vancouver, Canada, 2010–2013

Work Environment Domain	Properties		
	Mean, range Median (IQR)	Cronbach Alpha (standardized)	K-R coefficient <sup>†</sup>
<b>Full Safer Indoor Work Environment Scale</b>	21.1, 22 (16–28)	0.914	-
<b>Social and Policy Venue-Based Features<sup>+</sup></b>			
<i>Venue Safety Policies &amp; Managerial Practices Component:</i>	1.11, 7	0.903	0.870
Women's only space (e.g., workers)	0(0,2)		
Women's only front desk staff and management			
Venue has restrictions on hours of operation			
Management explicitly discuss sex work			
Management post bad date (violent perpetrator) sheets			
Venue has restrictions on overnight guests			
Management restricts number of clients to one at a time			
Management has explicit safety plan for violent clients			
<b>Physical Venue-based features<sup>+</sup></b>			
<i>Access to Sexual/Reproductive Health Services and Supplies Component</i>	0.71, 4	0.960	0.903
Primary health care/or street nurse comes to venue	0 (0,0)		
Voluntary and accessible Pap testing (e.g., comes to venue)			
Voluntary and accessible STI testing (e.g., comes to venue)			
Voluntary and accessible HIV testing (e.g., comes to venue)			
<i>Access to Drug Harm Reduction Services and Supplies Component</i>	0.67,3	0.926	0.895
Crack pipes and drug use cleaning supplies	0 (0,1)		
Sharps containers			
Syringes			
<i>Access Physical Security Features Component</i>	1.11,4	0.698	0.698
Management ask for client ID	1(0,2)		
Phone available in room			
Video camera in hallway or entrance			
Call button/camera available in room			
<b>Community Organization Level</b>			
Lippman, Kerrigan and colleagues' Social Cohesion Scale(27):	18.65 (37)	0.919	-
<i>measures perception of mutual aid, trust, connectedness, support among workers</i>	19 (15–23)		
You can count on your colleagues if you need to borrow money			
You can count on your colleagues to accompany you to the doctor or hospital			
You can count on your colleagues if you need to talk about your problems			

Work Environment Domain	Properties		
	Mean, range Median (IQR)	Cronbach Alpha (standardized)	K-R coefficient <sup>‡</sup>
In general, your colleagues in the area where you work only worry about themselves			
You can count on your colleagues if you need advice			
You can count on your colleagues if you need somewhere to stay			
You can count on your colleagues to help deal with a violent or difficult client			
You can count on your colleagues to help you find clients			
You can count on your colleagues to support the use of condoms			
The group of women/men with whom you work is an integrated group			
In general, people you work with are always arguing among each other			
In general, the people you work with get along well			
All items summed and standardized (0,1,2,3 points for ascending responses)			

Cronbach alpha scores >.70 indicate a high level of internal consistency

<sup>‡</sup> Kuder-Richardson coefficient

<sup>+</sup> All items summed (1 for yes; 0 for no)

AESHA, An Evaluation of Sex Workers' Health Access; STI, sexually transmitted infection

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**Table 3**

Bivariable and Multivariable Odds Ratios using Generalized Estimating Equations for the Relationship between Social, Policy and Physical Venue-Based Features, Social Cohesion and Condom Use for Pregnancy Prevention within the Last Month Among 588 Sex Workers in the AESHA Cohort in Metro Vancouver, Canada, 2010–2013

Condom Use for Pregnancy Prevention			
Characteristic	Crude Odds Ratio (95%CI)	Adjusted Odds Ratio (95% CI)	p-value
Total Safer Indoor Work Environment Scale <sup>+</sup>	1.02 (1.01–1.03)	1.02 (1.01–1.04) <sup>‡</sup>	<.001**
Social and Policy Venue-Based Subscale: Managerial Practices and Venue Safety Policies Component	1.05 (0.98–1.13)	1.09 (1.01–1.17) <sup>‡</sup>	0.032**
<b>Physical Venue-Based Features</b>			
Physical Venue-Based Subscale: Access to Sexual Reproductive Health Services and Supplies Component	1.07 (0.98–1.16)	1.10 (1.00–1.20) <sup>‡</sup>	0.044**
Physical Venue-Based Subscale: Access to Drug Harm Reduction Services and Supplies Component	1.06 (0.95–1.19)	1.13 (1.01–1.28) <sup>‡</sup>	0.042**
Access to Physical Security Features Component	1.08 (0.95–1.22)	1.13 (0.99–1.29)	0.057
Community Organization Environment: <i>Lippman, Kerrigan and colleagues' Social Cohesion Scale score</i>	1.06 (1.04–1.07)	1.05 (1.03–1.07) <sup>‡</sup>	<0.001**

<sup>‡</sup>Based on GEE bivariable results, models adjusted for the following confounders: age, migrant status, have a non-commercial intimate partner and pregnancy intention.

<sup>+</sup>Each venue-based sub-scale and social cohesion scale given equal weight in combined Safer Work Environment Scale

Statistically significant at p<0.05