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Successes and gaps in uptake of regular, voluntary HIV testing for hidden street- and off-street sex workers in Vancouver, Canada

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Despite evidence globally of the heavy HIV burden among sex workers (SWs) as well as other poor health outcomes, including violence, SWs are often excluded from accessing voluntary, confidential and non-coercive health services, including HIV prevention, treatment, care and support. This study therefore assessed the prevalence and association with regular HIV testing among street- and off-street SWs in Vancouver, Canada. Cross-sectional baseline data were used from a longitudinal cohort known as "An Evaluation of Sex Worker's Health Access" (AESHA; January 2010–July 2012). This cohort included youth and adult SWs (aged 14+ years). We used multivariable logistic regression to assess the relationship between explanatory variables and having a recent HIV test (in the last year). Of the 435 seronegative SWs included, 67.1% reported having a recent HIV test. In multivariable logistic regression analysis, having a recent HIV test remained significantly independently associated with elevated odds of inconsistent condom use with clients [adjusted (multivariable) odds ratios, AOR: 2.59, 95% confidence intervals [95% CIs]: 1.17–5.78], injecting drugs (AOR: 2.33, 95% CIs: 1.17–4.18) and contact with a mobile HIV prevention programme (AOR: 1.76, 95% CIs: 1.09–2.84) within the last six months. Reduced odds of having a recent HIV test was also significantly associated with being a migrant/new immigrant to Canada (AOR: 0.33, 95% CIs: 0.19–0.56) and having a language barrier to health care access (AOR: 0.26, 95% CIs: 0.09–0.73). Our results highlight successes of reaching SWs at high risk of HIV through drug and sexual pathways. To maximize the effectiveness of including HIV testing as part of comprehensive HIV prevention and care to SWs, increased mobile outreach and safer-environment interventions that facilitate access to voluntary, confidential and non-coercive HIV testing remain a critical priority, in addition to culturally safe services with language support.

Keywords: HIV test; HIV testing; sex workers; Vancouver; prevention; interventions

Introduction

Despite evidence globally of the heavy HIV burden among sex workers (SWs; Baral et al., 2012), as well as other poor health outcomes, including violence (K. Deering et al., 2014), SWs are often excluded from accessing voluntary, confidential and non-coercive health services, including HIV prevention, treatment, care and support (*Guidance Note on HIV and Sex Work*, 2009; Rekart, 2005; *Risks, Rights and Health*, 2012). World Health Organization's and United Nations' (UNAIDS) guidelines on HIV prevention and treatment call for ensuring universal access to non-coercive and supportive HIV-related health services as a primary goal in addressing and correcting human rights violations of SWs (*Prevention and Treatment of HIV and Other Sexually Transmitted Infections for Sex Workers in Low- and Middle-income Countries*, 2012).

Empirical research on HIV testing among SWs is surprisingly limited. Existing studies have focused on individual, psychosocial and interpersonal factors, with the majority conducted primarily in low- and middle-income settings (Armstrong et al., 2013; Hong et al., 2012; Huang et al., 2012; Park & Yi, 2011; Todd et al., 2007; Wang et al., 2011; Xu et al., 2011). For example, increased likelihood of HIV testing was associated with higher self-rated HIV knowledge (Hong et al., 2012); higher perception of HIV risk (Xu et al., 2011); higher (Xu et al., 2011) and lower (Hong et al., 2012) education; sexual behaviour (e.g., lower numbers of clients; having a regular partner) and drug use (Xu et al., 2011). Some studies have examined social or structural–environmental

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factors: HIV testing was found to significantly increase over time among SWs in India, which authors argue can largely be attributed to a scaled-up community–structural HIV prevention programme (the Avahan Initiative; Armstrong, et al., 2013). Heightened HIV-related stigma was associated with decreased HIV testing among SWs in Russia (King, Maman, Bowling, Moracco, & Dudina, 2013) while detention in sex work "rehabilitation centres" was associated with increased HIV testing in Vietnam (Grayman et al., 2005). Working in higher-income sex work environments (i.e., saunas) was found to be associated with increased HIV testing among SWs in China (Hong et al., 2012).

Barriers to accessing other HIV-related and health services include negative interactions with health care providers (e.g., fear of sex work disclosure; Aral et al., 2003; Jeal & Salisbury, 2004; Scorgie et al., 2011), experiences with occupational stigma, concealing an involvement in sex work to family, friends and service providers (Benotsch et al., 2008; Kerrigan, Telles, Torres, Overs, & Castle, 2007; Lazarus et al., 2012; Scambler & Paoli, 2008) and fear of arrest or prosecution resulting from disclosure to health care professionals (Ahmed, Kaplan, Symington, & Kismodi, 2011; Rekart, 2005). Hidden street-based SWs may face limited access to health services and barriers to HIV prevention and care (Lazarus et al., 2012; Shannon, Bright, Duddy, & Tyndall, 2005), while less is known about the health needs of off-street SWs. Other barriers are related to the organization and operation of HIV-related services, including long wait times, limited and/or inappropriate hours or geographic locations of service (Jeal & Salisbury, 2004; Shannon et al., 2005). SWs who use illicit drugs may experience additional drug use-related stigma and related barriers to care (Simmonds & Coomber, 2009). In contrast, access to safer-environment interventions including mobile outreach has been associated with increased access to drug treatment health services (K. N. Deering et al., 2011).

With efforts globally to scale up access to HIV testing, particularly with the now well-established role of "treatment as prevention" in reducing HIV risk on an individual level and HIV spread on a population level (Montaner, 2011), there remains a critical need to evaluate access to and uptake of regular HIV testing and inform barriers to care among marginalized women at high risk of HIV. Our study therefore assessed the prevalence and correlates of accessing recent HIV testing among hidden street- and off-street SWs in Metropolitan Vancouver, Canada. Vancouver provides a unique opportunity to evaluate updates of testing, given the provincial government has been supporting a large-scale pilot initiative (STOP-HIV/AIDS) to increase access to comprehensive HIV testing, treatment and care as part of the "treatment as prevention" strategy (O'Shaughnessy, Hogg, Strathdee, & Montaner, 2012).

Methods

Sample overview

For the purposes of the current study, we used cross-sectional baseline data (from participants' first study visit) from a longitudinal cohort known as "An Evaluation of Sex Worker's Health Access" (AESHA). Initiated in January 2010, this 5-year study includes women (aged 14+ years), is trans inclusive and is based on substantial community collaborations (e.g., sex work agencies and service providers) since 2005. AESHA aimed to include a rolling sample of 700 SWs (achieved by 2013). Participants complete a baseline survey at their first study visit and then complete follow-up surveys every six months over five years. In all, 435 seronegative SWs were eligible for the current analyses (up to July 2012). We used baseline data (which included the data at most recent HIV test) rather than follow-up data collected in six-monthly intervals because we wanted to examine HIV testing among SWs in the last year, consistent with provincial standards at the time.

Women who exchanged sex for money within the last 30 days (SWs) were recruited through outreach to outdoor sex work locations (i.e., streets, alleys), indoor sex work venues (i.e., massage parlours, micro-brothels and in-call locations) and independent/self-advertising SWs (e.g., online, newspapers), based on the specific times of work and areas of work locations. As executed previously (Shannon et al., 2007), outdoor sex work "strolls" and independent off-street and indoor venues were identified through a participatory mapping exercise with the outreach team (both current/former SWs and non-SWs) and continuously updated by the outreach team. For our follow-up surveys, we have a strong retention rate of >80%. All participants receive an honorarium of $40CAD at each biannual visit for their time, expertise and travel. The study holds ethical approval of Providence Health Care/University of British Columbia Research Ethics Board.

Questionnaires and measures

Participants completed informed consent and an interviewer-administered questionnaire that elicited responses relating to socio-demographics, sex work patterns and work environment; violence and policing experiences; non-commercial sex partners and drug use patterns. Participants also completed a nurse-administered questionnaire that elicited responses relating to overall physical and mental health; sexual and reproductive health; and experiences with HIV testing/treatment. Following extensive pre- and post-testing counseling by

the nurse, participants completed HIV/sexually transmitted infections (STIs)/hepatitis C screening, including collection of blood and urine samples.

Outcome

The outcome was a binary (Yes/No) variable measuring if a participant had a "recent HIV test", defined as being done within the preceding year (and before the current study visit). Options were included for the timing of the most recent test (last month, 2–3 months, 4–6 months, 7 months–1 year, 12 months–2years, >2 years).

Explanatory variables

The relationship between social and structural-environmental factors and having a recent HIV test was explored based on literature and a priori knowledge of known or hypothesized factors associated with uptake of HIV testing and other health services among SWs, adapted for relevance in our study context (Beattie et al., 2012; Hong et al., 2012; Huang et al., 2012; Park & Yi, 2011; Todd et al., 2007; Wang et al., 2011; Xu et al., 2011). Table 1 provides a summary of these factors, stratified by whether or not SWs reported a recent HIV test. Explanatory variables considered included age; age at first sex work; gender/sexual identity: sexual minority [lesbian, gay, bisexual, transgender, transsexual, two-spirit (i.e., Indigenous/Aboriginal cross-gender identity versus heterosexual and non-transgender)]; being of Indigenous/Aboriginal ancestry (inclusive of First Nations, Métis, Inuit, non-status Indigenous versus non-Aboriginal) versus not; migrant/new immigrant (versus Canadian born); drug use patterns (e.g., non-injection and injection drug use); inconsistent condom use with clients, both regular and one-time clients and non-commercial sex partners (responses included: never, sometimes, usually and frequently, versus always); having self-reported mental health issues; as well as a number of social–structural barriers to health care (see Table 1).

We also considered other variable including: work environment based on primary place of solicitation (coded as: street/public place, off-street independent/self-advertising, and off-street indoor venue-based solicitation); working with a manager/pimp; and, given the established role of mobile and outreach-based testing, we also considered the British Columbia Centre for Disease Control (BCCDC) Street Nurse Program, which provides mobile/outreach-based nursing and HIV/STI testing to marginalized and hidden populations, including SWs, individuals who use drugs and men who have sex with men (MSM). This BCCDC outreach nursing programme operates in Metro Vancouver and offers both street and venue-based outreach and HIV/STI testing, and has been one, and sometimes only, contact for more isolated street- and off-street SWs to access confidential HIV and STI testing.

Analysis

We calculated descriptive statistics for the study sample, overall and according to whether or not participants reported having a recent HIV test. In bivariate analysis, categorical variables were compared using the chi-square test and the Fisher's exact test, while continuous variables were compared using Wilcoxon rank-sum test. Using multivariable logistic regression, we fitted an explanatory model for the relationship between the explanatory variables and having a recent HIV test. As previously developed by our team and used successfully in a number of studies (Lima et al., 2008, 2010), a backward stepwise technique was used in the selection of covariates for an explanatory model. The final model was selected by the statistician by minimizing Akaike Information Criterion (AIC) in a stepwise manner, with selection starting with a model including only a constant and adding predictor one at a time. At each step, the effect on AIC is checked by removing a previously added variable, with a lower value suggesting a better fit. Missing data were dropped prior to model selection. Unadjusted (bivariate) odds ratios (ORs), adjusted (multivariable) odds ratios (AOR), 95% confidence intervals (95% CIs) and p-values were reported. Multicollinearity was assessed in the final model using variance inflation factor and tolerance measures and no problematic variables were identified. All statistical analyses were performed using SAS software ("SAS Version 9.3", 2012).

Results

As shown in Table 1, the median age was 35 years (interquartile range, IQR: 28, 42) and the median age at first sex work was 21 years (IQR: 16, 30). Overall, 62.4% were Canadian born, 36.8% reported being of Indigenous/Aboriginal ancestry (inclusive of First Nations, Inuit, Metis) and 27.6% were migrant/new immigrants to Canada. Overall, 45.1% reported primarily off-street solicitation (30.8% indoor venue-based solicitation, 14.3% independent/self-advertising) and 54.9% reported primarily outdoor/public place-based solicitation. Almost half of the participants (44.4%) reported contact with the BCCDC Street Nurse Program in the last six months, 87.4% reported ever having been tested for HIV and 76.1% reported having a recent HIV test (in the last year).

As shown in Table 1, in bivariate analysis, elevated odds of having a recent HIV test was significantly associated (on a $p < 0.05$ level) with older age at first

Table 1. Sample characteristics and bivariate associations (odds ratios [OR] and 95% CIs) with having a recent HIV among street- and off-street SWs in Metropolitan Vancouver, Canada.

	Overall	Had a recent HIV test	Did not have a recent HIV test	OR [95% CIs]	*p*-value
	Proportion (*N*) or median (IQR)				
Age (years)	35.0 (28.0, 42.0)	33.5 [28.0, 42.0]	38.0 [30.0, 43.0]	1.02 [1.00–1.04]	0.760
Age at first sex work (years)	21.0 (16.0, 30.0)	19.0 [14.0, 26.0]	28.0 (18.0, 37.0)	1.07 [1.05–1.09]	<0.001
Sexual minority (LGBTs)					
Yes	23.7% (103)	28.4% (83)	14.0% (20)	0.41 [0.24–0.70]	0.001
No	76.3% (332)	71.6% (209)	86.0% (123)	1.0 (ref)	
Aboriginal/Indigenous Ancestry					
Yes	36.8% (160)	44.5% (130)	21.0% (30)	3.02 [1.90–4.81]	<0.001
No	63.2% (175)	55.5% (162)	79.0% (113)	1.0 (ref)	
Migrant/new immigrant to Canada					
Yes	27.6% (120)	15.1% (44)	53.2% (76)	0.16 [0.10–0.25]	<0.001
No	72.4% (315)	84.9% (248)	46.9% (67)	1.0 (ref)	
Work with manager					
Yes	4.6% (20)	4.8% (14)	4.2% (6)	0.87 [0.33–2.31]	0.779
No	95.4% (415)	95.2% (278)	95.8% (137)	1.0 (ref)	
Condom use by clients					
Inconsistent	16.3% (71)	21.2% (62)	4.2% (6)	3.31 [1.36–8.05]	0.005
Consistent	83.7% (364)	78.8% (230)	95.8% (137)	1.0 (ref)	
Injection drug use					
Yes	35.2% (153)	45.2% (132)	14.7% (21)	4.79 [2.86–8.04]	<0.001
No	64.8% (282)	54.8% (160)	85.3% (122)	1.0 (ref)	
Mental health issues[a]					
Yes	47.6% (207)	55.8% (163)	31.8% (44)	2.84 [1.86–4.34]	<0.001
No	52.4% (228)	44.2% (129)	69.2% (99)	1.0 (ref)	
Primary place of solicitation					
Off-street/Independent/self-advertising	14.3% (62)	14.7% (43)	10.5% (15)	0.68 [0.35–1.33]	0.259
Indoor venue-based solicitation	30.8% (134)	18.8% (55)	57.3% (82)	0.16 [0.10–0.25]	<0.001
Outdoor/public	54.9% (239)	66.4% (194)	32.2% (46)	1.0 (ref)	
Contact with outreach nursing programme					
Yes	44.4% (193)	51.7% (151)	21.8% (42)	2.57 [1.68–3.95]	<0.001
No	55.6% (242)	48.3% (141)	78.2% (101)	1.0 (ref)	
Barrier: language barrier					
Yes	7.1% (31)	1.7% (5)	18.2% (26)	0.08 [0.03–0.21]	<0.001
No	92.9% (404)	99.3% (287)	81.8% (117)	1.0 (ref)	
Barrier: limited hours					
Yes	18.9% (82)	20.9% (61)	14.7% (21)	0.65 [0.38–1.12]	0.120
No	81.1% (353)	79.1% (231)	85.3% (122)	1.0 (ref)	
Barrier: long waiting times					
Yes	35.4% (154)	33.6% (98)	39.2% (56)	1.27 [0.84–1.93]	0.251
No	64.6% (281)	66.4% (194)	60.8% (87)		
Barrier: not knowing where to go					
Yes	6.9% (30)	6.2% (18)	8.4% (12)	1.39 [0.65–2.98]	0.389
No	93.1% (405)	93.8% (274)	91.6% (131)	1.0 (ref)	
Barrier: poor treatment by health professionals					
Yes	12.6% (55)	14.0% (41)	9.8% (14)	0.66 [0.35–1.26]	0.210
No	87.4% (380)	86.0% (251)	90.2% (129)	1.0 (ref)	
Barrier: find it difficult to keep appointments					
Yes	26.7% (116)	32.2% (94)	15.4% (22)	2.61 [1.56–4.38]	<0.001
No	73.3% (319)	67.8% (198)	84.6% (121)	1.0 (ref)	

[a]Self-reported mental health issue.

sex work (OR: 1.07 per year, 95% CIs: 1.05–1.09), being of Aboriginal ancestry (OR: 3.02, 95% CIs: 1.90–4.81), and in the last six months, reporting inconsistent condom use within clients (OR: 3.31, 95% CIs: 1.36–8.05), injecting drugs (OR: 4.79, 95% CIs: 2.86–8.04), contact with the BCCDC outreach nursing programme (OR: 2.57, 95% CIs: 1.68–3.95), having mental health issues (OR: 2.84, 95% CIs: 1.86–4.34) and difficulty keeping appointments as a barrier to health care access (OR: 2.61, 95% CIs: 1.56–4.38). Reduced odds of having a recent HIV test was significantly associated with having a language barrier to health care access (OR: 0.08, 95% CIs: 0.03–0.21), reporting being a migrant/new immigrant to Canada (OR: 0.16, 95% CIs: 0.10–0.25) and soliciting clients primarily indoors (OR: 0.16, 95% CIs: 0.10–0.25) versus in outdoor/public places.

As shown in Table 2, in multivariable analysis, having a recent HIV test remained significantly independently associated with elevated odds of inconsistent condom use with clients (AOR: 2.59, 95% CIs: 1.17–5.78), injecting drugs (AOR: 2.33, 95% CIs: 1.17–4.18) and contact with the BCCDC outreach nursing programme (AOR: 1.76, 95% CIs: 1.09–2.84) within the last six months. Reduced odds of having a recent HIV test was also significantly associated with being a migrant/new immigrant to Canada (AOR: 0.33, 95% CIs: 0.19–0.56) and having a language barrier to health care access (AOR: 0.26, 95% CIs: 0.09–0.73).

Discussion

Our results demonstrate that SWs with acute vulnerability to HIV infection are more likely to have recently been tested for HIV, including SWs reporting inconsistent condom use with clients and injecting drugs in the last six months. SWs who were migrants/new immigrants to Canada and SWs with a language barrier were significantly less likely to be recently tested. Importantly, contact with a mobile safer-environment HIV/STI programme (BCCDC outreach nursing programme) was also independently associated with having a recent HIV test.

In Vancouver, an epidemic among injection drug user populations in the mid-1990s led to concentrated efforts to reach street-entrenched populations over the last two decades, including the recent STOP-HIV/AIDS pilot study initiated in 2010 (O'Shaughnessy et al., 2012). Such programmes have likely resulted in marginalized and vulnerable populations, including SWs and people who use drugs, being more likely to be reached through scaled-up testing efforts. SWs who inject drugs and use condoms inconsistently may also have a higher perceived threat of HIV and other sexually transmitted or blood-borne infections, which previous studies have suggested to be associated with increased use of HIV testing services among SWs (Wang et al., 2011) and others (Balaji et al., 2012; Deblonde et al., 2010). Routine offers of HIV testing for all sexually active individuals may be better able to reach more hidden and isolated populations outside the public health umbrella, such as SWs, who may be less likely to disclose to health providers their occupation in sex work and need for testing (e.g., migrant/new immigrant SWs in long-term/marital partnerships). It is important to note that, ethical concerns relating to routine testing highlight the need to ensure that the development of guidelines and procedures are done in consultation with SWs and do not violate individual human rights (*Guidance Note on HIV and Sex Work*, 2009; *Risks, Rights and Health*, 2012). Evidence has shown that "routine testing" can be misinterpreted or adopted as punitive policies (e.g., coercive and/or mandatory testing practices) that further pushes marginalized SWs away from health services (*Risks, Rights and Health*, 2012).

Our results highlight the importance of mobile services to connect marginalized populations with services to improve health and access to HIV testing; peer-based and SW-led services have been shown to facilitate increased access to condoms, HIV/STI testing and contact with care (Blanchard et al., 2008; Prybylski et al., 2011). Such services enable SWs to use services such as HIV/STI testing by modifying their physical access (i.e., making it easier to keep appointments) and removing operational barriers such as limited hours and long waiting times, while also providing a non-stigmatizing and supportive environment for care. The applicability of new and emerging technologies such as rapid HIV testing, which has been piloted (administered by trained

Table 2. Multivariable associations [adjusted (multivariable) odds ratios (AOR) and 95% CIs] with having a recent HIV test among street- and off-street SWs in Metropolitan Vancouver, Canada.

	AOR [95% CIs]	*p*-value
Migrant/new immigrant to Canada		
Yes	0.33 [0.19–0.56]	
No	1.0 (ref)	<0.001
Condom use by clients		
Inconsistent	2.59 [1.17–5.78]	
Consistent	1.0 (ref)	0.019
Injection drug use		
Yes	2.33 [1.17–4.18]	
No	1.0 (ref)	0.004
Used mobile nursing programme		
Yes	1.76 [1.09–2.84]	
No	1.0 (ref)	0.021
Barrier: language barrier		
Yes	0.26 [0.09–0.73]	
No	1.0 (ref)	0.011

peers) in Vancouver, or a home test kit (which has not yet been approved for use in Canada), could increase access to testing. Our study suggests that migrant/new immigrant SWs (primarily East Asian in our sample) and SWs with language barriers to health care could in particular benefit from scaled-up safer-environment interventions and services. These interventions and services should be designed specifically for the local and cultural context of migrant/new immigrant SWs, and in concert with SWs to ensure safety and comfort, including language support and outreach to SWs' workplaces. Given the high proportion of migrant/new immigrant SWs in off-street venue-based sex work, existing indoor venues provide important potential settings in which to establish sustainable and culturally competent peer-based SW services to facilitate HIV prevention, testing and treatment services.

Connecting all SWs with health services continues to be impeded by current criminalized approaches to sex work in most of Canada. Criminalized and stigmatized SWs are inhibited from accessing HIV services since enforcement of sex work laws forces sex work underground and away from services (*Risks, Rights and Health*, 2012; Shannon et al., 2008). For example, the bawdy house provision in which "owning, managing, leasing, occupying, or being found in a bawdy house, is illegal" [as defined in Section 197, 210 of the Criminal Code of Canada ("Criminal Code, R.S., c. C-34, s. 193.," 1985)] prevents the development of safer indoor sex work spaces as well as reaching hidden indoor SWs. Striking down current sex work laws throughout Canada wide would contribute towards removing barriers to HIV testing and treatment to all SWs.

There are a number of ethical issues that are crucial to consider in the scale up of HIV testing to SWs, including within their own work environments. Safeguards should be implemented to ensure that HIV testing of SWs is voluntary as opposed to mandatory or coercive (*Guidance Note on HIV and Sex Work*, 2009; *Risks, Rights and Health*, 2012). Besides being a violation of SWs' basic human rights, mandatory HIV testing can place SWs' privacy at risk, alienate SWs from health services altogether and can further reinforce stigmatization and marginalization of sex work by perpetuating views that SWs are "vectors of disease" or result in non-disclosure of sex work involvement to health professionals (*Guidance Note on HIV and Sex Work*, 2009; *Risks, Rights and Health*, 2012). A non-confidential negative HIV test can result in coercion by clients or exploitative managers for unprotected sex. Formally recognizing sex work as an occupation through decriminalization would allow sex work to be regulated in a way to protect SWs as well as their clients, with SWs able to collectivize and organize to develop occupational health and safety standards, including regulations about HIV testing to ensure that HIV testing is safe, voluntary and confidential (*Guidance Note on HIV and Sex Work*, 2009; *Risks, Rights and Health*, 2012).

The study design is cross-sectional in nature and thus cannot determine causal relationships between outcome and explanatory variables. Since sampling frames are difficult to construct for hidden populations and was not feasible for our highly mobile study population, the sample was not randomly generated and may not be representative of all SWs in ours or other settings. The non-probabilistic sample also has implications for regression analysis which is considered more valid when samples are probabilistic. Selection bias could also be a potential limitation for this study (with SWs who are more likely to get an HIV test potentially also being those more likely to participate in our survey). Responses may be subject to recall or social desirability bias. To attract as representative a sample as possible, we made use of our experienced mobile outreach teams who kept detailed records of the key times when SWs work (tailored to different locations) and locations of outdoor sex work spaces (going back a decade) and indoor spaces and how they change over time. We recruited participants through this targeted outreach (Stueve, O'Donnell, Duran, San Doval, & Blome, 2001), an approach considered one of the best methods of recruitment for mobile/hidden populations. We also had a large sample size for both hidden street- and off-street SWs. Our interviewers had extensive experience working with SWs in the community and interviews were conducted in spaces where women were comfortable (i.e., indoor sex work venues or confidential research offices, as chosen by the participants), facilitating accurate responses.

Our results highlight the successes of HIV testing in reaching SWs most vulnerable to HIV infection through sexual and injection drug pathways. Increased mobile and safer-environment interventions involving peers who facilitate access to HIV testing for more hidden SWs, particularly migrant workers and those with language barriers remain a critical priority. Scaling up the broader implementation of routine offers of HIV tests across the entire system of care (e.g., primary care, acute care) should be used as a method to reduce the stigma of needing to identify as being a member of a "high-risk" population or having participated in stigmatized behaviour such as sex work. Removal of criminal sanctions on safer indoor work spaces that facilitate access to health and support services, including supportive and voluntary sexual health and HIV testing, provision, warrant consideration and needed to be developed and adopted with direct involvement of SWs.

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manuscript. CF performed statistical analysis and reviewed the manuscript. KS made key contributions to the conceptual and analytic design of the study and takes responsibility for the accuracy of the data. We thank all those who contributed their time and expertise to this project, including participants, partner agencies and the AESHA Community Advisory Board. We wish to acknowledge Peter Vann, Calvin Lai, Eric Fu, Ofer Amram, Jill Chettiar, Alex Scot and Kathleen Deering for their research and administrative support.

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