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HIV/STI risk among venue-based female sex workers across the globe: A look back and the way forward

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Abstract

Female sex workers (FSWs) continue to represent a high-risk population in need of targeted HIV prevention interventions. Targeting environmental risk factors should result in more sustainable behavior change than individual-level interventions alone. There are many types of FSWs who operate in and through a variety of micro- (e.g., brothels) and macro-level (e.g., being sex-trafficked) contexts. Efforts to characterize FSWs and inform HIV prevention programs have often relied on sex work typologies or categorizations of FSWs by venue or type. We conducted a systematic search and qualitatively reviewed 37 published studies on venue-based FSWs to examine the appropriateness of sex work typologies, and the extent to which this research has systematically examined characteristics of different risk environments. We extracted information on study characteristics like venue comparisons, HIV/STI prevalence, and sampling strategies. We found mixed results with regards to the reliability of typologies in predicting HIV/STI infection; relying solely on categorization of FSWs by venue or type did not predict seroprevalence in a consistent manner. Only 65% of the studies that allowed for venue comparisons on HIV/STI prevalence provided data on venue characteristics. The factors that were assessed were largely individual-level FSW factors (e.g. demographics, number of clients per day), rather than social and structural characteristics of the risk environment. We outline a strategy for future research on venue-based FSWs that ultimately aims to inform structural-level HIV interventions for FSWs.

Keywords

female sex work; HIV; risk environments; social factors; structural interventions; HIV prevention

INTRODUCTION

Women who engage in sex work are considered a high risk group for transmitting HIV and other sexually transmitted infections (STIs). Estimates of the proportions of female sex workers (FSWs) among women in different regions around the world range from 0.2% to 2.6% in Asia, 0.4% to 4.3% in sub-Saharan Africa, and 0.2% to 7.4% in Latin America [1]. Further, data from 77 countries suggest that the number of HIV-infected FSWs is the strongest predictor of countrywide HIV prevalence in the general population [2]. Not only do female sex workers frequently engage in high risk sexual behavior, they are exposed to multiple harms [3] including illicit drug use [4,5], violence [6,7], stigma and discrimination

[8,9], and exploitation [10]. Thus, comprehensive social interventions must continue to focus on the multiple needs of this vulnerable population. While risk reduction interventions targeted at FSWs have focused on individual-level factors [11,12], more recently efforts have been made to address the social and environmental factors that may influence HIV risk [13–19].

Women who sell sex work in a variety of environments. They solicit sex from different venues (e.g., brothels, bars, streets) or through different mediums (e.g., pimps, classified ads, telephone-service) and have sex with clients in different places (e.g., motels, homes, bars, vehicles, public places, alleyways). In recent years, prevention scientists have demonstrated the effectiveness of targeting structural factors, or factors exogenous to the individual, in HIV risk reduction interventions [13,14,18]. In doing so, interventions are argued to result in more sustainable behavior change. Given the broad spectrum of types of venues and risk environments in which FSWs operate, an organizing conceptual framework will inform harm reduction and intervention efforts.

One organizing approach has been to create typologies of female sex work. Harcourt and Donovan reviewed the literature on female sex work and differentiated between “direct” and “indirect” sex work [20]. They described ‘direct’ sex work as sexual services in which the primary purpose of the interaction is to exchange sex for a fee; women involved in direct sex work typically rely on this as their primary source of income. Working in a brothel is the most common and well known example of involvement in direct sex work. In contrast, women in ‘indirect’ sex work often have legitimate occupations providing non-sexual services to patrons in places like bars and massage parlors, and through this occupation they also solicit sex to clients. It is often the case that for women in indirect sex work selling sex is not always the sole or primary source of income for the women. While this direct vs. indirect typology provides an important step towards guiding research and intervention efforts, Harcourt and Donovan emphasize that there remains great variability in the social context and potential harms within both types of sex work.

Another approach to understanding structural factors relating to HIV risk is the risk environment framework developed by Rhodes and colleagues [21,22]. This framework gives primacy to the social and environmental context in influencing HIV-related risk behaviors. It encourages a focus on interactions between risk factors exogenous to the individual, and posits that physical, social, economic, and political factors operate at both micro-environmental and macro-environmental levels to confer risk or protection from HIV/STIs. Originally developed to understand HIV risk among injection drug users, this framework has also been successfully applied to understanding HIV risk among FSWs, as well as their male clients [14,23,24].

Sex work typologies, or at least distinctions between various types of sex workers, are often used in research on FSWs. For example, studies may examine categories of venues as an independent variable predicting HIV infection or sexual risk behavior. In addition, survey research on FSWs will often take typologies into account as part of the sampling strategy [25]. Categorization of sex workers into different types or venues have also been relied upon in the development of HIV prevention strategies and programs. Given this reliance, it is important to examine the extent to which sex work typologies provide meaningful and reliable information on HIV risk [25]. These typologies should not only reliably predict levels of HIV risk, they should also examine the characteristics of the different risk environments across venues. Not doing so limits the understanding of the underlying factors that may account for differential levels of HIV risk between the types of venue-based FSWs.

In this paper, we review the body of literature that has explicitly identified types/venues of sex workers and has examined HIV/STI prevalence across venues. Our primary aim was to examine the extent to which researchers have done work to characterize risk environments, as opposed to solely relying on the categorization of venues as an independent variable predicting HIV/STI risk. That is, we aimed to examine whether researchers are systematically assessing differences between venues/types along various factors related to the FSW (e.g., age, cost per sex act, mean number of clients per day), the clients (e.g., SES of typical clientele), or to the venues themselves (e.g., condom availability). In so doing, this review evaluates the appropriateness of using sex work typologies to inform HIV prevention programs for FSWs. We also have secondary aims to examine the extent to which researchers have been clear about labeling venues with regards to both solicitation of clients and the location where sexual transactions take place, a distinction that has important implications for the development of prevention programs. Finally, we also pay attention to the sampling strategies employed by the studies included in this review, as FSWs represent a hidden and difficult-to-reach population.

METHOD

Inclusion Criteria

Studies were included in this review if they met all of the following criteria: (1) Studies of FSWs; (2) Quantitatively examined prevalence of HIV and/or other STIs (either through biological samples and/or self-report); (3a) Explicitly identified venue/type(s) of FSW (e.g., brothel-based, entertainment venues, streetworkers) and (3b) If the study recruited FSWs from multiple venues, provided comparisons between those venues in HIV/STI prevalence. Because one secondary aim of this review was to examine to extent to which authors define whether the venue label refers to the place where FSWs solicited clients or where FSWs had sex with clients, we did not eliminate studies that only recruited from one venue (e.g., the study included on brothel-based women).

Search Strategy

In our review we followed the accepted guidelines outlined by the PRISMA (preferred reporting items for systematic reviews and meta-analyses) statement [26]. We searched PubMed and PsycInfo by cross-referencing multiple search terms including “female sex work,” “commercial sex,” “sex industry,” “sell sex,” “exchange sex,” “sex trafficked,” “prostitution,” with “HIV risk,” “HIV infection,” “HIV prevalence,” “sexually transmitted infection” for citations available in these electronic databases through March 2012. We also searched the World Health Organization public databases. Following PRISMA recommendations, our process for determining eligibility of inclusion is depicted in Figure 1.

This search strategy yielded a total of 1,649 records (1,354 PubMed records and 295 PsycInfo records). We reviewed titles of all of these records for relevance for this review. For example, we scanned titles for phrases like “HIV prevalence” or “HIV infection among sex workers.” This resulted in 343 abstracts to review after duplicate records were removed. The first and the third author reviewed these abstracts independently. Of the 343 abstracts, 141 were removed because they provided commentaries and no data, or were randomized controlled trials, or alternate research designs. Another 56 qualitative studies, 29 studies that examined male or transgender sex workers, and 30 that did not provide sufficient descriptions of the sample (e.g., did not explicitly identify venues or types of sex workers, or when this was identified, did not provide comparisons between the venues on HIV/STI) were excluded. This resulted in 87 full-text articles that were assessed for eligibility. From these 87, we removed 41 articles that reported behavioral data (e.g., condom use) only and

not HIV/STI infection, 4 articles that did not provide data on venue differences in HIV/STI prevalence, and 5 articles that used duplicate samples to other articles included in the final review (we included more recent and/or studies that had a larger sample size). In the end, 37 studies were included in this review.

Study Characteristics

We coded various study characteristics. Specifically we extracted information on publication date, location of study/sample, type of FSWs included in the sample, comparison groups of FSWs being evaluated in the study, whether the categorization or labeling of venue defined where clients were being solicited or serviced (i.e., where sex took place), HIV/STI prevalence differences between venues, how HIV/STI was assessed, whether and what venue differences were assessed apart from HIV/STI prevalence, and sampling strategy used.

Overview of Review

The primary aim of this study was to assess the appropriateness of sex work typologies, or the categorization of types of FSWs in understanding HIV risk. To investigate this, we assessed the validity of findings regarding differential HIV/STI prevalence as a function of venue. Specifically, we examined the extent to which seroprevalence was found to be reliably higher or lower among “direct” FSWs compared to “indirect” FSWs across the studies, and the extent to which seroprevalence was found to be reliably higher or lower among brothel-based vs. other FSWs.

RESULTS

A total of 37 studies spanning 2 decades (1992–2012) were included in this review (Table 1). Eight (21.6%) of the studies were published in the last two years (i.e., through 2010–2012), and 3 (8.1%) were published prior to 1996 and the advent of highly active antiretroviral therapy. Seventeen different countries were represented. The studies were primarily conducted in Asia (Vietnam, India, China, Cambodia, Thailand, and Singapore; $n=23$, 62%), South America (i.e., Bolivia, Guyana, and Mexico; $n=5$, 14%), North America (i.e., the United States and Canada; $n=2$, 5%), Western Europe (i.e., Scotland and England; $n=2$, 5%), Eastern Europe (i.e., Uzbekistan and Estonia; $n=2$, 5%), and sub-Saharan Africa (i.e., Democratic Republic of Congo and Ghana; $n=2$, 5%).

HIV/STI testing

All but two of the studies (Minh et al., 2004 and Shannon et al., 2005 used self-report) assessed HIV and/or STI using biological samples. Nine (25.7%) of the 35 studies using biological data did not determine seroprevalence and instead tested different STI (e.g., syphilis or HSV-2).

Venues/Typologies

Various venues and types of FSWs were represented by the studies included in this review. Counting each “group” (e.g., brothel-based, street-based, “direct,” and “indirect” FSWs) across the 37 studies, there were a total of 84 venues/typologies. Among these 84 categories, street-based FSWs represented the plurality ($n=15$, 17.9%), followed by brothel-based ($n=12$, 14.3%), an “other” category ($n=5$, 6.0%), home-based ($n=4$, 4.8%), bar ($n=3$, 3.6%), freelance ($n=2$, 2.4%), telephone-service ($n=2$, 2.4%), and sauna ($n=2$, 2.4%). Six (16.2%) of the 37 studies compared “direct” to “indirect” FSWs. Other venues that were examined across the studies included FSWs in hotels, hair salons, and entertainment establishments (e.g., nightclubs, karaoke bars) and other unique groups of FSWs included “beer-girls,”

Dhaba, or roadside resting places for truckers and other long-distance motorists in Karnataka, India [25], and *Phaseures*, or homeless people living and working on the street [27] and *Masquéés*, or women involved in clandestine or occasional sex work in the Democratic Republic of Congo [27].

A common comparison in HIV/STI prevalence was between “direct” and “indirect” FSWs. These included older as well as more recent papers (i.e., 1992 to 2009). All 6 of the studies that made this comparison found higher HIV/STI prevalence among direct than indirect FSWs. Of the 37 studies, 14 (37.8%) compared brothel-based FSWs to some other group (e.g., “other,” street-based, entertainment). Across these 14 studies, 7 (50%) found a greater prevalence of HIV/STI among brothel-based FSWs, 6 (42.9%) found a lower prevalence among brothel-based FSWs, and 1 (7.1%) found an equal HIV/STI prevalence.

Assessment of Venue Differences

Eleven (29.7%) of the studies recruited only one particular type of venue-based sex worker (e.g., street-based or brothel-based only). Not all of the studies examined differences between venues beyond differences in HIV/STI prevalence. Of the other 26 studies that identified different types of FSWs in their study, 17 (65.4%) tested differences in various characteristics between different types of FSWs. However, upon close examination of those 26 studies examining differences between venue-based FSWs, only 4 (15.4%) measured characteristics exogenous to individual FSWs. Three of those 4 studies measured client characteristics (e.g., age of clients, SES of clients, frequency of commercial sex used by clients, client occupation), and only 1 (Li et al., 2012) of the 26 studies asked about a venue-level factor, namely whether there were HIV prevention activities at the participant’s sex work location. Finally, of the 14 studies that compared brothel-based FSWs to some other group, 4 (28.6%) did not assess venue differences in FSW, client, or venue characteristics. Interestingly, these 4 studies were 4 of the 6 that found a lower prevalence of HIV/STI among brothel-based women to the other group(s), precluding examination of some potential reasons for why these differences were found.

Solicitation vs. Place of Sex

In light of the risk environment framework, an important distinction with regards to HIV risk among venue-based FSWs is the location in which FSWs solicit clients versus the location in which the sexual transaction takes place. For example, a sex worker may solicit a client on a street, and she may have sex with him on the street corner or in a motel. These different contexts may have substantially different influences on HIV risk (e.g., the FSW and client may be less likely to be caught by the police in a motel). In another example, different levels of risk may result from soliciting and servicing a client in a brothel, compared to soliciting and servicing a client in a bar, where alcohol use may compromise safer sex negotiation. Of the 37 studies in this review, 16 (43.2%) were not explicitly clear about whether the venues defined the place where the client was solicited or serviced. One notable exception is Buzdugan et al. (2010); in this study the authors assessed place of solicitation and sex separately. In doing this they were able to categorize FSWs by both (e.g., street-solicited and street sex vs. street-solicited and motel sex).

Sampling

The majority of the studies (n=20, 54.1%) relied solely on convenience sampling to recruit participants, whereas the other 17 (45.9%) utilized either an entirely different sampling strategy (e.g., cluster sampling, or respondent driven sampling) or some combination of convenience sampling and another method. Of the 8 studies published in the last two years, 37.5% (n=3) used only convenience sampling, whereas of the 29 studies published prior to

2010, 58.6% (n=17) relied solely on this method, suggesting a greater use of more advanced sampling methods in recent years.

DISCUSSION

We reviewed the literature on venue-based FSWs and HIV risk to examine the appropriateness of relying solely on categorization of types of FSWs as an independent variable predicting HIV and other sexually transmitted infections. We found that the “direct vs. indirect” sex work typology appears useful for differentiating between samples of FSWs who had higher versus lower HIV/STI prevalence. Comparisons between brothel-based FSWs with other types or venues did not yield consistent results, suggesting that categorizing FSWs by venue or type may not always be meaningful for understanding HIV risk, without also examining contextual factors that might explain venue differences.

The risk environment conceptual framework has been shown to be useful in understanding HIV risk among high risk groups, including FSWs. Research that has systematically examined the risk environments of FSWs using quantitative methods has been conducted in Mexico and the Philippines [14,23]. Strathdee and colleagues studied FSWs from Tijuana and Ciudad Juarez, Mexico who injected drugs and found that risk environment factors (e.g., police confiscation of syringes, injecting drugs with a client) were independently predictive of HIV infection rather than individual-level factors [14]. Based on these findings, the authors suggested that interventions should target unjustified policing practices and clients’ risk behaviors, and not solely target individual-level risk behaviors of FSWs. Similarly, Urada and colleagues studied women who engaged in sex trade in entertainment venues in Manila, Philippines and also found that social and structural factors such as less manager contact and not following co-workers’ condom use advice were predictive of inconsistent condom use more so than individual-level risk behaviors [23].

Qualitative research has also been conducted to characterize the risk environments of FSWs in Canada and Serbia [28–30]. For example, Krüsi and colleagues found that low-barrier, supportive housing for marginalized women who engage in sex work promoted women’s increased control over negotiation of sex work transactions. Environmental-structural factors such as support from staff and police in removing violent clients were associated with improved police relationships and the institution of informal peer-safety mechanisms which supports the notion that safer sex indoor sex work environments may improve FSWs’ health [28]. In Serbia, Rhodes and colleagues interviewed female and transvestite sex workers and found that the experience of violence from both clients and police was normative and was linked to unprotected sex, suggesting the need for legal protections for sex workers in this country [30]. Similar methods and approaches may be used to understand HIV risk and inform HIV risk reduction programs for venue-based FSWs around the world.

For those particularly interested in studying venue-based FSWs, we put forth a conceptual framework for this type of research, depicted in Figure 2. The model hypothesizes that HIV risk among FSWs is partly a function of venues or types of sex work, but also proposes that different structural characteristics *explain* such venue differences in HIV risk. For example, in one study, brothel-based FSWs in Thailand were shown to have a lower prevalence of HIV than street-based FSWs [31]; this difference may have been explained by the condom policies instituted in brothels, but this hypothesis was not formally tested. In another study, brothel-based FSWs in Cambodia had higher HIV prevalence than entertainment venue-based FSWs [32]; had it been assessed this difference may have been explained by the client-perpetrated violence that may be more likely to occur in the privacy of brothels. As these examples illustrate, risk environment characteristics should be assessed in research on venue-based FSWs. The model we put forth is akin to predicting a mediated process in

which venue-level factors are proposed to account for venue differences in HIV risk. By going beyond categorizing FSWs by venue or type, the assessment of characteristics of the FSW risk environment would provide valuable information for the development of HIV prevention programs targeted for this population. In addition, whereas sex work venues including streets may be considered as micro-environments in which FSWs operate, there is also a need to consider the larger, macro-level contexts surrounding women's lives, including community and legal factors. For example, collective power and community mobilization in India [19,33], community solidarity and safer sex government policy in the Dominican Republic [18], social cohesion and mutual aid in the community of Rio de Janeiro, Brazil [34], and both residential instability and parenting challenges in Andhra Pradesh, India [35,36] have all been demonstrated as macro-level structural forces influencing HIV risk among FSWs.

The clandestine and often illegal nature of sex work results in FSWs being a hidden and difficult-to-reach population. Consequently, studies of FSWs must often rely on convenience sampling (e.g., from STI clinics or visible and well-known brothels). Unfortunately, however, evidence suggests that harder to access FSWs tend to have higher STI prevalence [37]. Results from this review suggest that these more advanced sampling methods have been utilized more in recent years. While efforts should be taken to de-stigmatize sex work, other methods different from convenience sampling may be used, like time-location sampling. Unfortunately, police sweeps and other logistical problems can complicate the ability to select venues at random [38]. While some studies have reported success in recruiting FSWs and/or female IDUs through respondent-driven sampling (RDS) [39,40], others have not [41,42,43], suggesting that RDS [43–45] should be preceded by formative research to properly tailor this sampling method to the sociocultural context [46]. Altogether, more research is necessary to provide more information and guidance on proper sampling strategies to increase access to FSWs.

CONCLUSION

In this paper we reviewed the literature on HIV and other sexually transmitted infections among venue-based FSWs. Overall, results suggest that without more meaningful and rich assessments of risk environments, the use of false dichotomies or categorizations of FSWs may mask associations by grouping together FSWs who have very different risk profiles. In addition to information gleaned from quantitative methods, more qualitative and mixed method research is required to adequately describe the context of risk environments. The use of both quantitative and qualitative methods would also allow for detection of measurement bias from a given method [47], and the data gathered from one method may be used to complement and aid interpretation of findings from the other, painting a more comprehensive and rich picture of the risk factors at play. Understanding the social, physical, economic, and physical factors surrounding and influencing risk behaviors among different FSWs around the world is essential for HIV prevention aims. Ultimately, the conceptual and methodological approach outlined here should aid the development of effective and sustainable tailored HIV prevention interventions targeting FSWs.

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Figure 1.
Elimination process for the current review.

Figure 2. Proposed conceptual framework for HIV prevention research on venue-based female sex workers whereby macro- and micro-level risk environment factors are systematically assessed and hypothesized to explain venue differences in HIV risk.

Summary of studies reviewed (n=37)

TABLE 1

Study Authors, Date	City, Country	Sample	Venue/Type of Sex Work	Venue defines place where clients solicited or serviced	HIV/STI Prevalence ^a	Venue Differences Assessed ^b	Sampling Method
McKeganey et al. (1992) ⁴⁸	Glasgow, Scotland	206 street-based FSW's from Glasgow red light area	Street-based only	Solicited	2.5% HIV+ (out of 159)	--	Convenience
Rehle et al. (1992) ⁴⁹	Khon Kaen, Thailand	356 FSW's in Khon Kaen	Direct (i.e., brothel) vs. Indirect (i.e., massage parlour)	Solicited and serviced	12% HIV+ among direct > 2% among indirect	Age; Age first sold sex; Education; Total year in sex work; Total years of sex work in Khon Kaen; Avg. no. of clients per night; International clients per month; Condom use; Anal sex; Oral Sex	Convenience
van Griensven et al. (1995) ⁵⁰	Thailand	800 FSW's in Northern and Southern Thailand	Direct (e.g., brothels) vs. Indirect (e.g., bars, massage parlours, karaoke clubs)	Direct = solicited and serviced; Indirect = solicited	31.7% HIV+ among direct > 6.4% among indirect	Age; Age started sex work; Condom use; Geographic Origin	Convenience
Thuy et al. (1998) ⁵¹	Vietnam	968 FSW's in Southern Vietnam from "education establishment centers" (i.e., have been arrested)	Brothel vs. Other (street, entertainment establishments, home)	Undefined ("working place" of participant)	8.4% HIV+ among brothel-based > Other (Total seroprevalence = 5.2%)	Condom use; Client characteristics (i.e., SES, frequency of use of commercial sex, occupation)	Convenience
Levine et al. (1998) ⁵²	La Paz, Bolivia	508 brothel-based sex workers attending an STI clinic in La Paz	Brothel-based only	Solicited and serviced	9.9% gonorrhea, 8.7% syphilis, 1.3% genital ulcers, 10.9% chlamydia, 16.3% trichomoniasis	--	Convenience
Limpakarnjanarat et al. (1999) ⁵³	Chiang Rai, Thailand	500 FSW's from the Chiang Rai provincial STI clinic	Brothel vs. Other (e.g., massage parlours, music clubs, bars, restaurants, barber shops, etc.)	Brothel = solicited and serviced; Other = undefined	47% HIV+ among brothel > 13% among other (Total seroprevalence = 32%)	Age; Education; Marital status; Children; Age at first commercial sex; No. of sex partners and fee on most recent day worked	Convenience
Uribe-Salas et al. (1999) ⁵⁴	Mexico City, Mexico	757 FSW's in Mexico City	Street vs. Bar vs. Massage Parlour	Undefined ("work site")	78.9% HSV-2 among street > 55.4 among bar = 44.4 among massage parlour	None	Targeted Sampling ⁵⁵
Persaud et al. (1999) ⁵⁶	Georgetown, Guyana	124 FSW's from the streets and two popular	Brothel vs. Street	Brothel = solicited and serviced; Street = undefined	45% HIV+ among brothel = 46% among street	Age; Children; Marital Status, Education; Other source of income; Ethnicity; Length of time in sex work; No. clients	Convenience

Study Authors, Date	City, Country	Sample	Venue/Type of Sex Work	Venue defines place where clients solicited or serviced	HIV/STI Prevalence ^a	Venue Differences Assessed ^b	Sampling Method
		brothels in Georgetown				per work day; Condom use with clients and regular non-commercial sex partners; Substance use	
Wong et al. (1999) ⁵⁷	Singapore	444 free-lance FSWs arrested for illicit prostitution and randomly selected brothel-based FSWs)	Brothel vs. Freelance (i.e., solicit on streets, bars, nightclubs, karaoke lounges, or massage parlors or have pimps or agents who solicit)	Brothel = solicited and serviced; Freelance = solicited	34.8% any STI among freelance >24% among brothel	Nationality; Race; Age; Duration of sex work in Singapore; Education; No. clients per day; Condom use	Convenience (for freelance) and random (for brothel-based)
Ohshige et al. (2000) ³²	Sisophon, Cambodia	237 FSWs in Sisophon	Direct (i.e., brothel) vs. Indirect (i.e., legitimately employed in hotels, nightclubs or restaurants as maids, waitresses, dancing girls or beer promotion girls)	Brothel = solicited and serviced; Indirect = solicited	52.4% HIV+ among direct > 22.3% among indirect	Age; Nationality; Marital Status; Social support; Age started sex work; Duration of sex work; No. clients per day; Earnings per client; Condom possession; Condom use; History of STI; HIV knowledge; Post-coital hygiene; Method of genital hygiene	Convenience
Asamoah-Adu et al. (2001) ⁵⁸	Accra, Ghana	1013 FSWs from clinics for sex workers in Accra	Seaters (i.e., work out of own home) vs. Roamers (i.e., find customers in bars, hotels, brothels, or on the street)	Seaters = solicited and serviced; Roamers = solicited	74% HIV+ among seaters > 26% among roamers	Age; Region of origin; Ethnicity; Marital status; Children; Price per intercourse; Duration of sex work; Average number of clients per day; Sex work outside Ghana; Condom use	Convenience
Uribe-Salas et al. (2003) ⁵⁹	Soconusco, Mexico	484 FSWs from sex work-related bars in the municipalities of the Soconusco region	Bars only	Undefined	0.6% HIV+, 9.4% T pallidum, 85.7% HSV-2, 11.6% N gonorrhoeae, and 14.4% C trachomatis	--	Targeted Sampling
Minh et al. (2004) ⁶⁰	Nha Trang, Vietnam	610 FSWs in Nha Trang	Direct (i.e., street and beach) vs. Indirect (i.e., bars, restaurants, other facilities)	Solicited	19% self-reported prior STI among direct > 16% among indirect	Age; Marital Status; Children; Education; Previous occupation; Reasons for entering sex work; Age entered sex work; Time in sex work; Expected further time in sex work; Occupation of clients; HIV knowledge	Targeted Sampling
Balazar Reyes et al. (2005) ⁶¹	Cuautla, Mexico	100 FSWs from the red-light district of	Bars and night clubs only	Undefined	11% STI (syphiis and chlamydia)	--	Convenience

Study Authors, Date	City, Country	Sample	Venue/Type of Sex Work	Venue defines place where clients solicited or serviced	HIV/STI Prevalence ^a	Venue Differences Assessed ^b	Sampling Method
Cuaulia attending an STI clinic							
Tran et al. (2005) ⁶²	Hanoi, Vietnam	400 non-institutionalized FSWs	Middle-class FSWs (i.e., karaoke bars, hotels, massage parlors, guest houses, or dance clubs or stayed home and waited for calls from the above) vs. Lower-class FSWs (i.e., street or brothels)	Solicited	Total seroprevalence = 12%, HIV+ lower class > middle class	Age group of clients; Types of clients (e.g., businessmen, laborers); Ave. no. clients per day	Two-stage cluster sampling
Sarkar et al. (2005) ⁶³	Kolkata, India	622 brothel-based FSWs in Kolkata	Brothel-based only	Solicited and serviced	9.6% HIV+	--	Random (brothels) & convenience (participants)
Shannon et al. (2005) ⁶⁴	Vancouver, Canada	159 women engaged in survival sex from a low-threshold drop-in centre servicing street-level SWs in Vancouver	Street-based	Solicited	23% self-reported HIV+ (self-reported HIV testing > 95%)	--	Convenience
Kim et al. (2005) ⁶⁵	Cambodia	114 beer girls in Cambodia	Beer-girls only	Solicited	26.1% HIV+, 50% any STI (gonorrhea, chlamydia, trichomonas) and/or bacterial vaginosis	--	Convenience
Inciardi et al. (2006) ⁶⁶	Miami, United States	586 drug-involved, inner-city, street sex workers in Miami	Street-based only	Solicited and sometimes serviced	22% HIV+, 53% HBV, 30% HCV	--	Targeted Sampling
Sarkar et al. (2006) ⁶⁷	West Bengal, India	2076 sex brothels of West Bengal	Brothel-based only	Solicited and serviced	5.9% HIV+	--	Convenience
Todd et al. (2006) ⁶⁸	Tashkent, Uzbekistan	448 FSWs in Tashkent (some attending a counseling center)	Telephone service vs. Street-based vs. Brothel/pimp	Solicited	73.3% HIV+ among street > 62.2% among telephone service > 4.4% among brothel/pimp	None	Convenience and Modified snowball sampling

Study Authors, Date	City, Country	Sample	Venue/Type of Sex Work	Venue defines place where clients solicited or serviced	HIV/STI Prevalence ^a	Venue Differences Assessed ^b	Sampling Method
O'Farrell et al. (2006) ⁶⁹	Vietnam	904 FSW's in five border provinces of Vietnam	Direct (i.e., streets, parks, bus stops, boats, ferry piers, brothels and guesthouses) vs. Indirect (i.e., hotels, restaurants, massage parlours, cafes, kar-aoke lounges, bars and barsbershops)	Undefined ("selling sex from")	Direct > Indirect, Total HSV-2 = 27.7%	None	Targeted Sampling
Ruan et al. (2006) ⁷⁰	Southwest China	343 FSW's in a southwestern Chinese city located on a drug-trafficking route	High-end (i.e., star hotels, big karaoke and dancing bars, saunas, and VIP clubs) vs. Low-end (i.e., hair salons, massage parlors, small hotels, streets)	Undefined	20.1% syphilis among low-end > 11.5% syphilis among high-end	None	Convenience
Vandepitte et al. (2007) ⁷¹	Kinshasa, Democratic Republic of Congo	502 FSW's presenting for the first time in an STI clinic	Hotel vs. Home vs. Street vs. Phaseures (homeless people living and working on the street) vs. Masquees (women involved in clandestine or occasional sex work)	Hotel, Home, Street Solicited Phaseures, Masquees = Undefined	24.0% HIV+ among home-based > 20.0% among street > 11.8% among hotel > 10.0% among Phaseures > 6.6% among Masquees	Compared Masquees to others in Age; Education; Months in prostitution; Age at sexual debut; Steady partner; No. clients last working day/week; Condom use; Cost per sex act/night	Convenience
Sopheab et al. (2008) ⁷¹	Cambodia	1079 brothel-based FSW's in Cambodia	Brothel-based only	Solicited and serviced	Any STI 24.4% (13% gonorrhoea, 14% chlamydia, 2% syphilis)	--	Two-stage cluster sampling
Uuskula et al. (2008) ⁷²	Tallinn, Estonia	227 FSW's in Tallinn	Street vs. Brothel/apartment (i.e., supervised by organized sex industry) vs. Other (i.e., sex work entrepreneurs - "self-employed", soliciting sex at alcohol vending venues or hotels, other)	Street = undefined, Brothel = solicited and serviced, Other = Solicited	Street > Brothel/apartment > Other, Total seroprevalence = 7.6%	None	Multistage approach combining time- location, community and respondent-driven sampling

Study Authors, Date	City, Country	Sample	Venue/Type of Sex Work	Venue defines place where clients solicited or serviced	HIV/STI Prevalence ^a	Venue Differences Assessed ^b	Sampling Method
Shahmanesh et al. (2009) ⁷³	Goa, India	326 FSWs in Goa	Street vs. Establishment (i.e., lodge/bar or brothel) vs. Home-based	Undefined	Street > Other, Total seroprevalance = 25.7%	None	Respondent Driven Sampling
Wang et al. (2009) ⁷⁴	Kaiyuan City, China	737 FSWs in Kaiyuan City	Higher risk venues (i.e., streetwalkers, temporary sublets, and beauty salons) vs. Lower risk venues (saunas, karaoke, hotels, night clubs)	Undefined	17.9% HIV+ among higher risk > 5.7% among lower risk	Age; Nationality; Education; Marital status; Tooth filling; Tattoo; Blood transfusion; Vaginal douching; Drug use; Duration in sex work; No. clients in previous week; Condom use with clients and with regular non-commercial partners; Earnings per client	Convenience
Nguyen et al. (2009) ⁷⁵	Soc Trang province, Vietnam	406 FSWs in Soc Trang	Direct (i.e., income only from selling sex, and working on the streets, in parks, at us stops, on oats, on ferry piers, in rot els, at small cafés and at guesthouses) vs. Indirect (i.e., income from both selling sex and their employment in hotels, restaurants, massage parlors, karaoke lounges, bars, and barbershops)	Brothel = solicited and serviced. All else = solicited	6.5% HIV+ among direct > 0.5% among indirect. Total seroprevalance = 3.3%	Age; Residence; Education; Living along; Early sexual debut; Clients per month; Withdrawal as contraceptive method; Condom use; Illicit drug use	Convenience
Nhurod et al. (2010) ³¹	Bangkok, Thailand	684 FSWs from 3 public STI clinics in Bangkok	Street vs. Other (i.e., brothel, entertainment venue, others)	Undefined	45.8% HIV+ among street-based > 4.2%	Age; Place of birth; Education; Condom use with clients and with steady and casual non-commercial partners; History of injection drug use	Convenience
Buzdugan et al. (2010) ²⁵	Karnataka, India	2312 FSWs from 5 districts in Karnataka	Categorized by where FSWs solicited and where serviced clients: Home, Rented room, Lodge, Dhaba (roadside resting place for truckers and other long-	Solicited and serviced (asked separately)	34.0% among brothel to brothel, 29.6% among street to lodge, 19.1% among street to street, 15.7% among street to home, 14.0% among home to home, 12.7% among street to rented room, 11.1% among other	Monthly client volume; Mean occasional and regular clients; Condom breakage in last month; Anal sex with clients; Physical force to have sex; Alcohol in past week; HIV tested	Conventional cluster and time-location cluster sampling

Study Authors, Date	City, Country	Sample	Venue/Type of Sex Work	Venue defines place where clients solicited or serviced	HIV/STI Prevalence ^a	Venue Differences Assessed ^b	Sampling Method
Couture et al. (2011) ⁷⁶	Phnom Penh, Cambodia	160 FSWs from Young Women's Health Study in Phnom Penh	distance motorists), Brothel, Vehicle, Street, Other	Undefined	37.3 HIV + among freelance > 19.2% among multiple, 17.4% among brothel, 9.8% among entertainment	None	Convenience
Kang et al. (2011) ⁷⁷	Qingdao, China	1187 FSWs in Qingdao	Brothels vs. Entertainment vs. Freelance (i.e., outside of entertainment establishments, in private apartments, streets, and parks)	Undefined	4.5% syphilis among hair/beauty salon, 2.7% among club/bar/sauna/hotel, 2.5% among street	Age; Marital status; Ethnicity; Residency; Education; Age at sex debut; Age at first sex work; Duration of commercial sex; Condom use with clients; No. clients in past week; Condom use with regular non-commercial partners; Substance use; HIV knowledge; Uptake of HIV/STI services	Combined cluster and stratified sampling
Miller et al. (2011) ⁷⁸	Vancouver, Canada	255 street-based youth engaged in survival sex in Vancouver	Street-based only	Undefined	23% HIV+	--	Time-location sampling
Platt et al. (2011) ⁷⁹	London, England	268 indoor FSWs in London	Bar/private/other vs. Escort agency vs. Flat vs. Sauna	Solicited	23.5% HIV/STI among bar/private/other, 11.9% among escort, 7.7% among flat, 5.6% among sauna	None	Convenience
Li et al. (2012) ⁸⁰	Liuzhou, China	583 FSWs in Liuzhou	Two ways: 1) Low-, Middle-, and High-paid categories based on 3 pricing ranges charged per vaginal sex, 2) KTV - based (FSWs working at karaoke bars, night clubs, and bars) vs. sauna/bathhouses vs. massage/hair	Solicited	3.5% active syphilis among high price, 1.4% among middle, 25.4% among low; 3.8% among KTV-based, 1.0% among sauna, 0.7% among massage, 39.8% among street, 17.0% among phone	Age; Education; Ethnicity; Marital status; Duration of sex work; No. clients past week; Condom use; Injection drug use; HIV prevention activities at sex work location; Known HIV status	Venue-based sampling method called "LACE" (Weir et al., 2002) and Respondent-driven sampling

Study Authors, Date	City, Country	Sample	Venue/Type of Sex Work	Venue defines place where clients solicited or serviced	HIV/STI Prevalence ^a	Venue Differences Assessed ^b	Sampling Method
Medhi et al. (2012) ⁸¹	Dimapur, India	426 FSW's in the Dimapur district of Nagaland, India	salons vs. street-based vs. telephone-based Home vs. Hotel/ lodge vs. Public places/street	Serviced	59.6% HIV+ among hotel/lodge, 32.9% among home, 7.5% among public places/street	None	Respondent driven sampling
Total N (studies) = 37							

Notes:

^aUnless otherwise noted, HIV/STI status was assessed with biological samples

^bAll of the studies examined characteristics (e.g., age, condom use) associated with HIV/STI, but not all assessed venue differences in these characteristics

--Not applicable because study only recruited one type/venue

>Statistically significant difference

STI = sexually transmitted infection