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Sexual behaviour, structural vulnerabilities and HIV prevalence among female sex workers in Pakistan

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ABSTRACT

Background We sought to describe differences in individual and structural vulnerabilities faced by female sex workers (FSWs) in Pakistan between 2006 and 2011, and to characterise risk factors for inconsistent condom use and HIV prevalence in this population.

Methods To describe differences in vulnerabilities, we analysed behavioural data from serial cross-sectional surveys conducted across nine cities in 2006 and 2011. Using data from 12 cities in 2011, we used logistic regression to characterise risk factors for (a) inconsistent condom use in the past month (N=6987), and (b) HIV (N=4301).

Results Compared to FSWs in 2006, FSWs in 2011 were significantly more likely to solicit clients via cell phones, and to report a larger client volume and anal sex with clients, but also consistent condom use with clients (30.0% vs 23.6% in 2006). In 2011, independent risk factors for inconsistent condom use with clients included: recent sexual violence, recent sex with a person who injects drugs, and absence of programme exposure. HIV prevalence was 0.63% (95% CI 0.43% to 0.92%) in 2011, and was associated with a recent history of injection drug use and absence of programme exposure.

Conclusions While condom use with clients was higher in 2011, protective behaviours remained low and vulnerabilities related to sex work may have risen. HIV is emerging in this population and an adaptive HIV prevention programme that addresses different vulnerabilities and the intersection of sexual networks with injection drug use is needed.

INTRODUCTION

Female sex work has a long history in Pakistan. Traditionally practiced by dancers in the royal court, sex work moved into brothels within 'red light' districts under British rule and through national independence.^{1 2} The industry then dispersed into clandestine sex work in residential areas after the first military leadership began in the 1970s.^{1 2} Although changes in the organisation of female sex work^{3 4} and male circumcision⁵ likely play important roles in the emergence and persistence of HIV among female sex workers (FSWs), individual and structural vulnerabilities within a regional context are also important. An understanding of sexual behaviour and partnerships,⁶⁻⁸ the practice of sex work⁹ and experience of sexual violence^{10 11} alongside HIV prevalence among FSWs is required to inform and strategically design HIV prevention programmes.

There is considerable heterogeneity in the practice of sex work ('sex work typology') between and

within cities in Pakistan.¹² FSWs who solicit clients in public places are classified as street-based FSWs, and are differentiated from FSWs who also solicit alms (FSWs who 'beg' for money in addition to exchanging sex for money). Most FSWs entertain clients at the sex worker's home (home-based FSWs).^{3 4} Others live and work in brothels, a fixed location often owned and operated by madams and situated in neighbourhoods associated with sex work ('red light' districts).^{3 4} Kothikhanas (KK) are venues rented by madams or network operators where a small number of FSWs live and entertain clients.^{3 4} In contrast to brothels, KKS are situated in residential neighbourhoods and are clandestine operations that often shift locations due to insecurity and fear of recrimination.^{3 4} Home- and KK-based FSWs are particularly hidden and difficult to reach. As a result, their individual and structural vulnerabilities may differ from those of other FSWs. Within all typologies, the use of cell phones is increasing as a means of soliciting clients.¹³ Network operators (pimps, madams) and clients share FSWs' phone numbers with clients or potential clients, who in turn, reach FSWs via cell phones.

A respondent-driven sample of 730 FSWs in Lahore found that 0.7% of FSWs were living with HIV/AIDS in 2007.⁷ Consistent ('always') condom use with clients was reported by 65% of FSWs, but only 19% had heard of HIV.⁷ A 2003 study from Lahore and Karachi documented that 14%–20% of FSWs formed sexual partnerships with men who injected drugs (injection drug users, IDUs), suggesting the potential for the emergence of HIV among FSWs as a result of HIV infection in their IDU partners.⁸ Surveillance reports from 2007 revealed that across Pakistan, 22% of IDUs purchased sex from women.¹⁴ Therefore, combined with low levels of condom use in the context of increasingly clandestine sex work, the introduction of HIV via FSW-IDU sexual partnerships may lead to sustained HIV transmission among FSWs and clients. Yet the timing of these findings also offers the opportunity for early intervention to avert a sustained HIV epidemic among FSWs.

In 2005, Pakistan's National and Provincial AIDS Control Programs introduced HIV prevention interventions to key populations through public-private partnerships.⁸ As part of the prevention programmes, second generation HIV surveillance among FSWs was conducted via serial cross-sectional integrated biological and behavioural surveys (IBBS). Using two rounds of IBBS, we sought to examine differences in individual and structural vulnerabilities and HIV prevalence among FSWs between 2006 and 2011, and to



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characterise risk factors associated with inconsistent condom use with clients and HIV prevalence in 2011.

METHODS

Study setting and data collection

To describe differences in individual and structural vulnerabilities between IBBS rounds, we restricted our analysis to the nine cities included in the 2006 and 2011 surveys: Lahore, Karachi, Quetta, Peshawar, Multan, Faisalabad, Sargodha, Sukkur and Larkana. For analysis of 2011 data alone, all 12 cities surveyed in 2011 were examined: in addition to the above nine cities, the cities of Haripur, Rawalpindi and Dera Ghazi Khan were included.

Mapping and enumeration conducted in 2006 and 2011 estimated that 49 037 and 73 675 women, respectively, were actively engaged in commercial sex in the nine cities selected for comparison between survey rounds.¹⁵ Compared with 2006, the 2011 enumeration included additional information from network operators (pimps, madams).¹⁵ In the nine cities, 242 and 258 clusters (neighborhoods or 'zones') were enumerated in 2006 and 2011, respectively.¹⁵ Estimated FSW population size, and the number and size of clusters increased between rounds, representing dynamism in the location and nature of sex work, an increase in sex work, and improved mapping and enumeration in 2011.¹⁵ In 2011, it was estimated that 81 717 FSWs (across 310 clusters) were working in the 12 cities selected for surveillance.¹⁵

Sex work was defined as the provision of sex to a man in exchange for money or other financial benefits, and the survey was restricted to FSWs 15 years of age and older. The sample size for each city was calculated to detect a 15% difference in condom use between the baseline and 2011 surveys, with 80% power, an α error of 5% and a design effect of 2, assuming a baseline value of condom use 'at last sex' with commercial clients of 45%, and 10% non-response.¹³ The power analyses were conducted at the individual level, but the sample size accounted for the design effect. The sample size for in each city ranged between 211 and 377 participants.¹³ After stratifying by typology, participants were recruited via conventional cluster sampling¹⁶ (probability proportional to enumerated cluster size) and random sampling within clusters (proportional to cluster size) for the following typologies: home-based, street-based, FSWs who also solicit alms, and KK-based FSWs.¹³ Brothel-based FSWs were selected via systematic random sampling of enumerated brothel-based FSWs.¹³ Sampling was conducted independently for each round of the IBBS in an effort to obtain representative samples at both time points. In the nine cities compared between 2006 and 2011, 181 and 176 clusters are represented in the data, respectively. For the 12 cities examined for risk factors in 2011, 204 clusters are represented in the data. Mapping reports, with estimates of FSW population size, and information on surveillance sampling methodology (including sample size for each city) are available online at http://www.nacp.gov.pk/surveillance_and_research/.

After obtaining informed consent, trained interviewers administered a face-to-face structured questionnaire in the local language (Urdu). The questionnaire was designed in English, and included information on demographic characteristics, sex work and migration, sexual behaviour, access to intervention programmes, and knowledge of sexually transmitted infections (STIs)/HIV. Interviews were conducted at the brothels for brothel-based FSWs and at a central field office for all other participants. The questionnaire is available online at <http://www.nacp.gov.pk/library/publications/HASP/IBBS%20Manual%20English.pdf>.

Capillary dried blood spots (DBS) were collected by interviewers. The sample was immediately dried and stored at room temperature before weekly transport to the reference laboratories for testing (Sindh Institute of Urology and Transplantation, Karachi and Armed Forces Institute of Pathology, Rawalpindi). The DBS were screened using an enzyme immunoassay (HIV Genetic Systems rLAV ELISA/EIA, Bio-Rad, USA), with positive tests confirmed in duplicate with an alternative enzyme immunoassay (Vironostika HIV Uni-Form II EIA, Biomerieux, The Netherlands). In the case of indeterminate results with either enzyme immunoassay, the Genetic Systems HIV-1 Western Blot (Bio-Rad) was used to resolve the discrepancy and provide a final result. All participants were referred for voluntary counselling and testing for HIV, and given information on HIV prevention and local programme services for FSWs.

Data analysis

Data were double-entered using Microsoft Access and statistical analysis was performed using STATA V.11.0. Successive rounds of surveys were not linked via participant information, and therefore it was not possible to determine which individuals participated in both the 2006 and 2011 rounds of data collection. The cities of Multan, Faisalabad, Sargodha, Rawalpindi and Dera Ghazi Khan were combined and collectively referred to as 'other Punjab', while Sukkur and Larkana were combined and collectively referred to as 'other Sindh'. Data collected in Lahore, Karachi, Quetta and Peshawar were examined separately for each city.

We reported descriptive statistics using measures of central tendency. Bivariate analyses of sociodemographic covariates, the practice of sex work, sexual behaviour and partnerships, and structural vulnerabilities between the two rounds were examined with parametric and non-parametric tests of association. Adjusted analysis was conducted for three outcomes (inconsistent condom use with clients in the past month, inconsistent condom use with non-clients in the past month, and HIV prevalence) using multivariate logistic regression. Inconsistent condom use was defined as 'sometimes' or 'never' condom use in the month preceding the survey. Multiple imputation was conducted to resolve missing values for variables that were examined as covariates for these three outcomes. For HIV prevalence, only districts in which there was at least one case of HIV were included in the adjusted analysis. Results were corrected for within cluster homogeneity.

The institutional review boards of HOPE International in Pakistan and the Public Health Agency of Canada provided ethics approval for the study. Monetary compensation was provided to participants for their time in accordance with suggestions and discussions with each local FSW community during study planning.

RESULTS

Study population

The study population comprised 3647 FSWs in 2006 and 3340 FSWs in 2011 for the nine cities included in both rounds of data collection. The total study population in 2011 comprised 4301 respondents surveyed in 12 cities. Table 1 highlights the sociodemographic characteristics of participants for the nine cities included in both years. Over half of FSWs were married at the time of the surveys (59.8% and 57.0% in 2006 and 2011, respectively). Participants in 2006 were slightly older (median age 27 years) compared to participants in 2011 (median age 26 years, $p=0.02$), but the fraction of FSWs under age 20 was not significantly different (9.7% in both rounds, $p>0.1$). Literacy was lower among participants in 2011 (48.7% vs 57.6% in 2006, $p=0.002$), as was the fraction of FSWs who

Table 1 Sociodemographic characteristics of female sex workers in Pakistan in 2006 and 2011 for the nine cities included in both rounds of the IBBS (N=6987)

	Lahore		Other Punjab		Karachi		Other Sindh		Quetta		Peshawar		All cities*	
	2006 N=425	2011 N=375	2006 N=1200	2011 N=1126	2006 N=403	2011 N=377	2006 N=800	2011 N=750	2006 N=396	2011 N=345	2006 N=423	2011 N=367	2006 N=3647	2011 N=3340
Median age (range)	26 (15–45)	27 (15–45)	26 (15–45)	27 (16–45)	28 (15–45)	26 (15–48)†	28 (16–45)	25 (16–49)†	28 (16–45)	26 (16–40)†	25 (15–45)	27 (16–43)†	27 (15–45)	26 (15–49)†
% Illiterate (95% CI)	40.2 (32.7 to 48.3)	43.5 (36.5 to 50.7)	43.9 (37.0 to 51.1)	43.1 (38.1 to 48.4)	42.9 (37.2 to 48.9)	53.9 (46.8 to 60.7)†	28.8 (20.6 to 38.5)	54.4 (44.8 to 61.7)†	74.2 (66.3 to 80.8)	75.5 (70.5 to 79.9)	36.0 (28.3 to 44.5)	55.0 (48.7 to 61.2)†	42.4 (37.9 to 47.1)	51.3 (48.6 to 54.0)†
Marital status, % (95% CI)														
Unmarried	27.3 (22.2 to 33.1)	24.9 (18.7 to 32.2)	26.2 (21.2 to 31.8)	25.0 (21.0 to 29.6)	15.4 (11.1 to 21.0)	19.4 (14.6 to 25.2)	18.8 (13.8 to 24.9)	27.3 (20.6 to 35.3)	47.0 (40.3 to 53.8)	49.3 (44.9 to 53.7)	41.6 (36.3 to 47.1)	31.6 (25.8 to 38.1)	27.5 (24.6 to 30.7)	28.1 (25.0 to 31.4)
Married	48.7 (43.0 to 54.5)	70.3 (62.5 to 77.1)	56.8 (52.7 to 60.9)	62.3 (58.8 to 65.7)	77.4 (71.6 to 82.3)	69.8 (64.6 to 74.5)	78.4 (72.0 to 83.7)	54.3 (42.8 to 65.3)	42.4 (36.0 to 49.1)	38.2 (32.0 to 44.8)	43.5 (37.7 to 49.4)	37.3 (33.2 to 41.6)	59.8 (55.9 to 63.6)	57.0 (53.3 to 60.7)
Separated/ divorced/ widowed	24.0 (19.8 to 28.8)	4.8 (3.1 to 7.4)†	13.9 (20.6)	12.6 (9.4 to 16.7)	7.2 (4.7 to 10.8)	10.9 (7.9 to 14.8)	2.9 (1.3 to 6.4)	18.4 (13.7 to 24.3)†	10.6 (7.0 to 15.7)	12.5 (9.1 to 17.0)	14.9 (11.5 to 19.0)	31.1 (24.4 to 38.7)†	12.7 (10.7 to 15.1)	14.9 (13.3 to 16.5) (N=3337)
Living arrangements, % (95% CI)														
Family home	82.8 (78.0 to 86.8)	82.6 (75.3 to 88.1)	81.8 (73.2 to 88.0)	78.3 (73.8 to 82.3)	80.4 (69.0 to 88.3)	90.6 (84.3 to 94.6)	78.8 (67.4 to 86.9)	90.1 (83.7 to 94.2)	83.8 (79.4 to 87.3)	82.6 (73.0 to 89.2)	88.4 (80.8 to 93.3)	73.5 (68.5 to 77.9)	82.1 (79.0 to 84.8)	82.9 (80.4 to 85.2)
Guest house	4.0 (1.9 to 8.4)	0.41 (0 to 3.0)	1.4 (0.67 to 3.0)	0.49 (0.19 to 1.3)	0	0.27 (0 to 2.0)	2.5 (0.52 to 11.1)	0.40 (0 to 2.0)	7.4 (4.2 to 12.6)	5.2 (2.9 to 9.3)	1.9 (0.71 to 5.0)	11.9 (8.8 to 15.9)	2.5 (1.7 to 3.7)	2.3 (1.7 to 3.1)
KK/brothel	12.7 (9.7 to 16.5)	17.0 (11.7 to 24.1)	11.9 (8.3 to 16.8)	21.2 (17.2 to 25.8)	18.9 (11.0 to 30.4)	9.1 (5.1 to 15.6)	8.3 (4.0 to 16.3)	9.5 (5.8 to 15.1)	8.6 (6.4 to 11.5)	12.2 (5.7 to 24.3)	9.5 (4.7 to 18.2)	14.6 (10.8 to 19.5)	11.3 (9.2 to 13.9)	14.8 (12.6 to 17.3)
Other	0.47 (0.11 to 2.0)	0† (N=241)	4.9 (11.1 to 19.2)	0 (N=1015)	0.74 (0.24 to 2.3)	0† (N=374)	10.5 (3.0 to 31.1)	0 (N=749)	0.25 (0 to 2.1) (N=394)	0 (N=327)	0.24 (0 to 1.8)	0† (N=362)	4.1 (1.9 to 8.8) (N=3645)	0† (N=3068)
Non-local FSWs, % from another city (95% CI)	33.7 (27.8 to 40.1)	12.5 (9.7 to 16.1)†	19.0 (14.6 to 24.4)	13.5 (9.0 to 19.9)	48.1 (39.3 to 57.1)	33.7 (28.7 to 39.1)†	17.3 (7.1 to 36.3)	6.8 (3.7 to 12.2)	23.5 (19 to 28.5)	29.6 (22.5 to 37.7)	30.7 (23.2 to 39.4)	15.3 (11.2 to 20.4)†	25.4 (21.4 to 29.8)	16.0 (12.8 to 19.8)†

*Refers to the following cities where the IBBS was conducted in both 2006 and 2011: Lahore, Karachi, Quetta, Peshawar, Multan, Faisalabad, Sargodha (these last three in 'Other Punjab'), Sukkur and Larkana (these last two in 'Other Sindh').

†Significant difference at the 5% α -level using parametric and non-parametric tests of significance between survey rounds within each region, as well as between rounds for all cities combined.

Guest house includes hotels and hostels.

FSW, female sex workers; IBBS, integrated biological and behavioural survey; KK, kothikhana; N, number of respondents.

lived in another city (16.0% vs 25.4% in 2006, $p < 0.001$). Living arrangements varied across cities, with an overall higher fraction of FSWs living in kothikhanas and brothels in 2011 (except in Karachi). However, most FSWs (more than 70%) lived in their family home.

Practice of sex work

Differences were observed in the practice of sex work between 2006 and 2011 in the nine cities for which a direct comparison could be made (table 2). Overall, FSWs surveyed in 2011 had started sex work earlier (median age 20 years) than FSWs working in 2006 (median age 22 years, $p = 0.01$), but there was no significant difference between the fraction of FSWs who started sex work prior to age 15 (4.3% vs 4.5% in 2006 and 2011, respectively, $p > 0.1$).

Among participants in the province of Punjab (including Lahore), there were more home-based FSWs and fewer street-based FSWs in 2011 as compared with 2006 ($p < 0.001$). A larger fraction of FSWs also reported two emerging typologies—as FSWs who solicit alms and sell sex on a part-time basis, and FSWs whose sole method of solicitation occurs via cell phones (ie, mobile operators). Compared with 4.1% of FSWs overall in 2006, 5% (95% CI 4.2% to 6.0%) and 10.4% (95% CI 9.1% to 11.8%) of FSWs in 2011 were classified according to these two typologies: FSWs who solicit alms and mobile operators. In 2011, 29.4% of FSWs primarily used cell phones to solicit clients, compared with 19.5% in 2006 ($p < 0.001$; table 2), although a difference was not observed in Karachi or Quetta. The median income per FSW was also significantly higher in the second round, increasing from 9000 Pakistani rupees in 2006 to 17 000 Pakistani rupees in 2011 ($p < 0.001$). Of note, 85.9% (95% CI 83.1% to 88.5%) and 98.4% (95% CI 97.9% to 98.8%) of FSWs in 2006 and 2011, respectively, earned an income greater than the average monthly income of females in Pakistan in 2006–2007 (5000 Pakistani rupees per month).¹⁷ The median number of clients per FSW in the last month was also higher in 2011 (25 in 2006 vs 50 in 2011, $p < 0.001$; table 2).

Structural vulnerabilities, programme exposure and sexual behaviour

As shown in table 2, a greater proportion of FSWs reported recent injection drug use (1.8% vs 5.4%, $p < 0.001$), recent sex with an IDU (8.9 vs 16.0%, $p < 0.001$), recent sexual violence (15.7% vs 22.4%, $p < 0.001$) and a recent history of police arrests in 2011 compared with 2006 (7.7% vs 15.6%, $p < 0.001$). Overall, 10.3% of respondents were unaware of whether a partner injected drugs. More than half of FSWs in 2011 reported sharing sex work income with a mediator, their husband or the police, whereas in 2006, 17.4% of FSWs reported income-sharing ($p < 0.001$; table 2).

By 2011, 20.7% (95% CI 17.5% to 24.3%) had accessed the HIV prevention programmes, a significant difference from the 2.1% (95% CI 1.1% to 4.2%) of FSWs who had contact with the programmes in 2006 ($p < 0.001$). By 2011, 75.6% (95% CI 72.2% to 78.7%) of FSWs had heard of HIV/AIDS, a small increase from the 69.0% (95% CI 66.3% to 72.0%, $p = 0.001$) observed in 2006.

In 2011, 30.0% of FSWs reported 'always' condom use with clients in the previous month, compared with 23.6% of FSWs in 2006 ($p = 0.03$). Similarly, self-reported 'always' condom use with non-paying partners was higher in 2011 (20.7% vs 13.4% in 2006). In 2011, half of FSWs reported at least one anal sex act in the previous month with clients (table 2). Both anal and

oral sex with clients was less commonly reported in 2006 (table 2).

Predictors of non-condom use and emergence of HIV

In 2006, no cases of HIV were detected among study participants. In 2011, 25 cases of HIV were detected (0.63%, 95% CI 0.43 to 0.92%). The distribution of HIV-positive respondents is shown in table 3. As shown in table 4, after adjusting for region (in regions where at least one case of HIV was detected), programme exposure was protective with respect to HIV prevalence. Adjusting for region, a recent history of injecting drugs was associated with an increased risk of HIV. Caution is required when extrapolating further based on these two associations because of the small number of HIV-positive cases in this population.

Table 4 outlines the independent risk factors associated with inconsistent condom use with a client and the independent risk factors associated with inconsistent condom use with a non-paying partner, in the month prior to the 2011 survey. After adjusting for regional variability, literacy, duration in sex work, solicitation without a mediator, sex with a non-paying partner in the previous month, sex or being unsure of having sex with an IDU, recent sexual violence and lack of programme exposure were independently associated with inconsistent condom use with clients in the past month (table 4). Among FSWs who reported sex with a non-paying partner in the previous month, women who could not read or write, with a larger client volume (≥ 60 per month), recent experience of sexual violence, longer history of sex work and without previous programme access were least likely to report 'always' condom use with non-paying partners after adjusting for the region in which they practiced sex work (table 4).

DISCUSSION

Understanding the practice of sex work and vulnerabilities that place FSWs at risk of HIV is the key to formulating and adapting a targeted HIV prevention programme. In Pakistan, we observed important differences in work-related vulnerabilities experienced by FSWs between two rounds of representative surveys, profiled FSWs least likely to report recent condom use, and documented the emergence of HIV among FSWs. We report the first cases of HIV among FSWs officially detected in Pakistan outside of Lahore, although a different sampling method was used in previous studies.^{7 8}

We found differences in the practice of sex work between 2006 and 2011, with 29.4% of participants using cell phones as their primary method of solicitation in 2011. The use of mobile technology has emerged as a major 'operator' in the business of sex work,^{18 19} and this study reveals that sex work in Pakistan is no exception. The extent to which mobile technology has changed the sexual networks of FSWs and clients, social networks between FSWs, and the visibility of FSWs to prevention programmes remains unknown. While the dissolution of the red light district in Goa, India resulted in a dispersion of sex work,²⁰ it is unclear if cell phones are creating a similar effect in Asia, including Pakistan. The use of cell phones among FSWs also offers an opportunity to reach FSWs and form links with the prevention programmes, the health care team and peer-educators.^{21–23} Reported client volume and monthly income from sex work were higher in 2011. Although we do not interrogate this finding further in our study, the difference may be due in part to rising inflation in Pakistan.^{17 24}

Differences in the sociodemographic profile of FSWs, the practice of sex work and HIV prevalence between 2006 and

Table 2 Description of the practice of female sex work and related structural vulnerabilities in Pakistan in 2006 and 2011 for the nine cities included in both rounds of the IBBS (N=6987)

	Lahore		Other Punjab		Karachi		Other Sindh		Quetta		Peshawar		All cities*	
	2006 N=425	2011 N=375	2006 N=1200	2011 N=1126	2006 N=403	2011 N=377	2006 N=800	2011 N=750	2006 N=396	2011 N=345	2006 N=423	2011 N=367	2006 N=3647	2011 N=3340
Age at sex work initiation, median (range) (95% CI)	22 (6–43) (N=422)	21 (11–42) (N=374)	21 (8–41) (N=1197)	21 (8–41) (N=1120)	22 (10–44) (N=399)	21 (10–46) (N=376)	20 (12–40) (N=796)	20 (10–37)†	23 (9–44) (N=309)	19 (7–30)†	20 (10–39) (N=415)	23 (15–41)†	22 (6–44) (N=3538)	20 (7–46)† (N=3325)
Sex work typology, % (95% CI)														
Home-based	12.2 (7.5 to 19.4)	43.7 (33.8 to 54.2)	41.1 (34.8 to 47.6)	48.3 (43.0 to 53.7)	17.4 (10.4 to 27.7)	35.0 (24.7 to 47.0)	41.5 (19.2 to 67.9)	60.3 (49.7 to 70.0)	22.7 (13.7 to 35.4)	22.0 (11.9 to 37.2)	34.8 (24.4 to 46.8)	38.4 (29.3 to 48.5)	32.5 (27.8 to 37.6)	45.2 (41.0 to 49.4)
Brothel	11.8 (1.7 to 5.1)	8.0 (1.2 to 39.4)	8.3 (2.4 to 25.2)	5.3 (1.6 to 16.1)	12.4 (1.9 to 51.5)	8.0 (1.2 to 38.3)	19.9 (4.6 to 55.7)	5.9 (0.48 to 44.8)	0	0	0	0	9.8 (4.3 to 21.1)	7.5 (3.9 to 13.9)
Street-based	46.1 (32.7 to 60.2)	15.7 (10.3 to 23.4)	36.4 (28.6 to 45.0)	11.2 (7.3 to 16.8)	31.0 (22.4 to 41.3)	19.4 (13.8 to 26.5)	25.3 (14.7 to 39.8)	11.2 (3.4 to 30.9)	59.6 (46.1 to 71.8)	28.9 (28.7 to 50.1)	24.8 (17.2 to 34.4)	20.2 (12.3 to 31.3)	35.7 (31.2 to 40.4)	16.5 (12.8 to 21.0)
KK	29.9 (21.3 to 40.2)	16.5 (12.4 to 21.7)	14.2 (10.5 to 18.9)	19.2 (15.0 to 24.2)	39.2 (27.1 to 52.8)	21.8 (15.8 to 29.2)	13.4 (4.1 to 35.8)	10.7 (6.9 to 16.1)	5.6 (2.3 to 12.7)	14.8 (7.9 to 25.9)	16.3 (9.6 to 26.4)	18.3 (13.9 to 23.5)	17.9 (14.4 to 22.0)	16.7 (14.5 to 19.1)
Other	0	16.0 (10.1 to 24.4)†	0	16.0 (9.6 to 25.5)†	0	15.9 (10.4 to 23.5)	0	12.0 (6.3 to 21.8)	12.1 (7.0 to 20.2)	24.4 (16.8 to 34.0)	24.1 (14.9 to 36.7)	23.2 (16.7 to 31.2)	4.1 (2.5 to 6.8)	16.7 (14.1 to 19.8)†
Usual method of solicitation, % (95% CI)														
Mediator	41.9 (34.7 to 49.6)	41.3 (35.4 to 47.5)	45.8 (41.8 to 50.0)	62.5 (53.6 to 70.7)	38.8 (33.0 to 44.9)	39.9 (31.7 to 48.7)	25.9 (16.9 to 37.5)	26.9 (20.3 to 34.6)	27.7 (22.3 to 33.8)	16.9 (10.8 to 25.5)	43.2 (31.2 to 56.0)	23.8 (15.0 to 35.6)	37.9 (34.7 to 41.2)	40.7 (35.9 to 45.7)
Phone	9.4 (6.6 to 13.3)	15.6 (10.1 to 23.3)	11.6 (9.6 to 14.0)	14.7 (9.1 to 22.9)	28.0 (21.6 to 35.4)	33.8 (28.9 to 30.0)	18.5 (9.5 to 32.9)	48.0 (33.8 to 62.6)	32.7 (25.9 to 40.4)	40.8 (33.3 to 48.7)	33.2 (22.8 to 45.6)	35.7 (29.1 to 42.9)	19.5 (17.0 to 22.2)	29.4 (24.5 to 34.9)
Public places	43.6 (32.7 to 55.2)	23.1 (17.0 to 30.5)	20.8 (26.3 to 35.8)	19.5 (15.7 to 23.8)	26.5 (19.3 to 35.1)	22.3 (15.4 to 31.3)	44.9 (27.6 to 63.5)	16.4 (9.1 to 27.8)	32.5 (25.2 to 40.8)	36.7 (26.7 to 48.0)	17.9 (13.4 to 23.5)	22.7 (14.8 to 33.1)	33.6 (29.4 to 30.1)	21.6 (18.5 to 25.2)
Referral	5.1 (2.1 to 11.7)	20.1 (14.5 to 27.1)†	11.8 (8.8 to 15.6)	3.3 (2.2 to 5.0)†	6.8 (4.4 to 10.4)	4.0 (2.3 to 6.7)	10.8 (5.9 to 18.7)	8.7 (5.4 to 13.7)†	7.1 (4.4 to 11.2)	5.5 (2.6 to 11.6)	5.7 (4.4 to 7.4)	17.9 (13.7 to 23.0)†	9.0 (7.7 to 10.5)	8.3 (6.0 to 10.1)†
Monthly sex work income in Pakistani rupees, median (range)	10000 (500–60000)	10000 (2000–50000)	9000 (200–95000)	20000 (2000–90000)†	9000 (17–80000)	15000 (2000–80000)†	5000 (300–70000)	15000 (100–120000)†	13000 (600–40000)	25000 (100–150000)†	12000 (20–60000)	15000 (100–45000)†	9000 (17–95000)	17000 (100–150000)†
Median number of clients in last 1 month (range)	18 (2–97) (N=418)	40 (1–222)† (N=370)	21 (1–800) (N=1189)	70 (8–270)† (N=1125)	5 (1–500) (N=373)	25 (1–200)† (N=359)	50 (1–501) (N=760)	45 (7–200) (N=745)	20 (1–140) (N=128)	60 (2–190)† (N=330)	20 (1–70) (N=332)	35 (10–90)† (N=358)	25 (1–800) (N=3200)	50 (1–270)† (N=3287)
Injected drugs in the past 6 months, % (95% CI)	1.7 (0.56 to 4.8) (N=423)	5.1 (3.0 to 8.5) (N=372)	3.3 (2.1 to 5.1) (N=1197)	9.5 (7.0 to 12.9)† (N=1123)	0.74 (0.23 to 2.4)	1.9 (0.78 to 4.3)	0.51 (0 to 5.2)	3.2 (2.1 to 4.8)	1.6 (0.56 to 4.5) (N=374)	6.9 (4.4 to 10.5)† (N=336)	1.7 (0.88 to 3.2) (N=418)	0†	1.8 (1.2 to 2.7) (N=3595)	5.4 (4.6 to 6.3)† (N=3324)
In the past 6 months, had sex with a man who injects drugs, % (95% CI)	17.0 (12.5 to 22.7) (N=424)	7.2 (5.2 to 9.9)† (N=373)	15.5 (12.4 to 19.1) (N=1184)	20.4 (17.6 to 23.6)†	4.3 (2.9 to 6.5) (N=394)	5.6 (3.4 to 8.9)†	0.13 (0 to 1.3)	20.2 (13.9 to 28.2)† (N=749)	3.7 (2.0 to 6.7) (N=353)	30.6 (23.1 to 39.2)† (N=340)	7.0 (4.2 to 11.4)	0.27 (0 to 1.7)†	8.9 (6.8 to 11.6) (N=3521)	16.0 (13.9 to 18.4)† (N=3332)

Continued

Table 2 Continued

	Lahore		Other Punjab		Karachi		Other Sindh		Quetta		Peshawar		All cities*	
	2006 N=425	2011 N=375	2006 N=1200	2011 N=1126	2006 N=403	2011 N=377	2006 N=800	2011 N=750	2006 N=396	2011 N=345	2006 N=423	2011 N=367	2006 N=3647	2011 N=3340
Arrested at least once in the past 6 months, % (95% CI)	20.5 (14.3 to 28.5) (N=424)	24.2 (20.8 to 28.0) (N=372)	6.6 (4.5 to 9.7) (N=1191)	21.3 (17.9 to 25.2) [†] (N=1125)	3.5 (2.3 to 5.2) (N=401)	7.7 (5.5 to 10.7) [†]	3.2 (1.1 to 9.0) (N=782)	11.2 (8.3 to 14.9) [†]	4.4 (3.0 to 6.5) (N=383)	20.4 (16.6 to 24.9) [†]	13.4 (10.4 to 17.2) (N=418)	2.2 (0.85 to 5.5) [†]	7.7 (6.0 to 9.8) (N=3599)	15.6 (14.3 to 17.0) [†] (N=3333)
Physically forced to have sex in the past 6 months, % (95% CI)	20.8 (16.6 to 25.7) (N=424)	29.4 (24.6 to 34.8) [†] (N=374)	24.5 (20.1 to 29.6) (N=1192)	33.3 (29.6 to 37.3) [†] (N=1125)	5.2 (3.2 to 8.4) (N=402)	7.2 (4.5 to 11.2)	7.1 (4.4 to 11.2) (N=773)	10.9 (6.2 to 18.7)	5.3 (3.4 to 8.4) (N=376)	40.0 (34.1 to 46.3) [†] (N=340)	20.6 (16.7 to 25.1) (N=418)	4.6 (2.9 to 7.5) [†] (N=366)	15.7 (13.3 to 18.4) (N=3585)	22.4 (20.0 to 25.0) [†] (N=3332)
Share income with mediator, police or husband, % (95% CI)	20.2 (14.9 to 26.9)	56.3 (49.1 to 63.2) [†]	9.7 (7.5 to 12.4)	72.9 (68.5 to 76.9) [†]	18.6 (13.6 to 24.9)	24.9 (20.4 to 30.1)	10.0 (5.7 to 17.1)	42.7 (31.3 to 54.9) [†]	25.6 (19.1 to 33.5) (N=394)	54.2 (48.7 to 59.6) [†]	41.9 (32.9 to 51.4) (N=420)	43.3 (34.4 to 52.7)	17.4 (14.8 to 20.4)	53.7 (50.3 to 57.0) [†]

*Refers to the following cities where the IBBS was conducted in both 2006 and 2011: Lahore, Karachi, Quetta, Peshawar, Multan, Faisalabad, Sargoda (these last three in 'Other Punjab'), Sukkur and Larkana (these last two in 'Other Sindh').

[†]Significant difference at the 5% α -level using parametric and non-parametric tests of significance between survey rounds within each region, as well as between rounds for all cities combined. Guest house includes hotels and hostels. Usual methods of solicitation: 'mediator' refers to solicitation via network operators (brothel madams, pimps); 'phone' refers to solicitation via mobile/cellular phones; 'public places' refers to direct solicitation in public venues; and solicitation via 'referral' pertains to referral from other clients.

IBBS, Integrated biological and behavioural surveys; KK, kothikhana; N, number of respondents.

2011 likely reflect a combination of the following: improved enumeration and mapping of FSWs in 2011¹³ and true 'changes' in the profile and practice of FSWs in Pakistan across the nine cities. Both rounds of the IBBS were as representative as possible of the enumerated FSWs. However, limitations of mapping and enumeration of high-risk groups will limit the extent to which the surveyed participants are representative of all FSWs (including those not reached by mapping and enumeration)—a limitation common to studies of FSWs. Improvements to mapping and enumeration in 2011 suggest that compared with 2006, participants in 2011 are likely to be more representative of FSWs in their respective year. However, anecdotal and qualitative evidence suggests that sex work is on the rise in Pakistan,¹³ and the differences observed in sociodemographic profile as well as the practice of sex work may also reflect increased entry into sex work. Additional rounds of behavioural and biological surveillance, using repeated and enhanced enumeration (as performed in 2011), are required to better characterise the temporal dynamics, or trends, in the practice of sex work in Pakistan.

Studies among FSWs in South Asia have identified individual risk factors for HIV/STIs and associations with higher levels of condom use.^{25–28} In this study, more than half of FSWs reported at least one non-paying partner in the previous month. Regular, repeat or non-paying partnerships are common among FSWs in Pakistan, and such partnerships have been associated with lower rates of condom use²⁶ and shown to be important to the sustained dynamics of STIs.²⁹ In this study, 'always' condom use with paying partners was lower than reported in other parts of South Asia.^{26, 27, 30} Condom use with non-paying partners is similar to that reported²⁶ outside Pakistan, and underscores the importance of differential uptake of condoms based on the type of partnership, and the need for a different approach to increasing condom uptake during sex acts between an FSW and her non-paying partner. Anal and oral sex was common in commercial partnerships, with approximately half of FSWs engaging in non-vaginal sexual intercourse. Although few studies have questioned FSWs about providing oral sex, self-reported anal sex in the context of female sex work in Pakistan is similar to that reported in Bangladesh.³⁰ Unprotected anal sex is associated with an increased risk of HIV transmission³¹ and unprotected oral sex is a mode of transmission for syphilis and gonorrhoea. Addressing protective behaviours during non-vaginal sex will be an important component for prevention of STIs and HIV in this population.

We found that FSWs faced several structural vulnerabilities, including sexual violence and arrest, despite an increasing but overall low level of contact with HIV prevention programmes as compared with districts in India.²⁶ Obstacles to reaching FSWs in Pakistan include social conservatism and legal sanctions against commercial sex work which drive FSWs 'underground'. Sexual violence and lack of programme exposure were associated with inconsistent condom use with clients. Addressing sexual violence in this vulnerable population is an important component of an effective HIV prevention programme for women.^{10, 32}

Sixteen per cent of FSWs reported that at least one of their sexual partners in the last 6 months had injected drugs. This finding may underestimate the overlap in high-risk networks because many FSWs were unaware of the injection drug use status of their partners. However, it has been suggested that in several parts of Asia, overlap in HIV transmission networks may be important for the emergence of HIV among FSWs.⁸ In 2011, HIV prevalence among male IDUs in Pakistan ranged from 7.1% in Quetta to 51.1% in Faisalabad.⁶ And the overlap could be

Table 3 Individual vulnerabilities related to sexual behaviour among female sex workers in Pakistan in 2006 and 2011 for the nine cities included in both rounds of the IBBS (N=6987)

	Lahore		Other Punjab		Karachi		Other Sindh		Quetta		Peshawar		All cities*	
	2006 N=425	2011 N=375	2006 N=1200	2011 N=1126	2006 N=403	2011 N=377	2006 N=800	2011 N=750	2006 N=396	2011 N=345	2006 N=423	2011 N=367	2006 N=3647	2011 N=3340
Condom use with clients in the last month, % (95% CI)														
Always	31.0 (25.8 to 36.7)	31.3 (24.6 to 38.8)	11.2 (8.2 to 15.1)	22.2 (19.0 to 25.6)	43.9 (37.6 to 50.4)	48.3 (41.4 to 55.2)	17.3 (10.2 to 28.0)	29.1 (19.5 to 40.9)	35.1 (29.3 to 41.3)	39.2 (32.3 to 46.5)	33.7 (26.7 to 41.4)	26.9 (23.1 to 31.2)	23.6 (20.6 to 26.7)	30.0 (26.6 to 33.6)
Sometimes	47.5 (41.1 to 54.0)	42.0 (34.2 to 50.2)	56.8 (52.7 to 60.7)	50.8 (48.9 to 52.7)	39.0 (32.5 to 45.8)	41.6 (34.6 to 49.1)	36.7 (24.4 to 51.0)	47.9 (42.2 to 53.6)	53.7 (46.4 to 60.9)	35.0 (28.1 to 42.7)	52.6 (45.5 to 59.7)	41.8 (36.1 to 47.6)	48.5 (44.2 to 52.7)	45.5 (43.5 to 47.5)
Never	21.5 (17.9 to 25.6) (N=423)	26.7 (18.9 to 36.4) (N=374)	32.1 (28.1 to 36.3) (N=1198)	27.1 (23.0 to 31.6)† (N=1124)	17.1 (12.5 to 23.0)	10.1 (6.9 to 14.4)†	46.0 (26.8 to 66.5) (N=796)	23.1 (16.1 to 31.9)†	11.2 (8.2 to 15.3) (N=365)	25.8 (19.5 to 33.3)† (N=337)	13.7 (9.7 to 18.9) (N=416)	31.3 (25.0 to 38.5)† (N=364)	28.0 (23.0 to 33.7) (N=3601)	24.5 (21.8 to 27.5)† (N=3326)
Anal sex with a client in the last month, % (95% CI)	11.8 (8.7 to 15.8) (N=424)	28.6 (22.2 to 36.1)† (N=374)	35.6 (28.5 to 43.5) (N=1188)	68.2 (61.9 to 73.9)† (N=1125)	12.0 (8.1 to 17.4) (N=399)	7.2 (4.5 to 11.3)	1.0 (0.38 to 2.7) (N=793)	52.9 (43.7 to 62.0)†	12.0 (8.5 to 16.7) (N=341)	77.2 (70.0 to 83.1)† (N=342)	5.2 (3.6 to 7.5) (N=420)	36.1 (30.1 to 42.5)† (N=366)	16.7 (13.0 to 21.0) (N=3565)	50.8 (45.4 to 56.2)† (N=3334)
Oral sex with a client in the last month, % (95% CI)	7.4 (4.7 to 11.3) (N=422)	17.4 (11.9 to 24.8)† (N=374)	39.8 (31.0 to 49.3) (N=1191)	66.1 (61.2 to 70.8)† (N=1125)	20.0 (13.6 to 28.4) (N=400)	20.1 (15.4 to 25.8) (N=373)	0.38 (0 to 2.5) (N=793)	55.3 (44.6 to 65.5)† (N=747)	8.7 (4.8 to 15.4) (N=333)	49.4 (39.0 to 59.9)† (N=340)	4.1 (2.5 to 6.6) (N=420)	13.9 (9.1 to 20.5)† (N=361)	17.8 (13.5 to 23.2) (N=3559)	45.6 (40.8 to 50.6)† (N=3320)
Had sex with a non-paying partner in the past 1 month, % (95% CI)	46.0 (39.1 to 53.0) (N=424)	63.7 (51.8 to 74.2)†	69.8 (65.6 to 73.7) (N=1199)	65.8 (61.8 to 69.6)	25.6 (19.5 to 32.8) (N=398)	23.6 (19.0 to 29.0)	39.2 (16.9 to 67.2) (N=798)	18.9 (15.6 to 22.8)	17.3 (14.2 to 20.8) (N=371)	71.2 (63.8 to 77.6)† (N=344)	6.0 (3.7 to 9.5) (N=418)	23.7 (18.1 to 30.4)†	42.6 (37.5 to 47.8) (N=3608)	46.2 (40.9 to 51.6) (N=3339)
Condom use with non-paying partner in the last month‡														
Always	21.4 (15.9 to 28.3)	20.2 (15.8 to 25.4)	8.7 (6.4 to 11.8)	15.5 (11.5 to 20.6)	21.8 (14.8 to 30.9)	36.4 (29.0 to 44.4)	11.0 (5.2 to 21.5)	15.6 (7.6 to 29.3)	39.7 (25.8 to 55.6)	33.5 (27.4 to 40.2)	20.0 (8.7 to 39.5)	23.0 (15.0 to 33.6)	13.4 (11.5 to 15.7)	20.7 (18.4 to 23.3)
Sometimes	31.1 (23.2 to 40.3)	34.9 (25.7 to 45.3)	34.7 (29.8 to 39.9)	36.8 (32.8 to 41.0)	35.5 (27.1 to 44.8)	29.6 (19.6 to 42.0)	29.7 (16.8 to 47.0)	34.8 (27.3 to 43.1)	47.4 (33.5 to 61.8)	35.9 (28.7 to 43.9)	32.0 (12.2 to 61.5)	36.8 (30.4 to 43.7)	33.9 (29.8 to 38.2)	35.7 (33.4 to 38.2)
Never	47.5 (39.3 to 55.8) (N=196)	45.0 (36.2 to 54.1) (N=238)	56.6 (51.6 to 61.6) (N=837)	47.7 (42.1 to 53.4)† (N=740)	42.7 (35.2 to 50.6) (N=110)	34.1 (24.6 to 45.1) (N=88)	59.4 (40.0 to 76.2) (N=310)	49.7 (45.3 to 54.0) (N=141)	12.8 (7.8 to 20.4) (N=78)	30.6 (24.9 to 37.0)† (N=245)	48.0 (23.0 to 74.0) (N=25)	40.2 (29.7 to 51.7) (N=87)	52.7 (47.7 to 57.6) (N=1556)	43.5 (40.9 to 46.2)† (N=1539)
HIV prevalence,§ % (95% CI)	0	0.53 (0.16 to 1.8)	0	0.18 (0 to 0.71)	0	1.9 (0.90 to 3.8)	0	1.3 (0.65 to 2.7)	0	0	0	0	0	0.63 (0.43 to 0.92)

*Refers to the following cities where the IBBS was conducted in both 2006 and 2011: Lahore, Karachi, Quetta, Peshawar, Multan, Faisalabad, Sargoda (these last three in 'Other Punjab'), Sukkur and Larkana (these last two in 'Other Sindh').

†Significant difference at the 5% α -level using parametric and non-parametric tests of significance between survey rounds and within each region, as well as between rounds for all cities combined.

‡Condom use among FSWs who had sex with a non-paying partner in the previous month.

§HIV prevalence was not compared between rounds.

FSW, female sex worker; IBBS, integrated biological and behavioural surveys; KK, kothikhana; N, number of respondents.

Table 4 Factors associated with inconsistent condom use with clients (N=4282) and non-paying partners (N=2276), and increased HIV prevalence (N=2838) among Pakistani female sex workers in 2011 across 12 cities

Characteristic	Inconsistent condom use with clients in the last month (N=3179)		Inconsistent condom use with non-commercial partners in the last month (N=1896)		HIV positive* (N=25)	
	Adjusted OR (95% CI)	p Value	Adjusted OR (95% CI)	p Value	Adjusted OR (95% CI)	p Value
Illiterate (unable to read/write)	1.8 (1.4 to 2.2)	<0.001	1.9 (1.4 to 2.7)	<0.001	–	–
Duration in sex work						
<2 years	Ref		Ref		–	–
≥2 years	1.5 (1.1 to 1.9)	0.004	1.7 (1.1 to 2.4)	0.009		
Usual method of solicitation						
Mediator	Ref		Ref		–	–
Phone	0.73 (0.57 to 0.93)	0.01	0.70 (0.47 to 0.97)	0.04		
Public places	0.62 (0.47 to 0.82)	0.001	0.59 (0.42 to 0.82)	0.002		
Referral	0.62 (0.46 to 0.84)	0.002	0.55 (0.34 to 0.88)	0.02		
Number of clients per month						
<60	–	–	Ref		–	–
≥60			1.5 (1.2 to 1.8)	0.001		
Have a non-commercial partner in the last 1 month	1.5 (1.1 to 1.9)	0.005	–	–	–	–
Injected drugs in the previous 6 months	–	–	–	–	4.7 (1.1 to 19.6)	0.04
In the past 6 months, had sex with a man who injects drugs						
No	Ref		–	–	–	–
Yes	1.7 (1.2 to 2.3)	0.001				
Don't know	1.6 (1.2 to 2.0)	<0.001				
Experienced sexual violence in the previous 6 months	1.4 (1.1 to 1.7)	0.01	1.4 (1.1 to 1.9)	0.04		
Has not accessed prevention programmes for FSWs	3.2 (2.2 to 4.4)	<0.001	1.9 (1.3 to 2.8)	0.003	7.5 (1.5 to 39.1)	0.02
Region						
Lahore	Ref		Ref		†	–
Other Punjab	1.9 (1.4 to 2.8)	<0.001	1.6 (1.0 to 2.6)	0.05		
Karachi	0.71 (0.45 to 1.1)	0.1	0.56 (0.33 to 0.96)	0.03		
Other Sindh	1.9 (1.2 to 3.1)	0.008	1.6 (0.75 to 3.4)	0.2		
Quetta	0.69 (0.40 to 1.2)	0.2	0.57 (0.33 to 0.99)	0.05		
Peshawar	1.5 (1.0 to 2.2)	0.05	0.95 (0.49 to 1.8)	0.9		
Haripur	1.6 (0.83 to 3.1)	0.2	2.4 (1.5 to 3.8)	0.001		

*For HIV prevalence, only regions in which at least one case of HIV was detected were included for analysis (Lahore, Other Punjab, Karachi, Other Sindh, Haripur). The adjusted ORs for each covariate associated with HIV prevalence were only adjusted for region.

†Adjusted ORs are not shown for region although region is included in the adjusted ORs for each of the following covariates separately: 'has not accessed prevention programmes for FSWs' and 'injected drugs in the previous 6 months'.

Usual methods of solicitation: 'mediator' refers to solicitation via network operators (brothel madams, pimps); 'phone' refers to solicitation via mobile/cellular phones; 'public places' refers to direct solicitation in public venues; and solicitation via 'referral' pertains to referral from other clients.

Inconsistent condom use refers to self-reported 'sometimes' or 'never' condom use in the month preceding the survey. Note that covariate 'typology' was not included in the regression model development because of correlation with 'usual method of solicitation'. For outcomes relating to condom use, all 12 cities were included, and the adjusted ORs from the final regression model are shown.

FSW, female sex worker.

caused by the fraction of FSWs who inject drugs and share needles, and also through sex between FSWs and IDUs. We found that recent injection drug use was associated with HIV-positivity in FSWs, although this association was based on a small number of HIV-positive FSWs and a small number of FSWs who report recent injecting behaviour. Despite this association, a considerable fraction of HIV-positive cases could not be attributed to recent injection drug use: 22 of the 25 HIV-positive FSWs denied having injected drugs in the past 6 months. Reports of injection drug use among sexual partners is expected to be less reliable than reporting one's own injection history. Although our survey did not include data on injecting behaviour in the remote past, the above finding suggests that HIV may be emerging among FSWs as a result of sexual transmission from networks with higher HIV prevalence, such as IDUs and high-risk men who have sex with men. Further study into the intersection of sex work and injection drug use in Pakistan, including the role of mediators (of paid sex and/or drugs), is needed.

Our findings are limited by the serial cross-sectional nature of the study, our inability to track individuals who were interviewed in both rounds, and therefore, the restrictions placed on interpreting differences in sexual behaviour and HIV risk over time. Enumeration and mapping improved in 2011. Hence, study samples could represent different FSW populations in the two survey rounds, which is a limitation of the comparison between FSWs in 2006 and FSWs in 2011. The overall ('all cities') comparison between 2006 and 2011 is also limited by the absence of proportional weighting for cities by FSW population size. An unweighted descriptive analysis was performed because the comparison between survey rounds reflects the nine cities included in both surveys, and was not intended to be representative of the whole country. The comparison between 2006 and 2011, therefore, is restricted to the nine cities included for analysis. The surveys are also conducted in the context of a surveillance programme, and therefore, detailed questions related to individual and structural vulnerabilities are limited to the

Key messages

- ▶ HIV may be emerging among female sex workers (FSWs) in Pakistan, where FSWs remain vulnerable to HIV and access to HIV prevention programmes remains low.
- ▶ Exposure to HIV prevention programmes is associated with protective behaviours (condom use with clients) and the absence of HIV.
- ▶ Overlap with injection drug use through sexual partners' injecting behaviour or FSWs' injecting behaviour is associated with lower levels of condom use and HIV, respectively.
- ▶ Adaptive HIV prevention strategies are needed to increase programme access and to address the intersection of vulnerable sexual networks and injecting drug use.

level of detail presented in this study (ie, a general overview). Nonetheless, important differences in vulnerabilities were detected between 2006 and 2011, and risk profiling of FSWs least likely to consistently use condoms with clients and non-paying partners will help prevention programmes focus on the most vulnerable FSWs. The emergence of HIV and overlap with intersecting sexual and injecting networks requires further study, and underscores the importance of addressing HIV risk in connected high-risk groups in Pakistan.

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Contributors JFB conceived of the study, designed the analyses, interpreted results and critically reviewed the manuscript. SM designed and performed the analyses, interpreted results, drafted the manuscript and contributed to manuscript revisions. LHT contributed to study conception, planning of analyses, manuscript writing, manuscript revisions and interpretation of results, and co-ordinated the study. FE conducted the surveillance project, led data collection, developed the questionnaires, contributed to study conception and critically reviewed the manuscript. AS and NK contributed to the surveillance project and data collection, and critically reviewed the manuscript.

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