

HIV risk in Karachi and Lahore, Pakistan: an emerging epidemic in injecting and commercial sex networks

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Summary: The objective of this study was to measure HIV prevalence and risk behaviour in injecting drug users (IDUs), male sex workers (MSWs), Hijras (transgenders), female sex workers (FSWs) and male truckers in Karachi and Lahore, Pakistan. The design was a linked-anonymous cross-sectional study of individuals identified at key venues or through peer referral. Approximately 400 respondents in each group (200 for Hijras) responded to a standardized questionnaire and were tested for HIV antibodies at each site. In Karachi, 23% of IDUs and 4% of MSWs were HIV positive, and HIV-positive individuals were identified in all risk groups in at least one city. Two-thirds of all IDUs used a shared needle in the previous week, and unprotected commercial sex activity with men and women was high. The HIV epidemic has entered IDU and male and female commercial sex networks in Karachi and Lahore. Targeted intervention services must be scaled up and risk group surveillance intensified.

Keywords: HIV, Pakistan, high-risk groups, drug use, sexual behaviour

INTRODUCTION

The United Nations Programme on HIV and AIDS (UNAIDS) median estimate for the number of HIV-infected individuals in Pakistan at the end of 2003 was 74,000, with an adult HIV prevalence estimated at 0.1%.¹ However, previous studies have warned that high levels of injecting and sexual risk networking behaviour give notice of HIV epidemic potential in Pakistan.² This would follow the pattern noted in other countries in Asia, where the HIV epidemic is concentrated among high-risk groups, most severely affecting those involved in injecting drugs and individuals buying and selling commercial sex.³ Clearly, the sexual partners of such individuals are also at risk of acquiring HIV infection. In India, 45% of wives of HIV-positive injecting drug users (IDUs) were found to be HIV

positive in Manipur.⁴ Also in south Asia, a principally heterosexual epidemic has led to an HIV seroprevalence in antenatal clinic women, which exceeded 3% in sentinel surveillance from 2000 to 2003 in the Indian State of Andhra Pradesh.⁵ In addition, a World Health Organization (WHO) modelling team estimated that unsafe medical injections may account for up to 7% of all new HIV infections in the region in which Pakistan is situated between 2000 and 2030.⁶ Such unsafe medical injections could also be a source of spread from high-risk groups into the general population.

A study of IDUs in Karachi in December 2003 identified one HIV-infected individual out of 160 tested, confirming a low-level presence of HIV in this group, at that site.⁷ The Government of Pakistan recognized the critical need to accurately measure both biologic and behavioural parameters in high-risk populations so that prevention programmes could be planned to appropriately respond to and avert a generalized epidemic that would be costly in both human and monetary terms. With assistance from the Department for International Development (DFID), these studies were commissioned in Karachi and Lahore, the two largest cities.

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METHODS

The high-risk groups sampled in the cities of Lahore and Karachi were (i) male IDUs: men who have injected drugs at least once in the past six months, (ii) female sex workers (FSWs): women who have engaged in selling sex at least once in the past three months, (iii) male sex workers: males who have sold sex at least once in the past one year, (iv) Hijras: individuals who were born biologic males or transgenders, and have adopted a predominantly female sexual persona and dress as women and (v) truckers and assistants: men driving trucks or assisting drivers along inter-state transport routes.

A target sample size of 400 respondents was chosen in each city for each target group (except Hijras) to meet the competing technical need for statistical power to detect differences over time, and the practical considerations of cost and human resource supervision and management. The Hijra sample size of 200 in each city was agreed upon due to the relatively smaller size of the Hijra population. Study protocols, questionnaires and consent forms for the target groups were approved by the Family Health International (FHI) Protection of Human Subjects Committee, and the Institutional Review Board of a Pakistani non-governmental organization, HOPE, in Karachi. Participation was linked-anonymous, and respondents were given access to their HIV results with appropriate counselling and referral. Probability sampling was employed wherever possible. This involved systematic random cluster sampling, based on identification of group members at high-risk or employment venues in defined geographic areas or through Guru (mentor) networks in the case of Hijras. This was successfully managed for IDUs, Hijras and truckers in both cities, and FSWs in Lahore. Peer chain referral sampling was employed for MSWs at both sites and FSWs in Karachi.

Data collection began in March and ended in August 2004. A standardized questionnaire, translated into Urdu and Punjabi, was completed by face-to-face interview by trained gender-matched interviewers (males for Hijras). A 10 mL blood sample was drawn for HIV in all subjects. Serum and other appropriate biologic samples were also obtained and tested for other blood-borne and sexually transmitted infections (STIs), and these results will be presented in a companion paper. Serum samples were tested for antibody to HIV using the AxSYM1/2 gO microparticle enzyme immunoassay (Abbott Diagnostics, Chicago, USA) and confirmed by Ani LabSystems' HIV enzyme immunoassay (Ani LabSystems, Vantaa, Finland). Data were managed and analysed in Stata 8 (Stat Corporation, College Station, TX, USA) and SPSS 11.5 (SPSS, Chicago, IL, USA). Pearson χ^2 test or Fisher's Exact test was used for univariate analysis where appropriate. Multivariate analysis was performed on a logistic regression model, with entry of relevant variables identified at $P < 0.1$ on univariate analysis or on the prior belief that they may act as confounders.

RESULTS

HIV seroprevalence, sociodemographic and drug injecting indicators are outlined in Table 1. Injecting drug users in

Karachi clearly had the highest HIV seroprevalence at 23%, followed by males (4%) and Hijras (2%) who sold sex in that city. Infection with HIV was identified in all groups in at least one city.

In total, 18% of IDUs in each city stated that they used a needle previously used by someone else at their last injection, and 24% in each city stated that they passed the needle they had just used to someone else. Over half (51%) of Lahore IDUs reported that they had injected drugs in another city or district in the last year, compared with 21% from Karachi. Commercial sex indicators for all groups are outlined in Table 2. In addition to the commercial sex indicators reported in the table, a total of 42% of Karachi IDUs and 62% of Lahore IDUs reported any sex with a woman in the previous year. Male-to-male sex behaviour was also commonly reported by IDUs in both cities, and 14% of all IDUs reported unprotected anal sex with a male partner in the past month. Condom use by IDUs was below 50% in all reports for male and female partner types.

The median number of one-time clients of FSWs (men not previously known by the FSW) in the previous week was three (range 1-35), and the median number of regular clients in the previous week was four (range 1-30) in the two cities. In addition to clients, 86% of FSWs in Karachi and 56% of FSWs in Lahore also reported sex with a non-paying male partner in the previous month, and only 22% reported condom use at last sex with that partner. Of those with non-paying partners, 14% knew that those partners injected drugs, and 20% of all FSWs reported that they had male clients who also injected drugs. In addition, almost 6% (48/827) of FSWs reported anal sex with clients in the past week, with 21% reporting condom use at last anal sex.

Among MSWs who sold anal sex in the past week, the median number of clients was four (range 1-20), and 28% of the total sample reported sex with a non-paying male partner in the previous month. A condom was used in under 3% of last sex acts with these non-paying male partners. The reported insertive or receptive nature of anal sex differed at each site, with 47% of MSWs in Karachi stating that they were an exclusively insertive partner, compared with 2% in Lahore. Conversely, 33% of Lahore MSWs reported exclusive receptive role during anal sex, compared with 18% in Karachi. The remainder practised both roles. Less than 1% used a water-based lubricant with a condom at last anal sex, in either city. In total, 24% of MSWs in Lahore and 9% in Karachi had sex with a non-paying female partner in the past month, and 17% of those sex acts were covered by a condom.

Hijras reported a median duration of commercial sex experience of six years in Lahore and 10 years in Karachi; 96% had sold anal sex to men in the past month, with a median of four partners in the past week (range 1-21). Forty percent (40%) had non-paying male anal sex partners in the past month, and they used a condom during 8% of last sex acts with these partners. Eleven percent (11%) had sex with a woman in the last year, and 25% of last female sex acts were covered by a condom.

In addition to the male and female commercial sex partners outlined in Table 2, 15% of truckers reported sex with other non-paying female partners, with whom 6%

Table 1 HIV prevalence, sociodemographic and drug injecting indicators for each group, by city

Target groups	Lahore									
	Karachi					Lahore				
	IDU (n=402)	MSW (n=409)	Hijra (n=199)	Trucker (n=402)	FSW (n=423)	IDU (n=397)	MSW (n=400)	Hijra (n=204)	Trucker (n=400)	FSW (n=404)
HIV prevalence	23.1% (93/402)	3.9% (16/409)	1.5% (3/199)	0% (0/402)	0% (0/423)	0.5% (2/397)	0% (0/400)	0.5% (1/203)	1% (4/400)	0.5% (2/404)
Age, median (range)	35 (14-70)	24 (14-65)	25 (15-50)	27 (17-59)	35 (15-66)	33 (18-75)	23 (13-62)	22 (13-45)	32 (17-65)	35 (15-70)
No formal schooling (%)	59.0 (237/402)	57.9 (237/409)	50.3 (100/199)	45.3 (182/402)	76.3 (322/422)	61.2 (243/397)	57.5 (230/400)	51.5 (105/204)	34.6 (138/399)	83.6 (337/403)
Total income from previous month, median (60PKRs/1 US\$)	3000	3000	3000	3500	4000	3000	3000	3500	3500	5000
Currently legally married	26.2% (105/401)	15.5% (63/407)	6.1% (12/198)	57.8% (231/400)	82.9% (350/422)	42.5% (168/395)	18.3% (73/400)	10.3% (21/204)	74.3% (297/400)	62.5% (252/403)
Currently living with a spouse or regular partner (male partner for Hijras, heterosexual for others)	14.0% (56/400)	3.9% (16/407)	17.9% (35/195)	53.1% (211/398)	7.2% (30/416)	35.0% (138/394)	14.0% (56/400)	23.5% (48/204)	72.3% (289/400)	7.7% (31/401)
Sold blood for money in the past 12 months	0.5% (2/387)	0.8% (3/405)	1.1% (2/197)	0.5% (2/400)	0.5% (2/422)	1.5% (6/395)	0.5% (2/400)	0.5% (1/204)	0.3% (1/400)	0.7% (3/403)
Injected drugs during last 12 months	100% (402/402)	3.7% (15/405)	1.1% (2/199)	0.5% (2/390)	1.7% (7/422)	100% (397/397)	3.5% (14/400)	1.5% (3/204)	0% (0/392)	5/403 (91.2%)
IDU=injecting drug user; MSW=male sex workers; FSW=female sex workers										

used a condom at last sex. In this nominally heterosexual male risk-group, 22% of Karachi male truckers reportedly buying sex from a male or Hijra in the past year, compared with 7% in Lahore. Condom use at last male commercial sex act was under 1% overall for truckers, and under 15% stated that they could access a condom any time they needed one.

Information was also collected on risk reduction intervention access for all groups under study. Intervention contact in the past year was below 2% for MSWs, Hijras and truckers, under 6% for FSWs and 24% for IDUs in Karachi and 62% for IDUs in Lahore. Contact was defined as having been specifically approached by someone for the purpose of discussing HIV prevention or having attended a meeting for HIV prevention.

Differences in knowledge, attitudes and behaviour among FSWs, according to their membership of sex worker organizations, which may not have a direct HIV intervention focus or access to HIV intervention prevention projects, are shown in Figure 1. Membership of sex worker organizations did not appear to have significant positive effect on safe behaviour, but women who had access to specific HIV interventions reported consistently more beneficial risk reduction indices than those who did not. There were highly significant increases in condom use with last client of 53% (24/45) versus 30% (217/734) (odds ratio 2.7: 95% confidence interval 1.5-5.0, $\chi^2 P=0.001$), and consistent condom use with male clients in past week of 32% (13/41) versus 9% (65/691) (odds ratio 4.5: 95% confidence interval 2.2-9.0, Fisher's Exact test $P<0.001$). Gaps in HIV knowledge among risk groups can be viewed in Figure 2. Male clients in Figure 2 are defined as those IDUs and truckers who reported FSW contact in the past one year.

Of those IDUs who attended needle exchange, the median number of visits in the past month was two, and the mean number of injections per month was 65. In addition to clean injecting equipment, 22% of IDUs reported receiving condoms in the previous year; 11% said they received education about HIV and 4% received STI care. Additional demographic, behavioural and intervention access variables for IDUs in Karachi and statistical associations with HIV infection are outlined in Table 3. The strongest positive associations for HIV infection were with needle exchange knowledge and access. When selected variables were entered into a logistic regression model, only needle exchange access in the past month remained statistically significant ($P=0.005$). However, 74% of those HIV-positive IDUs who did attend needle exchange in the past month did so on only two occasions or less, while 74% also reported at least two injections a day in the previous week.

It was not possible to identify any individual statistical correlates of HIV infection in Karachi MSWs and Hijras in this context of high levels of unprotected commercial anal sex. Fifteen Karachi MSWs reported injecting drugs in the past year, but none were HIV positive. Respondents were not asked if they knew that they had IDU clients. Only five MSWs had been reached by an intervention in the past year, and one of those was HIV positive.

Table 2 Commercial sex and condom access indicators for each group, by city

Study cities	Karachi					Lahore				
	IDU (n=402)	MSW (n=409)	Hijira (n=199)	Trucker (n=402)	FSW (n=423)	IDU (n=397)	MSW (n=400)	Hijira (n=204)	Trucker (n=400)	FSW (n=404)
Females selling sex to males										
Had one-time client during the last week					50.7% (214/422)					52.4% (211/403)
Used condom during vaginal sex with last one-time client					28.5% (61/214)					47.9% (101/211)
Had regular client during the last week					80.6% (337/418)					82.9% (334/403)
Used condom with last regular client during vaginal sex					25.5% (66/337)					47.0% (157/334)
Males buying sex from females										
If sexually active, paid any female for vaginal or anal intercourse, in the past 12 months (1 month for MSW)	29.5% (111/376)	12.3% (49/400)		32.3% (120/372)		33.9% (127/375)	39.3% (157/400)		21.5% (86/400)	
Used a condom last time paid a woman to have sex	17.2% (19/111)	12.3% (6/49)		1.7% (2/120)		31.5% (40/127)	17.9% (28/157)		6.9% (6/86)	
Males selling sex to females										
Given money or drugs by a woman in exchange for sex in the past 12 months (1 month for MSWs)	2.4% (9/375)	12.8% (51/399)				4.8% (18/378)	19.8% (79/400)			
Used a condom last time paid for vaginal or anal sex by those women	22.3% (2/9)	5.9% (3/51)				38.9% (7/18)	25.3% (20/79)			
Males and Hijiras selling sex to males										
Sold anal sex to a man during the last one week (12 months for IDUs)	4.6% (17/374)	84.1% (342/407)	74.3% (147/198)			11.1% (42/377)	86.8% (347/400)	91.7% (187/204)		
Used a condom at last anal sex with one-time client (used condom with any last client in past month for IDUs)	25.0% (2/8)	5.9% (16/270)	8.8% (10/114)			10.0% (2/20)	8.6% (12/140)	15.6% (14/90)		
Males and Hijiras buying sex from males										
Paid a man or Hijira to have anal sex in the past 12 months (1 month for MSW and Hijiras)	18.2% (68/375)	26.6% (107/403)	1.1% (2/198)	21.9% (82/373)		22.5% (85/378)	32.3% (129/400)	27.9% (57/204)	6.8% (27/400)	
Used a condom last time paid a male or Hijira partner for anal sex	13.3% (9/68)	4.7% (5/107)	0% (0/2)	0% (0/82)		7.1% (6/84)	6.9% (9/129)	7.1% (4/57)	3.7% (1/27)	
Condom access										
Can obtain a condom anytime one needs it	8.6% (30/351)	57.8% (221/382)	64.2% (120/187)	5.9% (18/303)	41.8% (140/335)	35.2% (132/375)	39.3% (140/356)	42.5% (82/194)	22.7% (72/317)	67.5% (261/387)
IDU=injecting drug user; MSW=male sex workers; FSW=female sex workers										

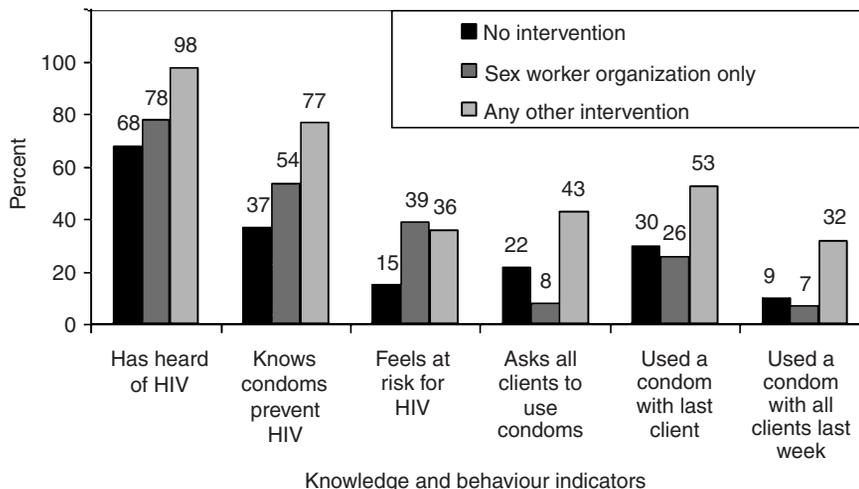


Figure 1 Female sex workers' knowledge and condom use, by intervention access

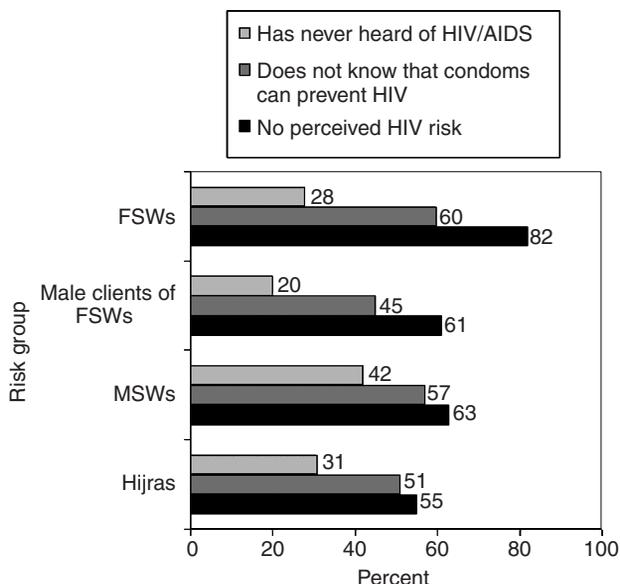


Figure 2 Vulnerability to sexual HIV transmission in commercial sex. FSW=female sex worker; MSW=male sex worker

DISCUSSION

Karachi has experienced an explosive HIV epidemic in IDUs in late 2003 and early 2004, which has spilled over into the male commercial sex networks. Given the reported high levels of heterosexual risk behaviour, it is now probable that spread into the female commercial sex networks, including their male clients, will occur.⁸ The ultimate size and impact of the HIV epidemic in Pakistan will depend on the effectiveness of prevention activities in the risk groups studied in this first round of high-risk group surveillance in Pakistan.

The study in Karachi, which found one in 160 IDUs infected with HIV in late 2003,⁷ was carried out in the same population and geographic area as these studies in mid-

2004. The dramatic rise to 23% HIV prevalence in Karachi IDUs in those few short months reflects the pattern of exponential growth possible in IDUs where needle sharing is common.⁹ The fact that the correlates of HIV infection did not reveal strong behavioural associations is perhaps not surprising for two reasons. Firstly, the epidemic is new and still unfolding, and we have obtained a time-point estimate of HIV prevalence. It is not unusual for prevalence levels to reach 50% within the first two years of an IDU epidemic.¹⁰ Secondly, in contexts where needle sharing is common, the timing and pattern of take-off of an IDU epidemic depends more on networking characteristics rather than solely on individual risk indicators.¹¹ Current high-risk group venue sampling techniques do not map these networking characteristics well and while we are unable to measure the effect of the network dynamics on the correlates of HIV infection, these dynamics are almost certainly a source of significant confounding for the measured associations. The fact that the strongest statistical association with HIV infection was for needle exchange attendance in the past month informs us that at least one of the highest risk networks has been successfully accessed. It should also be noted that two-thirds of HIV infected IDUs sampled did not attend needle exchange in the past month. Ensuring that HIV-positive injectors have regular access to sterile needles, so that they avoid passing on the infection to others, can be a highly effective way of reducing HIV transmission. Another aspect of networking that was not addressed in this study was injection by medical practitioners, licensed or otherwise. As stated in the introduction, a WHO model has estimated that 7% of new HIV infections may be attributable to that route.⁶ Another group of modellers from institutions, including UNAIDS, WHO and the Centers for Disease Control and Prevention, Atlanta, USA (CDC) have concluded that efforts should be increased to reduce exposure of patients to blood-borne infections in health-care settings, but that sexual transmission is the predominant mode of HIV transmission in sub-Saharan Africa.¹² It is likely that sexual and non-medical injection transmission will also be the predominant modes

Table 3 Karachi IDU indicators: associations with HIV infection

Indicators	Percent of respondents	HIV prevalence by indicator status		
		Yes	No	P value*
Age under 30 years	32.6% (127/402)	27.6% (35/127)	21.1% (58/275)	0.2
Had any formal education	41.0% (165/402)	21.2 (35/165)	24.5% (58/237)	0.3
Drug injection for less than two years	13.4% (48/358)	29.2% (14/48)	22.6% (70/310)	0.4
Usually injected heroin during the past one month (compared with other drugs)	79.1% (318/402)	20.8% (66/318)	32.1% (27/84)	0.04
Injected more than twice the day before (median 2 injections/day)	33.3% (134/402)	21.6% (29/134)	23.9% (64/268)	0.7
Last time injected, used a needle or syringe after someone else	18.4% (74/402)	20.3% (15/74)	23.8% (78/328)	0.6
When injected in past week, always used a needle and syringe that no one else had used	59.2% (238/402)	26.5% (63/238)	18.3% (30/164)	0.07
Last time injected with others, cleaned the needle and syringe between users	94.6% (124/131)	16.9% (21/124)	28.6% (2/7)	0.6
Knows where NGO needle exchange facility is	35.6% (143/402)	34.3% (49/143)	17.0% (44/259)	<0.001
Visited needle exchange in past month	18.3% (73/402)	42.5% (31/73)	18.8% (62/329)	<0.001
Ever heard of HIV or the disease called AIDS	72.3% (288/398)	25.0% (72/288)	17.3% (19/110)	0.1
Reported that used needles can spread HIV, when prompted	70.9% (282/398)	24.8% (70/282)	19.0% (22/116)	0.1
Knows that a healthy looking person can be infected with HIV	65.6% (261/398)	25.7% (67/261)	17.5% (24/137)	0.9
Did not report perceived personal HIV risk	41.8% (167/402)	25.1% (42/167)	21.5% (50/233)	0.4

*Pearson χ^2 with continuity correction

NGO=non-governmental organization

of HIV transmission in these drug injecting and sexual high-risk groups in Pakistan. All aspects of injection networking are important subjects for further study, both qualitative and quantitative.

The need for rapid scale-up of needle exchange and harm reduction interventions is clear, with assured regularity of supply and ease of access for injectors. This access may have come too late for those members of the injecting networks who became infected, and the mismatch between the high frequency of injecting and low frequency of programme access also suggest that access to clean injecting equipment was not sufficient, for client or supply reasons. It is also possible that other practices, when the drugs are prepared and injected in a group, led to contamination of the fluid injected, despite each group member having his own needle and syringe. These issues require further qualitative study, which should also examine health-seeking behaviour and medical injecting standards.

It is noted that the injecting and sexual risk indicators in Lahore are at least as great as those in Karachi. Also, the identification of two HIV-infected IDUs in Lahore places that city in much the same position as Karachi in late 2003. Experience from the neighbouring country of Nepal, however, has shown that a rapid rise in HIV prevalence in IDUs is neither predictable nor inevitable if effective harm reduction strategies, including needle exchange, can be sustained, with high percentage of risk group coverage.¹¹

In this study, we have attempted to survey representative samples of the risk groups at each study site. No claims are made that these data are representative of Pakistan, or even of all of the large cities from which they were drawn. The decisions on where to place the study sites were based on local information on an individual group basis. The MSW groups and the FSW group in Karachi proved extremely difficult to characterize and map, and sites were placed in centrally located high-population density housing areas where risk behaviour was known to be common.

Information that is also required to plan an effective response is the total size of the target populations. It was not an objective of these studies to estimate the number of high-risk individuals, but future studies are planned to meet this need.

The fact that none of the MSWs or Hijras, who were identified as HIV positive in Karachi, reported drug injection has significance for the mode of spread of the epidemic. It is highly likely that they were infected through unprotected anal sex with IDUs, 18% of whom reported buying sex from a male or Hijra in the past year, with very low condom use. As anal sex is much more efficient for the transmission of HIV to the receptive partner than vaginal sex,¹² it was to be expected that the male commercial sex networks would be involved sooner than the female, despite the fact that 30% of Karachi IDUs reported sex with an FSW in the past year, with 17% condom use at the last such sex.

The data provide evidence of the importance of effective condom programming. In order to protect themselves and others from HIV infection, men and women who sell sex must know that there is an infection called HIV and that they can get protection by using condoms (and water-based lubricants). They should advise all their clients to use condoms, and have quick and easy physical and financial access to supplies of condoms wherever and whenever they are needed. Males who buy sex, from both men and women, must also understand the risk of HIV involved in buying sex and be prepared for 100% condom use and appropriate lubricant use, if they decide to do so.

The full results of these studies were presented to a national and international audience, including the Pakistan Director General Health and donor representatives, within three months of the completion of data collection. As a result, a rapid resource mobilization and scale-up of surveillance and intervention planning was possible. It is hoped that these coordinated and

collaborative efforts of the Government of Pakistan and the international community will produce a strong HIV prevention response, which will avert a major HIV epidemic in Pakistan.

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