

Drug use among female sex workers in Hanoi, Vietnam

Trung Nam Tran¹, Roger Detels¹, Hoang Thuy Long² & Hoang Phuong Lan³

Department of Epidemiology, University of California, Los Angeles School of Public Health, Los Angeles, CA, USA¹, National Institute of Hygiene and Epidemiology, Hanoi, Vietnam² and Hanoi Dermatology and Venerology Center, Hanoi Health Department, Hanoi, Vietnam³

Correspondence to:

Roger Detels
Professor of Epidemiology
UCLA School of Public Health
Box 951772
Los Angeles
CA 90095-1772
USA
Tel: 310 206 2837
Fax: 310 206 6039
E-mail: detels@ucla.edu

Submitted 26 June 2004;
initial review completed 7 September 2004;
final version accepted 3 December 2004

ABSTRACT

Aims To describe the drug use practices among female sex workers (FSWs) in Hanoi and to identify factors associated with their drug injecting.

Design, setting and participants A two-stage cluster survey of 400 FSWs was conducted from June to September, 2002. Participating FSWs were both establishment- (160) and street-based (240), who were practising in seven urban and one suburban districts of Hanoi.

Measurements Subjects were interviewed face to face using a structured questionnaire.

Findings Among the middle-class FSWs, 27% used drugs, of whom 79% injected. Among low-class FSWs, 46% used drugs and 85% injected. Among drug-using FSWs, 86% had started using drugs within the past 6 years. Among drug-injecting FSWs, 81% had started injecting within the past 4 years. Cleaning of injecting equipment was not common among those who shared. Having drug-injecting 'love mates', drug-using clients, longer residence in Hanoi, more clients and not currently cohabiting were found to be independently associated with drug injecting among FSWs.

Conclusions The high prevalence of injecting drug use among FSWs makes them susceptible to HIV infection, and is a threat to their clients. There is a strong relationship between drug-using FSWs and male drug-using clients and non-client partners. Intervention to prevent drug use initiation among non-drug-using FSWs and harm reduction among drug-using FSWs are urgently needed.

KEYWORDS Drug use, Hanoi, HIV/ AIDS, injection, sex workers, Vietnam

INTRODUCTION

The HIV epidemic in Vietnam is established in several high-risk populations, such as injecting drug users (IDUs) and female sex workers (FSWs), and has the potential to spread to the general population [1,2]. Although IDUs account for the majority of HIV infections, more and more FSWs are being infected [3]. HIV prevalence among the FSW population has been increasing steadily in many cities and provinces. In Hanoi and Hai Phong in the north, and Ho Chi Minh City and Can Tho in the south, HIV prevalence among FSWs increased from 0.1%, 0%, 1.2% and 2.8%, respectively, in 1996, to 14.5%, 7.8%, 14.3% and 11% in 2002, respectively [4].

There is concern that the FSWs in Vietnam may be injecting drugs, through which they acquire HIV. The behavioral surveillance survey conducted in five major cities in Vietnam in 2000 showed that drug use is common among the FSWs studied in some of these cities. The proportion of FSWs who had ever used drugs varied from 0.3% in Can Tho to 0.4%, 3.8%, 13.7% and 29.3% in Da Nang, Hai Phong, Ho Chi Minh City and Hanoi, respectively [5]. Tuan *et al.* [2] reported that drug injecting was responsible for the rapid increase of HIV among the street-based FSWs in Ho Chi Minh City. Drug involvement, in addition to the sexual route, puts FSWs at an increased risk of HIV infection. Thus, drug-injecting FSWs may play a core role in the transmission of HIV.

Knowledge about FSWs' drug use risk characteristics is urgently needed and is critical for developing effective intervention strategies for FSWs.

In Vietnam both drug use and prostitution are considered 'social evils', and are illegal. The government policy is to wipe out these 'evils'; therefore, drug users and FSWs are highly stigmatized, and are subject to detainment. This has created enormous challenges to studying and delivering intervention to these high-risk groups. In Western Europe and the United States, the HIV epidemic among FSWs was believed to be associated with drug injecting. Thus, drug use-related characteristics of FSWs have been studied and described thoroughly in these populations [6–9]. In Vietnam, because the drug use epidemic is relatively current among FSWs and it is difficult to study them, few studies have examined the issue of HIV and drug use among FSWs [2,5,10–14] and little is known about their drug use behaviors and practices. We conducted a cross-sectional study in Hanoi in 2002 among practising FSWs who were not in drug use or sex worker rehabilitation centers to examine their HIV risk characteristics. This study is a continuation of a qualitative study among FSWs in Hanoi in 2001, which described qualitatively the characteristics of FSWs in the capital city [13]. Here we describe the drug use behaviors and practices of FSWs quantitatively, as well as the factors associated with drug injecting.

METHODS

Subjects and procedures

A two-stage cluster survey of 400 FSWs working in the community in Hanoi was conducted from June to September, 2002. According to our previous qualitative study [13], there is a hierarchy of classifications of FSWs in Hanoi (ranging from highest to lowest class): call girls with expensive motorcycles and cell phones and dancers working at dancing clubs are high-class; those working at hotels, karaoke bars, massage parlours and 'wholesale' service women (who can be called from various establishments when their services are needed) are middle-class; and street- and brothel-based women are low-class FSWs. In this study, we recruited only middle- and low-class FSWs. In the first stage, the outreach peer workers who worked in the field identified and mapped a total of 832 sex establishments/venues, including both establishment- and street-based locations, in all urban and one suburban (Gia Lam) districts of Hanoi. The establishments included karaoke bars, hotels, massage parlors and coffee shops. The street-based locations included streets, parks and the lake areas, where sex workers recruit their clients. We then used this map as a sampling

frame to select 80 clusters randomly (40 each from each establishment- and street-based site). In the second stage the outreach workers approached the selected clusters, talked to the FSWs about the study, and encouraged every potential subject in each cluster to participate. The only inclusion criterion was that the subject was a FSW in Hanoi who had traded sexual intercourse for money or gifts within the last 30 days. Subjects were invited to the study center located at the Hanoi Center for Dermatology and Venerology where they were interviewed face to face, using a structured questionnaire. The questionnaire asked about background information, knowledge of HIV, self-experience of HIV testing and counseling, awareness of other sexually transmitted infections, and sexual and drug use risk characteristics. The questionnaire was developed primarily using the results of the previous qualitative study among FSWs in Hanoi [13] and on other background information already available. All interviewers were female medical doctors who were carefully trained regarding the questionnaire and interviewing techniques. If the subject did not want to go to the study center, a mobile team went to a place she selected to conduct the interview, which helped increase participation. Twenty-four per cent of the sample was interviewed by the mobile team. No personal identifying information was collected, and study participation was voluntary. The study was conducted with the understanding and consent of each participant, and was approved by the Institutional Review Boards of the University of California, Los Angeles and the Vietnam National Institute of Hygiene and Epidemiology.

Statistical analysis

Data were entered by two different people, using EpiInfo version 6.04d, and analyzed using STATA 7 (STATA Inc., College Station, TX, USA). Comparisons of proportions between groups were conducted using χ^2 tests. Continuous variables that were highly skewed were transformed into the log scale for comparison using the *t*-test. Multivariate logistic regression was used to examine the associations of independent variables with drug injection, adjusting simultaneously for potential confounders. Confidence intervals were adjusted for the design effects of the stratified cluster sampling. Variable selection into the multivariate model was based on prior knowledge.

Sample characteristics

Of the 400 study participants, 160 (40%) were middle-class FSWs and 240 (60%) were low-class FSWs. The mean age of the participants was 30 years, ranging from 16 to 56 years. The majority of subjects worshipped ancestors and did not follow any organized religion

(65%). Nineteen per cent were Buddhist and only 3% were Catholic. Seventy-eight per cent attended high school or higher, and only 3% had not gone to school. Husbands and boyfriends were termed 'love mates'. The majority were cohabiting with boyfriends or lived alone (43% and 47%, respectively). Only 7% were living with their husbands and 3% with both a husband and a boyfriend. FSWs' mean age at first sexual experience was 19 ± 2.8 years. Fifteen per cent of the sample had previously entered rehabilitation centers. More low-class FSWs had entered rehabilitation centers (86%) than middle class FSWs (56%) ($P = 0.0001$). The average number of clients (both irregular and regular) per day among the middle- and low-class FSWs was 1.2 and 2, respectively. Thirty-four per cent had ever had a drug-using husband/boyfriend, and 42% had clients who were drug users. The mean proportions using condoms with regular and irregular clients in the past month were 76% and 92%, respectively.

RESULTS

Drug use and duration of drug use

Of the middle- and low-class FSWs, 43 (27%) and 110 (46%) used drugs, respectively ($P = 0.0001$). Figure 1 illustrates the proportions of drug injecting, sharing and lending of injecting equipment among each group of FSWs who were drug users. Sharing was defined as using equipment used previously by others. Among those who used drugs, 79% and 85% ($P = 0.42$) of middle- and low-class FSWs injected drugs; 40% and 58% ($P = 0.05$) had ever shared, and 40% and 52% ($P = 0.18$) had lent their injecting equipment, respectively. Among subjects who had shared and lent equipment in the past 6 months, the median proportions of sharing and lending frequency were 5% and 6%, respectively. When compared with par-

ticipants who had never entered rehabilitation centers, those who entered rehabilitation centers were more likely to inject drugs (60% versus 27%, $P = 0.0001$) and to share injecting equipment (35% versus 18%, $P = 0.004$).

The median durations of drug use and drug injecting were 2.6 and 1.8 years, respectively. Low-class FSWs had used and injected drugs for longer periods of time than middle-class FSWs ($P = 0.04$ for both). Subjects who had entered rehabilitation centers had also used and injected drugs longer than those who had not entered the centers: median 4.8 versus 2.3 years ($P = 0.002$) for use and 2.4 versus 1.6 years ($P = 0.05$) for injecting. Among the drug-using FSWs, 86% had started using drugs within the past 6 years (from 1996). Among those who injected drugs, 81% had started injecting within the past 4 years (from 1998).

Sequence of drug use and sex work

Among the 153 drug-using FSWs, 100 (65%) had initiated sex work before they started using drugs; the remaining 53 (35%) began drug use before initiating sex work. Sex work prior to drug use was more common among the middle-class drug-using FSWs (77%) than among low-class drug-using FSWs (61%) ($P = 0.06$). As expected, subjects who had used drugs before initiating sex work had been using drugs for a longer period (median 4.8 years) than those who started sex work first (median 2 years) ($P < 0.0001$). The former group was also more likely to inject drugs (92%) than the latter group (78%) ($P = 0.02$).

Needle and syringe cleaning practices

Cleaning of injecting equipment was uncommon and very poorly practised among those who shared. Among

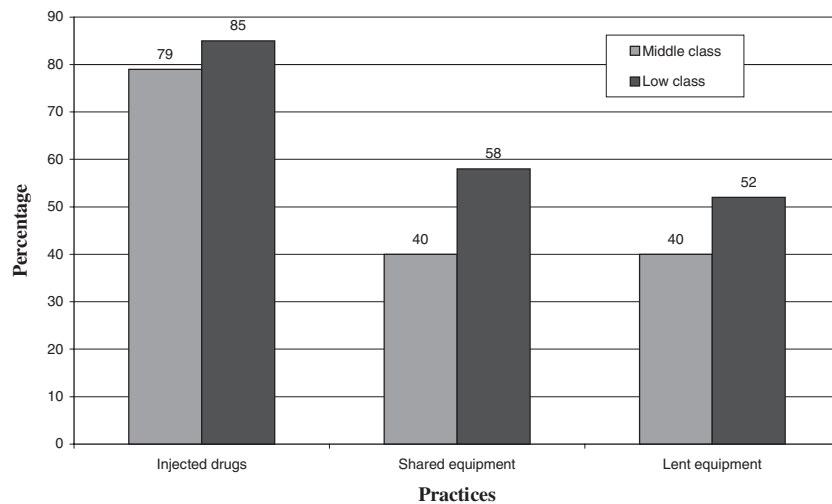


Figure 1 Drug injecting, sharing and lending practices among drug-using FSWs in Hanoi

67 subjects who had shared needles and syringes in the last 6 months, only 22 (33%) always cleaned the equipment. Eleven (16%), seven (11%) and five (8%) subjects cleaned them 'most of the time' (75–99%), 'half of the time' (25–74%) and 'not very often' (1–24%), respectively. Twenty-two subjects (33%) said they never cleaned the equipment. Warm water was usually the means mentioned for cleaning the equipment (59%; 32 of 54), followed by cold water (33%; 18 of 54). Very few subjects mentioned boiled water or alcohol (7.4%; four of 54) as a cleaning agent. No one mentioned bleach. Only two of 54 (3.7%) said they cleaned equipment to kill virus and bacteria. Forty-five of the 54 subjects (83%) said it was to remove the blood to avoid fever, and seven of 54 (13%) said cleaning made them more comfortable (safe) when sharing. Among those who had shared in the past 6 months, female injecting friends and love mates were the first and second most common sharing partners, accounting for 51% and 31% of all partners, respectively. Regular clients, male friends (not sex partners), drug dealers, and others accounted for only 18%.

Correlates of drug injection

Table 1 presents the unadjusted associations of different factors with drug injecting among the FSWs. 'Currently living with a partner' is defined as currently living with a

husband or other sexual partner, or with both a husband and other sexual partner. Having IDU love mates (OR = 13.0; 95% CI: 7.3–22), having drug-using clients (OR = 4.0; 95% CI: 1.9–8.3), having resided for more than 6 years in Hanoi (OR = 3.9; 95% CI: 2.3–6.5), being low-class (OR = 2.3; 95% CI: 1.3–4.3), not currently living with a partner (OR = 2.0; 95% CI: 1.1–3.6), not having other jobs (OR = 1.6; 95% CI: 1.1–2.3) and having more clients in the last month (OR = 1.2 for each increase of 10 clients; 95% CI: 1.1–1.4) were associated with drug injecting among FSWs.

In multivariate analysis (Table 2), we simultaneously controlled for age, education level, duration of residence in Hanoi, religion, ethnicity, cohabitation status, income level, classes of sex worker, having other occupations, number of clients, age at first sexual experience and drug use by boyfriends and clients. In accordance with univariate analysis, having drug-injecting love mates (OR = 10.0; 95% CI: 5.2–20), not currently cohabiting (OR = 2.8; 95% CI: 1.4–5.7), having drug-using clients (OR = 2.5; 95% CI: 1.0–6.1), having more clients in the last month (OR = 1.1 for each increase of 10 clients; 95% CI: 1.0–1.2) and longer residence in Hanoi (OR = 1.06 for each year; 95% CI: 1.03–1.08) were found to be associated with drug injection. Being a low-class FSW, not having other jobs, age of subject, education level, religion, ethnicity, level of income and age at first sexual experi-

Table 1 Univariate analysis for correlates of drug injection among FSWs.

	<i>Drug injection (%)</i>	<i>Odds ratios</i>	<i>95% CIs*</i>
Love mates' drug use			
Injecting	69 (72.6)	13.0	7.3–22.0
Smoking	12 (29.3)	2.0	0.9–4.5
Not using	46 (17.4)	1	
Clients' drug use status			
Don't know	27 (19.9)	1.0	0.5–2.1
Yes	81 (48.8)	4.0	1.9–8.3
No	19 (19.4)	1	
Duration of stay in Hanoi			
6 years or more	91 (45.7)	3.9	2.3–6.5
Less than 6 years	36 (17.9)	1	
Class of FSWs			
Low-class	93 (38.8)	2.3	1.3–4.3
Middle-class	34 (21.3)	1	
Currently living with a partner			
No	75 (39.7)	2.0	1.1–3.6
Yes	52 (24.6)	1	
Have other occupations			
No	91 (35.0)	1.6	1.1–2.3
Yes	36 (25.7)	1	
More or fewer clients last month (increase of 10 clients)		1.2	1.1–1.4

*Adjusted for cluster sampling's design effect.

Table 2 Multivariate analysis for correlates of drug injection among FSWs.

	Adjusted ORs	P-values	95% CIs*
Love mates' drug use status			
Injecting	10.0	0.001	5.2–20.0
Smoking	1.8	0.24	0.7–5.1
Not using	1		
Currently living with a partner			
No	2.8	0.006	1.4–5.7
Yes	1		
Clients' drug use status			
Don't know	1.3	0.58	0.6–2.8
Yes	2.5	0.04	1.0–6.1
No	1		
More versus fewer clients last month (increase of 10 clients)	1.1	0.06	1.0–1.2
Longer versus shorter residence in Hanoi	1.06	0.001	1.03–1.08

*Adjusted for cluster sampling's design effect.

ence were not found to be associated with drug injection among FSWs.

DISCUSSION

Although HIV had been introduced into the FSW population, its presence among this population had been at a low level for many years. However, since 1998, concurrent with the outbreak among male drug users, HIV began to spread rapidly among the FSW population [4]. The fact that the majority of drug-using FSWs in Hanoi began involvement in drugs within the past 6 years (from 1996) and that most started injecting only within the past 4 years (from 1998) probably explains the recent outbreak of HIV among them.

Previous studies among IDUs in Hai Phong and Ho Chi Minh City showed that about half the male IDUs had visited FSWs [11,15]. Our qualitative studies among male drug users and FSWs in Hanoi suggested a strong relationship between drug-using FSWs and male drug-using clients and non-client partners [13,14]. This study provides quantitative evidence of this relationship, which has important implications for HIV/AIDS spread in Vietnam. Multivariate analysis of drug injecting among FSWs indicated a strong association between drug injecting by FSWs and their love mates. FSWs whose boy-friends/husbands were IDUs were more likely to inject drugs; i.e. love mates' drug use influences that of the FSWs. The tendency of FSWs to partner with drug users may explain why the majority (two-thirds) of the FSWs studied become involved in drugs after becoming sex workers. However, our study could not rule out the possibility that once the FSWs initiate drug use, they are

more likely to partner with drug-using males so that they can share their drug use habits. Clients' drug use status was also associated with drug injecting among FSWs. Thus, FSWs and male drug-users are strongly associated. Those who have more clients and reside longer in Hanoi are more likely to inject drugs. Longer residence in Hanoi means longer exposure to drugs and drug-users, thereby increasing their opportunities to use and inject drugs. Given the strong influence of drug use by love mates and clients of sex workers, it was surprising to find that those who do not currently cohabit are more likely to inject drugs. Not being in a stable relationship may make FSWs more susceptible to drug use. These FSWs may be more careless about their health, responsibilities and life-styles than those who are involved in a stable relationship. On the other hand, lack of cohabitation of the FSWs could be the consequence of their drug-injecting practices, as a non-drug-using male partner would be unlikely to stay with a drug-injecting FSW partner. Even though the class of FSWs was not found to be associated independently with drug injection, low-class FSWs were using and injecting drugs for longer periods of time than middle-class FSWs. One explanation was that when a middle-class FSW has been involved in drugs for a while, she loses some of her prestige, and her class consequently would be reduced to working on the street [13].

Of great concern is the proportion of drug-using FSWs in Hanoi who share injecting equipment. Sixty-four per cent of the drug-injecting FSWs had ever shared injecting equipment, which approximated the sharing proportion (68%) among male IDUs in Hai Phong in 1999 when this population was experiencing a rapid outbreak of HIV infection [15]. The high proportion of drug injecting and sharing among the FSWs in Hanoi obviously puts them at

a very high risk of HIV infection. However, to date the contribution of drug use to HIV infection among FSWs in Vietnam has not been adequately recognized and not well addressed in the interventions for FSWs. Drug use intervention is often general and not targeted specifically at FSWs. In addition, due to the interaction between male drug users and FSWs, especially drug-using FSWs, drug use interventions that target one group but not the other are unlikely to achieve success. Therefore, interventions for these populations should be coordinated and integrated to increase their effectiveness and to conserve resources. Strathdee [16] has pointed out that the lack of understanding of the temporal associations between sex work and drug use among the FSWs has important implications for prevention. Condom use is important for sex workers, regardless of whether and when they use drugs. Drug harm reduction programs are especially important for FSWs who had initiated drug use before sex work, but are relevant for all drug-using FSWs.

Cleaning practices were very poor among the drug-sharing participants. Cleaning has been reported to have little effect on HIV transmission [17,18]. In Vietnam, 'social evils' legislation has developed concurrently with HIV/AIDS legislation. However, HIV/AIDS harm reduction and 'social evils' reduction strategies are not the same. Harm reduction methods such as needle exchange programs, bleach for sterilization of injecting equipment, educational outreach and condom distribution had typically been sensitive topics. It is argued by some that distributing clean needles to drug-users and condoms to sex workers encourages the social evils that the government is trying to eradicate. However, evaluations of needle exchange programs in developed countries failed to reveal any evidence that these programs increased numbers of IDUs, induced people to initiate drug use or increased the number of improperly discarded needles [19–21]. High-risk drug use behavior of FSWs and the increasing prevalence of HIV/AIDS in this group warrant an immediate and flexible response. Recently, the Ministry of Health has recognized the need for harm reduction and supported evaluation of pilot harm reduction programs (H. T. Nguyen and R. Detels, personal communication). Some needle exchange and methadone replacement programs have been initiated successfully [22].

This study has several limitations. We were unable to determine the number of potential participants at all the selected establishments (middle-class) and street corners and parks (low-class). Thus, we were not able to obtain the actual participation rate. It is possible that we did not enroll every potential subject at some clusters. Those who participated may be different from those who did not, which could make the study sample unrepresentative of the FSW population.

The results of this study indicate that drug use is a major problem among FSWs in Hanoi, and could fuel further spread of HIV infection both among the FSW population and their clients. Given the similarity among urban centers in Vietnam, this problem could be occurring in other cities or regions of Vietnam. Appropriate measures are needed, including intervention that stops drug use initiation among non-drug-using FSWs and harm reduction among drug-using FSWs. More research is necessary to develop appropriate interventions for this group.

Acknowledgements

This project was supported by a grant from the National Institutes of Health/Fogarty International Center (no. D43 TW00013).

The authors thank Dr Nguyen Tran Hien and Mr Nguyen Anh Tuan for their valuable support. We are very grateful to the outreach workers, the staff of the Hanoi Dermatology and Venerology Center and DKT Vietnam for their contributions to the conduct of the study, and to Wendy Aft for assisting in the preparation of this manuscript.

References

- Gorbach, M. P., Ryan, C., Saphonn, V. & Detels, R. (2002) The impact of social, economic and political forces on emerging HIV epidemics. *AIDS*, **16**, S35–S43.
- Tuan, N. A., Hien, N. T., Chi, P. K., Giang, L. T., Thang, B. D., Long, H. T., Saidel, T. & Detels, R. (2004) Intravenous drug use among street-based sex workers: a high-risk behavior for HIV transmission. *Sexually Transmitted Diseases*, **31**, 15–19.
- United Nation General Assembly Special Session (UNGASS) on HIV/AIDS (2003) Country Report on Follow-up to the Declaration of Commitment on HIV/AIDS, Reporting Period January–December 2002. Hanoi, Vietnam.
- Subcommittee on HIV/AIDS, Surveillance (2003) *HIV Sentinel Surveillance Report*. Hanoi, Vietnam: Ministry of Health.
- National AIDS Standing Bureau (NASB), Family Health International (FHI) (2001) *HIV/AIDS Behavioral Surveillance Survey, Vietnam 2000*. Hanoi, Vietnam: FHI.
- Gossop, M., Powis, B., Griffiths, P. & Strang, J. (1994) Sexual behaviour and its relationship to drug-taking among prostitutes in south London. *Addiction*, **89**, 961–970.
- McKeganey, N., Barnard, M., Leyland, A., Coote, I. & Follet, E. (1992) Female streetworking prostitution and HIV infection in Glasgow. *BMJ*, **305**, 801–804.
- Padian, N. S. (1988) Prostitute women and AIDS: epidemiology. *AIDS*, **2**, 413–419.
- Tirelli, U., Spina, M., Mancuso, S., Traina, C. & Sinicco, A. (1996) HIV seroprevalence study among 729 female prostitutes in Italy. *Journal of Acquired Immune Deficiency Syndromes and Human Retrovirology*, **11**, 208–209.
- Hien, N. T., Long, N. T. & Huan, T. Q. (2004) HIV/AIDS epidemics in Vietnam: evolution and responses. *AIDS Education and Prevention*, **16**, 137–154.

11. Hien, N. T., Giang, L. T., Binh, P. N., Deville, W., Van Ameijden, E. J. & Wolffers, I. (2001) Risk factors of HIV infection and needles sharing among injecting drug users in Ho Chi Minh City, Vietnam. *Journal of Substance Abuse*, **13**, 45–48.
12. Quan, V. M., Chung, A., Long, H. T. & Dondero, J. T. (2000) HIV in Vietnam: the evolving epidemic and the prevention response, 1996–99. *Journal of Acquired Immune Deficiency Syndromes*, **25**, 360–369.
13. Tran, N. T., Detels, R., Hien, T. N., Long, T. H. & Nga, H. T. P. (2004) Drug use, sexual behaviors and practices among female sex workers in Hanoi, Vietnam—a qualitative study. *International Journal of Drug Policy*, **15**, 189–195.
14. Tran, N. T., Detels, R., Hien, T. N., Long, T. H. & Nga, H. T. P. (2004) Drug use, sexual behaviors and practices among male drug users in Hanoi, Vietnam: a qualitative study. *International Journal of Drug Policy*, **15**, 182–188.
15. Nguyen, A. T., Hoang, T. L., Pham, Q. V. & Detels, R. (2001) Risk factor for HIV-1 seropositivity in drug users under 30 years old in Haiphong, Vietnam. *Addiction*, **96**, 405–413.
16. Strathdee, A. S. (2003) Sexual HIV transmission in the context of injection drug use: implication for interventions. *International Journal of Drug Policy*, **14**, 79–81.
17. Vlahov, D., Astemborski, J., Solomon, L. & Nelson, K. E. (1994) Field effectiveness of needle disinfection among injecting drug users. *Journal of Acquired Immune Deficiency Syndrome*, **7**, 760–766.
18. Moss, A. R., Vranizan, K., Gorter, R., Bacchetti, P., Waters, J. & Osmond, D. (1994) HIV seroconversion in intravenous drug users in San Francisco, 1985–90. *AIDS*, **8**, 223–231.
19. Lurie, P., Reingold, A. L., Bowser, B., Chen, D., Foley, J., Guydish, J., Kahn, J. G., Lane, S. & Sorensen, J. (1993) *The Public Health Impact of Needle Exchange Programs in the United States and Abroad*, vol. 1. San Francisco, CA: University of California.
20. Normand, J., Vlahov, D. & Moses, L. E. (1995) *Preventing HIV Transmission: the Role of Sterile Needles and Bleach*. A report of the panel on needle exchange and bleach distribution programs. Commission on Behavioral and Social Sciences and Education, National Research Council and Institute of Medicine. Washington, DC: National Academy Press.
21. US General Accounting Office (1993) *Needle Exchange Programs: Research Suggests Promise as an AIDS Prevention Strategy*. GAP/HRD-93-60. Washington, DC: US Government Printing Office.
22. Quan, V. M., Chung, A. & Abdul-Quader, A. S. (1998) The feasibility of a syringe-needle-exchange program in Vietnam. *Substance Use and Misuse*, **33**, 1055–1067.