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Intravenous heroin use in Haiphong, Vietnam: Need for comprehensive care including methamphetamine use-related interventions

Laurent Michel[a,*], **Don C. Des Jarlais**[b], **Huong Duong Thi**[c], **Oanh Khuat Thi Hai**[d], **Khuê Pham Minh**[c], **Marianne Peries**[e], **Roselyne Vallo**[e], **Thanh Nham Thi Tuyet**[d], **Giang Hoang Thi**[c], **Mai Le Sao**[f], **Jonathan Feelemyer**[b], **Vinh Vu Hai**[g], **Jean-Pierre Moles**[e], **Didier Laureillard**[e,h], **Nicolas Nagot**[e,i], and **for the DRIVE Study Team**

[a]CESP/Inserm1018, Pierre Nicole Centre, French Red Cross, 27 Pierre Nicole Street, 75005, Paris, France

[b]Mount Sinai Beth Israel, 39 Broadway 5th Floor Suite 530 New York, NY 10006, USA

[c]Hai Phong University of Medicine and Pharmacy, 72A Nguyen Binh Khiem, Hai Phong, Viet Nam

[d]Supporting Community Development Initiatives, 240 Mai Anh Tuan Street, Ba Dinh District, Hanoi, Viet Nam

[e]Inserm UMR 1058, Etablissement français du Sang, University of Montpellier, 60 de Navacelles Street, 34394 Montpellier Cedex 5, France

[f]Departement of mental health, Hai Phong University of Medicine and Pharmacy, 72A Nguyen Binh Khiem, Hai Phong, Viet Nam

[g]Infectious Diseases Department, Viet Tiep Hospital, So 1, duong Nha Thuong, Le Chan, Hai Phong, Viet Nam

[h]Infectious Diseases Department, Caremeau University Hospital, Prefessor Robert Debré Place, 30900 Nîmes, France

[i]Department of Medical Information, University Hospital of Montpellier, 34090, Montpellier, France

Abstract

Background—The aim of this study was to describe patterns among people who inject drugs (PWID), risk-related behaviours and access to methadone treatment, in order to design a large-scale intervention aiming to end the HIV epidemic in Haiphong, Vietnam.

[*]Corresponding author at: Centre Pierre Nicole, 27 rue Pierre Nicole, 75005 Paris, France. laurentnmichel@gmail.com (L. Michel).

Contributors

NN, DCDJ, DL and OKTH conceptualized the study. NN, DCDJ, LM, OKTH, HDT, KPM, DL, JPM designed the questionnaires. HDT, KPM, TNTTB, GHT, VVH, MLS participated in the implementation of intervention, supervised the work with the Community Based Organizations and the data collection. MP and RV performed the data analysis with input from LM and NN. LM drafted the manuscript, NN and DCDJ edited the manuscript, NN, DCDJ, HDT, KPM, JF, VVH, JPM provided critical revisions. All authors have approved the final version of the paper for submission.

Conflict of interest

None.

Methods—A respondent-driven sampling (RDS) survey was first conducted to identify profiles of drug use and HIV risk-related behaviour among PWID. A sample of PWID was then included in a one-year cohort study to describe access to methadone treatment and associated factors.

Results—Among the 603 patients enrolled in the RDS survey, 10% were female, all were injecting heroin and 24% were using methamphetamine, including 3 (0.5%) through injection. Different profiles of risk-related behaviours were identified, including one entailing high-risk sexual behaviour (n = 37) and another involving drug-related high-risk practices (n = 22). High-risk sexual activity was related to binge drinking and methamphetamine use. Among subjects with low sexual risk, sexual intercourse with a main partner with unknown serostatus was often unprotected. Among the 250 PWID included in the cohort, 55.2% initiated methadone treatment during the follow-up (versus 4.4% at RDS); methamphetamine use significantly increased. The factors associated with not being treated with methadone after 52 weeks were fewer injections per month and being a methamphetamine user at RDS.

Conclusion—Heroin is still the main drug injected in Haiphong. Methamphetamine use is increasing markedly and is associated with delay in methadone initiation. Drug-related risks are low but sexual risk behaviours are still present. Comprehensive approaches are needed in the short term.

Keywords

Methadone; Methamphetamine; People who inject drugs; Vietnam; Heroin

1. Introduction

Drug use is a major public health concern in Vietnam. It is associated with the HIV epidemic but is also responsible for numerous overdoses, a high level of morbidity and a heavy family and social burden (Bergenstrom et al., 2008; Giang et al., 2013; Lee et al., 2015; Quan et al., 2011; Rudolph et al., 2012; Salter et al., 2010). Today the main drug used in Vietnam is heroin, usually injected, while the second most commonly used drug is methamphetamine, almost exclusively smoked. Drug injection has been the main cause of the HIV epidemic in Vietnam, but sexual transmission has increased over recent years (Giang et al., 2013). Methamphetamine use has been associated with HIV sexual risk worldwide and is now a major concern in the harm reduction field (Degenhardt et al., 2010).

In 2004, Vietnam implemented access to syringes and condom distribution programs for key populations, and the first methadone clinic opened in 2008. With the exception of the management of methadone treatment on the initiative of the Ministry of Health, all interventions for people who use drugs in Vietnam are under the responsibility of a special branch of the Ministry of labor, invalids and social affairs (MOLISA), the department of social evils prevention. The 2013 Renovation Plan committed to a transition away from the system of “06 centres” (compulsory centres for people who use drugs) to a voluntary, community-based system and methadone treatment. At the end of 2014, people who use drugs could face administrative sanctions if they repeatedly screened positive in urine drug tests. The first step is usually a home-based or community-based detoxification, ordered by the local authorities. In case of relapse with positive urine testing, people who use drugs can

be sent to a compulsory centre for at least 2 years. They can also be admitted on a "voluntary" basis to these compulsory centres, usually by the family's request. At the time of the survey, access to methadone treatment required a household registration, an ID card, and payment of 15 US dollars per month. Methadone is dispensed daily including weekends in methadone clinics, with no "take home" dosages. Access to HIV outpatient clinics is free and less restricted. In June 2013, 61 methadone clinics were providing methadone to nearly 14,000 people who use drugs, with an objective to treat 80,000 people who use drugs by 2015 (Giang et al., 2013), which, however, was not met (44,479 in March 2016).

Haiphong is the largest harbour city in North Vietnam with approximately 2 million inhabitants. It has an estimated population of 10,000 PWID and has experienced a very high prevalence of HIV among PWID, reaching 68% in 2006 (Ahmed et al., 2015). Around 3500 people were treated with methadone in 2014. However, despite access to methadone treatment and HIV care, the current epidemiological situation of drug use and related infections such as HIV and Hepatitis C (HCV) is unknown. This lack of knowledge prevents the identification of shortfalls (and relevant actions) in ending the HIV epidemic among persons who inject drugs (PWID).

The main objective of this survey is to describe the profiles of drug use, access to methadone treatment and HIV-related risk behaviours among PWID in Haiphong, Vietnam.

2. Material and methods

2.1. Respondent-Driven sampling (RDS) survey

Participants were recruited using standard RDS strategy (Heckathorn, 1997, 2002) with twelve initial "seeds" who were each given three coupons to distribute to potentially eligible participants. The recruitment was conducted until the target sample size was reached (n = 600) (for detailed procedure, see Des Jarlais et al., 2016).

The RDS eligibility criteria were (1) age 18 or older, (2) capable of giving informed consent, (3) current injection drug use, verified by skin marks and positive urine test for opiates or methamphetamine.

Data were collected using a face-to-face questionnaire on socio-demographic characteristics, injecting and sexual behaviours, drug use, use of health services, and blood samples for HIV and HCV screening. The PWID were also screened for opiates, methadone, methamphetamine ("ice", which commonly refers to crystal methamphetamines in Vietnam), cannabis, ketamine and ecstasy by urine tests (Nal Von Minden Drug-Screen Urine® rapid test). Sexual partners included primary partners with whom PWID had an emotional attachment for at least 3 months (husband/wife, boyfriend/girlfriend, lover), non-primary (casual) partners, and paying "clients" for sex workers. Hazardous and binge drinking were assessed using the Audit-C questionnaire (Bush et al., 1998; Dawson et al., 2012). Current hopelessness, feelings of sadness, suicidal ideas, excessive worries and a past history of suicide attempt were collected in the questionnaire. The RDS procedure and follow-up visits took place in the office of the largest Community-Based Organisation (CBO) in Hai Phong. CBO members contributed to all study procedures, and after specific

training, they recruited the seeds, registered participants, presented the study, determined eligibility, paid honoraria and distributed coupons for further recruitment (Des Jarlais et al., 2016). Participants received VND 150,000 ($7.50 USD) compensation for their participation and ($2.50 USD for each PWID recruited, with a maximum of 3) for recruiting new participants. The study was approved by the Institutional Review Board of the Haiphong University of Medicine and Pharmacy (Vietnam) and the Icahn School of Medicine at Mount Sinai (USA). All PWID included in the study signed an informed consent.

2.2. Cohort study

After completion of the RDS phase, 250 participants were enrolled in a cohort study with follow-up at 12, 24 and 52 weeks, in order to document access to methadone and HIV care, and to describe the evolution of drug use. These participants included 41 new initiate PWID (injecting for <2 years), 27 FSW-PWID, 28 men who have sex with men (MSM)-PWID, and up to 154 other PWID, selected from participants in the RDS procedure. New initiate PWID, sex workers and MSM were intentionally oversampled because of their potential for increased risk of HIV transmission, while PWID on antiretroviral therapy or methadone were not included in order to put more focus on access to care during follow-up. During the cohort study, CBO members maintained contact with cohort participants, provided harm reduction activities (including distribution of condoms and syringes), and provided support for obtaining methadone treatment and HIV care. Data were collected using a face-to-face questionnaire on drug use, access to methadone treatment and risk-related behaviours at each visit. Urine testing for drug detection was conducted at W24 and W52, and participants were screened for hazardous/binge drinking (Audit-C) at W52. Participants received VND 150,000 ($7.50 USD) compensation for each visit.

2.3. Statistical analyses

In order to identify subgroups of PWID with specific patterns of HIV risk-related behaviours, we used a cluster analysis based on a multiple correspondence analysis (MCA) on active and non-redundant variables (inactive variables enable description of the clusters) in order to minimize random fluctuation.

We then implemented a hierarchical ascending classification (HAC), the results of which were consolidated with k-means clustering. HAC on continuous factors (derived from MCA) is a usual agglomerative hierarchical procedure (Euclidian distance and Ward’s method), which enables a reasonable number of homogeneous and easily interpretable clusters to be defined.

We used Fisher’s exact test or Chi-square test to compare the characteristics of the 4 clusters.

Considering that HIV-positive PWID aware of their status may adapt their behaviour to avoid HIV transmission, only data from PWID who reported being HIV negative (n = 276) or not knowing their HIV status (n = 205) were included in the analysis. For the PWID who did not answer the question regarding their HIV status (n = 40), only those who tested negative for HIV at RDS were included (n = 26). Active variables reflecting HIV risk-related behaviours included: sharing needles, using needles already used by someone else, giving/

lending/renting/selling a used needle, unprotected sex without knowledge of the primary partner's HIV status, unprotected sex with a casual partner, unprotected sex for sex workers and their clients. Descriptive variables included in the final analysis to characterize the different subgroups of PWID with risk behaviours included socio-demographic characteristics, patterns of drug and alcohol use (with the exception of drug-related risk behaviours), sexual behaviours (with the exception of sexual risk behaviours), past experience of overdose and suicide attempts, current medical and psychological situation, previous experience with facilities or care involving drug use and urine testing.

Using multivariable logistic regression on PWID not on methadone at the time of the RDS, we identified factors linked to not having initiated methadone treatment during follow-up using summarized variables. Variables with p-value <0.20 in univariate analysis were included in the multivariable model. Analyses were performed using SAS software version 9.4 (SAS Institute, Cary, NC, USA).

3. Results

3.1. RDS sample

From 16 September 2014–7 October 2014, 581 PWID were recruited using an RDS procedure. An additional 22 MSM and FSW participants were directly recruited by peer support staff in order to oversample these groups. Among them, 541 (90%) were male, 61 (10%) were female and 1 was transgender. Only 17,4% of the PWID had a medical insurance (Table 1).

The median duration (years, [IQR]) of drug injection was 8 years [4.0-13.0] and the mean frequency (SD) of drug injection in a typical day was 2.7 (1.0) injections. All were injecting heroin and only 3 injected methamphetamines. The most common non-injected drug was methamphetamine, used by 24.4% of the participants. Only 32 (5.3%) PWID reported injecting with a syringe/needle already used by someone else in the last 3 months and 19 (3%) reported sharing their needle/syringe with other PWID in the last 3 months. Syringes/needles were mainly obtained from pharmacies (83.4%), 108 subjects (17.9%) had previously experienced an overdose and among them, 52 (48.2%) had experienced 2 or more overdoses. Forty-five (7.5%) reported being on MMT at the time of the RDS procedure.

281 (46.6%) PWID were sexually active in past 3 months. Of those with a primary partner (n = 227), a condom was not used at the last sexual intercourse by 71.5% of PWID. Among those with casual partners (N = 31), 15 (48.4%) reported they had not used a condom with their last casual partner. Among sex workers (n = 75), 19 (25.3%) reported they had not used a condom with their last client and 25 (33.3%) reported that they had not always used condoms with their clients in the last 3 months; among clients of sex workers (n = 38), 4 (10.5% of clients) reported that they had not used a condom during their last sexual intercourse with a sex worker.

Results of urine tests are presented in Table 1. All PWID (n = 603) screened positive for heroin (opiates). The most common illicit drug identified other than heroin was methamphetamine (17.1%).

More than 80% of PWID had previously been in contact with substance use treatment: 408 (67.7%) through home-based detoxification, 232 (38.5%) in a compulsory centre, 129 (21.4%) in a voluntary centre, 105 (17.4%) in a private detoxification centre, 33 (5.5%) through community-based detoxification programme, 30 (5.0%) at a hospital, and 63 (10.5%) received methadone treatment including 45 (7.5%) who were still currently treated with methadone at RDS (Percentages sum to > 100% as PWID could report contact with multiple types of treatment).

3.2. Profiles of risk-Related behaviours

According to the cluster analysis, 5 profiles of risk-related behaviours were identified among PWID who were HIV-negative or unaware of their HIV status (n = 507) on the basis of self-report of injecting and sexual practices. A comparison of the descriptive variables among the different population profiles is presented Table 2.

- Two profiles were merged (profiles 1, n = 32, and 3, n = 5) as they both identified PWID with risk-related sexual practices. These PWID had no drug-related risk practices but risk-related sexual behaviours with primary partners, casual partners, or in relation to sex work. They tended to be young and female, with a short history of injection, they were poly-substance users (methamphetamine, binge drinking), and had high levels of sexual activity (one or several primary or casual sex partners), including receiving money for sex. They also more often reported anxiety and had more often attempted suicide in the past.
- Another profile (profile 2, n = 22) identified PWID with high-risk injection behaviours. They were more often males unlikely to have a household registration. These PWID reported being aware of other PWID using syringes they had already used, or reported they themselves used syringes that had already been used by other PWID, or were lending, selling or renting their used syringes to other PWID. These PWID had no risk-related sexual intercourse with casual partners, sex workers or their clients, but 7 (32%) reported unprotected sex with their primary partner despite having no knowledge of the partners serostatus. Their alcohol consumption was less problematic (less excessive alcohol consumption or binge drinking). They frequently helped others to inject the first time, and did not very often attend a compulsory or voluntary addiction centre.
- The third profile (profile 4, n = 86) identified PWID with safe sexual activity irrespective of the partner, with the exception of some (n = 17) who did not always use condoms with their primary partner although they did not know his/her HIV status, and there were no risk-related practices related to drug use. These PWID were more often female, with a shorter history of injection. They reported excessive alcohol consumption, they were less likely to help someone with their first injection, and they had one or several primary sexual partners and often paid for sex.

- The last profile (profile 5, n = 362) concerned the vast majority of PWID and also included 80% of the recent injectors. They did not report any drug-related risk-prone behaviour and most of them (2/3) had no sexual activity in the last 3 months. For those reporting sexual activity (n = 110), the partners were exclusively primary sexual partners, with whom all had unprotected sex. These PWID were mainly male, older, with a longer history of injection, they were less likely to use other substances (methamphetamine or alcohol), and they were more likely to have a fixed address. They were more likely to have attended a compulsory or voluntary substance use centre, they were less likely to have attempted suicide in the past, and expressed less anxiety.

3.3. Cohort sub-Sample

Among the 250 RDS participants enrolled in the cohort (socio-demographic and drug-use characteristics at RDS are presented Table 1), 91.6%, 85.6% and 77.6% respectively returned at week 12, week 24 and week 52 visits. Nine PWID died during follow-up: 2 from overdose, 2 from suicide, 4 from AIDS and one from cachexia.

3.3.1. Evolution of intravenous (IV) heroin use, methamphetamine use and other psychoactive substance use (Table 3)—Among cohort participants, 76 (30.4%) were using methamphetamine at the time of the RDS phase, on the basis of either self-report (N = 59, 23.6%) or urine testing (N = 46, 18.4%). The proportion of participants using methamphetamine increased markedly at week 52 (N = 95, 49.0% on the basis of self-report and urine testing). The proportion of cannabis users was the same (3.6%) at RDS and week 52. Cocaine, ketamine and ecstasy use was rare (N = 0, N = 3 and N = 5 respectively) at RDS and none at week 52, but hazardous and binge drinking increased between RDS and week 52.

3.3.2. Access to methadone treatment—At RDS, week 12, week 24 and week 52, respectively 11(4.4%), 79 (34.5%), 109 (50.9%) and 139 (71.6%) subjects had initiated methadone treatment (Table 3). A total of 138 (55.2%) had initiated methadone after RDS. Among those who initiated methadone, 92 (66.2%) still screened positive for heroin at week 52. About a quarter (27.8%) reported no longer injecting at week 52 but non-injecting heroin use increased (from 2.4% at RDS to 8.2% at week 52). In the final multi-variable model, a lower frequency of injection (AOR = 2.50, 95%CI: [1.44–4.33]) and methamphetamine consumption (AOR = 3.34, 95% CI: [1.92–5.79]) at the RDS visit both independently increased the odds for not being treated with methadone at week 52 (Table 4).

4. Discussion

Although heroin remains the most commonly injected drug in Haiphong, Vietnam, non-injected methamphetamine use has become more and more popular among PWID. Methamphetamine use increased markedly in the cohort and was associated with a high-risk sexual profile and non-initiation of methadone treatment. In the literature, methamphetamine use is associated with high-risk behaviours, including unprotected sex with multiple sexual partners, marathon sex, and poly-drug use (Strathdee and Stockman, 2010). It is also

associated with reduced adherence to antiretroviral therapy in HIV-positive patients and higher viral loads (Ellis et al., 2003; Montoya et al., 2014; Moore et al., 2012) and mental health problems such as depression, anxiety or psychosis (Darke et al., 2008), and it has been linked to antisocial activities and behaviours as a result of its stimulant effects (Embry et al., 2009). It could become a major concern in the coming years, especially if methamphetamine injection increases significantly, which in turn may increase the risk of blood-borne infections (Colfax et al., 2010).

At week 52, about a quarter of the cohort participants reported no longer injecting heroin, with a transition to inhaled heroin for some of them and a lower frequency of injection for most of those still injecting. The persistence of widespread heroin injection practices during methadone treatment and the increase in methamphetamine use and hazardous drinking at week 52 in this study highlight the fact that methadone treatment is only part of a global process targeting substance use disorders. This process should include a comprehensive assessment, and the diversity of needs of PWID should be taken into account (Degenhardt et al., 2010; Mathers et al., 2010; Nambiar et al., 2015; Strathdee et al., 2012; Tran et al., 2016b). Increased alcohol consumption has already been associated with lower injection frequency among PWID in Northern Vietnam (Go et al., 2013) and more generally, it could soon become a major public health concern in Vietnam (Giang et al., 2008; Hoy et al., 2013; Lincoln, 2016; Lundin and Mortensen, 2015). Nearly 2/3 of the PWID who initiated methadone still screened positive for opiates/heroin in urine tests, which is considerable (Dolan et al., 2003; Gerra et al., 2004; Schwartz et al., 2006; Soyka et al., 2008). However, this should be interpreted with caution since methadone initiation could have occurred at any time during follow-up. Nevertheless, it suggests the need to combine harm reduction tools with methadone treatment to prevent HIV/HCV infection (Beyrer et al., 2010; Hagan et al., 2011; MacArthur et al., 2014; Van Den Berg et al., 2007; Wolfe and Cohen, 2010).

Few PWID reported risk-related behaviours. This finding is consistent with previous observations reporting the impact of harm reduction interventions on risk-related behaviours and HIV prevalence/incidence in Vietnam (Hammett et al., 2012). However, the cluster analysis identified two high-risk groups that could represent priority targets for interventions: the first group of participants, reporting high-risk sexual behaviours, included younger, more often female subjects, with more recent, poly-substance use (including methamphetamine and alcohol), and there was an association with sex work. This subpopulation had impaired mental health, probably linked to poly-substance use, especially methamphetamine use, and poor social conditions associated with sex work (Colfax and Shoptaw, 2005; Darke et al., 2008). Alcohol abuse has already been linked to risk-related sexual behaviours among sex workers (Scott-Sheldon et al., 2016; Tran et al., 2016a), people living with HIV/AIDS (Shuper et al., 2009) and people who use drugs (Tross et al., 2015). These results suggest that tailored prevention interventions for this subpopulation, including repeated testing, education-information-communication, and measures addressing alcohol and methamphetamine use, are needed.

The second high-risk group reported high-risk injection practices, but with low sexual risk. It included mainly males, more often socially impaired (including less often having a household registration). Nevertheless, and whatever the profile of risk-related behaviours,

many PWID had unprotected sex with their primary sexual partner despite being unaware of their partner's or their own HIV status. This could constitute a risk for HIV transmission and suggests the need for wider promotion of HIV screening among PWID and their sexual partners, and among the children of women who screen HIV positive (Dao et al., 2013; Hammett et al., 2007).

It is not surprising that the PWID with a lower frequency of injection, *i.e.*, a less severe heroin addiction, did not enlist in methadone programs; this could reflect a voluntary choice on the part of PWID still in relative control of their heroin addiction. It could also reflect existing barriers to methadone access, those with the most severe addiction being more prone to overcoming all the obstacles (administrative, geographic or financial) and obligations (required daily medication and sometimes twice daily medication in the methadone clinics) to have access to methadone treatment. Widening treatment options or allowing easier and more flexible methadone issue could facilitate access to new patients, while enabling individualization of the treatment and job rehabilitation for those already stabilized under methadone treatment. But many obstacles still have to be faced (Carrieri et al., 2014; Hammett et al., 2014; Ma et al., 2016; Matheson et al., 2016).

Another finding is the ability of CBOs to identify, screen, maintain contact and provide harm reduction tools to PWID, and support them in accessing methadone treatment, particularly by overcoming administrative barriers. In countries where the scaling-up of health services dedicated to addiction medicine cannot cover the needs of PWID, CBO interventions should be strongly supported, as they can mobilize quickly and reach this population easily (Des Jarlais and Semaan, 2008; Kerr et al., 2006; Marshall et al., 2015).

Only 17% of the PWID had a medical insurance at RDS. This is a major concern since HIV treatment will only be available through health insurance in most regions by the end of 2017, as a response to the reduction of funds from the US President's Emergency plan for AIDS (PEPFAR) in Vietnam.

At RDS, 11.4% of the PWID reported a past suicide attempt (13.5% in the subpopulation with a high-risk sexual behaviour profile). More than 1/3 were hopeless about the future, and during follow-up 2 patients committed suicide and 2 died from overdose. These results emphasize the importance of addressing psychiatric co-morbidities among PWID, particularly depression. Psychiatric co-morbidities are associated with reduced quality of life, increased HIV risk behaviours, an increase in drug use, and compromise adherence to treatment programs (Iskandar et al., 2012). It is a complex issue in Vietnam where psychiatric care is limited and psychiatric disorders/drug use are stigmatized, alongside a lack of specialized knowledge amongst professionals in methadone or HIV clinics. Routine assessment and appropriate referral should be organized according to local resources, including integrated care in MMT clinics (Iskandar et al., 2012; Tran et al., 2015). However, studies focusing on the treatment for psychiatric co-morbidity among PWID are still needed in Asia (Iskandar et al., 2012), in order to explore the crucial role of family support (Li et al., 2014; Li et al., 2013).

Some strengths and limitations of the study should be noted. The main strength is the high retention rate at week 52 and the fact that some information was available for most of the PWID lost to follow-up, due to the considerable support CBOs were able to provide throughout the study. One limitation is that PWID self-reported their risk-related practices, giving figures that were quite low, which could reflect a social desirability bias. However, the validity of self-reports by drug-using individuals has already been widely documented (Darke, 1998; Darke et al., 1991) and it is very difficult to assess risk-related practices in other than through self-report. Moreover, self-reported drug use was fairly concordant with urine tests.

5. Conclusions

The results of the survey underline the need to develop a comprehensive approach to drug addiction treatment in Vietnam, not limited to harm reduction for HIV, but including co-morbidities and the emergence of new drug use patterns, particularly methamphetamine. Facilitated access to substance use facilities, including methadone treatment, with fewer obligations, training on psychiatric co-morbidity for specialized staff, interventions targeting methamphetamine users, and interventions aiming to decrease the stigmatization associated with drug use and mental health disorders are all needed (Iskandar et al., 2012; Tran et al., 2016b). Because such measures are likely to relieve the burden associated with substance use disorders and their treatment, they need to be urgently implemented and evaluated.

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Table 1

Sociodemographic and drug use characteristics of PWID at RDS (n = 603) and of the cohort sub-sample at RDS (n = 250).

	Total RDS (n = 603)	**Total cohort (n = 250)**
Age (mean, std)	36.5 (8.4)	37.6 (8.4)
Education (N,%)[a]		
- Never been to school – grades 1–9	345 (57.2%)	148 (59.2%)
- Grades 10–12	234 (38.8%)	90 (36.3%)
- Above grade 12	20 (3.3%)	10 (4.0%)
Marital Status (N, %)		
- Single	228 (37.8%)	85 (34.0%)
- Married/living with a partner	203 (33.7%)	88 (35.2%)
- Divorced/separated/widowed	161 (28.4%)	77 (30.8%)
Monthly income (VND[b]) (median, IQR)	4 000 (3 000 – 5 000)	4 000 (3 000 – 5 000)
Medical insurance in Hai Phong (N, %): Yes	105 (17.4%)	44 (17.6%)
Duration of injection use (median, IQR)[c]	8.0 (4.0 – 13.0)	7.0 (3.0 – 13.0)[–]
Duration of injection use (N, %)		
-<5 years	178 (29.5%)	84 (33.7%)
- ≥ 5 years	422 (70.0%)	165 (66.3%)
Age at initiation of injection (median, IQR)[e]	26 (21–33)	28 (22–35)
Frequency of drug injection (mean, std)		
- How many days in the last 30 days	28.5 (4.3)	28.7 (3.9)
- How many times in a typical day	2.7 (1.0)	2.7 (1.0)
Drugs injected (N, %)		
- Heroin alone	602 (99.8%)	250 (100%)
- Heroin and other drugs	3 (0.5%)	1 (0.4%)
- Methamphetamine	3 (0.5%)	2 (0.8%)
- Other	1 (0.2%)	1 (0.4%)
Non-injected drugs (N, %)		
- Heroin alone	12 (2.0%)	6 (2.4%)
- Heroin and other drugs	1 (0.2%)	1 (0.4%)
- Methamphetamine	147 (24.4%)	58 (23.2%)
- Ecstasy	15 (2.5%)	5 (2.0%)
- Ketamine	11 (1.8%)	3 (1.2%)
- Other	22 (4.6%)	9 (3.6%)
Alcohol consumption (Audit-C) (N, %)		
- Hazardous drinking[d]	132 (21.9%)	54 (21.7%)
- Binge drinking[e]	52 (8.6%)	14 (5.6%)
Main source of needles/syringes (N, %)		
- Pharmacy/chemist	503 (83.4%)	215 (86%)
- Needle/syringe exchange programme	4 (0.7%)	2 (0.8%)

	Total RDS (n = 603)	**Total cohort (n = 250)**
- Outreach worker/self-help groups (N, %)	2 (0.3%)	4 (1.6%)
- Someone who sells needles/syringes	77 (12.8%)	27 (10.8%)
- Other	17 (2.8%)	2 (0.8%)
Mental health (last 30 days) (N, %)		
- Felt hopeless about the future nearly every day or more than half the time	218 (36.2%)	89 (35.6%)
- Worrying too much about things nearly every day or more than half the time	200 (33.2%)	81 (32.4%)
- Felt depressed or lost interest in things he/she usually cares about nearly every day or more than half the time	147 (24.4%)	61 (24.4%)
- Felt so bad he/she thought of committing suicide nearly every day or more than half the time	32 (5.3%)	11 (4.4%)
Past history of suicide attempt	69 (11.4%)	33 (13.2%)
Urine test (N, %)		
- Presence of opiates	603 (100%)	250 (100%)
- Presence of methamphetamine[f]	103 (17.1%)	46 (18.4%)
- Presence of cannabis	33 (5.5%)	10 (4.0%)
- Presence of cocaine[g]	2 (0.3%)	0 (0%)
- Presence of benzodiazepine[h]	29 (4.8%)	6 (2.4%)

[a] 4 missing data among RDS population and 2 among cohort population.

[b] VND: Vietnamese Dong.

[c] 3 missing data among RDS population and 1 among cohort population.

[d] Audit-c score ≥3 in women and ≥4 in men.

[e] 6 or more drinks on one occasion daily or almost daily, weekly or monthly.

[f] 6 missing data among RDS population and 2 among cohort population.

[g] 1 missing data among RDS population.

[h] 3 missing data among RDS population and 3 among cohort population.

Table 2

Characteristics of the different RDS subpopulations according to sexual/injection risk profiles (n = 507).

N (%)	Profile 1 & 3 High-risk sexual behaviour N = 37 N (%)	Profile 2 High-risk injection practices N = 22 N (%)	Profile 4 Safe injection and safe sex N = 86 N (%)	Profile 5 Safe injection and low sexual activity N = 362 N (%)	P value[a]
Gender: male	27 (73)	20 (91)	62 (72)	354 (98)	<0.01
Age: ≤35 years	26 (70)	14 (64)	53 (62)	173 (48)	0.01
Household registration in Haiphong: Yes	31 (84)	17 (77)	78 (91)	343 (95)	0.003
Median injection duration: ≤ 8 years	26 (70)	12 (55)	60 (70)	195 (54)	0.02
Non-injected drugs: methamphetamine	16 (43)	6 (27)	26 (30)	71 (20)	0.004
Hazardous drinking (Audit-C[b])	11 (30)	3 (14)	33 (38)	93 (26)	0.05
Binge drinking (Audit-C[c])	8 (22)	1 (5)	11 (13)	29 (8)	0.04
Helped someone for the first injection: Yes	8 (22)	8 (36)	8 (9)	53 (15)	0.01
Has already had sexual intercourse: Yes	37 (100)	10 (46)	86 (100)	110 (30)	<0.01
One or several primary partners: Yes	25 (68)	10 (46)	56 (65)	110 (30)	<0.01
At least one casual partner: Yes	15 (41)	1 (5)	13 (15)	0 (0)	<0.01
Has already received money for sex: Yes	23 (62)	3 (14)	35 (41)	0 (0)	<0.01
Has already paid for sex: Yes	6 (16)	4 (18)	21 (24)	0 (0)	<0.01
Compulsory or voluntary stay in the past: Yes	14 (38)	6 (27)	38 (44)	192 (53)	0.03
Worries too much about things: Yes	15 (41)	11 (50)	36 (42)	107 (30)	0.03
Past suicide attempt: Yes	5 (13.5)	6 (27)	11 (13)	31 (9)	0.04

[a] Fisher's exact test or Chi square test.

[b] Audit-c score ≥3 in women and ≥4 in men.

[c] 6 or more drinks on one occasion daily or almost daily, weekly or monthly.

Table 3

drug/alcohol use and access to methadone treatment among the participants in the cohort sample between RDS and week 52.

	RDS N = 250 N (%)	**W12 N = 229 N (%)**	**W24 N = 214 N (%)**	**W52 N = 194 N (%)**
Intravenous heroin use N (%)				
- No	0 (0.0%)	5 (2.2%)	39 (18.2%)	54 (27.8%)
- Yes, less than once or once a day	15 (6.0%)	163 (71.2%)	108 (50.5%)	53 (27.3%)
- Yes, more than once a day	235 (94.0%)	61 (26.6%)	67 (31.3%)	87 (44.8%)
Non-intravenous heroin use N (%)	6 (2.4%)	9 (3.9%)	14 (6.5%)	16 (8.2%)
Non-intravenous methamphetamine use N (%)	58 (23.2%)	30 (13.1%)	54 (25.2%)	78 (40.2%)
Alcohol use (Audit-c) N (%)				
- Hazardous drinking[a]	54 (21.7%)			57 (29.4%)
- Binge drinking[b]	14 (5.6%)			21 (10.8%)
Participants who had initiated methadone treatment before or at the visit	11 (4.4%)	79 (34.5%)	109 (51.2%)	139 (71.6%)
- Participants with heroin urine test positive	11 (100%)		78 (72.2%)	92 (66.2%)

[a]Hazardous drinking: Audit-c score ≥3 in women and ≥4 in men, 1 missing data.

[b]Binge drinking: 6 or more drinks on one occasion daily or almost daily, weekly or monthly, 1 missing data.

Table 4

Univariate and multivariable[a] analyses for factors associated with not starting methadone treatment during follow-up.

Variables	Crude OR [95% CI]	Adjusted OR [95% CI]
At RDS visit:		
Age group		
- ≤ 31 *to.* > 43 years	2.06 [0.99–4.30]	
- [31–37.5] to > 43 years	2.09 [0.96–4.57]	
- [37.5–43] *to* > 43 years	2.62 [1.22–5.63]	
Income:		
>3 000 to ≤ 3 000 VND[b]	1.68 [0.99–2.84]	
Duration of injection at RDS visit	0.97 [0.93–1.01]	
Summarized variables:		
Having a medical insurance at some point (yes/no)	1.42 [0.85–2.39]	
Having consumed non-injected drugs other than methamphetamine (yes/no)	2.12 [1.05–4.29]	
Having a small mean number of injections per month (<75 *vs.* > 75 injections/month)	2.37 [1.40–4.01]	2.50 [1.44–4.33]
Having consumed methamphetamine (yes/no)	3.21 [1.88–5.48]	3.34 [1.92–5.79]

[a]Other variables tested in univariate model: gender, marital status, having a child, living partner, educational level, having household registration, men having sex with men, female having sex in exchange of money, having risk-prone sexual intercourse with casual partner, feeling hopeless, feeling worry, feeling depressed, suicidal ideations methadone history, consumption of alcohol, HIV infection, HCV infection, rehabilitation in compulsory or voluntary centre.

[b]VND: Vietnamese Dong.