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## HIV prevalence and risk behaviors among people who inject drugs in Songkhla, Thailand: A respondent-driven sampling survey<sup>☆</sup>

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### Introduction

People who inject drugs (PWID) in Thailand are a key affected population with high levels of Human Immunodeficiency Virus (HIV) prevalence over the last two decades. Thailand's longstanding national HIV sentinel surveillance has reported high HIV prevalence (26–51%) among PWID and Songkhla has historically had the highest provincial prevalence levels over time (Bureau of Epidemiology, 2010b).

Despite the high HIV prevalence among PWID in Songkhla, there is a lack of systematic data on key issues such as drug use patterns, HIV risk behaviors and access to interventions. The national sentinel surveillance only reports data on HIV prevalence and these data are collected exclusively from PWID in drug treatment facilities. No behavioral data are monitored as part of this surveillance system. Moreover, most published studies have focused on PWID in the capital city of Bangkok and Northern Thailand (Choopanya et al., 2013; Kerr et al., 2010; Razak et al., 2003; van Griensvan et al., 2005; Vanichseni et al., 2004; Vongchak et al., 2005; Wattana et al., 2007). The few published studies in Songkhla, and Southern Thailand more broadly, were conducted at methadone treatment clinics and

<sup>☆</sup>*Disclaimer:* The findings and conclusions in this report are those of the authors and do not necessarily represent the views of the U.S. Centers for Disease Control and Prevention.

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#### Conflict of interest

All authors have no conflicts of interest with respect to the submitted manuscript.

#### Contributors

All authors have made substantial contributions warranting authorship on the current manuscript. Author NP designed the study, wrote the protocol and supervised the data collection. Authors PT and WS provided IT support for the development of the data collection program. Authors SP and PT conducted the statistical analyses. Author PV contributed to the drafting and revision of the manuscript. Authors DP, CM and ST provided a critical review of the manuscript. Author MW supervised the preparation of the manuscript. All authors have given his/her approval for the current version to be submitted for peer-review at the journal.

may not be representative of community-based PWID (Perngmark, Celentano, & Kawichai, 2003; Perngmark, Vanichseni, & Celentano, 2008; Saelim, Geater, Chongsuvivatwong, Rodkla, & Bechtel, 1998).

To address gaps in the understanding of the HIV epidemic among PWID in Songkhla, the Thai Bureau of Epidemiology (BOE) and its provincial partners conducted an integrated bio-behavioral survey (IBBS) in Songkhla in 2010 with funding from the Global Fund and technical assistance from the Thailand Ministry of Public Health – U.S. Centers for Disease Control and Prevention Collaboration (TUC). The major objective of the survey was to describe the characteristics of community-based PWID in Songkhla to help inform the development of evidence-based interventions and a more robust surveillance system.

## Methods

### Setting

This cross-sectional IBBS survey was commenced during March to October 2010 at a methadone treatment clinic in Jana hospital located in Jana district of Songkhla province.

### Survey sampling

This survey used respondent-driven sampling (RDS), a sampling methodology recommended to sample hard-to-reach populations such as PWID (Johnston, Sabin, & Prybylski, 2010).

Survey staff selected an initial group of participants ('seeds') who in turn recruited their peers into the survey, continuing in multiple 'waves' of recruitment. Seeds were people who injected drugs in the past six months and were determined to have large diverse social networks. Seeds were diversely selected based on sex, age, type of drugs injected and methadone treatment status. A total of five seeds were selected by survey staff. Seeds provided voluntary informed consent, and provided with three referral coupons to recruit their peers.

The study sample size was based on feasibility of recruitment rather than precision of the prevalence estimate. We aimed to recruit at least 200 PWID to allow for estimation of HIV prevalence with an assumed prevalence of 24%. This allowed for a precision of  $\pm 8.5\%$ , with  $\alpha = 0.05$  and power  $(1 - \beta) = 0.80$  using nQUERY 5.0 software (Statistic Solution, 2002). A design effect of 2.0 was assumed.

### Inclusion criteria

Eligible PWID were aged  $\geq 18$  years, reported injecting illicit drugs in the last six months and were living or working in Songkhla province. They were also agreeable and able to provide informed consent, and had a valid referral coupon. Potential participants were screened by asking them to show injection marks. If no injection marks were observed, they would be asked to describe and/or demonstrate how they prepare and inject drugs. PWID who were intoxicated at the time of the survey were excluded from the survey.

## Survey procedures

Survey staff from the Songkhla Provincial Health Office, Jana hospital and the Ozone drop-in center were trained on RDS survey procedures, and with the assistance of a PWID peer, screened individuals arriving with a valid coupon to participate in the survey. Eligible and consenting participants completed a standardized behavioral questionnaire, using a self-administered hand-held computer (HP iPaq hx2790b Pocket PC, Hewlett-Packard, Palo Alto, CA, USA.) or via face-to-face interview with a trained staff, where the interviewer directly inputted responses into the hand-held computer.

Survey staff provided HIV and STI pre-test counseling to all participants and collected blood samples (5 ml) for HIV testing. The samples were delivered to hospital laboratory to perform HIV testing following Thai national HIV diagnostic testing guidelines using three-test algorithm. Samples were tested with the Determine HIV 1/2 (Abbott Japan Ltd, Tokyo, Japan) rapid test, and samples testing non-reactive were reported negative. Samples with reactive results were subjected to both second and third tests using the Serodia HIV 1/2 (Fujirebio Inc., Tokyo, Japan) test and SD Bioline 3.0 (Standard Diagnostics Inc., Kyonggi-do, South Korea) tests. Samples were considered HIV-positive if all three tests were reactive. Urine samples were also collected for sexually transmitted infections (STIs). *Chlamydia trachomatis* [CT] and *Neisseria gonorrhoeae* [NG] testing was conducted using the COBAS Amplicor CT/NG molecular test (Roche Molecular Systems, Branchburg, NJ, USA). Survey staff made appointments with participants to return to the survey site after two weeks to obtain both their HIV and STI test results. Post-test counseling was provided to participants who returned for their test results.

Finally, participants were given three coupons for recruiting their peers and a compensation of 200 Thai baht (6.7 USD) for their time for completing the survey and 50 baht (1.7 USD) for recruiting each peer. Those who returned for their HIV and STI test results received an additional compensation of 100 baht (3.3 USD). All participants with HIV or STI positive test results were referred to Jana hospital for follow-up care and treatment.

## Data management and analysis

Survey data from the interviews were transferred daily from the hand-held computers into a database program on the main survey computer created using MS Access 2003 and 2007 software (Microsoft, Redmond, DC, USA). The RDS Analysis Tool (RDSAT) software version 6.0 (Cornell University, Ithaca, NY, USA) was used to generate adjusted proportion estimates weighted by degree (i.e. network size). Characteristic estimates that could not be generated by RDSAT were reported by proportion and 95% confidence interval was calculated using Binomial distribution.

## Ethical considerations

The survey protocol was approved as a non-research public health surveillance activity by the Ethical Review Committee, Thailand Ministry of Public Health, and the Institutional Review Board of the Centers for Disease Control and Prevention, Atlanta, USA.

## Results

### Demographics

Characteristics of participants are shown in Table 1. Of the 202 participants, all but three were men, about half (53%) were 25 to 35 years of age, almost half of participants were unmarried and half had completed only primary school. Most (91%) were currently working and about three-quarters (76%) had a monthly income >5000 Thai baht (approximately 160 USD).

### Injection and sexual behaviors

In the past one month, the majority of participants injected heroin (90%), followed by methamphetamine (22%) and mid-azolam (2%). One-third (37%) injected multiple drugs and most (87%) had been injecting for more than two years. The median frequency of injection in the past one month was ten times and 14% had experienced a drug overdose. Seven percent of participants reported using needles that had been used by others during their last injection. Among those reporting having had sexual intercourse in the past three months, only about one-quarter (27%) reported using a condom during their last sex act.

### HIV/STI prevalence and access to services

HIV prevalence was high (22%), with low CT (1%) and NG (0.6%) prevalence (Table 1). More than three-quarters of participants (78%) had been HIV tested in their lifetime and 72% reported being tested for HIV in the past 12 months with their test results received. Most (83%) knew a place for HIV testing. Nearly half (42%) were currently on methadone treatment.

In the past 12 months, few participants received new needles (10%) and condoms (11%) from drop-in centers and/or peer outreach workers (Table 1). In the past month, pharmacies (65%) were the most popular place to obtain new needles, and about 1% received from drop-in centers and/or peer outreach.

## Discussion

To our knowledge, this community-based survey is the first to use the probability-based RDS methodology to obtain a representative sample of PWID in Southern Thailand.

Among the overall survey sample we found that HIV prevalence was high (22%), injecting and sexual risk behaviors were common and access to HIV prevention programs was limited. Risk behaviors included needle-sharing, injection of multiple drugs and low condom use. Despite the reported lack of consistent condom use, STI prevalence was low (1%), a finding that may be explained by the low levels of casual (4%) and commercial (1%) sexual partnerships among participants and fairly high rates of recent HIV testing and counseling (72%). Drug overdose experience was also not uncommon (14%) which is an indicator of unsafe drug injection practices. In Bangkok, Thailand, a report of history of drug overdose was found to be associated with a history of incarceration and poly-drug use among a community-recruited PWID (Milloy et al., 2010), and drug overdose was the main cause of death among PWID participating in a cohort study (Choopanya et al., 2013). Nevertheless, it

is encouraging that the use of new needles at last injection is relatively high (92%) and that PWID are obtaining new needles from routinely available outlets such as pharmacies and private clinics and continued availability will remain important at these outlets. However, drop-in centers and peer outreach program appear under-utilized and there is a need to increase the coverage of more comprehensive community-based HIV prevention services and including information on drug overdose prevention and first aid for hard-to-reach PWID. However, it should be noted that these community-based programs were just initiated in 2009, only about one year before this survey was conducted.

In addition, we found that almost one-third of participants reported injecting multiple drugs including heroin, methamphetamine and midazolam. Even higher levels of multiple drug use have been reported in other areas of Thailand (Wattana et al., 2007). While heroin was still the major drug of choice (90%), injection of methamphetamine (22%) appears to be emerging among Songkhla PWID, compared to the earlier study among PWID in five southern provinces in the last decade that found that 91% injected only heroin (Perngmark et al., 2003). A shift from heroin to methamphetamine injection has also been observed in other areas of Thailand and Southeast Asia (Martin et al., 2010; van Griensvan et al., 2005; Vongchak et al., 2005). In 2010, a series of RDS-based IBBS surveys found high levels of methamphetamine injection in the last six months in both Chiang Mai (57%) and Bangkok (44%) that was much higher than we report in Songkhla. Injection of other drugs including midazolam (35%) and methadone (13%) had also become common among Bangkok PWID (Bureau of Epidemiology, 2010a). A similar trend was found in the recent Bangkok Tenofovir Study reported the predominant drugs injected in past 12 weeks were heroin (22%), methamphetamine (33%) and midazolam (23%) (Choopanya et al., 2013). It is thought that heroin use has decreased over time since the “war on drugs” campaign in 2003 because of its increased price and due to the greater availability and lower price of other drugs (van Griensvan et al., 2005; Vongchak et al., 2005). Reported midazolam injection prevalence has been consistently higher in Bangkok than in others areas of Thailand, including Songkhla, as this is where midazolam distribution is focused and it is a cheap and easily accessible substitute for heroin (Kerr et al., 2010; Prybylski et al., 2015).

Our survey had a number of limitations. First, the findings were based on self-reported responses. Data may possibly subject to socially desirability bias especially when participants chose to complete a questionnaire through face-to-face interview with a survey staff. Nevertheless, the use of experienced and well trained staff conducting the interview, the use of a hand-held computer for participants to complete the questionnaire, and the promise to keep their confidentiality may have helped to reduce this bias. Second, it is possible that non-PWID participated because of the financial compensation available to the participants. To reduce the possibility of having non-PWID to participate, we trained a PWID peer to help the survey staff with systematic screening. Third, RDS survey data should be analyzed using RDSAT or similar software to adjust proportion estimates based on participants’ network size, however the small cell size for certain response categories meant that adjusted proportions could not be calculated in which case crude (i.e. unadjusted) proportions were reported instead.

In conclusion, the Thai MOPH and partners were able to successfully implement RDS in Songkhla as a form of integrated bio-behavioral surveillance to more effectively monitor the HIV epidemic and the programmatic response in Songkhla and elsewhere. This survey was effective at recruiting PWID who were not currently in drug treatment, and provided information about this sub-group which had not been previously available in Songkhla or Southern Thailand more generally. Given the increasing trend of poly-drug injecting use documented among both in- and out-of-treatment PWID, it is recommended a comprehensive and integrated combination intervention approach for both HIV services (i.e., prevention and linkages to care and treatment) and drug treatment is adopted (Prybylski et al., 2015).

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**Table 1**Demographic, injection and sexual risk behaviors of PWID in Songkhla, Thailand, 2010 (*N* = 202).

Characteristics	<i>n</i>	RDSAT-adjusted	
		%	95% CI
<b>Demographic</b>			
Male	199	99.6	98.8–100.0
Age group			
<25 years	13	7.5	3.1–12.1
25–35 years	107	52.5	44.7–63.0
>35 years	82	40.0	30.6–47.5
Marital status			
Single	95	46.7	37.8–55.8
Married or living together	89	46.2	36.9–54.8
Married but living separately, divorced or widowed	18	7.1	3.7–11.4
Education			
Primary school (6 years of education)	100	47.6	38.0–57.0
>Secondary school	102	52.4	43.3–62.0
Currently employed	181	90.5	85.6–95.1
Monthly income			
No income	24	10.6	6.0–15.4
5000 baht (~160 USD)	34	13.1	9.0–18.6
>5000 baht	144	76.3	69.3–82.8
<b>Injection behaviors</b>			
Type of drugs injected in past 1 month (multiple responses)			
Heroin	176	89.7	84.6–93.7
Methamphetamine	49	21.8	15.5–30.4
Midazolam	3	2.3	0.0–8.2
Multiple drug use in past 1 month (N = 177)			
Multiple drugs	68	36.5	28.4–47.2
Single drug	109	63.5	52.8–71.6
Number of times of injected drugs in past 1 month (N = 177)			
1–10 times (median = 10)	97	49.1	41.3–57.8
>10 times	80	46.9	36.6–56.5
Time since first started injecting			
2 years	27	13.4 <sup>a</sup>	9.0–18.8 <sup>a</sup>
>2–5 years	73	36.1 <sup>a</sup>	29.5–43.2 <sup>a</sup>
>5 years	102	50.5 <sup>a</sup>	43.4–57.6 <sup>a</sup>
Used new needle at last injection	183	92.5	89.3–95.5
Used needle having been used by others at last injection	15	6.8	3.8–10.1
Overdose experience	27	13.9	9.5–19.0
<b>Sexual behaviors</b>			
Had sexual intercourse in past 3 months	133	68.6	62.9–74.6



Characteristics	<i>n</i>	RDSAT-adjusted	
		%	95% CI
Type of sexual partners among those having sex in past 3 months (multiple responses) (N = 133)			
Steady partner	121	64.2	57.6–70.6
Casual partner	10	4.1	1.7–7.2
Sex worker	5	0.9	0.4–2.6
Used condom at last sex with any partner in past 3 months	55	26.6	21.4–33.4
Currently in methadone treatment	104	42.2	33.1–52.4
Ever tested for HIV	164	78.1	71.3–85.1
Tested for HIV in past 12 months and knew the result	154	71.5	64.4–79.3
Knew the place for HIV testing	174	83.1	76.0–89.7
Places to get new needles in past 1 month (multiple responses)			
Department stores	24	13.7	8.3–20.0
Places selling drugs	27	16.9	10.0–24.0
Clinics	84	44.3	35.5–52.8
Pharmacies	124	65.1	56.7–73.0
Friends	7	2.8	0.6–5.7
Drop-in centers or peer outreach workers	6	1.2	0.0–3.9
Have been to drop-in centers	38	19.2	12.2–30.2
Have met with peer outreach workers	32	12.9	6.8–23.7
Received new needles from drop-in centers/peer outreach workers in past 12 months	27	9.9	5.3–17.6
Received condoms from drop-in centers/peer outreach workers in past 12 months	30	10.6	5.8–18.2
<b>HIV/STI prevalence</b>			
HIV positive	53	21.9	16.4–28.2
<i>Chlamydia trachomatis</i> (CT) positive	3	1.0	0.6–3.0
<i>Neisseria gonorrhoea</i> (NG) positive	1	0.6	0.5–1.7

<sup>a</sup>Crude percent and confidence interval as RDSAT could not generate results.