HHS Public Access

Author manuscript

*Int J STD AIDS*. Author manuscript; available in PMC 2016 July 06.

Published in final edited form as:

*Int J STD AIDS*. 2013 January ; 24(1): 34–38. doi:10.1177/0956462412472300.

# Unexpectedly high HIV prevalence among female sex workers in Bangkok, Thailand in a respondent-driven sampling survey

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## Summary

The pattern of sex work in Thailand has shifted substantially over the last two decades from direct commercial establishments to indirect venues and non-venue-based settings. This respondent-driven sampling survey was conducted in Bangkok in 2007 among female sex workers (FSW) in non-venue-based settings to pilot a new approach to surveillance among this hidden population. Fifteen initial participants recruited 707 consenting participants who completed a behavioural questionnaire, and provided oral fluid for HIV testing, and urine for sexually transmitted infection (STI) testing. Overall HIV prevalence was 20.2% (95% confidence interval [CI] 16.3–24.7). Three-quarters of women were street-based (75.8%, 95% CI 69.9–81.1) who had an especially high HIV prevalence (22.7%, 95% CI 18.2–28.4); about 10 times higher than that found in routine sentinel surveillance among venue-based FSW (2.5%). STI prevalence (*Chlamydia trachomatis* and *Neisseria gonorrhoeae*) was 8.7% (95% CI 6.4–10.8) and 1.0% (95% CI 0.2–1.9), respectively. Lower price per sex act and a current STI infection were independently associated with HIV infection ($P < 0.05$). High HIV prevalence found among FSW participating in the survey, particularly non-venue-based FSW, identifies need for further prevention efforts. In addition, it identifies a higher-risk segment of FSW not reached through routine sentinel surveillance but accessible through this survey method.

### Keywords

female sex workers; HIV; prevalence; sexually transmitted infection; epidemiology; Asia

## INTRODUCTION

Thailand's 100% condom programme, focused on the commercial sex industry and launched in the early-1990s, has been lauded as one of the most successful models of HIV prevention



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in the fight against HIV. An estimated 5.7 million HIV infections have been averted through this programme.[1] The response to the HIV epidemic included the establishment in 1990 of a national annual sentinel surveillance system to track the epidemic among high-risk populations. This system has two main components among female sex workers (FSW): (a) cross-sectional HIV prevalence surveys conducted among FSW at a sample of commercial establishments mapped during an annual census of such venues and (b) routine notifiable disease reporting of sexually transmitted infections (STI) from STI clinics serving FSW. Results from the sentinel surveillance system have been remarkable: between 1997 and 2007, national HIV prevalence decreased from 27% to 5% among FSW in brothels and from 10% to 3% in non-brothel sex establishments during the same time period.[2]

However, in recent years the STI clinic network and the 100% condom programme have been seriously weakened, due in part to HIV prevention funding reductions and re-structuring under health-care reform.[1] Further challenging the success of the programme is the changing sex industry in Thailand.[3] There has been a gradual increase in the number of non-brothel-based FSW along with a shift of sex work outside commercial establishments entirely. The proportion of non-brothel-based sex workers in Bangkok has increased from 42% of total FSW in 1989 to 67% in 1994[4] and up to 95% in 2007.[5] There are no estimates available of the number of non-venue-based FSW, that is, FSW who work on streets, in parks or other public spaces, or through phone networks rather than through an establishment. Unlike FSW in venues, non-venue-based FSW are not required to have periodic HIV/STI testing. They may have less access to outreach, condoms and health services, and less condom negotiating capacity with clients.[6] They are not captured in venue-based annual sentinel surveys and are a ‘blindspot’ in the current national surveillance system. A 2004–2006 study of FSW accessing HIV voluntary counselling and testing (VCT) services in Bangkok found much higher HIV prevalence among street-based FSW (45.5%) compared with other FSW (4.2%).[7] Studies in other settings have also documented higher HIV prevalence and risk factors among non-venue-based FSW than venue-based FSW.[8–12] As such there is a need for new surveillance approaches to monitor behavioural risks and HIV/STI infections among this hidden segment of FSW.[13 – 15]

Respondent-driven sampling (RDS) has been developed to sample hidden and high-risk populations.[16,17] We piloted RDS as a new surveillance method to reach both venue- and non-venue-based FSW (hidden segments of the FSW population in Bangkok) and to obtain estimates of HIV-related risk behaviour and HIV prevalence among FSW.

## METHODS

### Sampling

RDS is a form of chain-referral sampling (sometimes known as snowball sampling) designed to sample hard-to-reach populations. RDS uses a dual system of structured compensation and quota limits on each individual’s ability to recruit members of their social network to reduce biases associated with other chain-referral methods.[3,4] Study staff select an initial group of participants (‘seeds’) who in turn recruit and refer their peers, continuing in multiple ‘waves’ of recruitment. In this survey, a total of 15 seeds were selected from the three survey sites in Bangkok to start the recruitment chain. The survey sites (a beauty salon,

a hotel and a shophouse) were located in areas where non-venue-based FSW congregate in Bangkok.

### Inclusion criteria

Eligible FSW were female, aged 15 or older, exchanged sex for money or gifts in the past month, able and agreeable to provide informed consent, living or working in Bangkok and in possession of a valid referral coupon.

### Survey procedures

The RDS survey was implemented from August to November 2007 by staff from community-based organizations with extensive experience working with FSW. Consenting participants completed a behavioural questionnaire either face-to-face with a trained same-sex interviewer or by themselves using a handheld personal digital assistant with audio. At the survey sites participants also provided oral fluid using the OraSure™ HIV-1 oral specimen collection device (Orasure Technologies, Inc., Beaverton, OR, USA) for HIV testing using the Oral Fluid Vironostika™ HIV-1 Microelisa System (BioMerieux, Inc. Durham, NC, USA) and a urine specimen for STI (*Chlamydia trachomatis* [CT] and *Neisseria gonorrhoeae* [NG]) testing by polymerase chain reaction (Amplicor, Roche Molecular Systems, Branchburg, NJ, USA). Participants were given not more than three coupons to recruit their peers. They received compensation of 400 Thai baht (USD 11.8) for their time in completing the primary survey and 50 Thai baht (USD 1.5) for recruiting each additional peer. All women who returned for results and had either a positive oral fluid test for HIV or a urine test positive for CT or GC were referred to local STI clinics for confirmatory HIV testing or STI treatment as indicated.

### RDS data analysis

The RDS Analysis Tool (RDSAT) software version 5.6 (Cornell University, Ithaca, NY) was used to generate estimates of key outcome variables.[18] For multivariate analysis, RDSAT-generated weights were exported to SAS version 9.0 (Carey, NC, USA) and incorporated into a multiple logistic regression model using a backward stepwise approach that included variables significantly associated with outcomes in the bivariate analysis. These models were weighted by degree and recruitment weights, and also include adjustment by a design effect factor of 2 to account for potential clustering among recruits.

### Type of female sex worker

In this survey, venue-based FSW includes both ‘direct’ establishments (where there are rooms on the premises to be used by FSW with clients) and ‘indirect’ establishments (FSW and clients go elsewhere once a transactional agreement is made). Non-venue FSW include those who work in public spaces such as streets/intersections, bars, beauty parlours, parks, shopping malls and phone networks.

### Ethical consideration

No personal identifying data were collected. All records and specimens were labelled using the coupon ID number. The survey was approved by the Ethical Review Committee,

Thailand Ministry of Public Health, and the Institutional Review Board, Centers for Disease Control and Prevention, Atlanta, USA.

## RESULTS

### Survey flow

Fifteen seeds recruited 707 FSW who consented to complete the behavioural survey. Among these, 692 (98%) agreed to provide an oral fluid specimen for HIV testing, and 688 (97%) to provide a urine specimen for CT and NG testing; 190 (27%) women returned for test results.

The network of recruited FSW extended to include women who worked in 36 (72%) of 50 districts in Bangkok, with the highest concentration in the districts where the survey sites were located.

### Demographic, behavioural characteristics and HIV/STI prevalence of participants

The majority of women (76.3%, 95% confidence interval [CI] 71.0–80.8) were ≥25 years of age. More than half (57.8%, 95% CI 52.6–64.0) had completed primary education and 43.8% (95% CI 38.4–49.5) were living with a sex partner. The median number of years of working as a sex worker was 4 with a median of 11 clients in the past month. The median price for the last client was 500 Thai baht (approximately USD 14.7). Most women (75.8%, 95% CI 69.9–81.1) were non-venue-based FSW. Ninety-three percent (95% CI 90.1–95.3) reported condom use with their last client. Approximately one in five women (20.2%, 95% CI 16.3–24.7) tested positive for HIV infection. CT prevalence was 8.7 (95% CI 6.4–10.8) and NG prevalence was 1.0 (95% CI 0.2–1.9).

### Factors associated with HIV prevalence

In bivariate analysis, younger age was associated with lower HIV prevalence while lower price (<500 Thai baht, USD14.7) and current STI infection were associated with higher HIV prevalence (Table 1). In the multivariate analysis, price under 300 Thai baht (USD 8.8), and current STI infection remained independently associated with HIV infection after adjustment for age, years of sex work, number of clients in the past month and type of sex work (Table 1).

### HIV prevalence by type of sex work and comparison to sentinel surveillance findings

HIV prevalence was higher among non-venue-based FSW compared with venue-based FSW (Table 2). The overall HIV prevalence from the RDS survey was eight times higher than that seen in the same year of routine sentinel surveillance of venue-based FSW (Table 2). Moreover, the HIV prevalence among venue-based FSW in the RDS survey was five times higher than the prevalence among venue-based FSW assessed through the routine sentinel surveillance system (Table 2).

## DISCUSSION

This is the first published report of the use of the RDS methodology to survey FSW in Bangkok. It demonstrated that both venue-based and non-venue-based FSW were

successfully recruited for community-based integrated biological and behavioural surveillance and it suggests that this approach would potentially be feasible for peer-driven HIV prevention programmes targeting this overlooked population.[19]

The unexpectedly high overall HIV prevalence found among FSW is of great concern because data from longstanding routine sentinel surveillance surveys have shown much lower prevalence and a consistent decline since the mid-1990s.[2] Our findings suggest that subpopulations of FSW in Bangkok, not currently reached by routine sampling through establishments, have much higher infection levels and need to be targeted by prevention activities.

In the RDS survey, venue-based FSW had higher HIV prevalence than detected through routine sentinel surveillance but the highest prevalence was found among non-venue-based FSW. The RDS results are consistent with data from FSW accessing HIV VCT at STI clinics and mobile VCT sites in Bangkok that found that street-based FSW had the highest HIV prevalence (47%).[7] However, the RDS survey data are based on active probability-based sampling of FSW in the community and have greater external validity.[13 – 17]

Despite finding a high HIV prevalence, CT and NG prevalence were very low in this population. HIV prevalence reflects cumulative lifetime sexual risk exposure in contrast to bacterial STIs which reflect recent exposure. Our findings may suggest that women with HIV reduce their sexual risk behaviours after infection or that current sexual risk behaviors in the population are lower now than in the past. The lack of association between condom use with last client and HIV may also be due to differences between cumulative and current sexual risk exposure (i.e. high level of condom use with last client reported among study participants). Measuring condom use with last client may overestimate consistent condom use; however, it is a globally recommended indicator as it is less subjected to recall bias and generally reflects trends in consistent condom use over time.[20]

There are important limitations to the findings presented in this report. HIV was evaluated by oral fluid testing which has a specificity of 97.7%[21] possibly resulting in more false-positives than a survey using blood tests with confirmatory assays. However, the number of false-positives would be small; RDS weighting considerations prevent exact calculation of the number. Survey participants with positive test results were offered HIV confirmatory testing and STI treatment, but results of this testing were not part of the survey data. Returning rate for results were also low, no contact information was collected from survey participants for follow-up purpose due to confidentiality concern.

Study eligibility and classification of workplace type and social network size were based on self-report only and it is possible that non-FSW participated because of the financial compensation available to participants. We also cannot rule out non-response bias or violation of the assumption of random recruitment within subgroups of social networks.[22 – 24] However, the study findings are believed to be valid in that measurable assumptions were met in the RDSAT-based analysis (e.g. equilibrium was reached, sufficient waves of recruitment were reached, homophily was within expected limits).[25,26]

Based on the successful completion of this pilot RDS survey, the Thai Ministry of Public Health is currently adopting this method to supplement its routine establishment-based sentinel surveillance in select provinces with high FSW prevalence. In addition, prevention for this population is being strengthened in Bangkok and nationally through peer intervention initiatives with linkages to VCT and STI services.[27] Prevention interventions should be tailored to different segments of the FSW population in Bangkok and Thailand more generally, with intervention strategies that take into account the diverse contexts of sex work.[8,11,28]

## Acknowledgments

We thank survey participants, SWING and ISSARACHON organizations and staff of the Bangkok Metropolitan Administration for their assistance and support in implementing this survey. We also thank Dr Keith Sabin, Dr Neha Shah, Ms Warunee Thienkrua, Dr Panreudee Manomaipiboon, Dr Achara Teeraratkul and Ms Sarika Pattanasin for their assistance and useful comments during implementation and analysis of this survey.

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*Int J STD AIDS*. Author manuscript; available in PMC 2016 July 06.

**Table 1**

Factors associated with HIV infection among female sex workers in Bangkok, Thailand, 2007

| Characteristics | *N* (number positive)/ *N* (number tested)* | HIV prevalence (RDSAT-adjusted) % | 95% CI | Crude OR (95% CI) [*P* value]†,‡ | aOR (95% CI) [*P* value]§ |
|---|---|---|---|---|---|
| **Age** | | | | | |
| <25 years | 11/142 | 6.8 | 2.8–11.6 | 0.2 (0.1–0.6) [0.03] | 0.2 (0.05–1.0) [0.05] |
| ≥25 years | 120/545 | 24.1 | 19.4–29.7 | 1 | 1 |
| **Currently living with a sex partner** | | | | | |
| Yes | 47/269 | 21.3 | 14.9–28.6 | 0.9 (0.4–1.8) [0.38] | |
| No | 75/346 | 24.0 | 18.8–31.9 | 1 | |
| **Years of sex work** | | | | | |
| <median (4 years) | 40/292 | 14.7 | 9.5–21.2 | 1 | 1 |
| ≥median | 82/370 | 24.9 | 18.1–30.5 | 1.9 (0.9–3.9) [0.12] | 1.2 (0.5–2.8) [0.64] |
| **Number of clients past month** | | | | | |
| <median (11 clients) | 66/309 | 24.8 | 18.0–31.6 | 1.7 (0.8–3.5) [0.14] | 1.7 (0.8–3.9) [0.17] |
| ≥median | 57/321 | 15.9 | 11.1–21.1 | 1 | 1 |
| **Price with last client** | | | | | |
| <1st quartile (<300 baht) | 46/154 | 32.9 | 24.6–39.9 | 5.2 (1.6–16.1) [0.02] | 3.2 (1.2–8.5) [0.04] |
| 2nd quartile (≥300–499) | 42/182 | 27.1 | 20.1–37.6 | 3.9 (1.2–12.5) [0.04] | 2.8 (0.6–12.7) [0.17] |
| 3rd quartile (≥500–1499) | 25/158 | 14.0 | 7.2–17.7 | 1.8 (0.5–6.2) [0.3] | 1.4 (0.3–5.3) [0.66] |
| 4th quartile (≥1500) | 16/183 | 8.2 | 4.1–11.8 | 1 | 1 |
| **Type of work** | | | | | |

| Characteristics | *N* (number positive)/ *N* (number tested)* | HIV prevalence (RDSAT-adjusted) % | 95% CI | Crude OR (95% CI) [*P* value]†,‡ | aOR (95% CI) [*P* value]§ |
|---|---|---|---|---|---|
| Venue based | 17/163 | 12.5 | 6.3–20.1 | 1 | 1 |
| Non-venue based | 111/515 | 22.8 | 18.2–28.6 | 2.2 (0.8–5.7) [0.13] | 0.8 (0.2–2.9) [0.72] |
| **Condom use last client** | | | | | |
| Yes | 118/637 | 19.7 | 15.9–24.5 | 1 | |
| No | 12/52 | 26.3 | 11.4–43.5 | 1.5 (0.4–5.1) [0.67] | |
| **Ever received outreach** | | | | | |
| Yes | 84/424 | 23.3 | 17.8–29.1 | 1 | |
| No | 46/260 | 15.6 | 10.6–21.7 | 0.6 (0.3–1.3) [0.82] | |
| **CT/NG status** | | | | | |
| Positive | 22/68 | 43.2 | 27.2–62.3 | 3.2 (1.2–8.2) [0.04] | 4.5 (1.5–13.2) [0.03] |
| Negative | 107/619 | 18.1 | 14.5–22.3 | 1 | |

CT = *Chlamydia trachomatis*; NG= *Neisseria* gonorrhoeae; RDSAT = RDS Analysis Tool; CI = confidence interval; OR = odds ratio; aOR = adjusted odds ratio

* Denominators for each characteristic vary due to missing data

† Number of observations included = 707. Crude OR, weighted by probability weight and CIs were adjusted with design effect = 2

‡ *P* value calculated by $Z = \frac{\beta}{\sqrt{2\mathrm{SE}^2}}$

§ Number of observations included = 596 as not all respondents had complete data for all variables included in the multivariate model. aOR, weighted by probability weight, other variables and CIs were adjusted with design effect = 2. Backward stepwise logistic regression model included statistically significant variables in bivariate analysis (i.e. age, price with last client and current STI infection status) in addition to the important *a priori* variables, years of sex work, number of clients in the past month' and type of sex work

## Table 2

HIV prevalence by type of female sex worker in the 2007 RDS survey compared with 2007 routine sentinel surveillance data, Bangkok, Thailand

| Type of sex work | 2007 RDS survey* *N*, HIV prevalence (%) (95% CI) | 2007 Sentinel surveillance survey *N*, HIV prevalence (%) (95% CI) |
|---|---|---|
| Venue based† | *N* = 163, 12.5 (6.2–19.9) | *N* = 556, 2.5 (1.4–4.1) |
| Non-venue based‡ | *N* = 515, 22.7 (18.2–28.4) | NA§ |
| Total | *N* = 678, 20.2 (16.4–24.7) | *N* = 556, 2.5 (1.4–4.1) |

FSW = female sex worker; RDS = respondent-driven sampling; RDSAT = RDS Analysis Tool

*RDSAT-adjusted results

†Venue based includes both ‘direct’ establishments (where there are rooms on the premises to be used by FSW with clients) and ‘indirect’ establishments (FSW and clients go elsewhere once a transactional agreement is made)

‡Non-venue based includes public spaces such as streets/intersections, bars, beauty parlours, parks, shopping malls, phone, etc

§NA = Not available because routine sentinel surveillance surveys not conducted among non-venue-based FSW