Low incidence of HIV infection in an anonymous HIV counselling and testing clinic cohort in Bangkok, Thailand despite high HIV prevalence and self-report of high-risk behaviour

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Abstract

Background: HIV counselling and testing (HCT) clinics have the potential to be entry points for recruiting populations at high risk for HIV infection for HIV prevention and treatment studies. Cohort data from key populations are crucial for HIV study site selection.

Method: This cohort study recruited clients at an HCT clinic in Bangkok, Thailand. HIV prevalence was assessed along with demographics, perception of risk and behavioural risk factors. Participants who were HIV negative at baseline were followed up every 4 months for up to 1 year to measure HIV incidence and changes in risk behaviour.

Results: A total of 992 subjects enrolled; median age was 30 years, 27% were men who have sex with men (MSM) and 8% were commercial sex workers (CSW). Baseline HIV prevalence was 10%. Factors positively associated with HIV infection were age >30 years, lower educational status and being MSM. Factors negatively associated with HIV infection were self-perception of minimal or moderate risk. Overall dropout rate was 49%, with 24% not returning after enrolment. HIV incidence was lower than expected at 0.50 per 100 person-years overall and 1.95 per 100 person-years for MSM.

Conclusions: This HCT population had a high baseline HIV prevalence but a low incidence rate on follow-up. Overall retention in the cohort was poor and may have resulted from suboptimal reminders and characteristics of high-risk clients who use anonymous HIV testing services. MSM had higher HIV incidence and better retention than other high-risk groups.

Keywords: HIV, incidence, prevalence, Thailand, MSM, cohort

Introduction

Globally, there were estimated to be 35.3 million people living with HIV at the end of 2012 [1]. An estimated 2.3 million new HIV infections occurred while 1.6 million people died from AIDS in 2012. Approximately, 13.8% of people living with HIV are in South and Southeast Asia, and an estimated 15.2% of new infections worldwide occurred in this region [1,2].

Thailand is the fourth largest country in Southeast Asia with a population of 67 million [3] and with the highest prevalence of HIV infection in Asia [1]. In past decades, the majority of HIV infections in Thailand were acquired through heterosexual sex, but by 2012 homosexual sex was the single most common route of transmission [4]. During 2005–2009, HIV prevalence among Thai male military recruits remained constant at 0.5% with a slight increase in HIV incidence from 1.4 to 2.5 per 1,000 per year [4]. This trend was mirrored in Thai pregnant women, whose HIV prevalence has remained at around 0.7%, with a small increase in HIV incidence from 0.5 to 1.8 per 1,000 per year during the same period. HIV prevalence among Thai men who have sex with men (MSM), however, is higher with a range of 5% in rural provinces to 17–31% in large urban areas.

We conducted a study to assess baseline HIV prevalence and risk factors, HIV incidence over time, longitudinal changes in risk behaviours and study retention as part of cohort development efforts among high-risk heterosexual men, women and MSM populations who attended the largest HIV counselling and testing (HCT) centre in Bangkok, Thailand.

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Methods

Study setting and population

The Thai Red Cross Anonymous Clinic (TRC-AC) has been operated by the Thai Red Cross AIDS Research Centre in Bangkok, Thailand since 1991. Clients receive HCT without any requirement to disclose their identity. Comprehensive healthcare services beyond HCT are provided to all, regardless of HIV status, in order to decrease the stigma associated with HIV testing and to link HIV-positive persons to appropriate care and treatment services. This study enrolled male and female clients who presented for HCT at the TRC-AC during the period 1st August 2008–5th August 2009. Clients were pre-screened for eligibility criteria by one of several HIV counsellors and then referred to a study nurse for informed consent and enrolment. Information on study procedures, including the requirement to provide contact information, was disclosed by research staff only during the consent process.

Clients were considered eligible to participate if they had Thai citizenship, were aged 18–50 years, allowed contact and provided contact information, were available for follow-up for the planned study duration, and reported any one or more of the following HIV risk criteria over the preceding 6 months:

- vaginal or anal intercourse in exchange for money, goods or services;
- diagnosis of a sexually transmitted infection;
- work in bars, massage parlours, night entertainment complexes or sex establishments;
- unprotected sex with a known or suspected HIV-infected partner or a partner with unknown HIV status.

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This was a prospective cohort study. At the first visit, all enrolled subjects received HCT and completed a standardised questionnaire. Participants who tested HIV positive at the first visit were referred for HIV treatment. Participants testing HIV negative at the first visit were followed every 4 months for up to 1 year. Follow-up appointments included HIV testing, risk-reduction counselling, and referrals for other services as indicated. Cohort participants were given priority when returning for study visits such that they would not have to wait for HIV testing and counselling. Average study visits lasted approximately 90 minutes for all procedures, including HIV testing and receipt of test results.

Participants were compensated 500 Thai Baht (approximately US$15) per visit for travel and meal expenses. For the first and last visits, they were offered a choice of either monetary compensation or a health check-up package of equivalent value comprising complete blood count, total cholesterol, high density lipoprotein cholesterol, low density lipoprotein cholesterol, fasting plasma glucose, creatinine and alanine aminotransferase with referral to physician or nutritionist if needed. In order to protect volunteer confidentiality, all clinical and laboratory information generated by study procedures was coded with a subject identification number.

All study volunteers were counselled and provided with written information before documenting their consent to study participation. The study protocol was approved by the institutional review boards of Chulalongkorn University, Bangkok, Thailand and the Walter Reed Army Institute of Research (WRAIR), Silver Spring, MD, USA.

Diagnosis of HIV infection

HIV screening and confirmatory testing was performed according to standard TRC-AC procedures. A fourth-generation enzyme immunoassay (EIA) (AxSYM, Abbott Laboratories, Wiesbaden, Germany), designed to simultaneously detect antibodies against HIV-1 and/or HIV-2 and HIV p24 antigen, was used for HIV screening. A second blood draw was taken on the same day for confirmatory testing of HIV-reactive samples. Confirmatory tests were performed using a recombinant antigen EIA (Genscreen HIV 1/2, Marne-la-Coquette, France) and a particle agglutination assay (Serodia HIV 1/2, Fujirebio, Tokyo, Japan). HIV infection was confirmed if one or both of the two confirmatory tests were reactive from the second blood sample. If the initial screening test was reactive, participants received post-test counselling on the same day for a preliminary positive result, and were asked to return for confirmatory test results as well as for additional post-test counselling 7–10 days after the first visit.

From June 2009, pooled nucleic acid testing (NAT) using the Aptima HIV-1 RNA qualitative assay (Gen-Probe Inc., San Diego, CA) was also performed on all negative HIV EIA samples at the TRC-AC to identify acutely infected individuals during routine HCT, which included participants in this study.

HIV counselling

Study personnel provided the participants with HIV counselling at every study visit, consistent with the TRC-AC standard operating procedures and nationally accepted HCT practices. The counselling process included HIV risk assessment, risk-reduction planning, psychosocial implications of HIV infection, sources of HIV care and treatment, and referrals for other services if indicated.

Data collection

At baseline, basic socio-demographic data were collected using a self-administered questionnaire. At baseline and all other visits, a standardised, self-administered questionnaire was used to collect data regarding general health, HIV/AIDS knowledge, and behavioural risk factors for HIV. All questionnaires were paper-based and written in the Thai language.

HIV-positive participants

Participants who tested HIV-positive at the first visit received post-test counselling and referral for care and treatment. For participants who seroconverted during the study, confirmatory HIV testing was performed using Western blot (Genelabs Diagnostics HIV Blot 2.2 or equivalent), as well as CD4 cell count and HIV viral RNA analysis. These participants were scheduled for additional visits at 1 and 3 months in which further CD4 cell count and HIV viral RNA quantifications were performed.

With support from the study staff, HIV-positive participants were referred to an HIV healthcare facility of their choice at no cost through the Thai government national healthcare program. CD4 cell counts and viral load results were also provided to participants who seroconverted, or to their physicians at the request of the participants.

Reminders and contacts to participants

Appointment reminders were conducted by a team of research assistants and consisted of short message service (SMS) messages to mobile telephone numbers 7 days and a telephone call 1 day before each appointment date. Attempts to contact participants who missed scheduled visits included five follow-up telephone calls (three calls during office hours, one call after office hours and one call on Sunday) performed within 1 week after the missed appointment date. In participants who gave permission and who could not be contacted by telephone, contact reminders and follow-up could also be attempted through SMS messages, electronic mail and postal mail.

Early closure of the cohort study

After an interim analysis of the study data in August 2009 found a very low HIV incidence rate and high rate of loss to follow-up, the investigators and study sponsors decided to close the study to new recruitment and to complete final visits on all remaining study participants. The last enrolment occurred on 5th August 2009 and the last study visit was on 11th December 2009.

Data analysis

All subjects with baseline data were included in the assessment of baseline prevalence, risk factors and demographics. Those who were HIV-negative at baseline and attended at least one follow-up visit were included in the analysis of incidence. Participants who were lost to follow-up were censored at the date of their last HIV-negative test. Lost to follow-up patients were defined as those who could not be contacted by two sets of five follow-up telephone calls or who had missed two consecutive study visits.

MSM were defined as male participants who reported any male or transgender sexual partners in the 4 months preceding study enrolment. Inconsistent condom use was defined as any report of condom use less than every time for sexual intercourse. High-risk behaviour was defined as inconsistent condom use with any partner other than the regular sex partner [casual, commercial sex worker, paying or injection drug user (IDU) partners] or sharing of needles for IDU during the preceding 4 months.

HIV prevalence was calculated as the number of HIV-infected participants identified at screening divided by the total number screened. The calculation of incidence used person-years

contributed by HIV-negative participants as the denominator, with left censoring. The numerator included those subjects who were newly identified with HIV-infection at one of the follow-up visits. The date of infection was defined as the midway point between the last negative and the first positive HIV tests. Risk factors and demographics were compared between prevalent and uninfected populations.

Retention was defined as completion of the study until visit 4 at 12 months or completion of the last scheduled study visit before the close of the study. Participants who missed one visit but then came to a subsequent visit, or presented late, were counted as retained. Analyses utilised contingency tables and either Chi-squared or Fisher's exact tests for associations between categorical variables and t-test or Kruskal–Wallis test for continuous variables. Unadjusted odds ratios (OR) were determined using bivariate logistic regression. Multivariate logistic regression was used to determine associations and adjusted odds ratios (aOR) between independent factors and the outcomes of HIV infection at baseline and retention in the cohort. Factors included in the final multivariate models included basic demographics such as gender and age as well as all factors with $P<0.10$ on bivariate analysis. All reported P-values are two-sided and $P<0.05$ was considered statistically significant. Data analyses were done using Stata/IC 12.1 (Stata Corp., College Station, TX).

Results

Between 1st August 2008 and 5th August 2009, 1,075 clients who attended the TRC-AC for HCT services underwent screening for this study. This represents 11% of the 9,486 clients who had HIV testing at the centre during this time. Of these, 992 participants (92.3%) were eligible for enrolment and consented to participation. The most common reasons given for screening failure included an absence of HIV risk behaviour during the preceding 6 months and inadequate availability for study follow-up.

The study sample was not significantly different than the total clinic population for 2009 in proportion of MSM (27% *vs* 26%, $P=0.31$), overall HIV prevalence (10% *vs* 12%, $P=0.19$), or HIV prevalence among MSM (20% *vs* 23%, $P=0.25$).

Baseline characteristics

Baseline demographics are reported in Table 1, disaggregated by HIV status. The median age of participants was 30 years [interquartile range (IQR) 25–36 years]. Two-thirds (66%) were male, 34% were female, and four (0.4%) identified as transgender. Sexual orientation in the cohort was 325 exclusively heterosexual men (32.8%), 332 women (33.5%), 270 MSM (27.2%), four transgender individuals (0.4%) and 61 men with unspecified sexual preferences (6.1%). The median age of MSM was younger (28 years, IQR 24–33) than non-MSM (31 years, IQR 26–37; $P<0.001$).

Commercial sex worker (CSW) was the reported occupation for 9% ($n=88$) of participants. Women were five times more likely to be a CSW (18%) than men (3.8%) ($P<0.001$). Among males, 6.7% of MSM reported sex work, four times the rate of 1.5% reported by heterosexual men ($P=0.001$). Of the four transgender individuals in the study, two (50%) were CSW.

Risk behaviour

The majority (85%) of participants reported having sex in the past 4 months. Of these, 50% had only one sex partner, 50% had multiple sex partners and 11.4% of MSM also reported sex with women during the same time period. Receptive anal sex was reported by 64% of MSM, 5.4% of women and 1.6% of heterosexual men. Only five (0.5%) of the participants reported IDU in the past 4 months, four of whom reported sharing needles with others. Inconsistent condom use over the preceding 4 months was very common. Of the sexually active participants, 65% reported inconsistent condom use with regular partners, 31% with casual partners, 10% with paying partners, 9% with CSW and 3% with IDU. Inconsistent condom use with any non-regular partner was reported by 30% ($n=299$) of all participants. In total, 302 participants met the definition for high-risk behaviour.

Signs and symptoms of sexually transmitted diseases (STD) in the past 4 months were reported among 9% of participants. However, another 13% answered that they were not sure if they had STD symptoms or not.

Factors associated with HIV prevalence

HIV prevalence at baseline was 104/992 or 10%. The highest HIV prevalence was 20% among MSM, followed by 7.5% for women and 4.9% for heterosexual men. Table 2 shows the results of the bivariate and multivariate analyses of associations between independent variables and HIV infection. All factors that were associated with HIV infection on bivariate analysis with $P<0.10$ were included in the multivariate analysis with the exception of receptive anal intercourse, which was excluded due to a high correlation (0.5, $P<0.001$) with MSM. In the multivariate analysis (Table 2), factors positively associated with HIV infection were age >30 years [aOR 1.66, 95% confidence interval (CI) 1.06–2.61], primary school education (aOR 2.37, 95% CI 1.28–4.40), secondary school education (aOR 1.72, 95% CI 1.06–2.77) and MSM (aOR 4.7, 95% CI 2.96–7.43). Factors negatively associated with HIV infection were self-perception of minimal risk (aOR 0.39, 95% CI 0.20–0.76) or moderate risk (aOR 0.41, 95% CI 0.21–0.80).

Circumcision was reported by 11% of male participants. Circumcised men had a lower HIV prevalence of 7% compared to 13% among uncircumcised men, but the difference was not significant ($P=0.17$) and was seen both among MSM (11% *vs* 21%, $P=0.22$) and non-MSM males (4.5% *vs* 6.7%, $P=0.59$).

Of note, none of the four transgender individuals and none of the 18 women who reported engaging in receptive anal intercourse tested positive for HIV infection. Moreover, none of the five current IDU was HIV infected despite four who reported sharing needles with other IDU.

HIV incidence in the cohort

All 888 HIV-negative participants at baseline were scheduled for follow-up visits every 4 months for up to 12 months or until their last visit preceding closure of the study. Of these, 672 (76%) made at least one follow-up visit for a total observation of 394 person-years. Two MSM clients demonstrated HIV seroconversion during the 12-month follow-up period of the study giving an overall HIV incidence of 0.50 (95% CI, 0.1–2.0) per 100 person-years and an incidence of 1.95 (95% CI, 0.5–7.8) per 100 person-years for MSM.

Changes in risk behaviours over the course of the study

Prevalence rates for selected risk behaviours at each study visit are shown in Table 3 for the 156 individuals for whom complete data were available at baseline through 12 months. There was no significant change in receptive anal intercourse, inconsistent condom use with regular partners or inconsistent condom use with CSW. A large change was seen in self-perceived risk for HIV infection, with the proportion reporting moderate or high risk

Table 1. Baseline demographic and behavioural risk characteristics of participants at the Thai Red Cross Anonymous Clinic, Bangkok

Characteristics	Total (*n*=992) *n* (%)	HIV-negative (*n*=888) *n* (%)	HIV-positive (*n*=104) *n* (%)	*P*
Age, median (IQR)	30 (25–36)	30 (25–36)	31 (24–36)	0.53
>30	487 (49)	427 (48)	60 (58)	0.06
Sex				0.10
Male	656 (66)	577 (65)	79 (76)	
Female	332 (33)	307 (35)	25 (24)	
Transgender	4 (0.4)	4 (0.5)	0 (0)	
Marital status				0.83
Single	589 (59)	525 (59)	64 (62)	
Married or living together	283 (29)	256 (29)	27 (26)	
Divorced/separated/widow	120 (12)	107 (12)	13 (13)	
Religion				0.03
Buddhist	946 (95)	844 (95)	102 (98)	
Christian	18 (2)	17 (2)	1 (1)	
Muslim	27 (3)	27 (3)	0 (0)	
Other	1 (0.1)	0 (0)	1 (1)	
Education				0.09
Primary or lower	132 (13)	112 (13)	20 (19)	
Secondary school	108 (11)	93 (11)	15 (14)	
High/technical school	225 (23)	201 (23)	24 (23)	
College or university	527 (53)	482 (54)	45 (43)	
Occupation				0.51
Not working	68 (7)	61(7)	7 (7)	
Student	139 (14)	129 (15)	10 (10)	
Home maker	35 (4)	32 (4)	3 (3)	
Commercial sex worker	88 (9)	81 (9)	7 (7)	
Other employment	662 (67)	585 (66)	77 (74)	
Living in Bangkok	746 (75)	674 (76)	72 (69)	0.13
Family income in THB, median (IQR)	25,000 (10,000–50,000)	30,000 (12,000–50,000)	15,000 (8,000–30,000)	<0.01

IQR: interquartile range; THB: Thai Baht (34.5THB~US$1)

declining from 48% to 15% (P<0.001). Multiple sexual partnerships declined from 38% to 26% (P=0.003). Inconsistent condom use declined with both casual (P=0.02) and paying partners (P=0.04).

Cohort retention

In August 2009, after 1 year of study enrolment, the decision was made to end the study prematurely due to lower than expected participant retention and a very low rate of HIV seroconversion. No new enrolment occurred and follow-up visits continued for an additional 4 months so that all participants could attend their next scheduled visit and be informed of the premature study closure. Therefore, the study closed before some of the participants reached the 8- and 12-month time points. Retention ratios, calculated as the number attending each visit divided by the number eligible for the visit, at visit 2 (4 months), visit 3 (8 months) and visit 4 (12 months) were 74% (657/888), 61% (392/641) and 37% (177/478), respectively. When the study ended, 51% (451/888) of participants met the definition of retention in the cohort.

Factors associated with retention in the study cohort

Factors associated with retention in the study cohort are presented in Table 4. Independent predictors for cohort retention were:

- Age >30 years (aOR 1.47, 95% CI 1.12–1.93);
- Commercial sex work (aOR 1.62, 95% CI 1.00–2.62);
- MSM (aOR 2.28, 95% CI 1.65–3.15);
- Inconsistent condom use with CSW (aOR 1.98, 95% CI 1.16–3.40).

Discussion

Overall, we demonstrated a rapid enrolment rate of 992 participants in 12 months from a single HCT centre in Bangkok, Thailand. Our cohort of Thai HCT clients showed an expected high HIV prevalence of 10%, with the highest HIV prevalence among MSM (20%). HIV incidence, however, was much lower than expected in the cohort. The overall HIV incidence was 0.5 per 100 person-years and 1.95 per 100 person-years among MSM.

HIV infection at baseline was significantly associated with age >30 years, lower educational status and MSM. Self-perceived minimal or moderate risk was protective in comparison to perceived risk as none or high. It is not clear why those who reported no perceived risk should have higher HIV prevalence rates, but it may be that those who answered 'no risk' included participants who could not or did not want to evaluate, or to reveal, their own perceived level of risk.

Several behaviours that are usually considered high risk for HIV infection were not associated with HIV prevalence in this study, including sex work, number of sex partners, inconsistent condom use and STD symptoms. However, risk behaviour in this survey was reported for only the previous 4 months and HIV prevalence is the result of years or decades of risk behaviour. The majority of HIV infections (57%) were found among participants who were over 30 years old; these individuals may have acquired HIV infection at younger ages when they engaged in higher levels of risk behaviour.

Male circumcision was reported among 11% of male participants in our study overall, with a non-significant trend toward lower HIV prevalence rates in the circumcised males. This low circumcision rate is consistent with prior studies in Thailand and

Table 2. Factors associated with baseline HIV infection at the Thai Red Cross Anonymous Clinic (n=992)

	HIV positive number (%)	Univariate analysis		Multivariate analysis	
		OR (95% CI)	*P*	aOR (95% CI)	*P*
Age					
≤30	44/505 (8.7%)	Ref.			
>30	60/487 (12%)	1.47 (0.98–2.22)	0.07	1.66 (1.06–2.61)	0.03
Age at first sex					
≥18	65/677 (9.6%)	Ref.			
<18	39/308 (12.7%)	1.37 (0.90–2.08)	0.15		
Education					
Primary school or lower	20/132 (15%)	1.91 (1.09–3.37)	0.03	2.37 (1.28–4.40)	0.006
Secondary school	39/333 (12%)	1.42 (0.90–2.23)	0.13	1.72 (1.06–2.77)	0.03
University degree	24/225 (11%)	Ref.			
Occupation					
Others	97/904 (11%)	Ref.			
Commercial sex worker	7/88 (8.0%)	0.72 (0.32–1.60)	0.40		
Family income (THB/month)					
>15,000	48/614 (7.8%)	Ref.			
≤15,000	53/338 (15.7%)	2.19 (1.45–3.32)	<0.001		
Self-perceived risk					
No risk	18/123 (15%)	Ref.			
Minimum risk	28/357 (7.8%)	0.50 (0.26–0.93)	0.03	0.39 (0.20–0.76)	0.006
Moderate risk	25/292 (8.6%)	0.55 (0.29–1.04)	0.07	0.41 (0.21–0.80)	0.01
High risk	33/220 (15%)	1.03 (0.55–1.92)	0.93	0.69 (0.36–1.34)	0.28
MSM					
No	50/722 (6.9%)	Ref.			
Yes	54/270 (20%)	3.36 (2.22–5.08)	<0.001	4.7 (2.96–7.43)	<0.001
Number of sexual partners					
0–1	55/495 (11%)	Ref.			
>1	40/416 (9.6%)	0.85 (0.55–1.31)	0.46		
Receptive anal intercourse					
No	45/699 (6.4%)	Ref.			
Yes	43/201 (21%)	3.96 (2.52–6.22)	<0.001		
High-risk behaviour					
No	69/690 (10%)	Ref.			
Yes	35/302 (11.6%)	1.18 (0.77–1.82)	0.46		
STI symptoms					
No	82/763 (11%)	Ref.			
Yes	7/90 (7.8%)	0.70 (0.31–1.57)	0.39		

MSM: men who have sex with men; STI: sexually transmitted infection; THB: Thai Baht

other countries in Asia where Islam is not the predominant religion [5–8]. In contrast to Africa where circumcision is promoted prominently as an HIV prevention method for populations with generalised epidemics spread primarily through heterosexual sex, circumcision is not promoted as a priority in Asian countries with concentrated epidemics [1,2] and has not been recommended or proven to be effective for MSM [9].

Table 3. Changes in risk behaviours across study duration (n=156)

Time (months)	0	4	8	12
Risk behaviour				
Self-perceived risk				
Moderate–high risk (%)	48	25**	14**	15**
Number of sexual partners				
More than one partner (%)	38	24**	24**	26**
Had receptive anal intercourse‡				
Yes (%)	19	14	16	14
Inconsistent condom use with‡	3.9	3.1*	3.3*	
Regular sexual partner (%)	59	55	48	52
Casual sexual partner (%)	30	20	16**	16*
Commercial sex worker (%)	8.6	5.4	3.1	3.3
Clients (%)	10	3.9	3.1*	3.3*
Any non-regular partner (%)	32	22	18*	17*

*P<0.05 compared to baseline (0 months);
** P<0.01 compared to baseline (0 months);
‡ Among participants reporting at least one sexual partner in the past 4 months

The prevalence of HIV infection among MSM in our HCT setting was lower than those reported in a study conducted by the Thailand Ministry of Public Health–US Centers for Disease Control and Prevention Collaboration (TUC) that demonstrated an increase in the overall HIV prevalence among MSM in Bangkok from 17.3% in 2003 to 30.8% in 2007 [10]. However, HCT populations may not be representative of population prevalence rates because HCT clients self-select and individuals who know themselves to be HIV infected would have no reason to go to an HCT but might be included in a community survey.

The finding of the overall low HIV incidence was in contrast to other studies in Bangkok showing much greater incidence rates. The TUC estimated HIV incidence rates among younger MSM (aged 15–22 years) at 4.1% in 2003 to 7.7% in 2007 [10]. In a 2006 study at the TRC-AC using the BED capture enzyme immunoassay (EIA) (Calypte Biomedical, USA), nine of 406 samples were recent seroconverters for an estimated annualised HIV incidence rate of 5.8% (95% CI 2.02–9.7) among all clients and 17.3% (95% CI 2.1–32.5) among MSM clients [11]. It should be noted that the BED assay has been reported to overestimate incidence in some instances including false-positive EIAs not confirmed with an HIV-1 Western blot, and the current

Table 4. Factors associated with retention in the HIV negative cohort (*n*=888)

	Retained number (%)	Univariate analysis		Multivariate analysis	
		OR (95% CI)	*P*	aOR (95% CI)	*P*
Age					
≤30	217/461(47)	Ref.		Ref.	
>30	234/427 (55)	1.36 (1.05–1.77)	0.02	1.47 (1.12–1.93)	0.006
Age at first sex					
≥18	307/612 (50)	Ref.			
<18	142/269 (53)	1.11 (0.83–1.48)	0.47		
Sex at birth					
Female	150/307 (49)	Ref.			
Male	301/577 (52)	1.13 (0.85–1.48)	0.40		
Marital status					
Other status	182/363 (50)	Ref.			
Single	269/525 (51)	1.05 (0.80–1.37)	0.75		
Occupation					
Other occupations	401/807 (50)	Ref.		Ref.	
Commercial sex worker	50/81 (62)	1.63 (1.02–2.61)	0.04	1.62 (1.00–2.62)	0.05
Education					
Primary school or lower	53/112 (47)	0.99 (0.66–1.5)	1		
Secondary school	169/294 (57)	1.49 (1.12–2)	0.007		
Bachelor/advanced degree	229/482 (48)	Ref.			
Family income (THB/month)					
>15,000	284/566 (50)	Ref.			
≤15,000	154/285 (54)	1.17 (0.88–1.55)	0.29		
Self-perceived risk					
No risk	43/105 (41)	Ref.			
Minimum risk	171/329 (52)	1.56 (1.0–2.44)	0.05		
Moderate risk	135/267 (51)	1.47 (0.93–2.33)	0.10		
High risk	102/187 (55)	1.73 (1.07–2.81)	0.03		
Sexual orientation					
Other	312/672 (46)	Ref.		Ref.	
MSM	139/216 (64)	2.08 (1.52–2.86)	<0.001	2.28 (1.65–3.15)	<0.001
Number of sexual partners					
0–1	214/440 (49)	Ref.			
>1	201/376 (54)	1.21 (0.92–1.60)	0.17		
High-risk behaviour					
No	313/621 (50)	Ref.			
Yes	138/267 (52)	1.05 (0.79–1.40)	0.73		
Inconsistent condom use with CSW					
No	405/820 (49)	Ref.		Ref	
Yes	46/68 (67)	2.14 (1.27–3.63)	0.005	1.98 (1.16–3.40)	0.01
STI symptoms					
No	333/681 (49)	Ref.			
Yes	51/83 (61)	1.67 (1.04–2.66)	0.03		

OR: odds ratio; aOR: adjusted odds ratio; THB: Thai Baht; CSW: commercial sex worker; *Inconsistent condom use with any non-regular sex partner or IDU sharing needles

TRC-ARC testing algorithm does not usually include the Western blot assay. Another study conducted between March 2006 and September 2007 using pooled NAT of first-generation EIA non-reactive specimens found 11 of 6326 clients to have acute HIV infection (infected within the past 3–4 weeks) [12]. Seven of these 11 acute HIV infection cases were MSM. The acute HIV infection prevalence was 20.3 per 10,000 persons at risk (95% CI 10.1–36.4), and the estimated HIV incidence, based on a 28-day conversion window, was 2.7 per 100 person-years (95% CI 2.2–4.3).

Although the incidence rate in the study was low, the cohort was successful in retaining members of high-risk groups, including MSM, CSW and clients of CSW. There is a paradox in that the measured incidence rate was relatively low in these 'high-risk' groups. Most likely there is wide variation of risk behaviour within risk groups and it may be that the higher-risk individuals within groups were less likely to return for follow-up visits. Individuals aged over 30 were also more likely to remain in the cohort. Although the older age group had a higher HIV prevalence rate, higher incidence rates among MSM in Bangkok are more often found in the younger age groups [10,13].

Inconsistent condom use among our participants was reported to be more than 50% with regular partners but was less than 50% with other types of partners. These rates of inconsistent condom use among our HCT clients, although high, were lower than those reported among the general population and students from previous studies in Thailand [14–16].

Self-perceived risk of HIV infection declined across the 12 months of the study among those who completed all follow-up visits. Condom usage mirrored this finding, with a significant decline in participants not using condoms consistently with someone other than their usual partner. These findings may reflect the effects of repeated contact with healthcare professionals and risk-reduction counselling over the course of the year; it may also reflect the motivation and character of those individuals who did not miss any follow-up visits over the course of the year.

In the recent reviews of HIV vaccine preparedness studies in

Organization for Economic Co-operation and Development (OECD) and non-OECD countries, the retention rate at 12 months generally ranged from 67% to 92% [17,18]. The low retention rate in our study may reflect the high proportion of high-risk individuals, as higher-risk behaviours were previously shown to be associated with not completing follow-up in HVTN 903 [19]. HCT clients, who present to an anonymous clinic for specific services, may be less motivated to participate in a study that takes identifying information such as telephone numbers than subjects who are recruited through other means.

Reminders made by telephone, SMS and electronic mail along with the flexible appointment times on weekdays and weekends proved insufficient to ensure high rates of retention in our cohort. Better retention rates might be achieved if attempts to get more reliable patient contact information as well as friends'/relatives' contact information were made, but these were deemed inappropriate in our setting of an anonymous HCT clinic. Reminders were conducted by several study team members who rotated the task based on availability, which could have led to inconsistency in the way in which reminders were implemented and a lack of rapport between the study team members and cohort participants. Retention might have been better if a smaller number of team members conducted the reminders in a more standardised and consistent manner.

Several factors were considered and rejected as potential causes of poor retention in the study. The incentive for each visit of about US$15 was consistent with other studies conducted in Thailand at the same time and was considered sufficient for this type of study. Participants were given priority at the clinic when presenting for study visits such that wait times for HCT would not have been a disincentive. Language was not a barrier in that all participants were Thai citizens and were fluent in Thai.

Our study has some important limitations. The high rate of loss to follow-up in the cohort may have led to underestimates of HIV incidence and overestimates of change in risk behaviour if higher-risk individuals had lower retention rates. Self-perception of HIV risk may not be accurate, especially in those with lower educational status. Social desirability bias may have led to underreporting to HCT counsellors about high-risk behaviour such as injection drug use, anal sex and condomless sex, which could have decreased the number of HCT clients who screened positive for the study entry criteria. Findings from our study may not be applicable to other HCT settings in Thailand or elsewhere with lower uptake of HIV testing, different proportions of men, women and MSM clients or different demographic characteristics of clients.

In summary, we demonstrated that Thai HCT clients in Bangkok were an easily accessible population with a rapid enrolment rate for cohort development. However, despite high levels of self-reported high-risk behaviours and a high level of HIV prevalence, this cohort demonstrated a lower than expected HIV incidence. The reasons for this low incidence are unclear, and warrant further investigation. This cohort also demonstrated an unexpectedly high attrition rate; the reasons underlying the failure of many participants to complete the study require further investigation. If follow-up can be improved, Thai MSM may constitute a suitable group for further study of HIV prevalence and risk behaviours. Furthermore, incidence within this subgroup may be sufficient to recommend it as a suitable cohort for future investigation of possible biomedical prevention interventions such as pre-exposure prophylaxis (PrEP) or an HIV vaccine.

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