Evidence of an explosive epidemic of HIV infection in a cohort of men who have sex with men in Thailand

Frits van Griensven[a,b,c], Warunee Thienkrua[b], Janet McNicholl[a,b], Wipas Wimonsate[b], Supaporn Chaikummao[b], Wannee Chonwattana[b], Anchalee Varangrat[b], Pachara Sirivongrangson[d], Philip A. Mock[b], Pasakorn Akarasewi[d] and Jordan W. Tappero[e]

Objective: To assess HIV-prevalence, incidence and risk factors in a cohort of men who have sex with men (MSM) in Bangkok.

Design: Cohort study with 4-monthly follow-up visits conducted between April 2006 and July 2012 at a dedicated study clinic in a central Bangkok hospital. Participants were 1744 homosexually active Thai men, at least 18 years old and residents of Bangkok.

Methods: Men were tested for HIV-infection at every study visit and for sexually transmitted infections at baseline. Demographic and behavioural data were collected by audio-computer-assisted self-interview. Logistic regression analysis was used to evaluate risk factors for HIV-prevalence and Cox proportional hazard analysis to evaluate risk factors for HIV-incidence.

Results: Baseline HIV-prevalence was 21.3% ($n = 372$) and 60 months cumulative HIV-incidence was 23.9% ($n = 222$). Overall HIV-incidence density was 5.9 per 100 person-years. Multivariate risk factors for HIV-prevalence were older age, secondary/vocational education (vs. university or higher), employed or unemployed (vs. studying), nitrate inhalation, drug use for sexual pleasure, receptive anal intercourse, history of sexual coercion, no prior HIV-testing, and anti-HSV-1 and 2 and *Treponema pallidum* positivity at baseline. Multivariate risk factors for HIV-incidence were younger age, living alone or with roommate (vs. with a partner or family), drug use for sexual pleasure, inconsistent condom use, receptive anal intercourse, group sex, and anti-HSV-1 and 2 and *T. pallidum* positivity at baseline. Having no anal intercourse partners was inversely associated with HIV-incidence.

Conclusion: The high HIV prevalence and incidence in this cohort of Bangkok MSM documents an explosive epidemic. Additional preventive interventions for MSM are urgently needed.

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Keywords: AIDS, Bangkok, HIV, male homosexuality, South-East Asia, Thailand

[a]Division of HIV/AIDS Prevention, Centers for Disease Control and Prevention, Atlanta, Georgia, USA, [b]Thailand Ministry of Public Health-US Centers for Disease Control and Prevention Collaboration, Nonthaburi, [c]Thai Red Cross Society AIDS Research Center, Bangkok, [d]Ministry of Public Health, Nonthaburi, Thailand, and [e]Global AIDS Program, Centers for Disease Control and Prevention, Atlanta, Georgia, USA.

Correspondence to Dr Frits van Griensven, Thai Red Cross Society AIDS Research Center, 104 Ratchadamri Road, Bangkok 10330, Thailand.

Tel: +6622564107/8/9; e-mail: fritsvg@trcarc.org
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Introduction

Continuing and re-emerging HIV-epidemics have been reported among men who have sex with men (MSM) in the industrialized world [1–4]. In Africa, Latin America and Asia, studies have shown high HIV-prevalence in MSM [1,4–8]. MSM HIV-incidence estimates are scarce. Few MSM cohort studies exist, and estimates are usually based on detuning seroprevalent specimens [9]. MSM cohort studies from Amsterdam and Sydney showed yearly HIV-incidence around 1% [10,11], but in MSM in HIV-prevention trials this was 2.1–2.7% [12,13]. Detuned yearly HIV-incidence estimates were 1.5–5.0% in Europe [10,14–16], 4.2% in the United States [17], 5.1% in Central America [18] and 3.0% in China [19]. An acute HIV-infection study in Thai MSM found a yearly incidence of 2.7% [20]. However, methodological difficulties of detuned testing may have inflated HIV-incidence estimates [21]. HIV risk factors in MSM were mostly established during the early years of the epidemic, and current information is sparse. In this article, we report recent HIV-prevalence, incidence and risk factors in a cohort of MSM in Bangkok.

Methods

Study population

Eligible men were at least 18 years old, Thai national, Bangkok resident, had penetrative male-to-male sex in the past 6 months and available for 4-monthly follow-up for $\geq$3 years. Men were recruited from HIV testing services, entertainment venues (bars, discos, sauna's), the Internet and word of mouth. Men received pretest and posttest HIV and risk behaviour counselling during every study visit based on the FHI360 curriculum [22]. Those testing HIV-positive were referred for antiretroviral treatment (ART) according to Thai national guidelines [23]. Those with active sexually transmitted infections (STI) were treated and those without hepatitis B virus (HBV) immunity were offered HBV vaccination, free of charge. Study location was a dedicated clinic in a central Bangkok hospital.

Measures

HIV-infection was determined at baseline and every 4 months thereafter using OraQuick HIV-1/2 Rapid Test (OraSure Technologies, Bethlehem, Pennsylvania, USA), and if reactive, confirmed according to Thai national guidelines with three rapid tests on blood [Determine HIV-1/2; Abbott Laboratories, Tokyo, Japan; Double-Check II HIV-1&2; Organics, Yavne, Israel (after 02/2011 replaced by SD-Bioline HIV-1/2 3.0; Standard Diagnostics, Kyonggi-do, South-Korea); Capillus HIV-1/HIV-2; Trinity Biotech, Jamestown, New York, USA (after 11/2008 replaced by Core HIV-1/2, Birmingham, UK)]. The midpoint between the last HIV-negative and first HIV-positive date was considered the seroconversion date. Baseline blood specimens were tested for anti-hepatitis A virus (anti-HAV), anti-HBV, HBV-core antigen (HBcAg), HBV-surface antigen (HBsAg), and antihepatitis C virus (anti-HCV) (Murex anti-HAV, anti-HBV, HBcAg, HBsAg, anti-HCV; Murex Biotec, Dartford, UK) and antiherpes simplex virus type-1 and 2 (anti-HSV-1, 2) (HerpeSelect 1 and 2 Elisa; Focus Diagnostics, Cypress, California, USA), and for *Treponema pallidum* by rapid plasma regain (RPR) assay (Macro-Vue RPR 18 mm Circle Card Test; Becton Dickinson Microbiology Systems, Sparks, Maryland, USA) confirmed by immunochromatography (IC) (Determine Syphilis-TP; Abbott Laboratories). Persons with RPR at least 1 : 8 and positive IC were considered *T. pallidum* positive (current or past infection) [24]. Baseline urine was drug-use tested (TOX/See Drug Screen Test; Bio-Rad Laboratories, Hercules, California, USA); and rectal swabs for *Neisseria gonorrhoeae* and *Chlamydia trachomatis* by PCR. Demographic and behavioural data were collected at baseline and every 4 months thereafter using audio-computer-assisted self-interviewing. Circumcision was assessed clinically at baseline.

Statistics

Bivariate risk factors for prevalent HIV-infection were evaluated using odds ratios (OR) and 95% confidence intervals (CI). Variables with *P*-values of less than 0.05 were entered in multivariate stepwise backward logistic regression analyses to identify independent risk factors for prevalent infection. Crude HIV-incidence was calculated as the number of new infections divided by the number of person-years of follow-up, along with exact Poisson 95% CI. For time-dependent variables, person-years contributions were based on reports of the behaviour during the prior interval. The 60 months cumulative HIV-incidence was estimated using Kaplan–Meier analysis. Cox proportional hazard analysis using baseline demographic and behavioural characteristics as fixed and past 4-month behavioural risks as time-dependent variables (Table 1) was applied to evaluate bivariate and multivariate risk factors for incident HIV-infection (SAS, Version 9; SAS Institute Inc., Cary, North Carolina, USA).

Human patients review

The study protocol was reviewed and approved by the Thailand Ministry of Public Health Ethical Review Committee and by a CDC Institutional Review Board. Written informed consent was obtained from all participants.

Results

Baseline demographic and behavioural characteristics

Between April 2006 and November 2010, 1977 men were screened, 1764 (89.2%) were eligible, and 1744

Table 1. Demographic and behavioral characteristics and bivariate and multivariate analyses of risk factors for HIV-prevalence and incidence in a cohort of men who have sex with men in Bangkok, Thailand, 2006–2012.

Characteristic	*n* (%)	Baseline HIV prevalence *n* (%)	Bivariate analysis OR (95% CI)	Multivariate analysis OR (95% CI)	HIV incident cases/PY	Crude HIV incidence (95% CI)	Bivariate analysis HR (95% CI)	Multivariate analysis HR (95% CI)
Total	1744 (100)	372 (21.3)			222/3750	5.9 (5.2–6.8)	–	–
Demographic factors at baseline*								
Age group (years)								
18–21	314 (18.0)	50 (15.9)	1	1	50/566	8.8 (6.6–11.6)	2.42 (1.61–3.64)	2.49 (1.64–3.78)
22–29	935 (53.6)	211 (22.6)	1.54 (1.10–2.16)	1.82 (1.24–2.68)	129/2015	6.4 (5.3–7.6)	1.75 (1.24–2.47)	1.69 (1.19–2.40)
≥30	495 (28.4)	111 (22.4)	1.53 (1.06–2.21)	1.64 (1.03–2.60)	43/1169	3.7 (2.6–5.0)	1	1
Education								
Primary	58 (3.3)	21 (36.2)	2.91 (1.64–5.14)	1.85 (0.97–3.52)	3/50	6.0 (1.2–17.5)	1.25 (0.39–3.93)	
Secondary/vocational	926 (53.1.)	227 (24.5)	1.67 (1.31–2.13)	1.79 (1.34–2.39)	125/1754	7.1 (5.9–8.5)	1.48 (1.13–1.93)	
University or higher	760 (43.6)	124 (16.3)	1	1	94/1946	4.8 (3.9–5.9)	1	
Study/work status								
Studying (or studying and employed)	630 (36.1)	107 (17.0)	1	1	102/1366	7.5 (6.1–9.1)	1.56 (1.19–2.05)	
Employed	1036 (59.4)	239 (23.1)	1.47 (1.14–1.89)	1.50 (1.09–2.05)	108/2247	4.8 (3.9–5.8)	1	
Unemployed	78 (4.5)	26 (33.3)	2.44 (1.46–4.09)	1.96 (1.09–3.51)	12/136	8.8 (4.5–15.4)	1.84 (1.04–3.34)	
Current living situation								
With family	659 (37.8)	113 (17.2)	1		72/1594	4.5 (3.5–5.7)	1	1
With partner	261 (15.0)	68 (26.1)	1.70 (1.21–2.40)		32/534	6.0 (4.1–8.5)	1.33 (0.88–2.02)	1.35 (0.88–2.06)
Alone or with roommate	824 (47.2)	191 (23.2)	1.46 (1.13–1.89)		118/1623	7.3 (6.0–8.7)	1.62 (1.20–2.17)	1.52 (1.13–2.05)
Behaviors during the past 4 months at baseline and during follow-up*								
Binge drinking†								
Yes	208 (11.9)	53 (25.5)	1.31 (0.93–1.83)		20/296	6.8 (4.1–10.4)	1.16 (0.74–1.84)	
No	1536 (88.1)	319 (20.8)	1		202/3454	5.8 (5.1–6.7)	1	
Used 'club' drugs§								
Yes	189 (10.8)	51 (27.0)	1.42 (1.01–2.00)		29/253	11.5 (7.7–16.5)	2.01 (1.42–3.10)	
No	1555 (89.2)	321 (20.6)	1		193/3498	5.5 (4.8–6.4)	1	
Nitrate inhalation¶								
Yes	191 (10.9)	69 (36.1)	2.34 (1.69–3.22)	1.58 (1.0–2.47)	22/253	8.7 (5.5–13.2)	2.71 (1.74–4.21)	
No	1553 (89.1)	303 (19.5)	1	1	200/3601	5.6 (4.8–6.4)	1	
Drug use for sexual pleasure‡								
Yes	306 (17.6)	104 (34.0)	2.25 (1.71–2.95)	1.53 (1.04–2.24)	31/192	16.2 (11.0–22.9)	3.08 (2.10–4.50)	2.25 (1.51–3.36)
No	1438 (82.4)	216 (18.6)	1	1	191/3558	5.4 (4.6–6.2)	1	1
Erectile dysfunction drug use								
Yes	202 (11.6)	55 (27.2)	1.45 (1.04–2.02)		31/282	11.0 (7.5–15.6)	1.99 (1.36–2.91)	
No	1542 (88.4)	317 (20.6)	1		191/3468	5.5 (4.8–6.3)	1	
Sex with women								
Yes	159 (9.1)	26 (16.4)			7/167	4.2 (1.7–8.6)	1	
No	1585 (90.9)	346 (21.8)	11.43 (0.93–2.22)		215/3583	6.0 (5.2–6.7)	1.44 (0.68–3.05)	
Preanal receptive intercourse cleansing								
Yes	1350 (77.5)	329 (24.4)	2.62 (1.87–3.69)		202/2407	8.4 (7.3–9.6)	5.73 (3.62–9.07)	
No	393 (22.5)	36 (10.9)	1		20/1344	1.5 (0.9–2.3)	1	
Postanal receptive intercourse cleansing								
Yes	1376 (78.9)	332 (24.1)	2.61 (1.84–3.70)		203/2434	8.3 (7.2–9.6)	5.87 (3.67–9.41)	
No	368 (21.1)	40 (10.9)	1		19/1315	1.4 (0.9–2.3)	1	

Table 1 (*continued*)

Characteristic	*n* (%)	Baseline HIV prevalence *n* (%)	Bivariate analysis OR (95% CI)	Multivariate analysis OR (95% CI)	HIV incident cases/PY	Crude HIV incidence (95% CI)	Bivariate analysis HR (95% CI)	Multivariate analysis HR (95% CI)
Number of male sexual partners								
0	79 (4.5)	15 (19.0)	1		3/267	1.1 (0.2–3.3)	1	
1–5	966 (55.4)	180 (18.6)	0.98 (0.54–1.75)		142/2510	5.7 (4.8–6.7)	5.07 (1.62–15.91)	
≥6	699 (40.1)	177 (25.3)	1.45 (0.80–2.60)		77/974	7.9 (6.2–9.9)	7.08 (2.23–22.44)	
Condom use with male partners								
Always	686 (39.3)	135 (19.7)	1		100/2067	4.8 (3.9–5.9)	1	1
Not always	941 (54.0)	169 (22.6)	1.19 (0.94–1.52)		118/1383	8.5 (7.1–10.2)	6.49 (2.40–17.59)	4.84 (1.78–13.19)
No anal intercourse partner	117 (6.7)	12 (20.5)	1.05 (0.65–1.71)		4/301	1.3 (0.4–3.4)	0.27 (0.10 –0.75	0.35 (0.13–0.94)
Paid money for sex								
Yes	242 (13.9)	45 (18.6)	0.82 (0.58–1.20)		20/402	4.9 (3.0–7.6)	1	
No	1502 (86.2)	327 (21.8)	1		202/3346	6.0 (5.2–6.9)	1.23 (0.78–1.94)	
Received money for sex								
Yes	331 (19.0)	92 (27.8)	1.56 (1.19–2.05)		23/310	7.4 (4.7–11.1)	1.28 (0.83–1.98)	
No	1413 (81.0)	280 (19.8)	1		199/3440	5.8 (5.0–6.6)	1	
Sexual factors, sexually transmitted infections and drug use reactivity at baseline								
Anal sex position when having sex with men								
Insertive only	602 (34.5)	93 (15.5)	1	1	61/1522	4.0 (3.1–5.1)	1	1
Receptive only or both	1116 (64.0)	279 (25.0)	1.82 (1.41–2.36)	1.75 (1.32–2.31)	161/2228	7.2 (6.2–8.4)	1.81 (1.35–2.44)	1.67 (1.24–2.25)
No anal sex	26 (1.5)	0 (0.0)	–	–	–	–	–	–
Group sex (ever)								
Yes	621 (35.6)	160 (25.8)	1.49 (1.18–1.88)		55/553	10.0 (7.5–13.0)	1.93 (1.42–2.61)	1.51 (1.09–2.08)
No	1122 (64.4)	212 (18.9)	1		167/3198	5.2 (4.5–6.1)	1	1
Coerced into sex (ever)								
Yes	301 (17.3)	89 (29.6)	1.72 (1.30–2.27)	1.56 (1.15–2.12)	46/606	7.6 (5.6–10.1)	1.36 (0.98–1.88)	
No	1442 (82.7)	283 (19.6)	1	1	176/3141	5.6 (4.8–6.5)	1	
Prior HIV test (ever)								
Yes	869 (49.9)	158 (18.2)	1	1	110/2051	5.4 (4.4–6.5)	1	
No	874 (50.1)	214 (24.5)	1.46 (1.15–1.84)	1.62 (1.25–2.10)	112/1696	6.6 (5.4–7.9)	1.23 (0.94–1.60)	
Presence of circumcision (clinical exam)								
Yes	180 (10.3)	37 (20.6)	0.95 (0.65–1.39)		20/427	4.7 (2.9–7.2)	1	
No	1564 (89.7)	335 (21.4)	1		202/3323	6.1 (5.3–7.0)	1.30 (0.82–2.06)	
Rectal *Neisseria gonorrhea*								
Yes	97 (5.6)	39 (40.2)	2.64 (1.73–4.04)		16/129	12.4 (7.1–20.2)	2.15 (1.29–3.58)	
No	1497 (85.8)	304 (20.3)	1		191/3277	5.8 (5.0–6.7)	1	
Not consent to collection	150 (8.6)	29 (19.3)	–		15/340	4.4 (2.5–7.3)	–	
Rectal *Chlamydia trachomatis*								
Yes	151 (8.7)	56 (37.1)	2.37 (1.67–3.39)		30/192	15.6 (10.5–22.3)	2.89 (1.96–4.25)	
No	1443 (82.7)	223 (19.9)	1		177/3214	5.5 (4.7–6.4)	1	
Not consent to collection	150 (8.6)	29 (19.3)	–		15/340	4.4 (2.5–7.3)	–	
HAV antibody								
Yes	471 (27.1)	113 (24.0)	1.24 (0.96–1.59)		52/970.2	5.4 (4.0–7.0)	1	
No	1269 (72.9)	258 (20.3)	1		170/2777	6.1 (5.2–7.1)	1.15 (0.84–1.56)	
HBV antibody								
Yes	599 (46.4)	199 (33.2)	3.32 (2.51–4.39)		85/1239	6.9 (5.5–8.5)	1.22 (0.92–1.63)	
No	691 (53.6)	90 (13.0)	1		106/1888	5.6 (4.6–6.8)	1	
HCV antibody								
Yes	14 (0.8)	5 (35.7)	2.06 (0.69–6.20)		1/20	5.0 (0.1–27.9)	1	
No	1726 (99.2)	366 (21.2)	1		221/3729	5.9 (5.2–6.8)	1.18 (0.17–8.40)	

Table 1 (*continued*)

Characteristic	*n* (%)	Baseline HIV prevalence *n* (%)	Bivariate analysis OR (95% CI)	Multivariate analysis OR (95% CI)	HIV incident cases/PY	Crude HIV incidence (95% CI)	Bivariate analysis HR (95% CI)	Multivariate analysis HR (95% CI)
HSV-1 antibody								
Yes	983 (56.5)	188 (25.7)	1.55 (1.21–1.96)	1.47 (1.13–1.90)	138/1967	7.0 (5.9–8.3)	1.49 (1.14–1.96)	1.48 (1.12–1.94)
No	757 (43.5)	102 (18.2)	1	1	84/1781	4.7 (3.8–5.8)	1	1
HSV-2 antibody								
Yes	371 (21.3)	150 (40.4)	3.53 (2.74–4.54)	3.02 (2.78–4.00)	48/570	8.4 (6.2–11.2)	1.54 (1.12–2.18)	1.52 (1.09–2.11)
No	1369 (78.7)	221 (16.1)	1	1	174/3179	5.5 (4.7–6.4)	1	1
Treponema pallidum positivity								
Yes	82 (4.7)	38 (46.3)	3.43 (2.19–5.39)	2.09 (1.27–3.44)	14/97	14.4 (7.8–24.1)	2.56 (1.49–4.40)	1.82 (1.05–3.17)
No	1662 (95.3)	261 (20.1)	1	1	208/3653	5.7 (4.9–6.5)	1	1
Reactive drug use test**								
Yes	79 (4.5)	21 (26.6)	1.36 (0.81–2.26)		6/143	4.2 (1.5–9.1)	1	
No	1665 (95.5)	351 (21.1)	1		216/3607	6.0 (5.2–6.8)	1.44 (0.64–3.23)	

OR, odds ratio, CI, confidence interval, PY, person years; HR, hazard ratio.
*Demographic and behavioural variables at baseline (ever) were entered as time-fixed and behavioral variables during the 4 months prior to baseline and prior to each follow-up visit were entered as time-dependent variables in Cox proportional hazard analysis.
†Alcohol intoxication two to three times per week or more.
§Club drugs include: cannabis, 3,4-methylenedioxy-N-methylamphetamine (MDMA or ecstasy), amphetamine, methamphetamine, ketamine, cocaine, and gamma hydroxy butyrate (GHB).
¶Alkyl or other tnitrates or 'poppers' (slang) are inhaled to induce a short-term increase in sexual sensation.
‡Ever use at baseline, past 4 months during follow-up.
**Drug use testing panel included cannabis, MDMA, amphetamine, methamphetamine, PCP, cocaine, opiates, and benzodiazepines.

(98.9%) enrolled. The on-going 36-months retention rate was 76.1%. Participant's median and mean ages were 26 years (range 18–56 years). During 4 months prior to baseline, binge drinking was reported by 11.9%, use of 'club' drugs, 10.8%, nitrate inhalation, 10.9%, drug use for sexual pleasure, 17.6%, erectile dysfunction drug (EDD) use, 11.6%, sex with women, 9.1%, prereceptive and postreceptive anal cleansing, 77.3%, at least six male sexual partners, 40.1%, and inconsistent condom use, 54.0%. Having paid or received money for sex was reported by 13.9 and 19.0%, respectively. At baseline, receptive or both receptive and insertive anal intercourse was reported by 64.0%, group sex by 35.6% and a history of sexual coercion by 17.3%. Fifty percent ever had an HIV-test and 10.3% had been circumcised (Table 1).

Prevalence of baseline sexually transmitted infection and drug-use reactivity

Of those tested, 5.6% had evidence of rectal *N. gonorrhoeae* and 8.7% of rectal *C. trachomatis* (Table 1). Anti-HAV, anti-HBV, and anti-HCV prevalence was 27.1, 46.4, and 0.8%, respectively; 9.2% were HBV-antigenemic. Anti-HSV-1 and anti-HSV-2 was found in 56.5 and 21.3%, respectively and 4.7% tested positive for *T. pallidum*. Drug-use positive urine was found in 4.5%, mostly due to benzodiazepine reactivity.

HIV-prevalence and incidence

Baseline HIV-prevalence was 21.3%. Among 18–21-year olds it was 15.9%, among 22–29 year olds, 22.6% and among at least 30 year olds, 22.4%. The overall HIV-incidence was 5.9 per 100 person-years. Among 18–21 years olds it was 8.8, among 22–29 year olds, 6.4 and among at least 30 year olds, 3.7 per 100 person-years (Table 1). After 60 months of follow-up, the cumulative HIV-incidence was 23.9%. Among 18–21 year olds this was 31.3%, among 22–29 year olds, 26.3% and among at least 30 year olds, 15.2% (Fig. 1).

Risk factors for HIV-prevalence and incidence

In multivariate logistic regression analysis, older age, secondary/vocational education, not studying, nitrite inhalation, drug use for sexual pleasure, receptive anal intercourse, sexual coercion, no prior HIV-test, and baseline anti-HSV-1, 2, and *T. pallidum* positivity were significantly and independently associated with prevalent HIV-infection (Table 1).

In multivariate Cox proportional hazard analysis including data collected until July 2012, younger age, living alone or with roommate, drug use for sexual pleasure, inconsistent condom use, receptive anal intercourse, group sex, and baseline anti-HSV-1, 2 and *T. pallidum* positivity were significantly and independently associated with incident HIV-infection. Having no anal intercourse partners was inversely associated with incident HIV-infection (Table 1).

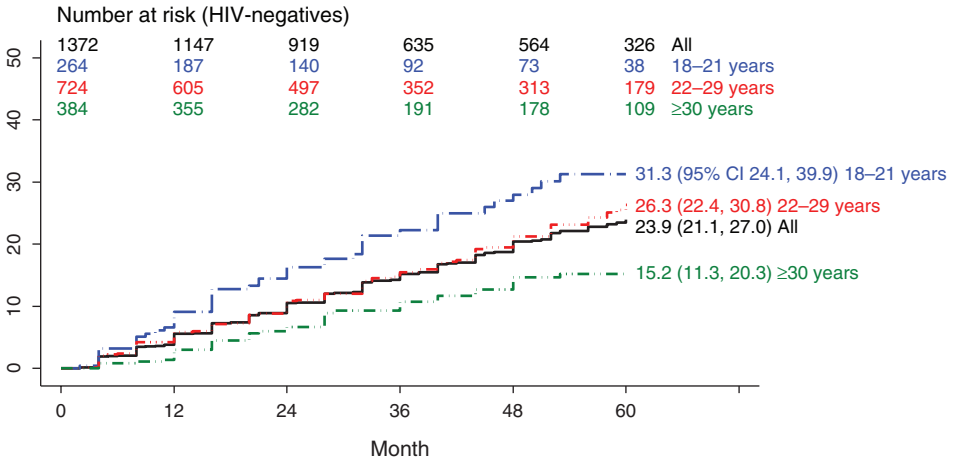

Fig. 1. Sixty months cumulative HIV-incidence (Kaplan–Meier method) in a cohort of men who have sex with men, Bangkok, Thailand, 2006–2012, by age group.

Discussion

This study documents an explosive epidemic of HIV-infection in Bangkok MSM. Baseline HIV-prevalence was 21.3% and HIV-incidence 5.9 per 100 person-years. This HIV-incidence is among the highest reported since the initial outbreak of HIV-infection among MSM in the Western world [25,26] and only comparable to current incidence among MSM in Kenya [27] and to that estimated among inner-city black MSM in the United States [17].

Risk factors consistent across HIV-prevalence and incidence were drug use for sexual pleasure, receptive anal intercourse, and anti-HSV-1, 2 and *T. pallidum* positivity. These are well established risk factors [28–31], but drug use, particularly of methamphetamine ('crystal-ice'), is an emerging risk in MSM in Asia [4,7,28,29,32]. Methamphetamine injection has been reported by MSM in the USA and Australia [28], but drug injection was rare in our cohort. Among Thai MSM, methamphetamine is usually smoked, often combined with EDD to prolong sexual intercourse and pleasure. This behaviour may cause anogenital trauma, whereas drug impairment may lead to inconsistent condom use and ultimately to HIV transmission. Prevention and education about drug use, possibly in combination with harm reduction strategies, should therefore be included in HIV prevention programs for MSM. As expected, older age was associated with HIV-prevalence, whereas younger age was associated with HIV-incidence. Younger age has been identified as an HIV risk factor in previous studies [33] and may be associated with increased risk taking and a higher background number of susceptible and acutely HIV-infected persons. Other known risk factors for HIV-prevalence included lower education, history of sexual coercion and lack of prior HIV-testing [34–38]. A remaining risk factor for incident HIV-infection was inconsistent condom use, while not having any anal intercourse partners was protective against HIV-infection. Consistent and correct use of condoms is an efficient method to prevent HIV-infection in MSM, and their use, in combination with water-based gels, should be promoted [39]. However, avoidance of any anal intercourse, if at all possible, appears to be a more effective prevention method.

A remarkable finding was the high prevalence of preanal and postanal receptive cleansing by Thai MSM. Cleansing usually consists of inter-rectal showering with water before and after receptive anal intercourse. Pre and postreceptive anal intercourse cleansing was more often reported than receptive anal sex, possibly as a result of underreporting and stigma associated with being receptive during anal sex. Because of collinearity with anal intercourse, cleansing could not be evaluated in our analyses. Nevertheless, these findings are important for future rectal microbicide studies as cleansing may confound or interfere with possible microbicide efficacy. Another area of interest is male circumcision. However, circumcision was rare in this cohort and was not associated with prevalent or incident HIV-infection. When evaluated separately among predominantly anal insertive or receptive men no association with HIV-infection was found.

Our study has several limitations. Men were not randomly selected and may not be perfectly representative of the Bangkok MSM population. Another limitation was the absence of incident STI, and their association with HIV-infection could not evaluated. Our study had several strengths as well, including the long follow-up time and the dual evaluation of risk factors for HIV-prevalence and incidence in one design.

Given the high and continuing HIV-incidence in our cohort, particularly among young MSM, this group

should be considered for recently proven daily oral antiretroviral preexposure chemo-prophylaxis (PrEP) for the prevention of HIV-infection [40]. Since the demographic and behavioural risk factors for HIV-acquisition in this cohort are well described, a targeted HIV prevention program consisting of behavioural and biomedical interventions for those at the highest risk should be considered. Such a program should include careful evaluation of PrEP efficiency by comparing HIV-incidence with historical information or in a wait-list control group design. In addition, peer-driven adherence support and monitoring of drug safety and tolerance as well as of drug resistance in break-through infections should be included.

The explosive HIV-epidemic in Bangkok MSM underscores the need for innovative and increased efforts to prevent HIV-infection in this population. Simultaneous and combined implementation of scientifically proven interventions, such as increased HIV-testing [38], ART for prevention [41], PrEP [40], together with educational and motivational programs for protective behavior and unlimited access to condoms and nonlatex deteriorating gels may decrease transmission [39]. Finally, discriminatory policies and stigmatizing practices that hinder access to HIV-prevention services for MSM should be eliminated.

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Conflicts of interest

There are no conflicts of interest.

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