

The epidemiology of HIV infection and AIDS in Thailand

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Introduction

In 1988, Thailand — along with much of Asia, Oceania, and North Africa — was classified as an epidemiologic 'Pattern III' country, signifying that small numbers of AIDS cases had been reported and that the introduction of HIV occurred relatively late in the AIDS pandemic [1,2]. In that same year, however, Thailand experienced an explosive increase in HIV prevalence among injecting drug users (IDU) (Fig. 1). The subsequent spread of HIV in predictable sequential waves into other high-risk groups, and more recently into subgroups of the general population, renders the Pattern III classification obsolete. We review the epidemiology and prevention of HIV infection and AIDS in Thailand, updating previous reports [6–9] and commentary [10–13], and including data hitherto unpublished or not widely available. A fourth epidemiologic pattern of HIV and AIDS appears to have occurred, and it may represent a paradigm for the experience of neighboring countries in Asia.

The harbingers: male prostitutes

Antibody to HIV was first detected in Thailand in 1985 in one of 101 male prostitutes surveyed in Bangkok, a 20-year old Thai who had worked for 12 months in a gay bar [3]. Despite the expectation that gay men would be the first group to experience rapid transmission of HIV in Thailand, HIV prevalence in this group has trailed prevalence in female prostitutes in various surveys (Table 1). National sentinel surveillance [20–25] of male prostitutes (Fig. 2) has shown increasing but unstable median provincial rates —

most recently 8% in June 1991 (range, 5–13%; n = five provinces among a total of 73 provinces nationwide) — probably as a result of the small samples of these men, who work primarily in Bangkok, Chiang Mai, Chon Buri, Phuket, and Songkhla.

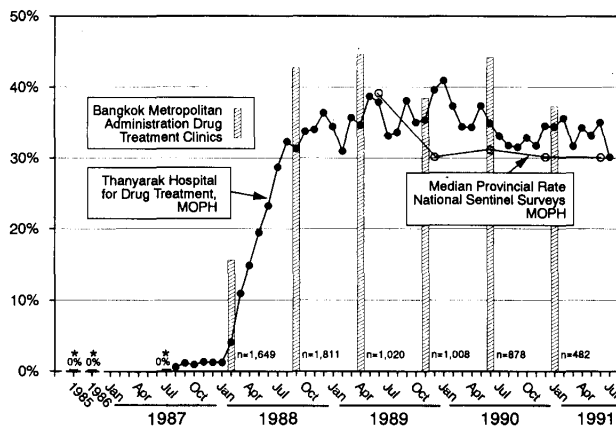


Fig. 1. HIV-1 infection rates among IDU in Bangkok, and national median rates, 1985–1991. A total of 36 788 patients were admitted and tested for HIV at Thanyarak Hospital from August 1987 through July 1991, for mean of 766 patients per month during the period. *Early *ad hoc* surveys in 1985 [3], 1986 [4], and 1987 [5] detected no infections.

Sociology of male prostitution

The annual 1990 census of gay bars and other sites for male prostitution recorded 1679 male prostitutes (1408 in Bangkok) working in 78 establishments (58 in Bangkok) in eight provinces (unpublished data from the Department of Communicable Disease Control). In Pattaya, a beach resort in Chon Buri province, six bars were observed in 1985 [26], but only four were officially reported in 1990. Ninety per cent of

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Table 1. Thailand serosurveys in male prostitutes*.

Survey year(s)	Location	No. tested	No. HIV +	% HIV +	Refs
1985	Bangkok	101	1	1	[3]
1985	Chon Buri (Pattaya)	127	3	2	[14]
1985	Chon Buri (Pattaya)	244	6	2	[14,15]
1985	Bangkok (Patpong)	63	0	0	[16]
1985-1986	Bangkok	476	0	0	[14]
1985-1986	Bangkok & Chon Buri	720	6	1	[6]†
1986	Bangkok & Chon Buri	532	3	1	[6]†
1986	Bangkok (Patpong)	49	0	0	[16]
1987	Bangkok (Patpong)	201	0	0	[16]
1987-1988	Bangkok	100	2	2	[17]
1987-1988	Khon Kaen	15	0	0	[18]
1988	Bangkok (Patpong)	180	7	4	[16]
1988-1989	Bangkok	1187	22	1	[15]
1988-1989	Chiang Mai	235	7	3	[15]
1988-1989	Chon Buri (Pattaya)	382	13	3	[15]
1988-1989	Phuket	81	2	2	[15]
1989	Bangkok (Patpong)	1341	35	3	[16]
1990	Bangkok (Patpong)	648	23	4	[16]
1990	Bangkok	NS	29	3	[19]

*Excludes data collected and summarized in national sentinel seroprevalence surveillance [20-25]. †Unpublished data from the Venereal Disease Division, Ministry of Public Health, Thailand. NS, not stated.

male prostitutes were 15-29 years of age [19], while 70% were 17-21 years of age [27]. Among men working in bars catering for foreigners, estimates of the frequency of their sexual contacts in the previous year varied from 10.5 [3] to 200 times [26].

The terms 'homosexual' and 'gay' do not accurately describe this risk group: most male prostitutes in Thailand appear to be preferentially heterosexual, often having wives or steady girlfriends. A 1988 survey found that in the 2 weeks prior to interview 100% of 141 subjects reported having had sex with male customers (5.8 times on average), 50% with female non-customers, 23% with female customers, and 13% with male non-customers [27].

Turnover among male prostitutes is high. In 1985, 100 male prostitutes reported working an average of 7.4 months (range, 1-84 months) in gay bars [3]. In 1988, 50% reported having worked for less than 2 months in the profession [27]. Only 1% of male prostitutes were IDU [19,27]. Only 37% reported having used a condom during their most recent receptive anal sex [27].

No HIV surveys of non-prostitute homosexual men are known to have been performed [28]. These men are well-tolerated in Thai society, and not believed to be as polygamous as some populations in San Francisco or New York [26]. In a random survey of 1126 men, 3.3% reported ever having had a homosexual experience [29], 0.2% exclusively with men and 0.1% mostly with men (W. Sittitrai, personal communication, 1991). In another survey, 3% had engaged in homosexual activity in the previous 6-month period [30]. Among lower

class conscripts, however, 26% reported ever having had one or more homosexual encounters [31].

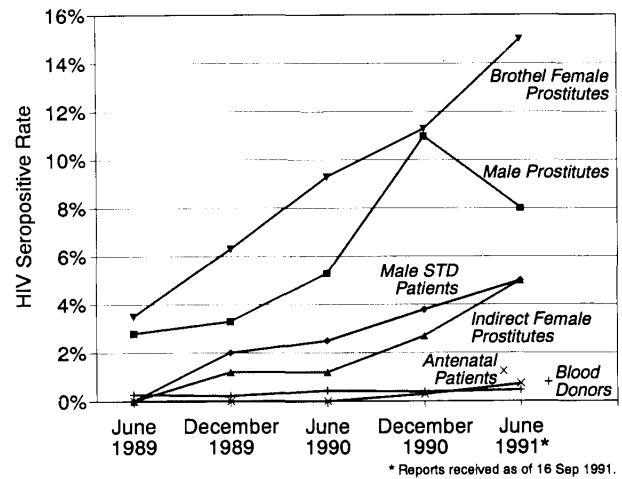


Fig. 2. Median provincial seroprevalence rates for selected groups in national sentinel surveys (data source: Division of Epidemiology).

The first wave: injecting drug users

The 1988 epidemic wave

HIV rates of 0 or 1% among IDU were found in various *ad hoc* serosurveys from 1985 through 1987 (Table 2) [43]. In 1988, surveillance by the Thanyarak Hospital for drug treatment [33] and the Bangkok Metropolitan Administration (BMA) Health Department [34-37] documented a remarkable explosive increase of HIV prevalence among heroin (and other opiate) users (predominantly IDU) attending methadone treatment. HIV rates climbed from about 1% at the start of 1988 to 32-43% by August-September 1988 (Fig. 1) [44,45]. Seroconversion rates in repeat survey participants in Bangkok were unprecedented: 20% of IDU initially seronegative in February 1988 seroconverted by September 1988 (3% incidence per month), and 35% seroconverted between September 1988 and April 1989 (5% incidence per month) [35]. From mid-1990 to mid-1991, prevalence rates in Bangkok have stabilized in the 30% range (Fig. 1). Such stabilization may mask continuing transmission in a population with probable high turnover: seroconversion rates were estimated recently at 4 to 8 per 100 person-years [46].

In June 1989, the first national sentinel serosurvey in 14 provincial capitals (Fig. 1) [20-22] and other *ad hoc* surveys (Table 2) revealed high rates similar to Bangkok in various other provinces around the country, even among IDU from remote hilltribe populations [41]. In the most recent of the 6-monthly national surveys, in June 1991 (Fig. 1), median seroprevalence among IDU was 30% (range, 0-100%; n = 52 provinces), with no marked regional variations.

Table 2. Thailand serosurveys in injecting drug users*.

Survey year(s)	Location	No. tested	No. HIV +	% HIV +	Refs
1985	Bangkok	99	0	0	[3]
1985–1987	Nationwide	3279	32	1	[32]
1986	Bangkok	75	0	0	[4]
1987	Bangkok	319	0	0	[5]
8–12/1987	Bangkok	3180	32	1	[33]
1987–1988	Khon Kaen	237	2	1	[18]
2/1988	Bangkok	1649	258	16	[34,35]
9/1988	Bangkok	1811	774	43	[35–37]
1988	Chiang Rai	223	2	0.9	[38]†
1988–1989	Chiang Mai	93	17	18	[39]
1988–1990	Chiang Mai	4132	537	13	[41]
4/1989	Bangkok	1020	454	45	[35]
11/1989	Bangkok	1008	388	38	‡
1989	Chiang Mai (Sanpetong)	200	NS	42	[42]
1989	Chiang Rai	28	17	61	[38]†
6/1990	Bangkok	878	388	44	‡
1/1991	Bangkok	482	180	37	‡

*Excludes data collected and summarized in national sentinel seroprevalence surveillance [20–25]. †Unpublished data from the Chiang Rai Provincial Public Health Office, Thailand. ‡Unpublished data from the Bangkok Metropolitan Administration Health Department, Thailand. NS, not stated.

HIV infection in prison inmates — many of whom are IDU — was detected as early as 1987. In the June 1991 national serosurvey the median provincial HIV infection rate among newly admitted male prisoners was 12% (range, 1–51%; $n = 20$ provinces), among newly admitted female prisoners 5% (range, 0–22%; $n = 13$), and among about-to-be-discharged male prisoners 19% (range, 6–51%; $n = 10$).

Risk factors for HIV

Although self-reported behavior may be inaccurate [47], more than half of drug users in treatment reported having been in jail or prison, where HIV transmission may be facilitated by widespread sharing of needles. Nationwide, 20% of people enrolled for drug detoxification treatment reported one previous incarceration, 11% two, 7% three, and 15% four or more [48]. Previous incarceration was significantly associated, on multivariate analysis, with HIV seropositivity [34,36,49], but not length of time in prison [37].

Sharing of needles, injection equipment, or the same 'load' of drug was significantly associated with HIV seropositivity [34–37,49]. Injection equipment was rarely cleaned [50]: only 1.7% who used public gathering sites to inject drugs reported cleaning their needles [35]. About 50% of IDU reported having heterosexual relations [49,51]; 5% reported bisexual behavior [34]. Of HIV-positive IDU, one-quarter reported continuing to have sex despite their seropositivity [52]. Condom use among sexually active IDU increased from about 7% in 1988 [36] to 19% in 1989 [35] following counseling in drug-treatment centers.

Sociology of drug use

The number of heroin or other opiate users in Bangkok and in Thailand is unknown; a 1991 estimate of the Bangkok total using capture/recapture methodology will report its findings in 1992. In fiscal year 1989, there were 60 323 admissions nationwide for standard 45-day methadone treatment (74% as outpatients) at the 138 registered heroin/opiate detoxification centers [53,54]; 27 056 of these admissions were in Bangkok [48,55]. Because of re-admissions, the number of heroin/opiate users attending treatment in Bangkok in 1989 was estimated to be about one-third of total admissions.

Ninety-six per cent of drug users admitted nationwide were male; 54% were 25–34 years of age. Heroin had been used in the previous 30 days by 88% of 57 894 people receiving drug treatment nationwide [54]; among Bangkok drug users the proportion was 97% [56]. Seventy-six per cent of admittees nationwide and 87% in Bangkok injected their drugs. Among injectors in Bangkok, 96% reported heroin as the primary drug used [56]. Nationwide, 18.3% also smoked their drug, but only 9.3% of Bangkok drug users reported using the inhalation route. Use of cocaine and its derivatives was rare [49].

The second wave: female prostitutes

From May 1985 through May 1989, all reported serosurveys of female prostitutes in Thailand detected nil HIV infection, or rates <1% (Table 3). In June 1989 — 1 year after the explosive spread of HIV among IDU — the first national sentinel serosurvey detected HIV infection in 44% (44 out of 100) of lower-class brothel-based prostitutes in Chiang Mai [20–22]. This high rate in Chiang Mai was confirmed in a follow-up study in August 1989, in which 37% (87 out of 238) were HIV-positive, and in which the incidence of seroconversion was measured at 10% per month [58]. Seven and eleven months later, monthly intermediary seroconversion rates in these women remained at 4.8 and 3.4%, respectively [61].

National median provincial rates for brothel-based prostitutes increased steadily from 3.5% (range, 0–44%; $n = 13$ provinces) in June 1989 to 15% (range, 2–63%; $n = 69$) in June 1991 (Fig. 2). Among higher-class 'indirect' female prostitutes (defined below), median rates are also rising steadily and in parallel to brothel-based prostitutes, from 0% (range, 0–5%; $n = 13$) in June 1989 to 5% (range, 0–29%; $n = 60$) in June 1991. Rates for brothel prostitutes have been consistently highest in the northern tier of provinces bordering Myanmar (Burma) and Laos (Fig. 3). In the December 1990 survey, for example — in which the median national rate was 11% — the rates in this northern tier of provinces ranged from 19% (7 out of 36) to 56% (107 out of 190).

Table 3. Thailand serosurveys in female prostitutes*.

Survey year(s)	Location	No. tested	No. HIV +	% HIV +	Refs
1985	Bangkok	100	0	0	[3]
1985	Chon Buri (Pattaya)	77	0	0	[14]
1985-1986	Bangkok	9	0	0	[14]
1985-1986	Chon Buri (Pattaya)	1964	0	0	[14]
1987	Chon Buri (Pattaya)	254	1	0.4	[5]
1987	Samut Sakhon	107	0	0	[5]
1987	Chon Buri (Bangsen)	60	0	0	[5]
1987	Chiang Rai	40	0	0	[38]†
1987	Chiang Mai	101	0	0	[57]
1987	Khon Kaen	292	0	0	[57]
1987-1988	Bangkok	986	0	0	[17]
1987-1988	Khon Kaen	40	0	0	[18]
1988	Chiang Rai	683	3	0.5	[38]†
1988-1989	Bangkok	3374	10	0.3	[15]
1988-1989	Chiang Mai	1092	4	0.4	[15]
1988-1989	Chon Buri (Pattaya)	2153	3	0.1	[15]
1988-1989	Phuket	647	0	0	[15]
1989	Chiang Mai	238	87	37	[58]
1989	Chiang Mai (Sanpatong)	NS	NS	42	[41]
1989	Chiang Rai	262	121	46	[38]†
1989	Tak (Mae Sot)	248	0	0	[59]
1989	Tak (Mae Sot)	373	15	4	[59]
1990†	Rayong	411	NS	17	[60]

*Excludes data collected and summarized in national sentinel seroprevalence surveillance [20-25]. †Unpublished data from the Chiang Rai Provincial Public Health Office. NS, not stated.

Among brothel-based prostitutes, factors significantly associated with HIV positivity were (1) greater frequency of sexual intercourse [61] [odds ratio, (OR) 2.52 for frequency > 3 times per day [60]; OR, 36.7 for > 6 times per day [58]]; (2) condom usage rate < 50% (OR, 2.25 [60]; OR, 2.6 [58]); (3) lower sexual service charge [OR, 22.9 for ≤ 50 baht (US \$2.00) [58], OR, 11.37 for < 100 baht [60]]; (4) decreased post-coital genital cleansing (OR, 3.7 for water alone without soap [58], OR, 1.9 for no cleansing at all [60]); and (5) history of genital ulcer disease (GUD) or positive venereal disease research laboratory (VDRL) serology [61,62].

Sociology of heterosexual prostitution

The largest proportion of heterosexual prostitution occurs in brothels (*samnak*) and tea houses (*rong nam cha*) that cater for urban and rural lower income male laborers and agricultural workers, who pay from 30 baht (US\$1.20) to about 200 baht (US\$8.00) for sexual services. Women working in such brothels and tea houses and similar establishments are referred to here as 'brothel-based' prostitutes. 'Indirect' female prostitutes work in massage parlors, bars, night clubs, discos, and coffee shops which cater to middle and upper income clientele. The negotiated tip for sexual service may vary from 200 baht (US\$8.00) to about 1500 baht (US\$60.00).

Indentured and forced prostitution occurs [63], but is difficult to quantify. Roaming agents indenture young

women from poor rural areas by paying lump-sum annual salaries in advance to their parents [64]. Foreign male tourists [65] and expatriate residents are attracted to a few districts where English-speaking high-income-earning women work in bars and discos (for example, 'Patpong' and 'Soi Cowboy' in Bangkok, 'the strip' in Pattaya, sections of Hat Yai district in Songkhla), but such places comprise only a small fraction of total prostitution in the country.

The annual census of prostitution by the Department of Communicable Disease Control in January 1990 recorded 86 494 female prostitutes working in 6160 establishments nationwide. The northern region (Fig. 3) had 10 241 women counted in 1290 sites; the north-eastern region, 8042 women in 1095 sites; the central region (excluding Bangkok) 22 969 women in 1560 sites; Bangkok, 28 656 women in 883 sites; and the Southern Region, 16 576 women in 1332 sites. This census data yields a rate of 157 prostitutes per 100 000 total population, or about one prostitute for every 146 men of age 15-44 years (mid-1988 Thai population: 55 million). Higher numbers of female prostitutes have been estimated, ranging from 200 000, representing 2.4% of women aged 15-29 years (W. Sittitrai, personal communication, 1991), to 500 000 [64].

The reported ages of female prostitutes working in brothels indicate that most are in the 15-to-29 year age range [15,66,67]. Reported mean ages were 20.9 years (range, 13-29 years) [68], 21.7 years [69], and 25 years [70]. Child prostitution does occur [63,71,72], but probably represents a small proportion of the total. One study reported that 38% (123 out of 323) of the women had husbands, and that 35% had children [67].

High rates of turnover and migration are common among female prostitutes. Length of time in the profession was reported as a median of 6 months (range, 2 months-6 years) in Tak province [59], as less than 2 years in 63% of 411 randomly selected prostitutes in Rayong [60], and as a mean of 3.0 years (range, 0-14 years) in Khon Kaen [69]. One study estimated that these women changed worksites — within the same town and to other towns and provinces — every 3-4 months [67]; cohort studies in Chiang Mai [61] and Tak [59] found annual turnover rates of 66 and 150%, respectively.

Women from the northern tier of provinces of the Northern Region, especially Chiang Rai and Payao, are widely believed to be over-represented in proportion to their provincial populations among prostitutes working throughout the country [64]. Most seropositive prostitutes studied in Tak were from Chiang Rai and nearby provinces [59]. Of 411 prostitutes in Rayong, 45% came from 'the North' [60], as did 'half' of 158 prostitutes working in Khon Kaen [68]. In 1990 and 1991 an increasing proportion of brothel-based prostitutes, sometimes up to half and more, especially in the northern region, were illegal immi-

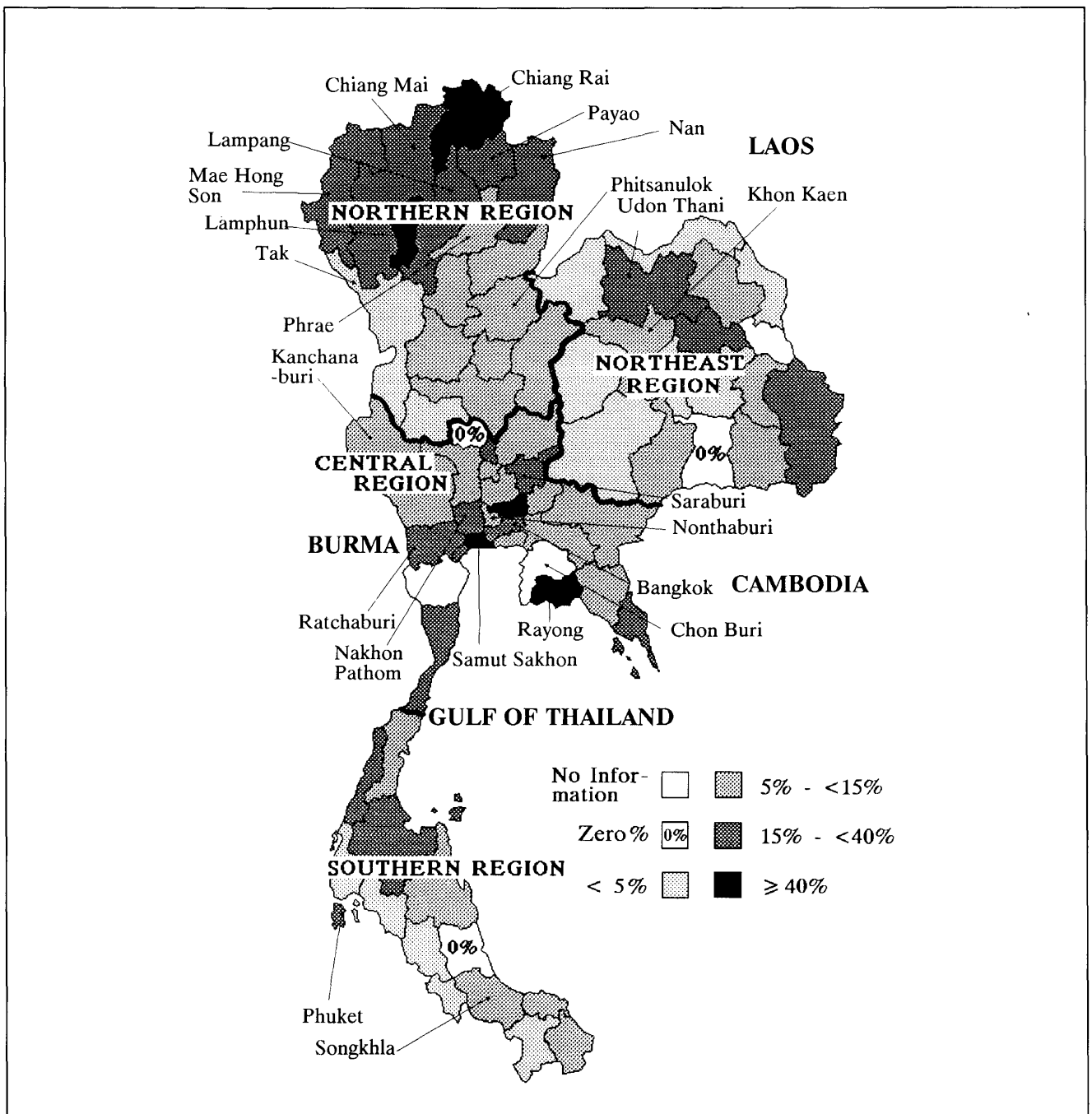


Fig. 3. HIV seroprevalence rates from December 1990 national sentinel survey [25] among brothel-based (lower-class) female prostitutes, by province. Rates not available for Chon Buri (in June 1991: 33%, 31 out of 93) and for the northeast province of Mukdahan (in June 1991: 5%, 1 out of 20). Mapping by Population Division, United Nations Economic and Social Commission for Asia and the Pacific, Bangkok (data source: Division of Epidemiology, Ministry of Public Health).

grants or indentured workers from neighboring Myanmar (Burma) and Laos, with a few from China [63]. Their low educational level and language barriers hamper prevention efforts by Thai public health workers.

The average daily number of male clients served by female prostitutes was 3 in Rayong [60], 3.6 in Khon Kaen [69], 5 to 6 in Kanchanaburi [66], and 9 (range,

0 to 26 clients per day), again in Khon Kaen [68]. Vaginal intercourse was most common, although oral sex was reported by 37% of prostitutes in Rayong [60], but by only about 6% in Tak [59]. Anal intercourse was rare: 2% in Rayong reported it [60], while its frequency in Tak dropped from 10 to 2% following AIDS prevention counseling [59]. Condom usage rates among prostitutes were reported as 38% [66] and 54% [60],

but others report lower baseline rates before intervention programs (described below). Injecting drug use is very rare among female Thai prostitutes [15,58,59].

The third wave: sexually-active heterosexual men

The third wave of the HIV epidemic, among non-IDU heterosexual men, was first detected at public sexually transmitted disease (STD) clinics in 1988 (Table 4). By June 1991, male STD patients had a national median provincial HIV rate of 5% (range, 0–31%; n = 70 provinces; Fig. 2).

Table 4. Thailand serosurveys in male sexually transmitted disease clinic patients*.

Survey (years)	Location	No. tested	No. HIV +	% HIV +	Refs
1985	Bangkok	100	0	0	[3]
1985–1986	Bangkok	95	0	0	[14]
1985–1986	Chon Buri (Pattaya)	214	0	0	[14]
1986–1987	Nationwide	136	0	0	[73]
1988	Nationwide	20061	31	0.2	[73]
1989	Nationwide	26032	335	1	[73]
1990	Nationwide	23517	519	2	[73]

*Excludes data collected and summarized in national sentinel seroprevalence surveillance [20–25].

Conscripts

Since 1989, HIV testing has been performed every 6 months among large numbers of 21-year-old Thai men selected for conscription by lottery; the findings corroborate the third epidemic wave among the general young, male heterosexual population [31]. In November 1989, 0.5% of 19 131 men were HIV-positive (by Western blot), a rate which rose to 1.7% of 31 638 in May 1990, to 2.1% of 24 272 in November 1990 [31] and to 2.9% of 31 230 in May 1991 (T. Nopkesorn, personal communication, 1991).

Men from the higher socioeconomic strata obtain educational deferments and other exemptions from the lottery. These conscripts, therefore, represent socioeconomically the lower four-fifths or so of the nation's men aged 21 years. Because of its large size and random selection methods, and despite the exclusion of the upper classes and the narrowness of the age group, this sample is the most comprehensive and reliable indicator available of HIV prevalence in the general young adult male population.

Conscripts from the northern tier of provinces of the northern region have consistently higher HIV rates than elsewhere. Men aged 21 years from the five provinces of Chiang Mai, Chiang Rai, Lampang, Payao, and Phrae had an overall rate in November 1990 of 10.3% of the 2100 men tested, compared with 2.4%

of 1234 men from the remaining six provinces of the northern region [31]. The November 1990 regional rates were 6.2% of 3989 men in the northern region, 3% of 1810 in the southern region, 1.1% of 4743 in the northeastern region, and 1.1% of 13 730 men in the central region.

Other male groups

HIV rates among men applying for visas to become expatriate laborers in Saudi Arabia reveal a marked increase in 1990 to 0.5% (Table 5). Spread to middle-class secondary school men is suggested by a 1991 survey of secondary school students aged 16–18 years entering public-health vocational training in Chiang Mai; two of 108 (2%) men were positive.

Table 5. HIV-1 prevalence in Thai laborers tested for Saudi Arabian visas.

Survey (years)	Location	No. tested	No. HIV +	% HIV +	Refs
1986	Nationwide	46124	0	0	[6,74]
1987	Nationwide	67496	6	0.008	[6]
1988	Nationwide	58526	13	0.02	[6]
1989	Nationwide	19369	NS	0.04	[75]
1990	Nationwide	NS	NS	0.5	[75]

Risk factors for HIV infection among men

Among heterosexual men, unprotected sex with female prostitutes is the primary factor contributing to HIV transmission. Of 55 HIV-positive male STD clinic patients with no risk factors other than heterosexual activity, 46 (84%) had used prostitutes in the previous year [76]. Greater frequency of sex with prostitutes correlated significantly with HIV seropositivity. Among patients with newly diagnosed active tuberculosis (TB), sex with prostitutes in the last 3 years was associated with HIV positivity [OR, 13.9 (4.6–45.0)] [77]. In a survey of 1654 male laborers at 13 factories and other work sites in Bangkok in February–April 1991, 12 (0.7%) HIV-positive laborers were detected, of whom 11 reported prior sex with female prostitutes and one a homosexual affair [78].

In both an STD clinic and a blood bank, GUD was more likely to be reported by HIV-positive than HIV-negative men [76]. Among new TB patients, history in the previous 3 years of gonorrhoea (OR, 5.4), GUD (OR, 6.12), and inguinal adenopathy (OR, 12.4) were significantly associated with HIV positivity [77].

By late 1990, only a small portion of the overall risk for HIV infection in men was attributable to injecting drug use. Self-reported IDU or those with opiate-positive urine were detected in only 7% (five out of 69) of HIV-positive male STD patients, and in none of 12 HIV-positive male blood donors [76]. Injecting drug use, in general, was reported by only 0.9% of randomly selected men aged 15–49 years nationwide [29], by 0.4% of 1176 surveyed male vocational students [79],

by 1.6% of 202 conscripts [31], and by 1% of about 600 men selected randomly nationwide [30].

Male sexual behavior

A sizable proportion of men have multiple female partners and visit female prostitutes. During 1989–1990, 28% of 1126 men selected by stratified random sample nationwide reported having had sex outside their marriage or steady relationship in the previous 12-month period, or were single and reported sex with casual partners in that period [29]. Of these 28%, 77% reported giving money or other items in exchange for sex. In early 1990, of about 600 randomly selected men aged 15 years and over surveyed in Bangkok and in each of the four regions, 75% reported having ever visited prostitutes; in the previous 6 months, 26% of these men reported sex with multiple female partners and 16% sex with prostitutes [30]. A history of ever visiting prostitutes was reported by 43% of 1176 male vocational students [79], by 64% (198 out of 311) of rural and 78% (135 out of 172) of urban men (20% of both groups having visited in the last month) in Tak province [80], and by 97% of 202 conscripts in northern Thailand [31].

The age of first sexual intercourse for men was reported as a median of 15–16 years among conscripts [31] and a mean of 19 years for a group of randomly selected men [30]. The reported age at first sexual contact with a prostitute was a median of 15–19 years among urban and rural men in Tak province [80] and a mean of 18 years in another study [30]. Among 202 northern region conscripts, 54% had such contact before the age of 16 [31]. During a previous 4-week period, 75% of 1126 surveyed men reported vaginal intercourse, 4.9% insertive oral intercourse, 0.7% insertive anal intercourse (sex of partner unspecified), 0.1% receptive anal intercourse, and 0.1% receptive oral intercourse [29].

The anticipated waves: non-prostitute women, newborns, others

Men who have sex with prostitutes also put their non-prostitute sexual partners — wives, girlfriends, and acquaintances — and their newborn children at risk for HIV infection. In 1991, the fourth and fifth waves of the HIV epidemic in Thailand appeared among these women and children. In the June 1991 national sentinel survey (Fig. 2), the median provincial rate for HIV infection among women attending public antenatal care clinics reached 0.7% (range, 0–12%; $n = 70$ provinces). In a large public hospital in Bangkok, rates among lower and middle-class women attending the antenatal clinic doubled from 0.6% (nine out of 1395) in July 1991 to 1.2% (19 out of 1617) in November 1991 (S. Koetsawang, personal communication, 1991).

In 1988 and 1989, most HIV-positive pregnant women were reported to be IDU [81,82]. By 1991, the proportion of HIV-positive pregnant women infected by their husbands (33%) exceeded those who were prostitutes (20%) or IDU (6%) (V. Siriwasin, personal communication, 1991). In early 1991, female secondary school students aged 18 years entering vocational training in Chiang Mai had a seropositivity rate of 0.6% (three out of 522).

Female sexual behavior

Women in the general population are less sexually active than men. Average age at first sexual intercourse for women was reported to be 21 years, and 95% of their first partners were their husbands [30]. In a survey of 1675 randomly selected women, only 1% of those with husbands or regular sexual partners reported sex outside their relationships [29]. Of 1247 female respondents with any sexual experience, 77.1% reported vaginal sex during a 4-week period prior to interview; 6.7% reported receptive oral intercourse; and 0.6%, receptive anal intercourse [29] (W. Sittitrai, personal communication, 1991).

Blood donors and recipients

Data from blood donor screening show marked increases from 1988 to 1990 (Table 6; Fig. 2). (Blood donor data is sometimes based on a single EIA screening test which, if reactive, is grounds for discarding the blood without further testing. Thus false-positives may represent a substantial proportion of some reported HIV rates.) Some donors have been paid, and 73% of one group of IDU gave a history of donating blood [44]. Conscripts occasionally donate as a group for public service reasons. HIV infections among patients receiving frequent blood donations (Table 7) probably result from transfusions performed before blood screening was widely instituted by 1989.

Table 6. Reports of HIV-1 prevalence in Thai blood donors.

Survey year(s)	Location	No. tested	No. HIV+	% HIV+	Refs
1985–1987	Nationwide	50000	0	0	[83]
1987	Bangkok	2627	0	0	[84]
1987	Bangkok	319	0	0	[5]
1987	Central Thailand	153	0	0	[57]
1987	Chiang Mai	299	0	0	[57]
1987–1988	Khon Kaen	12145	0	0	[18]
1988	Nationwide	168419	79	0.05	[6]
1988	Bangkok & environs	217373	105	0.05	[85]
1988	Bangkok	6713	1	0.02	[84]
1988	Bangkok	2820	NS	0.03	[86]
1988	Chiang Mai	25078	NS	0.83	[87,88]
1988	Chiang Mai	14755	85	0.57	[89]
1989	Bangkok & environs	226816	341	0.15	[85]
1989	Bangkok	4302	9	0.2	[84]
1989	Chiang Mai	14610	NS	3	[87,88]
1989	Chiang Mai	12426	289	2	[89]
1990	Chiang Mai	14531	410	3	[89]
1991	Chiang Mai	3151	96	3	[89]

Table 7. Serosurveys in frequent transfusion recipients (for thalassemia, hemophilia, etc.).

Survey year(s)	Location	No. tested	No. HIV +	% HIV +	Refs
1977–1984*	Bangkok	134	0	0	[90]
1985	Bangkok	100	0	0	[3]
1987	Bangkok	54	1	2	[91]
1987	Chiang Mai	44	3	7	[57]
1988	Chiang Mai	5	3	2	[92]
1989	Bangkok	38	0	0	[93]

*Retrospective survey on frozen sera.

Clinical and etiologic aspects

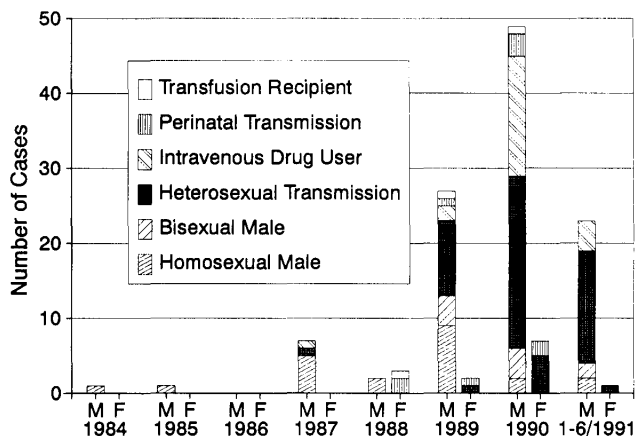
AIDS surveillance

The recent spread of HIV in Thailand is reflected in the relatively small number of reported AIDS and AIDS-related complex (ARC) cases, and the corroborating absence in 1991 of large numbers of HIV-positive patients with symptomatic HIV disease in hospital outpatient clinics and inpatient wards. As of 30 June 1991, 123 cases of AIDS have been reported since the first AIDS case appeared in late 1984. From 1984 to mid-1991, 289 cases of ARC have also been reported, with annual counts of 0, 5, 8, 13, 22, 90, 105, and 46 cases, respectively. The Ministry of Public Health (MOPH) follows the most current Centers for Disease Control (CDC)/World Health Organization (WHO) surveillance case definitions of AIDS, with ARC representing symptomatic HIV-positive patients without diagnoses, signs, or symptoms satisfying the AIDS definition. Physicians probably diagnose and report AIDS and ARC on clinical grounds when the necessary expertise or equipment for confirming or ruling out AIDS-indicator diseases are unavailable [94].

Half (seven out of 14) the early AIDS cases from 1984 through 1988 were homosexual men (Fig. 4), some of whom were foreigners or Thais with previous overseas residence [95–98]. Starting abruptly in 1989, the number of reported AIDS cases increased fivefold from the previous year, with heterosexual men and women comprising 50% (55 out of 109) of cases reported from 1989 through mid-1991, and injecting drug users 20% (22 out of 109).

Opportunistic infections

AIDS-indicator infections and related conditions were reported for 50 AIDS patients admitted from early 1987 through October 1990 [99]. Extrapulmonary or disseminated TB was diagnosed in 24% (12 out of 50), *Pneumocystis carinii* pneumonia in 22%, cryptococcal meningitis in 10%, cryptosporidiosis in 10%, chronic herpes simplex in 10%, *Salmonella* septicemia in 10%, esophageal candidiasis in 6%, atypical mycobacterium (MAI) in 6%, and Kaposi's sarcoma in 6%; other AIDS-indicating conditions and locally opportunistic infec-

**Fig. 4.** Reported AIDS cases, by year, by sex, and by risk category.

tions [100] were diagnosed in $\leq 4\%$ patients in the series. Mean survival time was approximately 6 months.

Virus studies

Study of neutralizing antibody in Thai patients suggests that HIV-1 strains in Thailand are considerably divergent from strains isolated elsewhere [101]. Recent nucleotide sequencing has shown two HIV-1 subtypes distinct from those in other world regions: type 'A' — phylogenetically closer to African isolates — predominates among individuals infected sexually, while IDU more frequently have type 'B' — closer to European and North American isolates (C-Y. Ou, personal communication, 1991). Nucleotide substitutions between patients with the same subtype averaged about 4%, compared with 17 and 13% for strains in Zaire and the United States, respectively, where the virus has had more time to mutate. No HIV-2 infections have been reported.

Knowledge, attitudes, practices

Knowledge, attitudes and practices (KAP) surveys have shown diverse results. In 1990, low-income prostitutes, teenagers, female IDU, and the wives of men who frequented prostitutes had little or no knowledge of AIDS, although high-income prostitutes did have knowledge of how to protect themselves [102]. Separate focus groups of female prostitutes, wives of IDU, and female slum dwellers all perceived themselves to be at high risk, but paradoxically felt the chance of infection was 'remote,' and reported low use of condoms [103]. Group education increased AIDS knowledge among sex workers [67]. Female users of contraceptives had a fairly accurate understanding of AIDS [104].

In Bangkok in late 1989 and early 1990, 62% of sampled men and women aged 15–49 years had good to moderate knowledge of AIDS — learned primarily from television — but only 50% intended to take pre-

ventive measures against it (i.e., use condoms), and only 22% actually took such action [105]. From 30% [79] to 86% [30] of surveyed men believed they were not at risk of acquiring AIDS.

In the rural province of Tak in 1989, 95% of 135 sexually active town-dwelling men and 93% of 198 rural men knew that condoms could prevent AIDS, but only 51 and 33%, respectively, had ever used one [80]. In November 1990, 47% of 1820 male students sampled in all four regions considered condoms 'unpleasant' and continued having sex without them [106]. In other studies, from 32 to 59% of men reported never having used a condom [29–31].

Health-care workers

In 1988, one-quarter of 274 health-care workers (HCW) in three Bangkok hospitals were uninformed about HIV transmission via bodily fluids and about recommended disinfection procedures; more than half feared contracting the disease from patients and preferred avoiding them [107]. In 1991, 62% of 189 HCW in Ratchaburi province health centers were very knowledgeable about AIDS but reported shortages of personnel, budget, and hospital supplies for the prevention of nosocomial transmission [108].

Estimates, projections and predictions

Estimates of the total number of HIV-infected people in Thailand have been revised periodically in accordance with changing seroprevalence data and estimates of the sizes of various population subgroups. In March 1990, a WHO/MOPH review team estimated 45 000–50 000 HIV-infected individuals. By September 1990, the MOPH estimated 85 000–100 000 infected individuals; by the end of 1990 the estimate increased to 129 800–244 800. In late December 1990, a non-governmental organization estimated a conservative minimum of 150 000 infected individuals [109]. In September 1991, the Thai Working Group (composed of various domestic and international AIDS surveillance and research agencies) estimated 200 000–400 000 infected individuals as of mid-1991.

Based on a WHO extrapolation method [110], the burden of infection and disease in Thailand by the year 2000 was estimated at 1–3.4 million cumulative HIV infections, with the range dependent on how well future transmission can be slowed [109]. Using the Inter-agency Working Group model [111], the Thai Working Group predicted 2–4 million cumulative HIV-infected individuals through the year 2000. The discounted direct and indirect economic costs over the decade of the 1990s for each adult AIDS case were estimated from 16 [109] to 20–30 times [112] per capita gross national product.

Tuberculosis is common in Thailand. Infection prevalence was estimated at 14 cases per 1000 population,

open TB (infectious smear-positive or culture-positive sputum) 3.1 cases per 1000, and annual incidence of new cases with positive acid-fast bacilli 85 per 100 000 [113]. Annual risk of TB infection among people 0–14 years of age was 2.17%, as measured by national tuberculin reactivity survey in 1978 [114]. TB incidence may increase dramatically as immunodeficiency occurs among HIV-infected people who also have tuberculous infection, or who become newly infected by exposure to contagious TB cases. This predicted surge may already be starting, as evidenced by the rapid increase to 14% HIV prevalence in patients with newly diagnosed active TB seen in Chiang Mai in early 1991 [77], and the emergence of HIV among new TB patients in Bangkok [115].

Rare locally endemic opportunistic infections such as melioidosis [116] and the fungosis caused by *Penicillium marneffei* [100], are also likely to occur with greater frequency as immune function declines among the large number of HIV-infected people.

Prevention programs and activities

Short-term and medium-term plans (MTP) for AIDS prevention and control were established in Thailand in 1988 and 1989 by the MOPH, with support from WHO. Nineteen million condoms in 1989 and 26 million in 1990 were promoted and distributed free by government agencies and non-governmental organizations (NGO) [117]. HIV testing was established in each provincial hospital to help achieve a safe national blood supply [94], although some isolated rural hospitals in 1991 must still send specimens elsewhere for testing [13]. General and targeted health education materials and advertising have been produced. A national sentinel HIV infection surveillance system now monitors the epidemic [20–25].

Areas for continued attention [117] — now being addressed by coordination of AIDS prevention in the Office of the Prime Minister — include: (1) involvement of other sectors — education, universities, defense, commerce, and labor — in prevention programs; (2) expanded training of counselors; (3) focused health education messages; (4) training and protective supplies for health-care workers; (5) strengthening condom distribution and quality assurance; (6) operational research linked to intervention programs; and (7) funding and encouraging NGO and the private commercial sector to implement additional AIDS prevention efforts.

Prevention of transmission among IDU

Since 1988, parenteral transmission of HIV among IDU has been discouraged by posters, videos, and counseling at many drug-treatment clinics, by home and community visits by volunteer health workers and ex-IDU, and by provision of free bleach and in-

structions in needle disinfection at many drug clinics. Needle-exchange programs have not been initiated. Although accurate knowledge about AIDS reached 90% in one study, commensurate changes in IDU behavior were not so comprehensive [35]. In serial studies in Bangkok in February 1988, September 1988, and April 1989 — during which interval active prevention activities were underway — the sharing of needles declined slightly (from 60 to 66 to 52%), bleaching of equipment increased (from not stated to 8 to 15%), and condom use increased (from 7 to 8 to 19%) [36]. Among those who continued to share needles in covert sites where drug users gather, only 2% bleached their equipment. In November 1989, 181 out of 596 (30%) drug users reported sharing needles two or more times in the previous 6 months [49].

Prevention programs for female prostitutes

A standard intervention model to prevent HIV transmission by heterosexual prostitution has emerged through various innovative programs initiated independently by public-health officers in various provinces. A common feature is to obtain the cooperation of owners and managers of brothels and other sex establishments — usually by friendly persuasion and occasionally with threats of closure by police. This permits public-health workers to distribute free condoms and provide health education to the prostitutes through flip charts, leaflets, posters, cassette tapes, and other media. Establishments are designated '100% condom-use-only brothels' by posting prominent posters on the premises to advise male customers of the requirement to use condoms.

As a result, condom usage rates in Chiang Mai were reported to rise from 10–20% in early 1989 to 80–90% in late 1990, as determined by undercover health-care workers posing as customers (S. Visarutrat, personal communication, 1991) [118,119]. Efficacy was suggested by the decline in male gonococcal urethritis cases at the public STD clinic, from a mean of 540 per month in the period from October 1988 through September 1989, to a mean of 306 per month from October 1989 through November 1990 (N. Pruitithada and C. Kuanusont, personal communication, 1991).

In Ratchaburi and nearby provinces, STD diagnosed at the public clinic in female prostitutes or in their male customers are considered *prima facie* evidence of violation by the corresponding brothel owner of the condom-only requirement, who is then warned or closed down (W. Rojanapithayakorn, personal communication, 1991). Condom usage has risen to 90%, from around 40% before the intervention. In Phitsanulok, by the end of a 6-month intervention from June to November 1990, the frequency of all STD among prostitutes (including clinical diagnoses) dropped from 15% (52 out of 357 checkups) to 2% (five out of 283), gonorrhoea dropped from 13% (47 out of 357) to 1% (two out of 283), and reported condom usage increased from 74% (405 out of 550 sex acts) to 95%

(480 out of 503) (P. Pinprateep, personal communication, 1991) [120].

In Udon Thani, by the end of a 4-month project through March 1990 that distributed 10 000 condoms, 60–70% of sex acts in participating brothels were protected with condoms (W. Apipunyanon, personal communication, 1991) [121]. In Khon Kaen, the rate of compliance with a condom-only policy, as measured by medical students posing as customers, increased from 59% in October 1990 to 71% in March 1991 [69,122]. Self-reported condom usage rose from 74 to 94% of all sex acts, and the number of brothels reporting all customers using condoms increased from 21 to 61%. In Tak province, where intensive prevention efforts began in March 1989, condom usage rates increased from 14% in January 1989 to 50% in December 1989, with the greatest increase occurring between June and July [59]. Monthly mean incidence rates for gonorrhoea among female prostitutes declined from 18% in January to 10% in July, and remained at that level during the remainder of 1989. A variety of other prevention interventions among female prostitutes have been instituted by the self-help group EMPOWER (Education Means Protection of Women Employed in Recreation) [119,123] and the Population and Community Development Association [70].

Prevention programs for male prostitutes

In Bangkok, NGO such as the Gay Bar Owner's Association and the Fraternity for AIDS Cessation in Thailand (FACT) have developed prevention programs which use plays, the gay 'Purple String' and straight 'White Line' dance troupes, videos, interviews and other means of influencing behavior change among male prostitutes [15,28,87,123,124]. The positive impact of these activities has been suggested by declining rates of syphilis, from 13% in 1985 to 5% in 1987 at the public male-prostitute STD clinic in Patpong in Bangkok [16].

Discussion

The Thai HIV experience — Pattern IV?

All evidence — HIV serosurveys, AIDS surveillance, and genetic sequencing — points to the recent nature and rapidity of the HIV epidemic in Thailand, beginning with the striking increase in transmission among IDU in 1988. Three years later, estimates of the numbers of infected people (300 000 among 55 million population) roughly equals the estimated rate of HIV infection in the United States (about 1 million in 250 million), where the epidemic is over 10 years old.

The reason and dynamics behind the timing and rapidity of the 1988 epidemic in IDU are unknown. One speculation implicates needle-sharing in Thai prisons in 1987 between Thais and HIV-positive expatriates imprisoned on drug charges. HIV infection was de-

tected among both these inmate groups in that year. The annual pardon of prisoners on 5 December 1987 was appreciably larger than in other years, and may have released a sufficient number of HIV-infected inmates to trigger a chain reaction of HIV spread among IDU in the community.

Secondary and tertiary heterosexual spread of HIV into female prostitutes and then their male customers has also occurred rapidly (although preliminary genetic evidence suggests the epidemics among IDU and heterosexuals may not be causally related). In the first wave, IDU reached seropositivity rates of 2% in February 1988; it took only 16 months for female prostitutes in the second wave to reach the same 2% level in June 1989. Heterosexual men in the third wave reached the same 2% level in December 1989 (male STD patients) and in November 1990 (male conscripts), only 6 and 17 months, respectively, after the female prostitutes did so in the preceding wave. Such speed of spread has not been documented elsewhere. The explanation of this rapidity is likely to come from research on sexual behavior and related diseases; there is no evidence for genetic factors of the human host nor virulence of the etiologic agent to explain it.

The Thai HIV experience might be summarized as: rapid spread first in IDU, followed by successive waves of transmission to female prostitutes, then into their non-IDU male clients, and then into the low-risk non-prostitute wives and girlfriends of these men in the general population. Reports from nearby countries in Asia suggest that this scenario, which might be termed Pattern IV, is being repeated elsewhere [125]. Much informal migration occurs between adjacent regions of Thailand, Laos, Myanmar (Burma), China, and India. Illegal social behaviors, such as injection of illicit drugs and male patronage of prostitutes, occur similarly in these countries and appear to be resulting in a similar pattern of HIV spread.

In Myanmar, HIV seropositivity increased among IDU from 17% (54 out of 313) in 1985–1989 to 63% (440 out of 701) in 1990 and to 76% (260 out of 340) in the first quarter of 1991 [126,127]. Rates in female prostitutes were 8% (45 out of 539) in 1990 and 3% (three out of 95) in early 1991. Male military personnel rates were 4% (three out of 76) in 1990 and 1% (two out of 224) in early 1991.

In India, IDU in Manipur state, bordering Myanmar, had HIV rates of 0% (none out of 2322) from July 1986 through September 1989. Between October 1989 and June 1990, the rate increased to 54% (765 out of 1412) [128]. Elsewhere in India, reports of growing rates in lower-class female prostitutes and their male clients have emerged [129–131], but the link with IDU is uncertain. In Kunming in southwest China, injecting heroin use is an emerging problem among young people [132]. Ninety per cent of the 429 HIV-positive individuals detected in this region among 19 000 tested be-

tween 1986 and 1990 were IDU living near the Myanmar border.

Northern Thailand enigma

HIV infection among female prostitutes and heterosexual men are consistently highest in the northern Thailand provinces adjacent to Myanmar and Laos (Fig. 3). For example, brothel-based lower-class prostitutes and male STD patients in Chiang Rai surveyed in June 1991 had the highest rates in the country, 63% (283 out of 450) and 31% (61 out of 200), respectively. Conscripts of age 21 years from Chiang Rai in May 1991 had HIV rates about 17% (T. Nopkesorn, personal communication, 1991). Various hypotheses to explain these high rates include: (1) increased frequency of visitation to prostitutes; (2) a relatively smaller pool of prostitutes serving the pool of male clients; (3) increased incidence and prevalence of cofactors, such as GUD; and (4) slower turnover of female prostitutes. There is no firm evidence, to date, to support these possible explanations.

Prevention based on research

As in other countries, there is a dearth of carefully controlled research documenting the effectiveness and impact of HIV prevention programs in Thailand on the course of the HIV epidemic. The major barriers to such research are difficulty in identifying suitable control populations not exposed to the intervention in question, inability to distinguish the effects of multiple interventions instituted simultaneously, and lack of serial records quantifying exactly how much of each intervention took place during the intervals of its implementation. However, the anecdotal and limited data reported from prevention programs for heterosexual transmission, described above, suggest that STD incidence — a surrogate marker for HIV incidence — can be significantly reduced with intensive targeted public-health programs.

With high rates of turnover in male and female prostitutes, and perhaps among IDU, continuous and ongoing educational programs, condom-promotion schemes, and efforts to stop needle-sharing will be required to reach a constant stream of newcomers into these professions and habits. A large proportion of heterosexual men have casual sex with prostitutes and others. These men must be targeted specifically in major, professionally-designed and evaluated efforts to increase condom usage: in the mass media, in primary and secondary schools before they reach the age of sexual activity, and in the workplace afterwards.

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The epidemiology of HIV infection and AIDS in Thailand

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The authors would like to apologize for the following errors: Table 3 (page S74) and Table 6 (page S77) should read as follows:

Table 3. Thailand serosurveys in female prostitutes.

Survey year(s)	Location	No. tested	No. HIV +	% HIV +	Refs
1989	Chiang Rai	262	121	46	[38]

Table 6. Reports of HIV-1 prevalence in Thai blood donors.

Survey year(s)	Location	No. tested	No. HIV +	% HIV +	Refs
1988	Bangkok	2820	NS	0.0?	[86]

Page S79, under the heading 'Estimates, projections and predictions' (1st column, 3rd paragraph, line 2), should read: 'Annual incidence of infection was estimated at 14 cases per 1000 population' [not 'infection prevalence was estimated ...].