Relationships of HIV and STD declines in Thailand to behavioural change

A synthesis of existing studies

UNAIDS

UNICEF • UNDP • UNFPA
UNESCO • WHO • WORLD BANK

UNAIDS Best Practice Collection
KEY MATERIAL

Relationships of HIV and STD declines in Thailand to behavioural change

A synthesis of existing studies

The contributions to this report of the following people are gratefully acknowledged: Tim Brown, Tony Bennett, Michel Caraël, Ryuichi Komatsu and Werasit Sittitrai.

UNAIDS/98.2

©Joint United Nations Programme on HIV/AIDS, 1998. All rights reserved. This publication may be freely reviewed, quoted, reproduced or translated, in part or in full, provided the source is acknowledged. It may not be sold or used in conjunction with commercial purposes without prior written approval from UNAIDS (contact: UNAIDS Information Centre – 20, avenue Appia – 1211 Geneva 27 – Switzerland or e-mail: unaids@unaids.org).

1. Introduction and overview

1.1 The beginnings of the Thai HIV/AIDS epidemic

Because of the extensive publicity received by the Thai HIV/AIDS epidemic in the international press, few people realize it began comparatively slowly. In 1984, the first visible evidence of HIV in Thailand was the diagnosis of AIDS in a man returning from overseas and receiving treatment at a hospital in Bangkok. Over the next year, a handful of other cases were reported, predominantly in men having sex with men (MSM) who had contracted the virus locally. Concerned that HIV might spread through the country, Thai health officials and researchers began conducting small-scale serosurveys for the virus in populations with high levels of risk behaviour. Several such surveys were made in populations of male and female sex workers and injecting drug users (IDUs) between 1985 and early 1987. However, they only sporadically detected HIV, most commonly in male sex workers (MSWs) at low levels between 1% and 2% or in injecting drug users at less than 1% (for a review of these studies see Weniger *et al.,* 1991). During this entire period, numerous published studies of female sex workers (FSWs) reported only a single infection, in Pattaya. Given this slow and limited growth in infections in the early years of the epidemic, many mistakenly thought HIV/AIDS would not become a major problem for Thailand.

This complacent attitude changed between 1987 and 1988 when surveillance among injecting drug users at Thanyarak Hospital and in Bangkok Metropolitan Administration (BMA) clinics saw an explosive increase in HIV infection levels. The percentage of injecting drug users infected rose from less than 1% in late 1987 to over 30% by mid-1988 [Uneklabh and Phutiprawan, 1988; Vanichseni *et al.,* 1989a; Phanuphak *et al.,* 1989]. A similar rapid rise in infections of IDUs at the national level was seen by the end of 1989, after which HIV prevalence in injecting drug users has remained stable between 30% and 40% through the present.

However, while attention was focused on injecting drug users, the heterosexual component of the Thai HIV/AIDS epidemic was building almost invisibly. During 1988 and 1989, continuing ad hoc serosurveys in female sex workers (FSWs) were starting to detect low levels of HIV around the country. For example, in a Chiangrai survey in 1988, 0.5% of sex workers tested positive (unpublished data from Chiangrai Provincial Public Health Office referenced in Weniger *et al.,* 1991), while in surveys in Bangkok, Pattaya, Chiangmai and Phuket seroprevalences between 0% and 0.4% were reported [Traisupa *et al.,* 1990].

These continuing low levels of infection seemed little cause for alarm. It thus came as a severe shock to the country when in mid-1989 the Ministry of Public Health's newly established national sentinel surveillance system reported that 44% of brothel-based female sex workers in Chiangmai were HIV positive [Division of Epidemiology, 1989]. Perhaps even more disturbing, the system found some HIV infections in each of the 14 provinces included in the first round of the surveillance. The geographical reach of the virus was extensive.

By the end of 1989 almost all of these 14 provinces were reporting HIV in men attending sexually transmitted disease (STD) clinics, most of whom reported being clients of sex workers, and roughly one-third were finding HIV in pregnant women. By June 1990 the Ministry had expanded the sentinel system to all provinces. As province after province began detecting HIV infection in sex workers, men attending STD clinics, and pregnant women, the predominantly hetero-sexual nature of the Thai epidemic became undeniably clear.

At the same time that epidemiological evidence was building of a widespread HIV/AIDS epidemic in the country in 1990, the first national survey on risk behaviours was being conducted by the Programme on AIDS of the Thai Red Cross Society and Chulalongkorn University. The Survey of Partner Relations and Risk of HIV Infection in Thailand,

funded by the World Health Organization's Global Programme on AIDS, gathered data on levels and patterns of sexual behaviour, injecting drug use, and knowledge of AIDS across the country [Sittitrai *et al.,* 1992a].

The findings of this study, widely circulated and presented to policymakers, were that 28% of Thai men between the ages of 15 and 49 had reported either premarital or extramarital sex in the last year, with three-quarters of those men having paid for sex during that time. Among young Thai men between 20 and 24, more than 40% reported having paid for sex in the last year. If clients of sex workers were at high risk for HIV, as all the evidence was showing, the potential impact of this epidemic on the Thai population and the Thai workforce would be immense.

1.2 An expanded response and its effects

Influenced by these and other epidemiological and behavioural findings, Thai society rapidly expanded its response to the epidemic starting in 1991, devoting increasing resources and manpower to the effort. The Royal Thai government adopted policies of aggressively promoting condom use in commercial sex (the 100% condom programme) and of substantially expanding STD treatment [Hanenberg *et al.,* 1994]. The Prime Minister took the chairmanship of the National AIDS Committee and the government steadily expanded its budget for AIDS activities to more than 80 million US dollars by 1996. Various ministries were given direct national funding for implementation of their AIDS plans. Mass media efforts were launched with the support of Thai advertising and marketing agencies to educate the public on protecting itself from HIV. Thai non-governmental organizations (NGOs) piloted programmes for peer education in factories, participatory development of locally relevant programmes in village communities, and community based care for those affected, some of them funded with government budget. People living with HIV and AIDS organized self-help groups and undertook both prevention and care and support activities. Many private businesses initiated AIDS prevention programmes in their workplaces.

These efforts produced substantial behaviour change. Reported condom use in brothels grew rapidly across the country, with some brothels reporting well over 90% of sexual contacts being protected. The proportion of men saying they visited sex workers in the last 12 months was cut in half between 1990 and 1993. Even as the number of people dying of AIDS grew, positive indications of a slowing of the epidemic were seen from a number of sources. The number of sexually transmitted diseases reported by the Venereal Disease Division of the Ministry of Public Health (MOPH) dropped substantially. Since 1993, the percentage of infected 21-year-old Thai males has begun a nationwide decline from its peak levels of 3.7%.

But these positive developments must not be allowed to weaken the country's commitment to HIV prevention and care. As this report will document, changes are occurring in the nature and direction of the Thai epidemic and the national response must react dynamically to these changes with new programmes and initiatives. At the same time, the programmes that have contributed so greatly to risk reduction must be sustained. Failure to do so could result in a major resurgence of new HIV infections in the country.

1.3 Exploring the linkage of HIV/STD declines to behavioural change

As the preceding material hints, the Thai HIV/AIDS epidemic has been perhaps the most extensively and completely documented infectious disease epidemic in the world. The Ministry of Public Health's national HIV sentinel surveillance system has captured the evolution of the epidemic from almost the beginning. Data on the risk behaviours driving the epidemic were collected early and disseminated widely. Large numbers of Thai researchers and their international collaborators have conducted hundreds of studies to understand the factors influencing the epidemic and to develop effective counter-

measures to slow its growth. These studies span the full range of disciplines, from epidemiology, to behaviour, to clinical manifestations and treatment, to prevention programme design and evaluation. They have resulted in well over 1000 published reports and papers on various aspects of HIV/AIDS [Ministry of University Affairs, 1995].

This strong research infrastructure and data availability makes Thailand a suitable place to examine the linkages between reported changes in behaviour and changes in HIV/STD prevalence and incidence. This paper undertakes a review of the available literature in order to:

- summarize existing epidemiological and behavioural data, documenting changes over time on both national and regional levels;
- examine the relationships found between behaviour and HIV/STD infection;
- determine the feasibility of linking behavioural and epidemiological aspects of the epidemic;
- examine the correlation of behavioural change with epidemiological change; and
- determine the practical implications of these findings for continuing Thai national programme and policy needs.

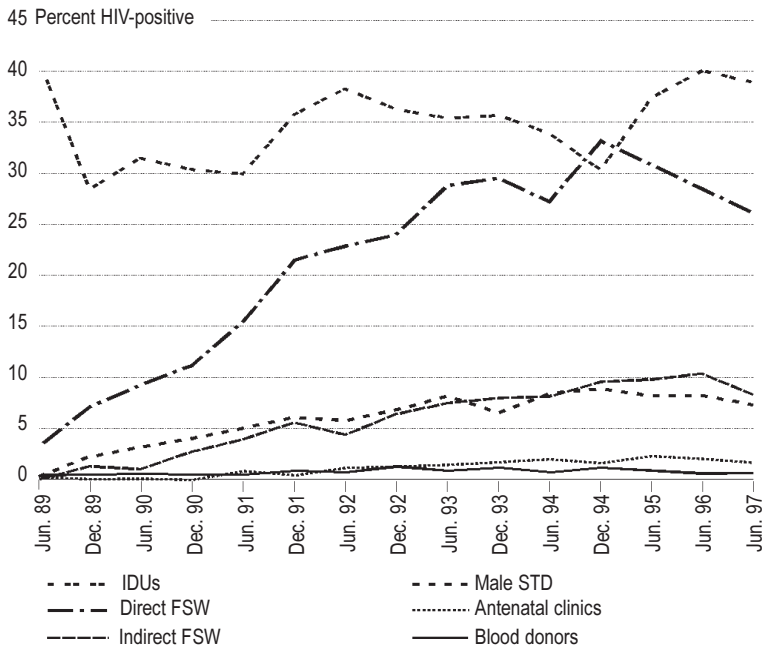
This is undertaken in the hope that the results will benefit both policymakers and those responsible for informing policymakers, programme managers, and the public of the current status of the epidemic. Detailed knowledge of the successes, methodological constraints, and limitations that can be drawn from the Thai experience will also benefit other countries, especially through the realization that behaviours can be changed, slowing HIV spread substantially and altering the course of the epidemic. But to accomplish this, appropriate levels of support must be provided for national AIDS programs and ongoing monitoring of the epidemiological and behavioural situation is essential.

II. Epidemiological trends in HIV and other sexually transmitted diseases

Extensive monitoring of the Thai epidemic since its earliest phases has shown a large scale decline in new HIV infections and STDs. Available data show that new HIV infections grew rapidly during the late 1980s and the early 1990s, largely through commercial sex and sharing of needles by injecting drug users. But by 1991, major reductions in new HIV and STD infections (incidence) were already underway in many populations. Despite these reductions, the first declines in current HIV infections (prevalence) were not seen until a few years later in 1994, illustrating the delay before incidence declines are reflected in prevalence. Evidence that new infections continue to occur at substantial rates is still found in some populations including injecting drug users, sex workers, and men who have sex with men. This section describes these findings in detail, as a basis for comparison with the changes over time in risk behaviour to be presented in section III.

Figure 1. HIV prevalence from sentinel serosurveillance, Thailand, 1989–1997

Source: Epidemiology Division, Ministry of Public Health, Thailand



II.1 National HIV and STD monitoring systems

Several systems have been established in Thailand which collect data on HIV and other sexually transmitted diseases on the national and provincial levels. These include:

1. The sentinel surveillance system conducted by the Epidemiology Division of the Ministry of Public Health. This system collects HIV sero-prevalences annually in each province for sex workers, men attending STD clinics, injecting drug users, women visiting antenatal clinics, and blood donors.
2. The HIV testing of newly recruited military conscripts by the Royal Thai Army. A sample of about 60,000 21-year-old men is tested each year, providing cross-sectional HIV prevalence data. In addition to HIV status, information is gathered on place of recent residence, allowing geographic patterns to be seen.
3. The annual reporting of sexually transmitted diseases from government clinics and hospitals by the Venereal Disease (VD) Division of the Ministry of Public Health. These data are available by province in annual VD Division reports, but the system only reports government sources of STD treatment.

II.2 National time trends and geographical variations in HIV and STDs

Distinct epidemiological trends have been apparent in each of these systems. Figure 1 shows the changes over time in mean infection levels (prevalences) in groups surveyed by the sentinel surveillance system. Infection levels in injecting drug users had already exceeded 35% by the time the system was implemented and have been relatively stable over time. The next most heavily affected population is direct female sex workers (direct FSWs), those working in brothels.

Prevalence among these women has shown a steady climb, exceeding 30% by 1995. Indirect FSWs, those working in non-brothel commercial sex sites such as bars or nightclubs, and who generally have far fewer clients than direct sex workers, show a much more gradual increase to about 12%. The growth of infections among men attending STD clinics, most of whom are clients of sex workers, closely parallels the growth in indirect FSWs. Prevalence in the male STD group appears to be leveling off at about 10%. Compared to these other groups, prevalences in blood donors have remained comparatively low and even dropped in recent years, but this decline may reflect increasing self-deferral of those with risk behaviour rather than falling prevalence in the general population. Prevalence among pregnant women rose from nearly 0% in 1989 to 2.4% in 1995, before falling back to 2.0% in 1996. Determining whether this decrease is a statistical fluctuation or represents a true drop in prevalence will require more time. However, the fall in prevalence among young Thai men, described in the next paragraph, gives hope that it is a true decline.

Figure 2 shows the national and regional prevalences obtained from testing of new military conscripts. The prevalence in this large sample of 21-year-old males peaked in 1993 at 3.7% and levels had fallen to 2.5% by 1995. This implies that young Thai men today are contracting fewer HIV infections before being conscripted at 21 years of age than did their older peers, that is, HIV incidence among young Thai men has fallen. The figure also illustrates the substantial geographic variation that has been a feature of the Thai epidemic. The north has seen a more severe epidemic than the other regions of the country, while the north-east has been the least heavily affected. The six upper northern provinces, including Chiangmai and Chiangrai, have shown especially high infection levels in both the conscript and sentinel surveillance data. Possible contributors to this geographic variation include time of introduction of HIV to the region and behavioural differences between the region.

The number of STD cases reported each year to the VD Division by government treatment facilities is shown in Figure 3. Between 1990 and 1995 there was a five-fold reduction in the number of cases treated at these clinics, even though the number of clinics was expanding [Rojanapithayakorn and Hanenberg 1996]. This decrease has been quite uniform across each region of the country. While the number of cases started to decline in 1986, a substantial acceleration in the rate of decrease began in 1989. The early decline is believed to correspond to the introduction of more effective drugs for STD treatment [Mugrditchian *et al.,* 1992], however the more recent drops probably reflect behavioural change and improved STD treatment and

Figure 2. Mean national and regional infection levels in military conscripts

Source: Jugsudee *et al.*, 1996, Royal Thai Army

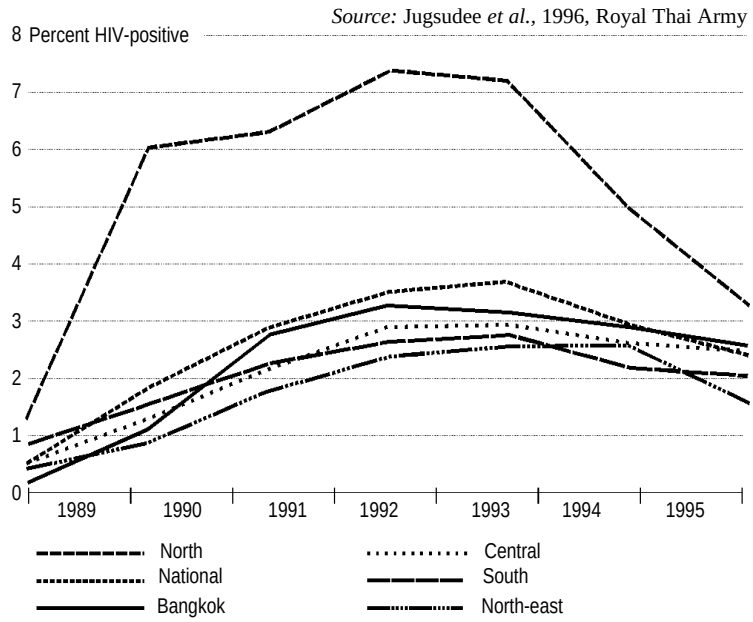
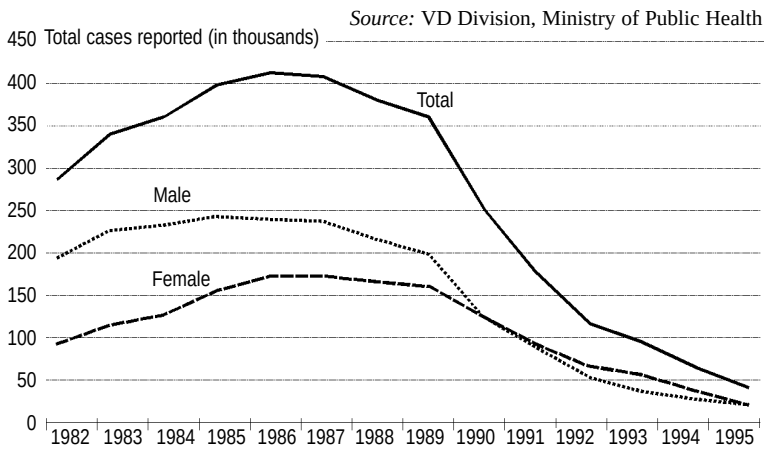


Figure 3. Number of STDs reported from government clinics by gender

Source: VD Division, Ministry of Public Health



control efforts. Because these STDs are treated when the person comes to the clinic, annual VD Division numbers primarily report new cases of disease transmission by sexual means. This means that they will show reductions in risk behaviour more quickly and effectively than will HIV prevalence measures, which can only decrease when people die or otherwise leave the population being tested.

II.3 Changes in HIV and STD incidences over time as seen in specific populations

Because HIV prevalence does change slowly even if all risk behaviour stops, HIV and STD incidences, that is the rates at which new infections occur, are better measures of the impact of behavioural change. However, incidence is more difficult to measure than prevalence because one is looking for a change in a person's HIV infection status. Thus, determining the incidence usually requires following a group of uninfected individuals, a cohort, over time to see how many of them become infected. This study design is referred to as a prospective cohort study. Alternatively, a much larger sample of individuals can be studied using methods which involve diagnostic tests that look for recent HIV infections by the presence or absence of certain viral proteins and immune responses in the blood [Brookmeyer *et al.,* 1995; Brookmeyer and Quinn, 1995]. Either of these study designs tend to be more expensive and require more effort than testing for prevalence, which can be done with a single blood or saliva test. (*Note:* for a general review of incidence studies in Thailand see Weniger, 1994 or Brown *et al.,* 1994).

Several cohorts have been followed in Thailand, in particular cohorts of military conscripts in the north during their two years of service [Nopkesorn *et al.,* 1993a,b; Celentano *et al.,* 1993 and Nelson *et al.,* 1993; Carr *et al.,* 1994] and cohorts of female sex workers in the north and north-east [Limpakarnjanarat *et al.,* 1993; Beyrer *et al.,* 1996a; Ungchusak *et al.,* 1996a]. More recently cohorts have also been established in STD clinic attendees in various sites [Nelson *et al.,* 1994a; Siraprapasiri *et al.,* 1996; Markowitz *et al.,* 1996]. Retrospective cohorts, built from records of individuals with more than one recorded HIV test have also been constructed for blood donors [Sawanpanyalert *et al.,* 1996; Kitayaporn *et al.,* 1996b], sex workers [Gray *et al.,* 1997], and injecting drug users [Kitayaporn *et al.,* 1994a].

These studies, whose results are described below, allow the incidences in specific populations to be determined. A few have even documented changes in incidence over a relatively long time period allowing incidence trends to be determined. The variability observed in the timing with geographic location and population group demonstrates that the Thai epidemic actually consists of a number of smaller epidemics, which occur when HIV is introduced locally into a group with high levels of risk behaviour.

II.3.a Conscripts

Summary: In the early 1990s cohort studies in conscripts found moderate HIV incidences, especially in the north, but by 1995 a ten-fold reduction in incidence had been observed there.

Cohort studies in conscripts have tended to confirm the patterns seen in the national level conscript and STD data. Incidences for men from the upper north during the 1991 to 1993 time frame were high, e.g., reported values of 3.2 per 100 person-years (abbreviated 3.2/100 py) [Carr *et al.,* 1994] and 2.4/100 py [Celentano *et al.,* 1996a]. Rates for the lower north and Bangkok were considerably lower, 1.0/100 py and 0.5/100 py [Carr *et al.,* 1994]. The incidence rates in subsequent cohorts in the north have declined substantially. For example, in the initial follow-up of a newly recruited northern conscript cohort in 1995, Khamboonruang *et al.* [1996a] reported a sero-incidence of 0.3/100 py.

STD incidences in northern conscript cohorts have also been seen to decline during follow-up, tracking the trends in the VD Division data. Celentano *et al.* [1996b] saw a decline in overall STD incidence from 21.1/100 py in 1991 to 10.4/100 py in 1993 in their conscript cohort in

the upper north. During this same period incident STDs treated at government clinics from the upper north where the study was done fell from 15,800 to 8,500, a similar two-fold decline in rates.

II.3.b Female sex workers

Summary: Incidences in female sex workers appear to have peaked at very high rates in 1990 and 1991, but HIV incidence continues at a lower, although still substantial level, in later times. STDs in sex workers have been observed to fall substantially.

Given the high prevalences seen in the sentinel surveillance data, female sex workers were among the first groups followed in longitudinal studies. Early studies found extremely high HIV incidences in brothel based sex workers. In a study in Chiangmai in mid-1989, 20% of sex workers contracted HIV over 2 months [Siraprapasiri *et al.,* 1991], a rate of 10/100 person-months. A larger study done in the same area in early 1990 found somewhat lower seroconversion rates of 5.2 and 3.6/100 person-months over two subsequent three-month periods [Sawanpanyalert *et al.,* 1994]. This was in spite of reported condom use rates that grew to almost 90% in the latter study. A separate study in rural Chiangrai saw incidences grow from 12/100 person-months in 1989 and 1990 to 17/100 person-months in 1991, before falling to 9/100 person-months in 1992 and 1993 [Gray *et al.,* 1997]. The epidemic in sex workers in the north-east appears to have exploded in the north-east about the same time; Ungchusak and associates [1996a] documented a rapid rise in sero-incidence between 1990 and 1991 in Khon Kaen.

Later studies have continued to document high seroconversion rates in sex workers, especially in brothels. This finding helps to explain the large differences in seroprevalence between direct and indirect workers. Studies have repeatedly shown significantly higher incidences among the direct workers. For example, Nelson *et al.* [1994a] report incidences of 29/100 py for direct workers compared to 0.4/100 py for indirect workers in the north in 1993; and Limpakarnjanarat *et al.* [1995] found rates of 15.1/100 py and 0.9/100 py respectively for the two groups in Chiangrai between 1991 and 1994. These extremely high seroconversion rates for direct FSWs explain the continuing growth of HIV prevalence seen in the sentinel data, even as prevalence in indirect workers seems to be leveling off.

But even while HIV incidence has stayed high, some of these studies have documented significant declines in other STD levels in sex workers, e.g., in the Chiangrai study gonorrhoea at enrollment declined from 17.5% to 3.8% between 1991 and 1994 [Kilmarx *et al.,* 1996]. This is again in reasonable agreement with the three-fold reduction in provincial STD levels in VD Division data over the same time frame.

II.3.c Injecting drug users

Summary: Incidence in injecting drug users peaked at very high rates quite early: in 1988 in Bangkok and probably within a year of that in the rest of the country. But incidence continues at a lower rate through the present with 5% to 10% of IDUs becoming infected every year.

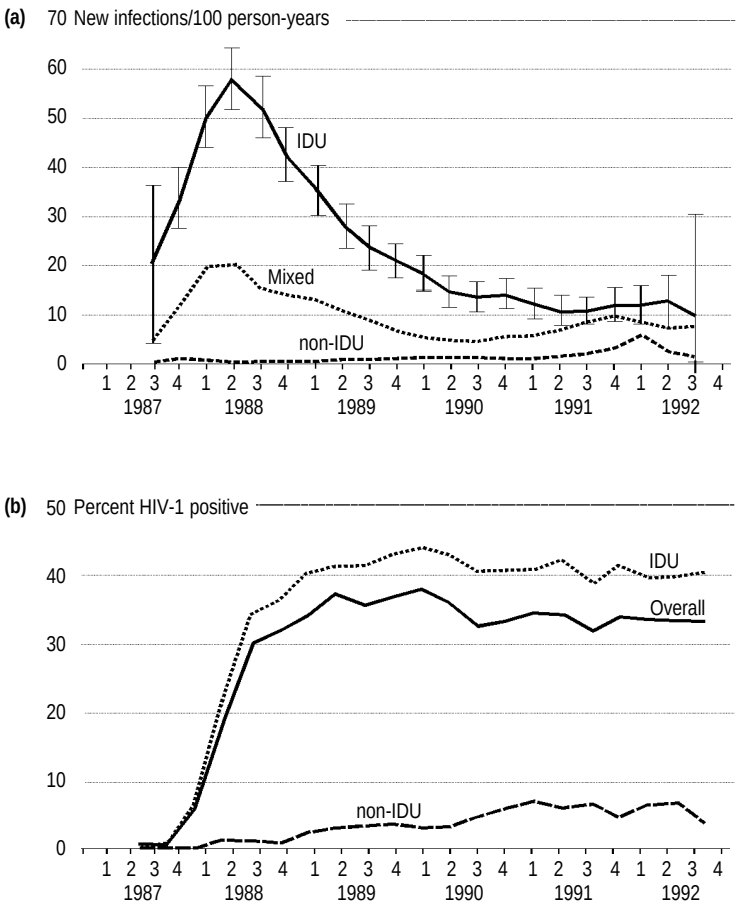
Because HIV monitoring systems had been established by mid-1987 for injecting drug users, the rapid growth in prevalence from zero to a stable level of roughly 40% by mid-1988 was well documented at both MOPH drug treatment facilities and in Bangkok Metropolitan Administration (BMA) clinics. Kitayaporn and colleagues [1994a] reconstructed the growth in new infections from drug detoxification patient records at Thanyarak Hospital between 1987 and 1992 (see Figure 4). As the upper graph shows, new infections peaked in early 1988 at roughly 60/100 person years before falling to a more constant rate of roughly 11/100 person years in 1991 and 1992. Prevalence, shown in the lower graph, rose rapidly through 1988 until levelling off with 40% of IDUs infected. Similar changes in the prevalence were seen in BMA clinics over the same time frame [Vanichseni *et al.,* 1990; Choopanya *et al.,* 1991].

These two graphs demonstrate that even when HIV prevalence in a given population has stabilized, there can still be incident infections. This results because the composition of the population

is not constant. Some IDUs leave treatment or die, removing infected individuals from the sample population, while new drug injectors take their place, some of whom contract HIV after starting injecting. Stable HIV prevalence does not imply zero incidence. It represents an equilibrium state in which those becoming newly infected replace others who leave the population being examined. Follow-up studies in Bangkok have shown continuing incidence of roughly 10% per year through 1993 [Vanichseni *et al.,* 1995]. Preliminary results of a 1995 cohort study of HIV-negative IDUs reported a lower incidence of 3 to 4/100 person-years [HIV/AIDS Collaboration 1996; Vanichseni *et al.,* 1996]. However this is based on a small number of conversions over a short period of time, and ongoing analysis is showing a somewhat higher rate (T. Mastro, personal communication).

Figure 4. The change in HIV incidence (new infections, upper graph) and prevalence (percent currently infected, lower graph) retrospectively determined from repeat drug detoxification patients at Thanyarak Hospital in Bangkok

Source: [Kitayaporn *et al.*, 1994a] (reprinted with permission)



The situation has not been studied in as much detail in the rest of the country, although some geographic variation is apparent in the sentinel data. Some provinces, e.g., Chiangmai, evidence higher average infection levels. However, the general stability of sentinel surveillance results from IDU treatment centers nationwide, coupled with the failure to detect substantial HIV levels in IDU populations anywhere in the country before late 1987 [Weniger *et al.,* 1991] are consistent with this same epidemiological pattern. That is, there was a period of high incidence around 1988, rapidly bringing national prevalence in IDUs to a plateau between 35% and 40%.

II.3.d Men having sex with men

Summary: Continuing high incidences have been seen in one cohort of gay bar workers, but no samples of the more general population of men having sex with men are available.

Although the role of men having sex with men was emphasized in discussing the Thai epidemic in the mid-1980s, attention shifted away after HIV exploded through injecting drug use and heterosexual commercial sex. Early studies usually failed to find any relationship between male same-sex behaviour and HIV infection (see, e.g., Nelson *et al.* [1993] or Nopkesorn *et al.* [1993b], although this situation is changing in more recent studies, e.g., Beyrer *et al.* [1995a], Celentano *et al.* [1996a]).

As a result, relatively limited data have been collected on either prevalence or incidence trends in this population. The primary window available is testing of gay bar workers, which has been done as part of the sentinel surveillance system in a few provinces. These have generally tended to show infection levels fluctuating between 5% and 20% with trends being somewhat difficult to discern. A closer examination of HIV trends in gay bar workers in Chiangmai by Kunawarak and colleagues [1995] found that incidence has remained relatively high, at an average of 12/100 py over the period from 1989 to 1994. HIV prevalence in this

group showed a rapid increase in early 1990 to roughly 15% and subsequently displayed a slower, steadily increasing trend to almost 20% by 1994.

This comparatively slow growth in prevalence, even with high incidence, probably reflects the high turnover in workers in these establishments. While gay bar workers are primarily heterosexual in orientation and many only work in the bars for a short time (see, e.g., Sittitrai *et al.,* 1994a or Weniger *et al.,* 1991), the high incidence recorded implies substantial HIV prevalence and ongoing unprotected sex within the MSM population these workers serve.

II.3.e STD clinic attendees

Summary: Limited studies indicate ongoing moderate incidence in this population.

Only limited data have been reported to date on the cohorts of STD attendees created, but two reports in the north for 1993 and 1995 give similar incidences of 4.0/100 py and 3.2/100 py [Nelson *et al.,* 1994a; Khamboonruang *et al.,* 1996a]. Thus, it would appear that some STD clinic attendees continue to be at substantial risk for HIV infection. Other results can be expected from these cohorts in the future. It should be kept in mind, however, that the size of this population is shrinking with the continuing decline in STD levels in the country.

II.3.f General population

Summary: A limited number of studies of repeat blood donors in different areas have shown incidence falling after 1990 or 1991.

Following incidence trends in the general population is usually difficult. However, at least one retrospective study provides evidence of trends in general population incidence in a northern Thai province. Sawanpanyalert *et al.,* [1996] examined samples from 11,000 repeat blood donors. The incidence was about 1.7/100 py in 1989 and 1990, then began to decrease steadily in 1992 to 0.5/100 py in 1994. While this group cannot be considered completely representative of the general population owing to possible changes in donor self-deferral over time, it provides a positive indication that the incidence trends were downward over this period. It should be noted that a village study near Chiangmai, which did have a representative sample, reported a similar incidence of 1.45/100 py between 1990 and 1992 [Nelson *et al.,* 1994b]. A similar retrospective study at a hospital in Bangkok saw incidence drop from 0.31/100 py in 1990 to 0.16/100 py in the three subsequent years [Kitayaporn *et al.,* 1996a].

These observations of falling incidence in the general population are supported by prevalence data from HIV testing of Thai laborers going to work abroad. Such testing is required by the employing country as part of their employment physical examinations. In samples collected at Siriraj Hospital, the prevalence in these primarily male laborers rose steadily from 0.25% in 1989 to peak at 1.16% in 1992, before falling to 0.7% in 1995 [Suwanagool *et al.,* 1993; Sonjai *et al.,* 1997]. These laborers are drawn from around the country, and while changes in the composition of the laborer population cannot be ruled out, these data provide a tentative indication of declining HIV prevalences by the mid-1990s in the male general population.

II.4 Overall trends in HIV incidence

There are limitations to the generalizability of the studies mentioned above. Many of them have been done in the north, where the epidemic has been most severe. Conscripts only provide data on a narrow age range of the population and are not in their normal social environment during their time in service. In fact, incidence rates have been seen to rise immediately after discharge from the military [Nelson *et al.,* 1994a]. Sex workers have many partners and consequently extremely high potential for exposure to HIV if they do not use condoms consistently and correctly. The IDU studies have been done in Bangkok and do not capture the situation in other parts of the country. They have also looked primarily at those in treatment programmes, who may have higher risk for infection than IDUs who do not seek treatment [Choopanya *et al.,* 1991].

The blood donor data are potentially affected by changes in patterns of self-deferral by those at risk.

However, even accepting these limitations, the national and small-scale study data is consonant with a picture in which new HIV infections grew very rapidly on a national scale in the late 1980s and early 1990s, largely through commercial sex and injecting drug use. But a major reduction in national incidence was under way by 1991 and continues through the present. But while HIV incidence was falling early in the 1990s, prevalence lagged behind. No prevalence declines were seen until three years later when conscript prevalence began to fall in 1994. Despite this generally positive picture, certain populations, including sex workers, injecting drug users, men having sex with men, and STD clinic attendees, continue to see high incidences, although usually at substantially reduced levels from those observed in the early 1990s. The next section will examine changes in behaviour in Thailand during this time, which have contributed substantially to these incidence declines.

III. Evidence of behavioural change in Thailand

HIV has been referred to as a "behaviourally" transmitted disease. In Thailand, the dominant routes of infection to date have been sexual behaviour, both in commercial sex and marital contexts, and sharing of injecting equipment among IDUs. Most sexual transmission has been heterosexual with men having sex with men playing a much smaller role on a national scale. Over the last few years perinatal transmission has become significant as HIV levels in pregnant women have grown, with an estimated five to six thousand infected children born every year [Brown and Sittitrai 1995]. Blood products have not been a major contributor in Thailand since blood screening was introduced in 1988 before HIV became widespread. Recognizing the predominantly behavioural roots of the Thai epidemic, this section focuses on trends in behaviour which are influencing the course of the epidemic.

Strong evidence is found in Thailand for major behavioural changes over a relatively short time in Thailand, beginning as early as 1989. Reported condom use in brothels rose from roughly 10% in 1989 to over 90% by 1992. The number of men visiting sex workers fell by a factor of two between 1990 and 1993. Between 1988 and 1989, needle sharing by IDUs dropped substantially and bleaching of injecting equipment increased. But, other behavioural trends observed give cause for concern. Commercial sex clients began preferentially choosing sites other than brothels where levels of condom use appear to be lower, perhaps motivated by a misplaced sense of "safety" at these sites. No substantial rise in condom use by married couples has been seen, although marital transmission remains the dominant route of infection for Thai women. Little change in behaviour is apparent in the limited data for men having sex with men. This section will present these findings in detail, setting the stage for a discussion of the links between HIV/STD epidemiology and behaviour in section IV.

III.1 Time trends and geographical variation in sexual risk—Behaviour from national surveys

As with HIV prevalence and incidence, there exists a variety of sources of qualitative and quantitative data on behaviours at both the national and regional levels. This section presents findings on behavioural change from two national surveys conducted in 1990 and 1993.

III.1.a The Survey of Partner Relations and Risk of HIV Infection

The first major national behavioural survey, the Survey of Partner Relations and Risk of HIV Infection in Thailand (henceforth, referred to as the Partner Relations Survey), collected data in 1990 using a locally modified version of the WHO Partner Relations core questionnaire [Sittitrai *et al.,* 1992a, 1994c]. The study used a geographically stratified random sampling technique to gather a national sample of 2,801 men and women between the ages of 15 and 49 who were then questioned about sexual, injecting, and other risk behaviours.

III.1.a.1 Behavioural variation by gender

The survey found large variations in sexual risk behaviour as a function of gender, marital status, urban/rural residence, and region. While almost half of the single men (47%) reported having sex in the last year, only 4% of the single women did so. Similarly 17% of married men reported extramarital intercourse compared to less than 1% of married women. This apparent behavioural gender disparity was explained by the fact that almost 80% of these men with recent premarital and extramarital experience, both married and single, reported purchasing sexual services in the last year. That is, commercial sex constituted the

most important component of Thai males' premarital and extramarital sexual activity [VanLandingham and Grandjean, 1994; Knodel *et al.,* 1996]. Numerous studies, discussed in the next section, have also found it to be the variable most strongly related to HIV infection in males. As a consequence, many Thai women, despite their personally low levels of premarital and extramarital sex, are placed at risk through the sexual networks linking their spouses or casual male partners to others [Havanon *et al.,* 1992, 1993; Xenos *et al.,* 1993; Thongthai and Guest, 1995; Morris *et al.,* 1996; OPTA, 1996].

III.1.a.2 Behavioural variation by urban/rural residence, education, and region

In the Partner Relations Survey, urban married men were almost three times as likely as their rural counterparts to have recent extramarital relations (31% versus 12%), while rates of recent sexual activity for single males were similar (51% versus 44%). However, when examining consistent condom use (defined here as reporting always using condoms with a particular class of sexual partner) in commercial sex, the pattern reversed. About 30% of both urban and rural married men reported consistent use, while urban single men were twice as likely as their rural counterparts to use them consistently (48% versus 26%). On closer analysis, much of the urban/rural variation resulted from differences in education levels. Men with secondary or higher education were more likely to purchase sexual services (29% versus 17%), but were also more likely to use condoms all the time (47% versus 23%). Regionally, men from the north-east were approximately half as likely to report commercial sex as men from the other regions, but were also less likely to use condoms regularly (see Figures 8 and 9). These were the behavioural patterns on which the early growth of the Thai epidemic was based: high levels of male extramarital and premarital sex, much of it with sex workers, coupled with relatively low levels of condom use.

Table 1. Changes in risk behaviour observed between 1990 and 1993 in the male Thai population aged 15–49.

Source: Brown *et al.*, 1997

Risk Category	TOTAL 1990	TOTAL 1993
Commercial sex unprotected	15.3	2.2
Commercial sex protected	7.0	7.3
Casual sex only	4.4	4.6
No casual sex	52.6	62.6
No sex	20.6	22.3
Undefined	0.1	1.0

Note: *Categories are as follows: commercial sex unprotected—bought or sold sex and did not always use condoms; commercial sex protected—bought or sold sex, always used condoms (these first two categories may have also had casual sex with someone besides a sex worker); casual sex—had sex with someone other than a spouse or regular partner who was not a sex worker.*

III.1.b The Survey on the Effectiveness of AIDS Media on Behaviour and Values

But Thailand had mounted an active national response, producing significant behavioural changes in a relatively short time. To evaluate the extent of this change, the Office of the Prime Minister of Thailand in 1993 commissioned Mahidol University to conduct a national Survey on the Effectiveness of AIDS Media on Behaviour and Values (henceforth referred to as the Media Effectiveness Survey) [Thongthai and Guest, 1995]. Along with data on media access and determinants of AIDS knowledge, this survey collected national information on risk behaviours from a sample of 4,090 respondents. The survey used a similar sampling frame in the same geographical areas as the Partner Relations Survey and similar sets of questions on AIDS knowledge and risk behaviour allowing the findings to be compared directly.

III.1.b.1 Overall risk behaviour reduction

What the study found was a substantial reduction in risk behaviour by Thai men when compared to the 1990 study. While 28% of men aged 15 to 49 in the Partner Relations Survey reported sex outside of a relationship in the last year, the comparable figure in the Media Effectiveness Survey was 15%. The proportion of men engaging in commercial sex fell from 22% to 10%. The total proportion of women reporting sexual risk

activity was even lower (only 0.4%) than the already low levels seen in the Partner Relations Survey (1.7%). Consistent condom use among men buying sex rose substantially from 36% to 71%. Table 1 summarizes the changes in risk behaviour observed for Thai men. The net effect was a substantial drop in the population's risk for HIV through decreasing numbers of men visiting sex workers and rapidly increasing rates of consistent condom use in commercial sex.

This risk reduction showed a distinct age structure with a greater drop in the proportion of older men visiting sex workers than younger men and all except the oldest men substantially increasing their consistent condom use in commercial sex. Figures 5 and 6 exhibit the change in these factors over time for different age groups.

Because respondents in the Media Effectiveness Survey were asked independently about casual (defined here as sex with a non-commercial partner who is not a spouse or a regular partner) and commercial sex, the mixing patterns, i.e., the combination of sexual partners that males reported during the last year, could be determined. Figure 7 presents these results. Interestingly, in the three younger age groups between 12% and 18% of the men reported having casual partners, inconsistent with the low levels of sexual activity reported by women. This implies that either Thai women are substantially underreporting risk behaviour or Thai men are misclassifying commercial partners as casual partners (a distinct possibility given the broad spectrum of commercial sex sites which include restaurants where a man might characterize a paid sexual partner as a "waitress" rather than a sex worker). There are indications that both may be the case from anecdotal reports (see, e.g., Sittitrai and Brown 1994).

III.1.b.2 Trends in non-commercial casual sex behaviour

Changes in casual sex behaviours cannot be determined directly from the two surveys, because Partner Relations Survey captured only two categories for sexual risk activity: commercial sex (with or without casual sex) and casual

Figure 5. Age structure of reduction in use of commercial sex by Thai males between 1990 and 1993. *Source:* Sittitrai *et al.*, 1992; Thongthai and Guest, 1995

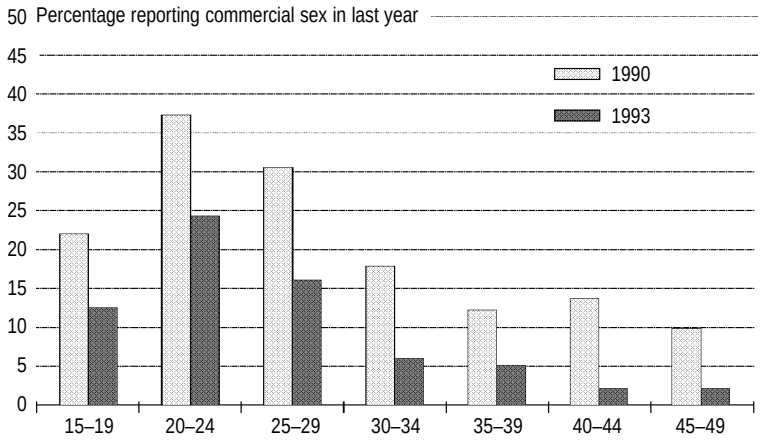


Figure 6. Age distribution of changes in consistent condom use in commercial sex by males. *Source:* Sittitrai *et al.*, 1992; Thongthai and Guest, 1995

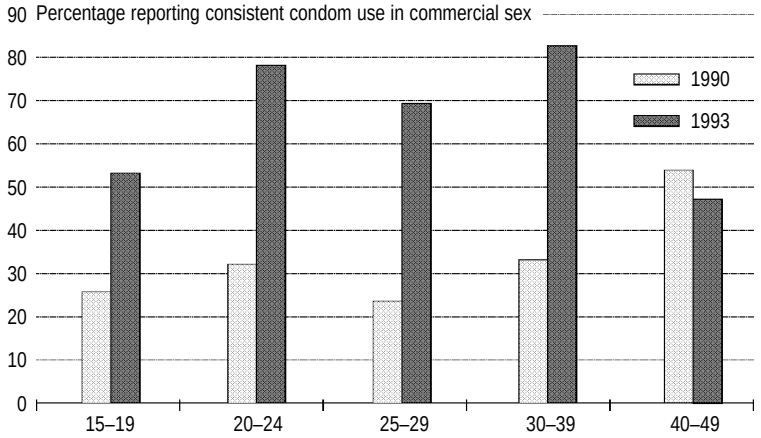
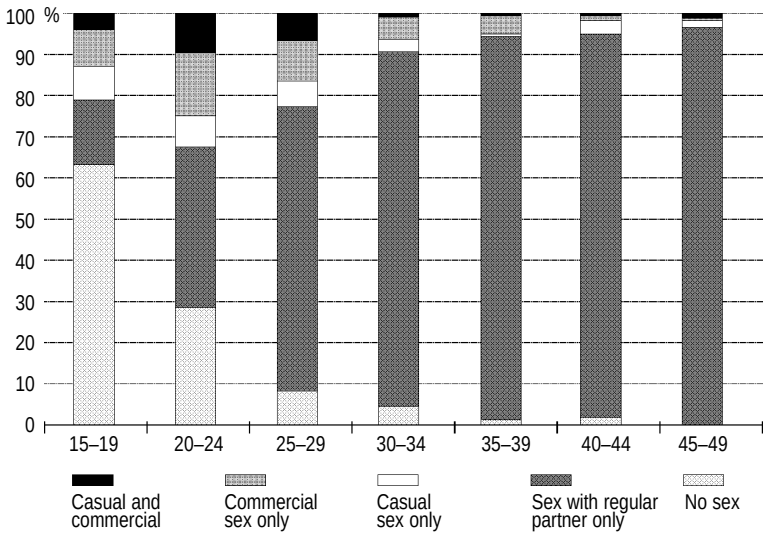


Figure 7. Sexual mixing patterns of male Thai respondents in 1993.
Source: Thongthai and Guest, 1995



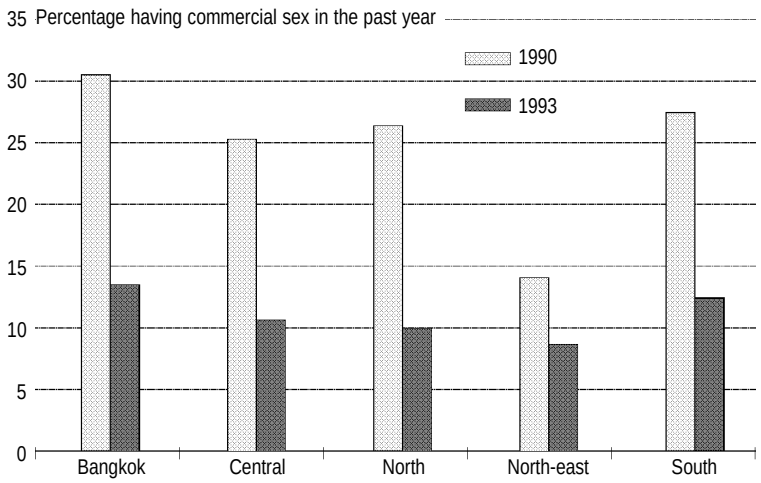
sex only. However, while the levels in both surveys of those reporting casual sex only are roughly the same (4.4% and 4.6%, see Table 1) a comparison of the age structure shows that men between ages 15 and 29 are almost 1.5 times as likely to report casual partners only in the last twelve months in 1993 than in 1990. The overall levels remain constant because the proportion of men 30 and above with casual partners has dropped substantially. Other smaller scale studies have shown conflicting findings on this issue. For example, the Bangkok Behavioural Surveillance Survey (BSS), described below, has found either no trend (e.g., for single women) or a slow decreasing trend for casual sex (e.g., for single male service workers) between 1993 and 1996 [OPTA, 1996]. In contrast, Nelson *et al.* [1996] report slowly increasing levels of sex with girlfriends by conscripts in the north, from 23% in 1991 to 28% in 1995.

III.1.b.3 Continued low condom use in casual sex

Trends in casual sex are of particular concern because levels of condom use with casual sexual partners have remained low, even though condom use in commercial sex has become the norm. This reflects negative attitudes toward condom use in relationships or concerns about their impact on intimacy which have been documented in both quantitative and qualitative studies [Sittitrai *et al.,* 1992a; Morris *et al.,* 1995; Ford and Kittisuksathit, 1996]. In the Media Effectiveness Survey consistent condom use by those having casual sex was 31%, less than half the rate of condom use in commercial encounters. Nelson *et al.* [1996] found no trend between 1991 and 1995 in the 32% of conscripts who have ever used condoms with their girlfriend in the north. Similarly no trends have been apparent over the past years years in the 20% of condom use at last sex by sexually active single women seen in the Bangkok BSS [OPTA, 1996]. This issue requires closer attention in future studies.

Figure 8. Reductions in Thai men having commercial sex by region between 1990 and 1993

Source: Brown *et al.*, 1997



III.1.b.4 Regional variations in behavioural change

When examining findings from smaller studies done in specific locales, it is valuable to keep regional variations in mind. Figures 8 and 9 present regional changes in the proportion of men visiting sex workers in the last year and in levels of consistent condom use in commercial sex [Brown *et al.,* 1997]. The north-east showed notably lower levels of commercial sex risk behaviour in the 1990 survey, but smaller reductions in risk over time left it with similar levels of risk to the north and central regions by 1993. Bangkok and the south showed higher risk levels at both times. Condom use also showed marked regional variation with Bangkok and the south having much higher levels than the other 3 regions. While the north-east started with very low levels in 1990, condom use had more than tripled by 1993 bringing it to rough parity with the Central and northern regions.

Many people believe that the major behavioural change in Thailand has resulted from the increased visibility of AIDS in the community, which raises awareness and convinces people to reduce their personal risk. However, while this may have been a factor in the upper north, where almost every village has seen AIDS cases, the epidemic is much less visible in most other regions. Thus, the high levels of behavioural risk reductions seen in these regions indicate that high epi-

demic visibility is not an essential prerequisite for large scale behavioural change.

Thongthai and Guest [1995] constructed logistic regression models from the Media Effectiveness Survey data to identify factors associated with men engaging in casual or commercial sex during the last year. The factors found to be significant were age (decreasing risk with age), marital status (higher risk for single), education (higher risk for those with high education), age at first sex (later age at first sex had lower risk), type of first sexual partner (those having first sex with spouse/ regular partner had lower risk), and sexual attitudes (men more accepting of extramarital sex had higher risk). Interestingly, after controlling for these other factors, no variation was seen by region.

A similar model for determinants of condom use found the following factors related to consistent condom use: age (decreasing condom use with increasing age), type of risk behaviour (lower use for those having casual sex only than those having commercial sex, and lower still for those who had both), knowledge of AIDS (greater knowledge implied greater condom use), sexual attitudes (more acceptance of extramarital sex related to more condom use), education (those with primary education only had lower use than those with no education), and occupation. Once these factors were controlled for, both region of residence and marital status were no longer significant.

III.2 Changes in behaviour in Bangkok and the provinces

In recognition of the value of tracking changes in behaviour, two major behavioural surveillance systems have been established, one covering Bangkok only and the other national in coverage.

III.2.a The Bangkok Behavioural Surveillance System

In 1993, the BMA in association with AIDSCAP created the Bangkok Behavioural Surveillance System, which uses a short face-to-face interview to follow a limited number of behavioural indicators in specific populations [AIDSCAP, 1995]. Populations under surveillance include male and female service workers (from factories, gas stations, etc.), office workers (from banks, department stores, etc.), and vocational school students; males attending STD clinics; antenatal clinic women; and direct and indirect female sex workers. Data collection for most groups focuses in the 15–29 age range where risk behaviours are most common. Roughly 1400 males, 3100 females, and 800 female sex workers are interviewed at each round.

The findings show that behavioural risk reduction among males in Bangkok has continued [OPTA, 1996]. Figure 10 illustrates a statistically significant decline in the percentage of men engaging in com-

Figure 9. Change in percentage of men buying sexual services who report always using condoms. *Source:* Brown *et al.*, 1997

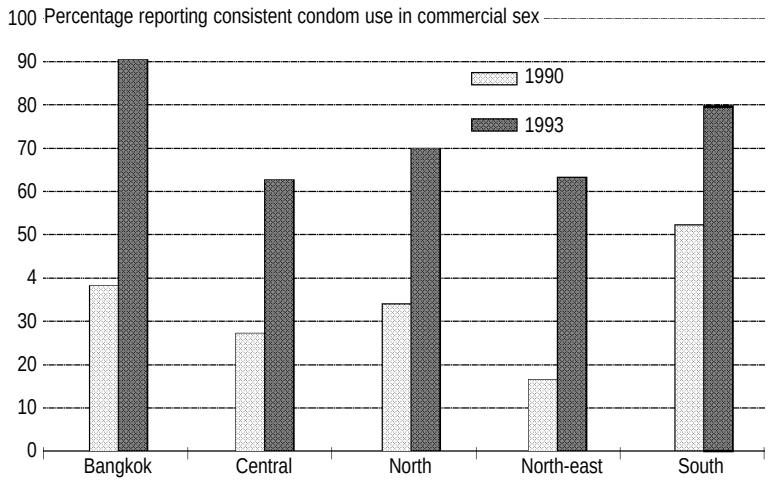
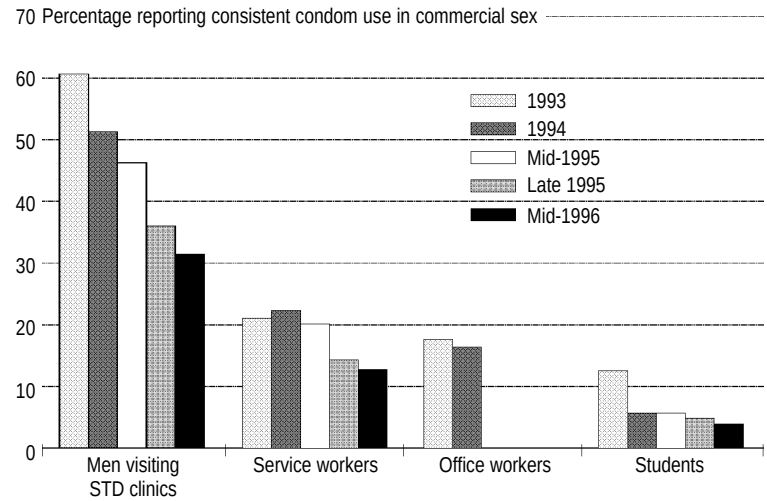


Figure 10. Percentage of men in specific categories having commercial sex in the past year in Bangkok *Source:* OPTA, 1996



mercial sex in the last year. Among most men visiting sex workers, condom use at last visit has remained almost constant over the 4 years of the survey at slightly more than 90%, in good agreement with the Media Effectiveness Survey findings for 1993. As would be expected men visiting STD clinics reported a lower overall rate of roughly 70%. While approximately one-third of the single male office workers and students had non-commercial sexual partners in 1995 and 1996, only about 12% of the total had more than one such partner. The only trend observed in casual sex was a slow decrease among the service workers.

In the 1995 and 1996 rounds of the BSS, approximately 4% of single women reported any sexual activity in the past year, with less than 1% having more than one partner. Of the sexually active, approximately 20% reported using condoms at the last sexual encounter. There were no apparent trends in the data for single women. Married women reported a borderline significant increase in condom use at last sex from 5.9% to 7.5%.

III.2.b Provincial Sentinel Surveillance for HIV Risk Behaviour

In 1995, the Provincial Sentinel Surveillance for HIV Risk Behaviour was started to monitor changes in sexual risk behaviour in conscripts, factory workers, students, and pregnant women [Ungchusak *et al.,* 1996b]. The system was initially established in 19 provinces distributed throughout the country, not including Bangkok. The focus is on behaviours of the 15–29 age group using a two-page self-administered questionnaire. In the first round (1995) for factory workers, approximately 30% of the men had visited a sex worker in the past year, but only 50% reported always using condoms. About 15% of the women reported casual sex in the last year with only 6% reporting consistent condom use. These were higher sexual activity rates than seen in Bangkok service workers at the time with lower rates of condom use. Over the next few years this system will be expanded to more provinces and should provide a clear picture of behavioural trends on a national scale.

III.3 Changes in behaviour over time as seen in specific populations

Many studies have been done collecting data on sexual behaviours and condom use since the late 1980s. Others have looked at the needle sharing and cleaning behaviours of injecting drug users. This section will discuss these in greater depth to more closely document changes in these behaviours over time and compare them with national trends.

III.3.a Conscripts

Summary: Studies in conscripts show that the decreases in visits to sex workers and increases in condom use among young Thai men seen in the national surveys discussed earlier have continued through at least 1995.

Several conscript cohorts in the north of the country have been followed behaviourally and epidemiologically since 1991. Members of the earliest cohorts in the north were already reporting increasing rates of condom use, but still made extensive use of commercial sex services.

For example, in the group in Phitsanuloke followed by Nopkesorn *et al.* [1993a,b] beginning in 1991, 47% reported commercial sex in the last 6 months, with 76% reported using condoms more than half the time [Nopkesorn, 1993a]. In the first cohort enrolled by Nelson *et al.* [1993] in 1991 in the upper north, 57% had visited a sex worker in the year before joining the military, and 61% had used a condom on the most recent visit. Over subsequent cohorts enrolled in 1993 and 1995, Nelson *et al.* [1996] saw recent commercial sex use fall to 44% and 24% respectively, while reported condom use at the last visit grew to 84% and 93%. This implies that, at least among young Thai men in the north, the behavioural change seen in the comparison between the Partner Relations and Media Effectiveness surveys continued through 1995.

In the Nopkesorn *et al.* cohort, significant behavioural differences were observed between conscripts from the upper northern six provinces and

those from the lower north. Upper northern men had an earlier age at first intercourse, more frequent first sex with a sex worker, more frequent visits to sex workers, less consistent use of condoms, and more experience with STDs. This is particularly interesting in light of the fact that these upper northern provinces are the ones most heavily affected by the HIV epidemic, giving a strong indication that geographic behavioural differences have influenced the Thai epidemics course.

III.3.b Female sex workers and their clients

Summary: Condom use by sex workers and their clients increased rapidly in the early 1990s, with studies in brothels verifying the trends reported in Division of Epidemiology data. However, much commercial sex activity has shifted away from brothels to more indirect sites where there are some indications of lower condom use. While the number of clients has declined, the number of workers has remained roughly constant, reflecting the shift in commercial sex to indirect sites where sex workers have fewer clients per night.

Condom promotion efforts in commercial sex were already in place before the detection of 44% HIV prevalence in sex workers in Chiangmai in 1989 [Ramasoota, 1991]. A number of behavioural and epidemiological studies of sex workers were underway, and this finding served as the impetus to start a number of others. These studies provide another view of the growth in condom use as reported by clients of sex workers in the surveys described above.

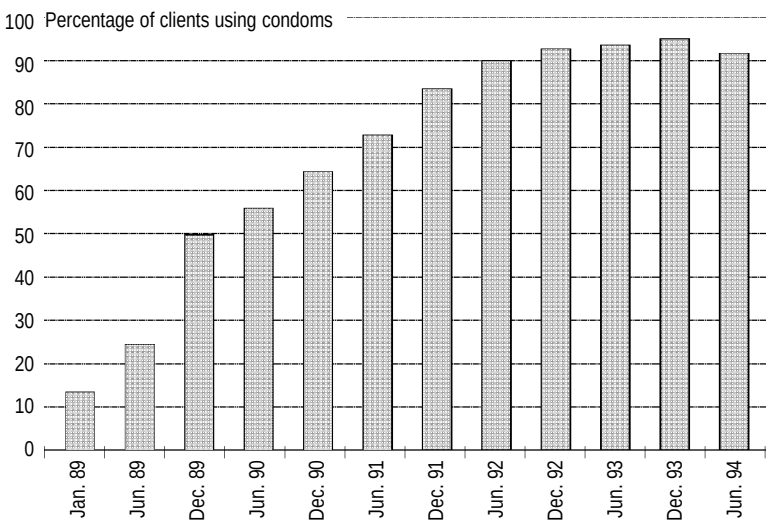
III.3.b.1 Condom Use— Direct sex workers and clients

The high HIV prevalence seen in direct sex workers, those working in brothels, gives special urgency to condom promotion in these sites. Fortunately, it is in these sites that efforts have had the most success. In the north the growth of condom use as reported by direct sex workers was phenomenally rapid. In Tak province, one study documented an increase in the proportion of clients using condoms from 14% to 50% between January and December 1989 [Swaddiwudhipong *et al.,* 1990a,b]. During 1990, condom use in brothels in Chiangmai was already at 90% levels [Sawanpanyalert *et al.,* 1994]. Similar findings of high condom use levels came soon thereafter from other parts of the country: 86% from direct sex workers in Khon Kaen in 1990 [Rehle *et al.,* 1992] and 78% from Lampang in 1990 [Puthikanon *et al.,* 1990]. However, on a national scale it took somewhat longer to reach high levels. The Epidemiology Division of the MOPH asks sex workers about condom use when conducting sentinel surveillance at direct sites. Figure 11 shows the growth in these numbers as reported in Rojanapithayakorn and Hanenberg [1996]. The greater than 90% levels of condom use with recent clients reached after 1991 have been seen in many other studies throughout the country: 93% in rural provinces near Bangkok in 1992 [Boonchalaski and Guest, 1994], 96% in Chiangmai in 1992 [Rugpao *et al.,* 1993], 99% in Bangkok and a north-eastern province [Komatsu *et al.,* 1996], and 99.6% in Lamphun in 1995 [Rugpao *et al.,* 1997].

However, several things should be kept in mind when evaluating the epidemiological impact of these high numbers. Some overreporting may be

Figure 11. Percentage of sex acts protected by condoms as reported by direct sex workers

Source: Epidemiology Division, Ministry of Public Health as reported in Rojanapithayakorn and Hanenberg, 1996



occurring given the social expectations of condom use in commercial sex in Thailand today. Sakondhavat [1991a-c] saw sex workers report a rise in condom use with the previous nights clients from 83% to 94% in Khon Kaen in 1990–91. But when researchers posing as clients checked, the actual percentages of workers insisting on condom use were only 59% and 74% respectively (although the sample size was small). A 1992 evaluation using a similar client based approach in 43 brothels in Chiangmai found 88% refused a client's request for sex without a condom, a number which fell to 80% when they offered to triple the customary fee [Visrutaratna *et al.,* 1995]. This was lower than the 90% plus self-reported numbers being seen in the city at the time. However, although these studies show some overreporting occurs, they also indicate it is not severe. In a review of methods for assessing condom usage among sex workers, Thanprasertsuk *et al.* [1991a] concluded that interviewing sex workers gave comparable results to interviewing clients and sending in researchers as clients.

Other studies have found that while sex workers may use condoms consistently with casual clients (those they do not know), condom use can be much lower with regular clients (those they see frequently) [Morris *et al.,* 1995 and 1996; Wawer *et al.,* 1996; Brown *et al.,* 1996]. For instance, Wawer *et al.* report recent condom use in brothels in Bangkok and 2 Central provinces as near 90% with the last 3 casual clients compared to about 70% with regular clients. Because regular clients may constitute perhaps 20% or so of the client population [Morris *et al.,* 1995], they can greatly increase a sex workers risk of HIV exposure without greatly reducing combined levels of condom use with all recent clients.

This is related to the final issue, whether the question is asked about condom use with recent clients or overall consistent condom use, i.e., using condoms with all clients all of the time. When Koetsawang and Ford [1993] examined this issue in Bangkok, they found brothel workers reporting 90% condom use with the last 3 clients reported only 71% consistent use over the last week. The critically important implication of these findings is that although condom use may exceed 90% levels on a percentage of client contacts basis, inconsistent condom use over longer times may still expose a substantial fraction of direct sex workers to HIV. Since these women typically have an average of 3 to 4 clients per day, many inconsistent users will eventually become infected. This inconsistency contributes to the continuing growth in HIV prevalence in direct sex workers despite high levels of condom use.

III.3.b.2 Condom use— Indirect sex workers and clients

Commercial sex is not confined to brothels. A variety of other types of commercial sex establishments exist including massage parlours, bars, nightclubs, karaoke bars, restaurants, barber shops, etc. These are usually referred to as indirect sites because they offer sex in the context of other services. While national levels of condom use were somewhat higher among indirect than direct sex workers in 1990 (62% versus 56% with recent clients [Thanprasertsuk *et al.,* 1991b]), the efficacy of condom promotion efforts has been lower in indirect than in direct sites. Recent indications are that overall rates are somewhat lower in indirect sites in most of the country, but regional variation appears in the studies.

In Chiangmai in 1992, Celentano *et al.* [1994] found 67% consistent use in brothels in Chiangmai as opposed to 37% in indirect sites. But in nearby Chiangrai around the same time, brothel workers were reported to use condoms less than others (53% consistent versus 66%) [Limpakarnjanarat *et al,.* 1993b]. In Bangkok, most studies have shown direct workers to have higher rates of condom use than indirect. For example, Koetsawang and Ford [1993] reported 71% consistent use in brothels and 45% in massage parlours. Komatsu *et al.* [1996] looked in more detail at the types of establishment and found consistent use rates in 1994 of 92% for brothels, 89% for massage parlours, 82% for bars, and 49% for restaurant sites. The BSS has tracked the trends between 1993 and 1996 and the results (Figure 12) show a clear increasing trend in consistent use for indirect sex workers. In a study in the south

in 1992 the pattern appears to be reversed with indirect workers having higher condom use rates than direct workers (14% direct versus 38% indirect [Limanonda *et al.,* 1993, 1994]) but this may be an effect of having many foreign clients. It should be kept in mind, however, condom use is changing rapidly over time, so the geographic variations outlined above may not hold in all regions today.

III.3.b.3 Clients per night and numbers of sex workers

An examination of the number of clients reported by direct and indirect workers as seen in various studies shows no apparent trends in the average number of clients served daily. Brothel workers in most studies report between 3 and 5 clients per night, massage parlour workers roughly 2 per night, and workers at other indirect sites about 0.5 to 1 client per night. A sampling of these numbers sorted by time is shown in Table 2.

The VD Division of the MOPH also follows the number of sex workers by enumerating sexual service establishments and the number of sex workers twice annually, the results of which are shown in Figure 13. The increase in 1995 reflects the change from a clinic based approach to a geographic mapping strategy, which improved detection of sites. While these numbers may not capture all sex workers in the country, they do give indications of only slow declines in the number of sex workers over recent years.

III.3.b.4 Client choice of type of sexual establishment

This raises an apparent inconsistency between the national survey data reported by male clients and the nightly client numbers reported by the women. The national survey data indicate that the total number of clients had been cut in half between 1990 and 1993, yet the number of sex workers had only declined slightly over that time frame and little change had been reported in their number of daily clients (although there could conceivably be a decline in frequency masked by the variability in the numbers from different studies). This seeming inconsistency is resolved by another

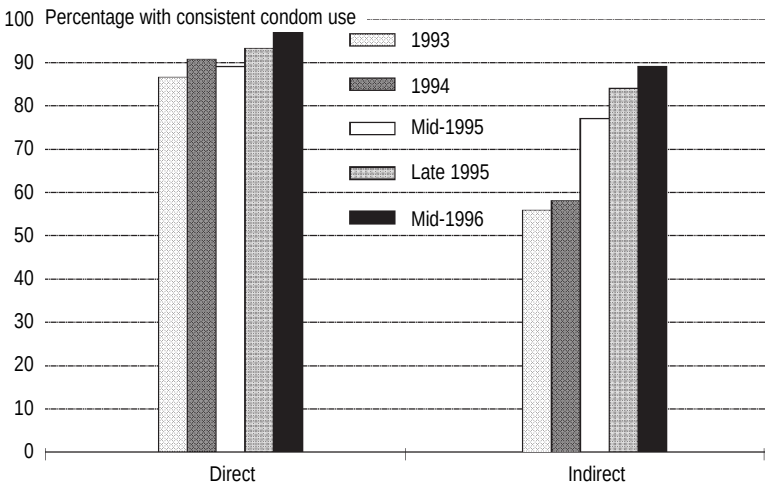
Table 2. Average numbers of clients reported each night by type of sex worker, year, and region

Note: *This list is not exhaustive, but only gives a sampling of available numbers*

Direct Sex Workers	Average no.	Source
1990 North-east	4.3	Rehle *et al.,* 1992
1991 Bangkok	3.5	Koetsawang and Ford, 1993
1991 North-east	3.6	Sakondhavat, 1991a
1991 North	2.8	Limpakarnjanarat *et al.,* 1993a
1992 Central	4.2	Boonchalaksi and Guest, 1994
1992 BKK/Central	4.6	Podhisita *et al.,* 1993
1992 North	4.4	Rugpao *et al.,* 1993
1993 Bangkok	3.3	OPTA, 1996
1994 Bangkok	3.7	OPTA, 1996
1994 Bangkok	3.5	Komatsu *et al.,* 1996
1995 Bangkok	4.0	OPTA, 1996
1995 Bangkok	3.2	OPTA, 1996
1996 Bangkok	3.5	OPTA, 1996
Massage Parlour Workers	**Average no.**	**Source**
1991 Bangkok	2.6	Koetsawang and Ford, 1993
1992 Bangkok	2.4	Boonchalaksi and Guest, 1994
1994 Bangkok	1.7	Komatsu *et al.,* 1996
Indirect Sex Workers	**Average no.**	**Source**
1990 North-east	2.0	Rehle *et al.,* 1992
1991 North	1.2	Limpakarnjanarat *et al.,* 1993
1993 Bangkok	0.5	OPTA, 1996
1994 Bangkok	0.3	OPTA, 1996
1994 Bangkok	0.4	Komatsu *et al.,* 1996
1995 Bangkok	0.9	OPTA, 1996
1995 Bangkok	0.7	OPTA, 1996
1996 Bangkok	0.9	OPTA, 1996

Figure 12. Percentage of Bangkok direct and indirect sex workers reporting using condoms with clients every time

Source: OPTA, 1996



important behavioural change among clients of sex workers: increasingly they are shifting away from direct sites to indirect ones. Since indirect sex workers have less than half as many clients per night as direct workers, the number of workers can remain almost constant even as the number of clients falls.

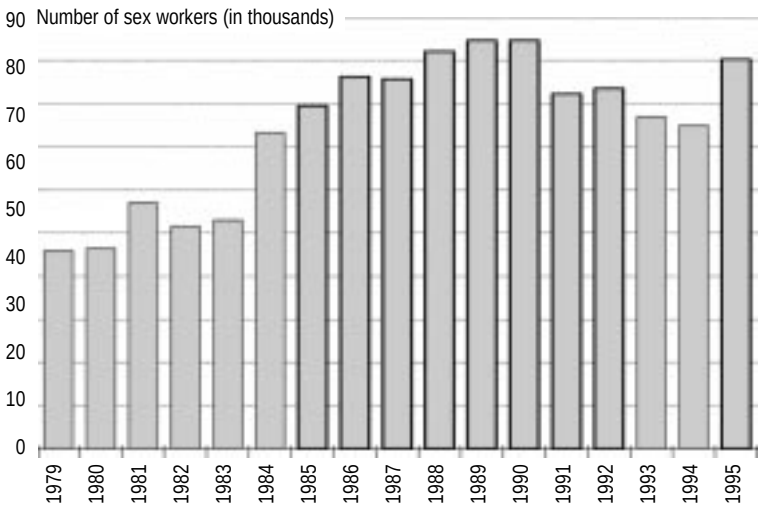
Ample evidence for this shift exists. According to VD Division figures, in the late 1980s roughly half of the sex workers were indirect. By the mid-1990s this proportion had risen to almost two-thirds. This shift is most likely a consequence of official pressure on brothel sites and changes in customer demand as clients seek what they perceive as lower risk sites. Extensive media coverage has created a strong public association of HIV risk with brothels. Several qualitative studies have documented men saying they choose safer establishments or do not visit sex workers as frequently of late [Beesey *et al.,* ND; Sawaengdee and Isarapakdee, 1991; Im-Em, 1996; Ford and Kittisuksathit, 1996]. Even as early as 1990 Sawanpanyalert *et al.* [1994] noted a decrease in the number of brothels in Chiangmai due to closures. In a study of rural brothels in late 1992, many of the owners complained of a long term downturn in business resulting from both AIDS and a poor economy [Boonchalaksi and Guest 1994]. By 1996 some provinces were reporting they had no brothels. The Thai Red Cross Society Programme on AIDS mapped and classified sex establishments in Bangkok during 1991 and 1993–94 [Sittitrai *et al.,* 1996]. While the total number of sites was roughly the same, direct sites declined by 60%.

The shift in types of sex establishments may also account for apparent inconsistencies between condom use as reported by sex workers and by clients. While many brothels studied are reporting near 90% consistent condom use rates, many indirect sites report much lower levels, e.g., the 49% seen in restaurants in Bangkok. If many of the men interviewed in the national behaviour surveillance are choosing indirect sites, the 50% consistent condom use they report may be consonant with the reports by the sex workers.

One additional validity check can be made on reported condom usage: comparison with national condom distribution figures to determine the availability of sufficient condoms for high risk sexual activity. The government provided budget for approximately 50 to 60 million condoms each year through the mid-1990s. These condoms were supplemented by the additional sale of roughly half this number of condoms through commercial outlets [Rojanapithayakorn and Hanenberg, 1996]. Assuming a high contraceptive prevalence of condoms of 2% [Knodel and Pramualratana, 1996], with 15 million married women in the country and an average coital frequency of 5 times per month [Sittitrai *et al.,* 1992a], 18 million condoms will be more than sufficient to meet contraceptive needs. Hanenberg *et al.* [1994] estimated roughly 57 million commercial sex acts in 1992, a number which would have decreased even further by 1993. This implies that the condom supplies distributed through the mid-1990s were adequate to both meet contraceptive needs and provide for complete coverage of all commercial sex acts.

Figure 13. Number of sex workers as reported by VD Division

Source: MOPH and Boonchalaksi and Guest, 1994



Note: *The apparent increase in number of sex workers in 1995 is the result of a change in VD Division procedures for locating sex establishments to use a geographic mapping procedure.*

III.3.c Injecting drug users

Summary: Needle sharing, numbers of sharing partners, and failure to clean injecting equipment all decreased substantially in 1988 and 1989. There are some preliminary indications that these behaviours may not have been sustained at the low levels they reached in the late 1980s.

Because monitoring detected the rapid growth in HIV prevalence in IDU populations as it was occurring, both the BMA in Bangkok and the MOPH nationally undertook major intervention efforts. These included prevention counseling at clinics on reduction of both injecting and sexual risk behaviours, outreach efforts to communities, small media efforts, and group education on cleaning of equipment with bleach [Des Jarlais *et al.,* 1994; Brown *et al.,* 1994].

Studies conducted in Bangkok document subsequent changes in injecting risk behaviours, which occurred well before visible AIDS cases developed in the IDU community. In a series of surveys in BMA clinics Vanichseni *et al.* [1990], reported sharing of injection equipment in the past 6 months declined from 66.5% in September 1988 to 39% in November 1989 [Vanichseni *et al.,* 1991a] to 24% in January 1991 [Vanichseni *et al.,* 1991b]. However, recent evidence indicates that sharing may have risen since then. In the cohort screening conducted at BMA clinics in mid-1995, the comparable figure was 43% [Kitayaporn *et al.,* 1996b].

Between 1988 and 1989, the surveys also showed declining numbers of sharing partners (from 41% with 3 or more sharing partners to 32%), increasing frequency of cleaning equipment with bleach (from 8% to 15%), and decreasing use of heroin at shooting galleries [Vanichseni *et al.,* 1990]. By November 1989, 92% of IDUs surveyed reported some risk reduction activity. Of the sample, 59% stopped sharing injecting equipment (with another 19% reducing sharing), 25% used new equipment more often, 20% cleaned equipment more frequently, 15% entered treatment, and 13% stopped injecting entirely [Choopanya *et al.,* 1991].

Sexual risk behaviour among IDUs visiting treatment centers in Bangkok appears not to have undergone major changes over the period between 1989 and 1993. In a 1989 survey 47% reported no sexual activity in the preceding six months [Choopanya *et al.,* 1991], compared to 48% in a similar survey in 1993 [Raktham *et al.,* 1996]. Another 14% and 10% in the two years respectively reported sex with casual partners over that same time period. Among those with casual partners there was an increase in consistent condom use from 35% in 1989 to 47% in 1993 [Vanichseni *et al.,* 1994; Raktham *et al.,* 1996]. But, among the 38% in both years with regular sexual partners, consistent condom use was 12% and 14% respectively. Analysis of the 1989 survey showed higher consistent condom use rates with regular partners among those who had previously tested HIV positive, implying some respondents were taking efforts to protect their partners [Vanichseni *et al.,* 1992, 1993].

III.3.d Men having sex with men

Summary: Behavioural trends in men having sex with men are difficult to assess because there is little serial data. However, existing studies do indicate high levels of behavioural risk with low levels of protective behaviour.

Behavioural trends in men having sex with men cannot be ascertained directly because of a lack of time sequential data in any comparable population. Indications of continuing high risk behaviours, however, are found in existing studies. Sittitrai *et al.* [1992b, 1993] conducted a 1991 study in the north-east which found a mean of 29 partners in the last year, very complex sexual networks involving sex workers, friends, strangers, and lovers, and low levels of condom use. Beyrer *et al.* [1995a] examined MSM among conscript populations in the north in 1993. Compared to those with only female partners, men who had ever had male partners reported higher numbers of lifetime sexual partners and more commercial sex partners, placing them at elevated risk for STDs and borderline elevated risk for HIV. Insertive anal sex was reported by 62% of MSM, of whom 76% had never used a condom during

anal sex. Continuing high levels of inconsistent condom use (42%) have been reported among gay bar workers in Chiangmai through 1994 [Kunawararak *et al.,* 1995]. And indications of low condom use are also found in the 1995 Provincial Sentinel Surveillance for HIV Risk Behaviour. In the first round survey of factory workers, approximately 6% of 20–29 year old factory workers reported sex with other men in the last year, but only about 10% said they always used condoms. These findings indicate ongoing low rates of protective behaviour in MSM in Thailand and a clear need for expanded prevention efforts.

III.3.e Other population sub-groups

Summary: Small-scale studies in other population groups, e.g., truckers, adolescents, or low income males, are difficult to assess for behavioural trends because of variability in geographic coverage, study design, or sub-population assessed. However, they do show significant behavioural variation among different groups in the Thai population.

Some small scale studies have been done in various population groups including truckers, low-income males, and adolescents (see, e.g., Somseta and Wacharapiyanone, 1996; Ungchusak *et al.,* 1992; Morris *et al.,* 1995; Ford and Kittisuksathit, 1994 and 1996; Chompootaweep *et al.,* 1988; Phiromsawat *et al.,* 1988; Pritchard *et al.,* 1991; and Tungphaisal *et al.,* 1989a,b). Some indications of risk reduction are seen. Whereas Sawaengdee and Isarapakdee [1991] reported only 18% of truckers consistently used condoms in commercial sex in late 1990, Podhisita *et al.* [1996] were reporting consistent use of 59% by 1992.

However, it is often difficult to discern behavioural trends because the risk varies so greatly among disparate groups and the composition of study populations is rarely the same. For example, VanLandingham *et al.* [1993, 1995a] reported large differences in risk behaviour in 1991 between never-married university students, soldiers, department store clerks, and semi-skilled/ unskilled laborers in Chiangmai. Students were found to substantially delay first intercourse relative to the other groups (while the median age at first intercourse was between 17 and 18 for the other groups, less than 50% of the students reported sexual intercourse by age 23). Of those with sexual experience, three-quarters of the students and clerks had visited sex workers in their lifetimes, while almost all of the soldiers and laborers had done so. Students and clerks reported less commercial sex (13% and 35% visiting a sex worker in the last 6 months), than the soldiers and laborers (71% and 59% respectively), and substantially higher levels of consistent condom use in commercial sex (83% and 73% for students and clerks versus 42% and 48% for soldiers and laborers). Levels of consistent condom use with non-commercial partners were much lower: roughly 20% for the students and soldiers and 10% for the clerks and laborers.

In addition, meaningful comparison among these studies is often difficult because the study locales differ geographically. For example, Ford and Kittisuksathit [1996] noted a possible decrease in use of commercial sex in favor of sex with friends among the young factory workers they interviewed when compared to an earlier study [Xenos *et al.,* 1993]. However, their study was done in Bangkok and environs while the other excluded Bangkok and Thonburi, so the variation might reflect differing social environments rather than actual behavioural change. However, a direct comparison of the percentage of 15–19 year olds reporting a sex worker as their first sexual contact from the Partner Relations Survey (49% in 1990) and the Media Effectiveness Survey (29% in 1993) supports the hypothesis that commercial sex is falling out of favor among the young.

III.4 Overall trends in risk behaviour

Despite these limitations for purposes of direct comparison, the various behavioural studies in Thailand are reasonably self-consistent, with no outliers reporting widely discordant results which cannot be explained by the geographic and demographic variations reported in national behavioural survey data. Major behavioural variations exist by gender, education, occupation, age, and

geographic location; and, just as HIV incidence continues in certain populations, the extent of behaviour change has varied from one group to the next. These factors must be taken into account in comparing behavioural findings over time and space.

However, taken in totality, the available data present a consistent picture of substantial risk reduction since 1990 on a national scale. The proportion of males visiting sex workers has been more than cut in half. Condom use in commercial sex has risen to 90% plus levels in brothels, although it probably remains somewhat lower in indirect sex work sites. Major behaviour change has been well documented among young males as revealed by sequential cohorts of conscripts. Levels of casual sex may be increasing, but if so, these changes are gradual, especially when compared to the rapid reduction in commercial sex activity.

IV. Linking behavioural change to the trends in HIV and STDs

As the preceding two sections have clearly shown, HIV and STD incidence has been declining since the early 1990s in Thailand and significant behavioural changes have occurred on a large scale. This section will examine the links between this behaviour change and HIV incidence declines in order to demonstrate that behaviour change has significantly altered the course of the Thai HIV epidemic.

Demonstrating this relationship will proceed in three stages:

1. Identifying the demographic and behavioural factors related to HIV infection. This will be done by examination of cross-sectional studies. In these studies those who are infected with HIV are most commonly compared with those who are not. Differences in behavioural and demographic factors identified through this process indicate a relationship between the factor and HIV infection.
2. Establishing that the behavioural factors so identified do result in HIV infection so that changes in these behaviours will be protective. Establishing these relationships requires a cohort study, one which follows uninfected individuals behaviourally and epidemiologically for a period of time and determines which behaviours are influencing transmission of HIV.
3. Showing that the expected relationships between levels of risk behaviour and HIV infection hold at the national and regional level. This will be accomplished by comparing national and regional behavioural and epidemiological time trends for consistency, showing that the correlations seen in the cross-sectional and cohort studies are reflected in the national and regional situation.

Table 3. Percent of conscripts infected with HIV and corresponding odds ratios (OR) as a function of visits to sex workers during the preceding year.

Source: Nelson *et al., 1993*

Frequency of sex with sex worker in the past year	% HIV+	OR
None	8.1	1.0
1	10.9	1.4
20–3	14.2	1.9
4–10	17.7	2.4
1/month	17.0	2.3
2–3/month	22.2	3.2
1/week	31.8	5.3

IV.1 Finding the links—Cross-sectional studies

The demographic and behavioural factors associated with HIV infection are usually located through cross-sectional studies. In these studies, a population is tested for HIV and uninfected and infected people are compared on the factors of interest.

IV.1.a Behavioural factors influencing infection in men

Summary: Cross-sectional studies have been done in male populations including conscripts, factory workers, laborers, and STD clinic attendees. The most common factors affecting HIV infection in men are: commercial sex experience, a history of STDs, sex with non-commercial casual partners, sex with other males, condom use, and a number of other behavioural or behaviourally related factors including alcohol use, education level, or region of the country. Table B-1 in the Appendix shows the odds ratios (OR), the relative odds of being HIV infected with the factor present, reported for several key factors appearing in studies of men.

IV.1.a.1 Commercial sex

For men, the factor most strongly associated with HIV infection is a history of commercial sex, with odds ratios from 3.6 to 13.6. The important role of commercial sex in the Thai epidemic has been confirmed in every general population sample done to date. The strength of this association is

strikingly clear in a study of conscripts in the upper north in 1991 [Nelson *et al.,* 1993]. HIV prevalence increased rapidly with the mens frequency of visiting sex workers in the last year (see Table 3). Similar trends were noted in another study in the lower north in the same year [Nopkesorn *et al.,* 1993a] and in a northern STD clinic in late 1992 [Siraprapasiri *et al.,* 1996]. Studies also show a significant increasing trend for HIV infection with the total number of lifetime sexual partners [Nelson *et al.,* 1993; Theetranont *et al.,* 1994; Khamboonruang *et al.,* 1996b], another factor strongly influenced by the dominant role of commercial sex in premarital and extramarital sexual activities in Thailand.

IV.1.a.2 History of STDs

The other very strongly correlated factor is not directly behavioural: a history of other STDs, with odds ratios from 2.3 to 13.4. However, given its importance and the fact that acquiring STDs is influenced by sexual activity and duration of illness is affected by treatment seeking behaviour, it has been included here. These two key factors, STDs and commercial sex, are themselves related. Most Thai males report the suspected source of STD infections as a sex worker, almost 90% in VD Division figures [VD Division, 1996; Suwangool *et al.,* 1992]. (Although, in recent years casual sex as a source of infection has been slowly increasing from 5.0% in 1993 to 6.4% in 1995.) The association of HIV with other STDs has been noted for some time and results from a synergistic relationship between HIV and STDs. The STDs increase the rate of HIV transmission, while HIV decreases the efficacy of STD treatment [Wasserheit 1992].

IV.1.a.3 Sex with non-commercial casual partners

In most cases, men reporting sex with casual partners or girlfriends had slightly higher HIV prevalence, although the difference was not significant in many studies. For example, conscripts having sex with girlfriends in the north in 1991 had a significantly higher prevalence than those who did not (14% compared to 11%, OR 1.2) [Nelson *et al.,* 1993]. But another study in the lower north around the same time, found no association with sex with casual partners [Nopkesorn *et al.,* 1993a]. The fact that this association is not very strong in the studies may reflect the fact that many men who have sex with their girlfriends are also more likely to have visited sex workers. Because they are much more likely to contract HIV from sex workers, who have much higher prevalence than the Thai female general population, it becomes difficult for studies to detect infections from girlfriends if the male is also visiting sex workers. However, despite this, evidence of transmission through casual sex routes has been seen. In a stratified analysis of incident STDs, Celentano *et al.* [1996b] found men who did not visit sex workers but had sex with girlfriends had double the incidence of STDs as men reporting no sexual partners.

IV.1.a.4 Having sex with other men

In cross-sectional studies, until the 1995 cohort of conscripts in the north [Nelson *et al.,* 1996], no significant association was usually found between HIV and having sex with other men. However, as Beyrer *et al.* [1995a] point out, men having sex with men in these conscript populations are more likely to have sex with a female sex worker, less likely to use condoms, and have higher number of lifetime female partners. These other elevated risk behaviours may hide associations of HIV infection with sex between males in much the same manner as the previous discussion of sex with girlfriends. Underreporting of same-sex behaviour may also be a factor. In this same study, discharged military men reported higher levels of same-sex behaviour than those still in the military, and in the discharge group same-sex behaviour was independently associated with HIV infection (OR 2.5).

IV.1.a.5 Condom use

Surprisingly, in early studies in the north, no protective effect of condom use in commercial sex was seen in cross-sectional studies [Nelson *et al.,* 1993, 1994c, 1996; Nopkesorn *et al.,* 1993]. In fact, in a 1991 study [Nelson *et al.,* 1996] HIV infection was significantly higher in those ever using a condom in commercial sex than in those

reporting none (15% versus 9%, OR 0.6). This is understandable in the context of rapid HIV spread and changing condom use patterns. The men at highest risk may have been the first to adopt condom use. However, with the rapid spread of HIV in the north at the time, many were unknowingly infected before making any behavioural change. In addition, some may have been less than consistent in their condom use at first. This would make condom use in the earliest stages of the epidemic a proxy for risk behaviour, explaining the higher HIV levels in those reporting condom use. These effects would lessen with time, and as Nelson *et al.* [1996] indicate, by 1995 those never using condoms were showing higher HIV prevalence (although the effect was still not significant). Other studies in the intervening years did find a significant association of infection with inconsistent condom use [Suwanagool *et al.,* 1993; Kham-boonruang *et al.,* 1996b]. Incidence studies, to be described in the next section, however, have shown condoms to afford significant protection.

A similar problem with positive relationships between condom use and HIV infection was reported by Choopanya *et al.* [1991] in injecting drug users in Bangkok. Those always using condoms were twice as likely to be infected with HIV as those who did not. Upon closer examination it was found that because of the extensive testing in treatment clinics, many IDUs had adopted condom use to protect their sexual partners after finding out they were HIV positive. Thus, the knowledge of their own HIV infection resulted in higher condom usage, confounding the association [Vanichseni *et al.,* 1992]. This early lack of protective association illustrates the difficulties of interpreting the findings of cross-sectional studies when the epidemiological and behavioural situation is dynamic.

IV.1.a.6 Other factors

Other behavioural factors have been related to HIV in cross-sectional studies. Men who had ever injected drugs, began sexual intercourse earlier, and visited lower cost sex workers all had higher HIV prevalence in most studies. Nelson *et al.* [1993] also found a positive association with alcohol use. In addition, a number of demographic factors are significant. Lower education and single marital status have been tied to higher HIV infection levels in most studies (see, e.g., Natpratan *et al.,* 1996). Given the strong relationship of HIV to commercial sex in Thailand, these associations are in agreement with the previously mentioned behavioural findings that men with lower education have significantly lower levels of consistent condom use, and single men are more likely to visit sex workers and have casual sex than married men. Based on national data from conscripts rural prevalence is slightly lower than urban, but not substantially so (odds ratio 0.8) [Sirisopana *et al.,* 1996]. Finally, strong regional variations, in agreement with the patterns apparent in the sentinel surveillance data, have been seen by region of residence with the north having the highest levels, the north-east the lowest, and the other regions being in-between [Suwanagool *et al.,* 1993; Sirisopana *et al.,* 1996].

IV.1.b Behavioural factors influencing infection in women

Summary: Most of the studies looking at risk factors for HIV in women have been of sex workers, but a few studies have looked at female general population samples. For sex workers, the most important factors correlated with HIV infection include client numbers, duration of employment, condom use, a history of other STDs, and mobility. For the general female population, however, the most important risk factor is sex with a husband or boyfriend. A summary of the findings of these studies is given in Table B-2 in the Appendix.

IV.1.b.1 Sex workers: Client numbers

For sex workers, a strong relationship has been seen between the number of clients per day and HIV. For example, Siriprapasiri *et al.* [1991] found 4% prevalence in direct workers having one or fewer clients per day in Chiangmai in 1989, compared to 62% in those having more than 6 clients per day. Working at direct sites and charging less for service have also proven significant factors in

multiple studies (in addition to being readily apparent in the national sentinel data).

IV.1.b.2 Sex workers: Duration of employment

Duration of employment in sex work has sometimes been found to be unrelated to HIV infection. Saturation of the risk population may contribute to this. The number of clients is often high, so anything short of strictly consistent use of condoms entails substantial risk. Studies have found incidence rates to be extremely high in new sex workers, who may not use condoms as frequently as more experienced workers. For example, Ungchusak *et al.* [1996] reported that women working less than 3 months had 7 times the incidence of those working longer. Another confounder is the early dropout of higher risk workers from the cohorts, making longer duration in sex work appear protective [Kunawararak *et al.,* 1995; Beyrer *et al.,* 1996a].

IV.1.b.3 Sex workers: Condom use

Findings are mixed on the association of HIV in sex workers with condom use. Some studies have not shown a significant protective effect for condoms, e.g., Cohen *et al.* [1995] for consistent use in the past month or VanGriensven *et al.* [1995] for overall consistent use. But, consistent condom use in the past month was found protective in the north in 1992 [Celentano *et al.,* 1994], and women with greater than 50% use in Chiangmai in 1989 had significantly lower prevalence [Siriprapasiri *et al.,* 1991]. Possible confounders include biases in condom reporting, changes in condom use over time, regular clients with whom condom use has been found to be lower [Morris *et al.,* 1995; Brown *et al.,* 1996], or infection through non-commercial sexual partners with whom condom use is much lower [OPTA, 1996].

IV.1.b.4 Sex workers: Other STDs

As would be expected, most studies have consistently shown a strong association with one or more STDs. The association of HIV with STDs for women has also been seen in other studies of non-sex workers. For example, in a study of wives of infected blood donors in the north, Suriyanon *et al.* [1996] found a significant association of HIV infection with the women's own STD history (OR 2.0), but not with her husbands STD history or other demographic or sexual frequency factors.

IV.1.b.5 Sex workers: Mobility and other factors

Sex workers in Thailand are known to be mobile [Archavanitkul and Guest, 1993; Singhanetra-Renard, 1994], and in many cases geographic factors were found to be related to HIV infection. For example, in Khon Kaen in 1990, sex workers with a past history of working in provinces with HIV prevalence greater than 40% were almost 5 times as likely to be HIV positive. The urban or rural location of the worksite has also been seen to play a factor. In Chiangmai in 1992, sex workers working outside Chiangmai city were more likely to be infected [Celentano *et al.,* 1994]. Interestingly, Nopkesorn *et al.* [1993a] had earlier noted in a 1991 study in nearby Phitsanuloke that prevalences of conscripts from rural areas were higher than those of urban conscripts, which probably reflects the lower levels of condom use reported by rural men compared to urban men.

Demographic factors associated with HIV in some studies, but not others, were lower education and ethnicity. For example, Burmese and Hill Tribe sex workers were found to have higher HIV prevalences [VanGriensven *et al.,* 1995]. These factors may be indirectly related to poor negotiation skills for safer sex, perhaps resulting from poor knowledge of the Thai language or lack of access to prevention materials. Age and marital status were not significant for HIV infection in any of the studies.

IV.1.b.6 General female population: Sex with husbands and boyfriends

Among women in the general population, the situation is somewhat different. In a case–control study comparing HIV positive and negative pregnant women at a hospital in Bangkok in 1993, positive women were significantly younger, more likely to have a history of STDs, to have worked as sex

workers, or to have had 3 or more lifetime partners [Mangclaviraj *et al.,* 1994]. However, 80% of the women with HIV had no risk factors for HIV, implying they contracted the virus from their husbands. However, one should not conclude that all marital HIV transmission is from husband to wife. One quarter of the HIV positive women enrolling in this study had husbands who were HIV negative, indicating that the risk for Thai women is not entirely from their current husbands [Roongpisuthipong *et al.,* 1994]. Other behaviours do contribute to some extent.

Among HIV positive married women with no risk factors for HIV other than sex with their husband or regular partner at an STD clinic in Bangkok, younger age was the only factor associated with HIV infection [Suwanagool *et al.,* 1995]. However, HIV positive women were significantly more likely to report that their husband or partner placed them at risk (62% versus 40%) and less likely to believe they could talk about AIDS or sex with friends, husbands, or boyfriends (15% of those with HIV can discuss confidently compared to 73% of uninfected women).

IV.1.c Behavioural factors influencing infection in IDUs

Summary: Factors most strongly associated with HIV infection in IDUs include number of needle sharing partners, recent needle sharing behaviour, and a history of incarceration.

Studies in Bangkok have examined the behavioural and demographic risk factors associated with HIV positivity in IDUs. The first seroprevalence survey in early 1988 found sharing of injection equipment (OR 1.82, $P = 0.0001$), younger age (OR 1.56, $P = 0.004$ for age <30), and history of incarceration (OR 2.1, $P < 0.01$) to be significantly associated with HIV infection [Vanichseni *et al.,* 1989b]. Sexual behaviour and the number of sexual partners were not. A study later that year found sharing equipment (OR 2.6), sharing the same load (OR 3.2), and injecting at the drug sellers house (OR 1.5) to be significantly related to HIV infection [Vanichseni, 1989c]. (Injecting at the drug sellers house increases the likelihood of needle sharing.) But again, no relationship was seen to sexual behaviour variables or history of STDs.

By late 1989, the situation had changed somewhat [Choopanya *et al.,* 1991]. Number of sharing partners (OR 1.27 for those with 2 or more partners), history of prison time (OR 1.68), and already being in a treatment programme as opposed to just entering one (OR 1.41) were significant factors influencing HIV infection. However, this study was the first to find a statistically significant relationship between sexual behaviour and HIV infection in IDUs, but in the opposite direction to what would be expected. Those reporting sexual intercourse in the past 6 months had a lower risk for HIV (OR 0.68). As with the adoption of condom use by HIV positive IDUs, this may have resulted from increased abstinence among the seropositive to protect their partners.

By 1993, the factors positively associated with infection were incarceration and duration of drug injection (OR 1.06 per year of injecting) [Choopanya *et al.,* 1993]. The shift from a dependence on recent injecting behaviours to length of injection probably results because the slowdown in incidence has made cumulative risk exposure more significant than recent risk behaviour. This might be expected in a maturing epidemic where protective behaviours have been taken up by a large portion of the population.

The Bangkok IDU cohort recruited in 1995 detected cross-sectional associations with needle sharing in the last 6 months (OR 1.4, $P = 0.02$) but not with sexual behaviours at time of recruitment [Kitayaporn *et al.,* 1996a]. In a multivariate analysis, the only significant factors for HIV seropositivity were older age (OR 1.03), not currently being married (OR 1.7), having less than 7 years of education (OR 1.4), and incarceration in the past 6 months (OR 2.1). This indicates that incarceration may directly affect the risk behaviours in which IDUs engage through either needle sharing in prisons or other social factors, e.g., continuing associations with networks of friends who share needles frequently.

IV.2 Establishing the links—Seroconversion studies

Epidemiologists use a number of criteria to determine the likelihood that a causal relationship exists between a given risk factor or risk behaviour and infection with a pathogen, in this case, HIV. These include: 1) the strength of the association between the risk and the infection; 2) a dose–response relationship, meaning that higher levels of the risk factor or increased frequency of the risk behaviour increases the probability of infection; and 3) a correct temporal relationship, i.e., the presence of the risk factor or behaviour precedes the infection. Additional criteria often invoked include biological plausibility (a scientific basis for linking the factor or behaviour and the transmission of the pathogen) and consistency of the findings among studies in different populations at different times (see, e.g., Rothman 1986). In practice, conclusively proving a causal relationship is not possible in human populations given the large number of factors beyond the control of the researcher. However, if these criteria are satisfied in the relationship between a risk factor or behaviour and infection, then the probability is greatly increased that the relationship is causal in nature.

Most of these conditions have been met to establish the relationship between commercial sex and HIV in Thailand. The cross-sectional studies discussed in the preceding section show the strength of the association between commercial sex and HIV infection and a strong dose-response relationship between increasing frequency of sex worker visits and higher HIV prevalence. Such findings are quite consistent across a number of different studies. But in examining the cross-sectional associations of HIV infection with increased condom use, the results have not been as convincing. This failure to demonstrate a clear protective effect of condoms in cross-sectional studies, however, may result from HIV infections which occurred before the adoption of condom use. The positive association between condom use and HIV infection in IDUs discussed earlier, resulting from increased condom use after determination of HIV status, provides a good example of how such difficulties can arise in cross-sectional studies.

This inability to control for the temporal ordering between a risk behaviour and HIV infection is a major weakness of cross-sectional studies. One can never be certain from cross-sectional studies that a particular behaviour preceded the infection, greatly reducing the apparent impacts of behaviour on HIV infection or, in some cases, disguising them entirely. One effective way to address this difficulty is with prospective studies, which follow a group of uninfected individuals and determine both their behaviours and infection status over time. Such studies can determine temporal relationships, allowing a much stronger case to be made for a causal relationship. Because prospective studies also generally assess current risk factors or behaviours rather than those from the past, they are also more likely than cross-sectional studies to produce clear associations between risk and HIV infection when a causal relationship exists. Thus prospective studies can help in establishing a convincing link between behaviour and HIV infection. A small number of such prospective studies have been done in Thailand in conscript and sex worker populations. This section will discuss the findings of these studies. The results of these studies are summarized in Table B-3 in the appendix.

IV.2.a Behavioural risks for HIV seroconversion among conscripts

Summary: Cohort studies in conscripts have confirmed the important role of commercial sex in HIV infection in Thailand. However, they have also found infections occurring through non-commercial casual sex and strong indications of HIV transmission between MSM. Unlike the cross-sectional studies, cohort studies give clear evidence of the protective effect of condoms. They also show higher infection rates among those with low education and from the upper north, in agreement with the higher risk reported in these groups in behavioural studies.

Celentano *et al.* [1996a,b] followed a large cohort of conscripts in the upper north for the 2 year duration of their military service from 1991 to

1993. These men were interviewed in detail about risk behaviours and tested for HIV every 6 months until discharge. Information on recent STDs was also gathered from self-reports. Only 9% of the more than 1,900 seronegative men enrolled were lost to follow-up, an extremely high retention rate. Nopkesorn *et al.* [1993a] followed a similar cohort of roughly 1,200 men in the lower north starting in 1991. Self-administered questionnaires on risk behaviours and HIV tests were administered twice through 1993 with 55% of the men retained in the cohort. Carr *et al.* [1994] followed other cohorts of conscripts in the north and Bangkok in 1991 and 1992, totalling 17,600 individuals. However, their retention was somewhat lower at 50% and they gathered no behavioural data, meaning only demographic factors related to seroconversion could be determined.

Taken together, these studies are particularly valuable because they provide large samples of males chosen by lottery from all 21 year old Thai males. Only a limited number of men receive deferments or avoid conscription, making this a generalizable sample of young Thai men [Mason *et al.,* 1995; Sirisopana *et al.,* 1996]. However, it should be noted that these men are not in their natural social environment during military service, since they are living in military camps with only occasional leave visits to their home provinces. Thus, the seroconversion rates observed cannot be assumed to be the same as in the general population. A study following discharged servicemen clearly demonstrated this by showing that incidence rates after discharge were somewhat higher than those observed during active service [Nelson *et al.,* 1994a]. However, despite their limitations, these conscript studies do allow the relationships between sexual risk behaviour and HIV to be examined carefully.

As in the cross-sectional studies, the most important factor influencing new HIV infections was visiting female sex workers. The two studies gathering behavioural data reported men visiting sex workers in the past 6 months were 5.2 times [Nopkesorn *et al.,* 1993a] and 3.6 times [Celentano *et al.,* 1996a] as likely to acquire HIV as those who didn't. Celentano *et al.* also reported a strong dose–response relationship between the frequency of sex worker visits and both HIV and incident STDs (see Table 4). No significant dependence on the price paid for sexual service was observed in this study, although such relationships have been seen in cross-sectional studies of sex workers (see Table B-2 in the appendix).

However, not all seroconversions were tied to commercial sex. In the study by Celentano *et al.,* 22% of the men seroconverting for HIV reported no contact with sex workers in the prior 6 months [Celentano *et al.,* 1996a]. Similarly 22% of the men reporting STD episodes had no recent contact with sex workers [Celentano *et al.,* 1996b].

Given heightened concerns about the risk inherent in visiting sex workers, such behaviours may have been underreported. However, it is also possible that other forms of sexual behaviour were contributing to HIV and STD transmission. A higher rate of acquiring HIV and STDs was reported in those men who reported sex with girlfriends than in those who did not (relative risk 1.9 for HIV and 1.3 for STDs). However, analyses of the behavioural data showed these men were more likely to have visited sex workers, which may explain this finding [Celentano *et al.,* 1993]. Men reporting sex with men also had a higher seroconversion rate (relative risk 4.5), but again had a history of more frequent use of commercial

Table 4. The relationship between frequency of sex worker visits and the HIV seroconversion rate in conscripts in the north, rates in person-years of follow-up (py).

Source: Celentano *et al.*, 1996a,b

Frequency of sex worker visits	HIV seroconversion rate (from serological testing)
None	1.04/100 py
1 visit	3.37/100 py
2–5 visits	3.64/100 py
≥ 6 visits	4.17/100 py

Frequency of sex worker visits	Relative rate of STD incidence (from self-reports)
None	1.00
1 visit	2.65
Monthly or less	2.94
More than monthly	5.45

sex services [Beyrer *et al.,* 1995a]. However, on controlling for this mix of behaviours, frequency of commercial sex and sex with men remained significant in a multivariate analysis, whereas sex with a girlfriend did not (although the risk of seroconversion for these men was elevated and the result did approach significance).

In contrast with cross-sectional studies, these cohort studies did report protective effects from the use of condoms in commercial sex. Nopkesorn *et al.* reported those using condoms less than 50% of the time with sex workers had 6.4 times the rate of seroconversion as those using them more than 50%. Celentano *et al.* reported a dose–response relationship with condom use for both HIV and STDs (see Table 5).

Men never using condoms in commercial sex had a 50% higher seroconversion rate than those reporting consistent use and 5.5 times the rate of men not reporting sex worker visits. This finding has important methodological implications. The high seroconversion rate among those reporting always using condoms suggests consistent condom use is overreported. While condom breakage could contribute to the observed seroconversions, the roughly 5% breakage rates reported elsewhere [Rugpao *et al.,* 1993] are probably not sufficient by themselves to explain the high seroconversion rates observed. Another contributing factor could be loss of protective effect due to misuse of or refusal to use condoms, sometimes related to alcohol consumption [Sawaengdee and Isarapakdee, 1991; Fordham, 1995]. Some studies have reported men deliberately damaging or removing condoms while engaging in commercial sex [Rugpao *et al.,* 1993; MacQueen *et al.,* 1996].

Other non-behavioural or demographic factors related to incident HIV infections have been identified in these studies. Incident STDs were strongly related to HIV infection (relative risk for any STD 9.7 [Nopkesorn *et al.,* 1993a] and 3.5 [Celentano *et al.,* 1996a]). Significant associations with single marital status were seen for both HIV (relative risk 4.7 [Carr *et al.,* 1994]) and STDs (relative risk 1.3 [Celentano *et al.,* 1996b]). Lower education was associated with STDs (relative risk 1.5 [Celentano *et al.,* 1996b]), and a trend in HIV incidence with educational level was reported by Carr *et al.* [1994] (see Table 6). The national surveys presented earlier found lower levels of condom use among men with lower education, explaining these seroconversion differences by educational level.

Higher seroconversion rates were seen for those born in the upper north when compared to those from the lower north (relative risk 6.7 [Nopkesorn *et al.,* 1993a] and 4.4 [Carr *et al.,* 1994]). Major variations were also seen by the region in which the conscripts were stationed with the upper north showing much higher rates than the lower north or Bangkok (see Table 7). Rural residence prior to conscription produced higher incidence in two studies (relative risk 1.3, not significant [Carr *et al.,* 1994] and 2.2 significant [Nopkesorn *et al.,* 1993a]). Again lower rates of condom use by rural men, coupled with regional

Table 5. Seroconversion rates for men using condoms in commercial sex

Source: Celentano *et al.*, 1996a,b

Frequency of condom use in commercial sex	HIV seroconversion rate (from serological testing)	Relative rate of STD incidence (from self-reports)
No visit	1.04/100 py	1.0
Always use	3.47/100 py	2.3
Sometimes use	3.75/100 py	7.1
Never use	5.46/100 py	6.9

Table 6. Relationship of HIV seroconversion with educational level

Source: Carr *et al.*, 1994

Educational level	HIV seroconversion rate
0–6 years	1.46/100 py
7–9 years	1.06/100 py
> 9 years	0.65/100 py

Table 7. HIV sero-incidence by region of station

Source: Carr *et al.*, 1994

Region of station	HIV seroconversion rate
Bangkok	0.48/100 py
Lower north	0.98/100 py
Upper north	3.23/100 py

variations in risk behaviour probably account for these findings.

A final important behavioural factor tied to HIV seroconversion was use of alcohol [Nopkesorn *et al.,* 1993a; Celentano *et al.,* 1996a]. Several studies have highlighted the relationship between alcohol, visits to sex workers, and lower condom use [Celentano *et al.,* 1993; Nopkesorn *et al.,* 1993c; Fordham, 1995; Morris *et al.,* 1995; Van Landingham *et al.,* 1995b and 1996; MacQueen *et al.,* 1996]. However, a similar association with illicit drug use and cigarette use reported by Celentano *et al.* [1996a] raises the question of whether alcohol use actually increases risk behaviour or is part of a complex of factors indicative of a risk seeking orientation in life [Fordham 1995].

IV.2.b Behavioural risks for HIV seroconversion among sex workers

Summary: Early cohorts of sex workers found high seroconversion rates among brothel workers despite reported high levels of condom use. This probably reflects both inconsistency of condom use in the early days of condom promotion programs and transmission from regular clients and regular non-commercial sex partners. Higher rates of infection are seen among brothel based than indirect sex workers.

Several cohorts of sex workers have been studied over the years. Ungchusak *et al.* [1996a] followed a group of 240 sex workers in the north-east between 1990 and 1991. The HIV/AIDS Collaboration has an ongoing cohort of roughly 500 sex workers in the upper north [Limpakarnjanarat *et al.,* 1993, 1994, 1995]. And Beyrer *et al.* followed a cohort of approximately 400 female sex workers in the north in 1993 [Beyrer *et al.,* 1996a]. Gray *et al.* [1997] constructed a retrospective cohort of 96 workers in rural Chiangrai from repeat STD clinic records covering the period from 1989 to 1993. Finally, a long running cohort of male sex workers in Chiangmai has reported results from 1989 to 1994 [Kunawararak *et al.,* 1995].

But while numerous incidence findings from these studies have been published, generally finding high seroconversion rates in brothel based workers as documented earlier, comparatively little on behavioural-epidemiological links has been written to date. Ungchusak *et al.* found only three factors (enrolling in the study later, working less than 3 months as a sex worker, and using injectable contraceptives) as significant in multivariate analysis. Condom use was not seen to have a significant protective effect, despite reported use with approximately 90% of clients. The HIV/AIDS Collaboration study, with a somewhat larger sample, did find several factors significantly associated with seroconversion: more clients per day, lower charge for service, and inconsistent condom use [Limpakarnjanarat *et al.,* 1994]. However, these studies are difficult to compare directly as the first was brothel based workers only, while the second included both brothel and indirect workers. Behavioural findings have not been published for the other cohorts of female sex workers.

The study of male sex workers in the north found never use of condoms a significant risk for incident HIV infection (relative risk 4.86). Less educated, younger, and ever married male sex workers had higher seroconversion rates, but none of these factors was statistically significant. One interesting finding was that working longer than 9 months had a significant protective effect (relative risk 0.87). Higher losses to follow-up of sex workers with greater risk may explain this. In an analysis of another female sex worker cohort those leaving the cohort earlier had significantly higher STD levels, were more likely to be inconsistent condom users, and had higher average numbers of clients [Beyrer *et al.,* 1996a]. Coupled with the very high incidence rates seen in most of these cohorts shortly after enrollment, this finding raises questions about the interpretation of incidence declines in long running sex worker cohorts.

IV.2.c Other studies linking condom use and STDs

Summary: Other studies have shown condom use by sex workers protective against STDs. A study in the north found a relationship between use of condoms and gonorrhea rates among sex

workers. And reductions in inconsistent condom use track the reduction in self-reported STDs in indirect sex workers in Bangkok.

Another cohort from the earliest days of the epidemic also found evidence of a strong relationship between condom use and STDs other than HIV. In a study of sex workers in the northern province of Tak in 1989, rapid increases in condom use with clients, resulting from an extensive condom promotion programme, occurred simultaneously with a two fold reduction in gonorrhea rates (see Figure 14) [Swaddiwudhipong *et al.,* 1990a,b].

While done as a series of sequential cross-sectional surveys and not a cohort, the Bangkok Behavioural Surveillance System data also show similar time trends in reported inconsistent use of condoms by indirect sex workers and self-reports of recent sexually transmitted diseases (see Figure 15) [OPTA, 1996].

IV.2.d Behavioural risks for HIV seroconversion among IDUs

Summary: One cohort study has shown behavioural changes, including reduction in needle sharing and having a regular sexual partner, to reduce incidence in IDUs.

Only one study has directly examined the relationship of reported risk reduction to HIV seroconversion in a Thai IDU population [Des Jarlais *et al.,* 1996]. This study provides evidence that behavioural change was a protective factor for IDUs in Bangkok as early as 1989. Based on retrospective reports of previous HIV status in a sample of 173 IDUs, it found that those who reported no longer sharing injection equipment had substantially reduced risk of HIV seroconversion (adjusted odds ratio 0.25, $P = 0.01$). Having a regular sexual partner was also found to be protective (adjusted odds ratio 0.24, $P = 0.03$) [Des Jarlais *et al.,* 1994], but no specific sexual behaviours were associated with seroconversion. This probably reflects the dominance of transmission through shared injections over sexual transmission at that time in Bangkok. In mid-1989, infection levels in brothel based sex workers in the city were 3% while those in IDUs were around 40%. A history of incarceration after beginning injecting was the only other risk factor for seroconversion detected. In 1995 the HIV/AIDS Collaboration and cooperating agencies began following a large prospective cohort of injecting drug users in Bangkok to lay the foundation for future vaccine efficacy trials, but results on factors influencing seroconversion are not yet available [HIV/AIDS Collaboration, 1996].

Figure 14. Gonorrhoea rates and condom use with clients in sex workers in Tak province

Source: Swaddiwudhipong *et al.,* 1990b

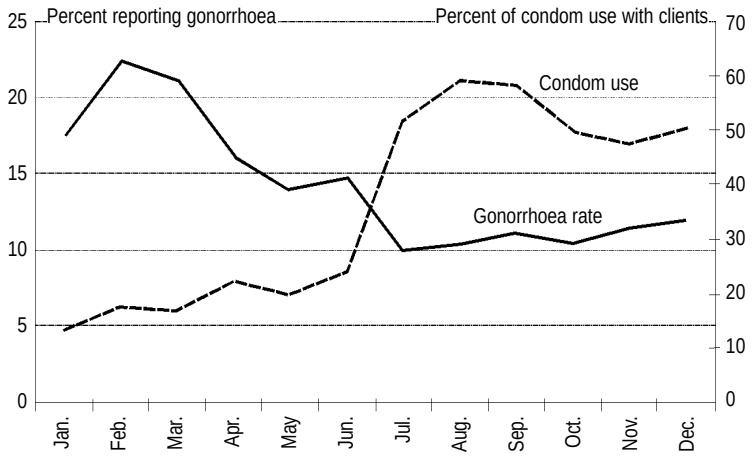
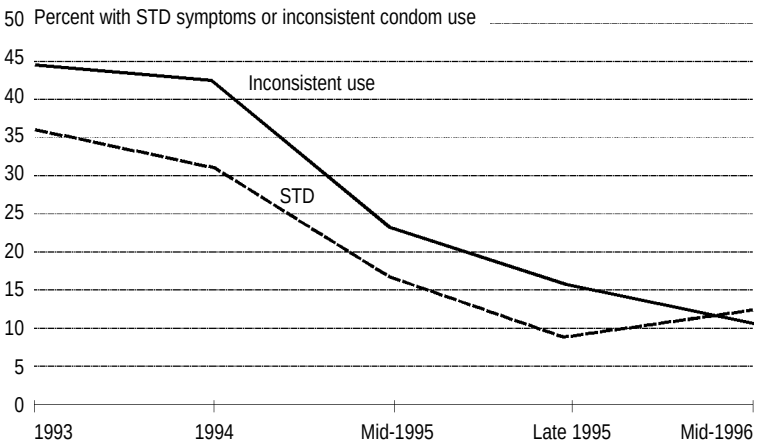


Figure 15. Self-reported STD symptoms in last year and inconsistent condom use with clients by indirect sex workers in Bangkok

Source: OPTA 1996

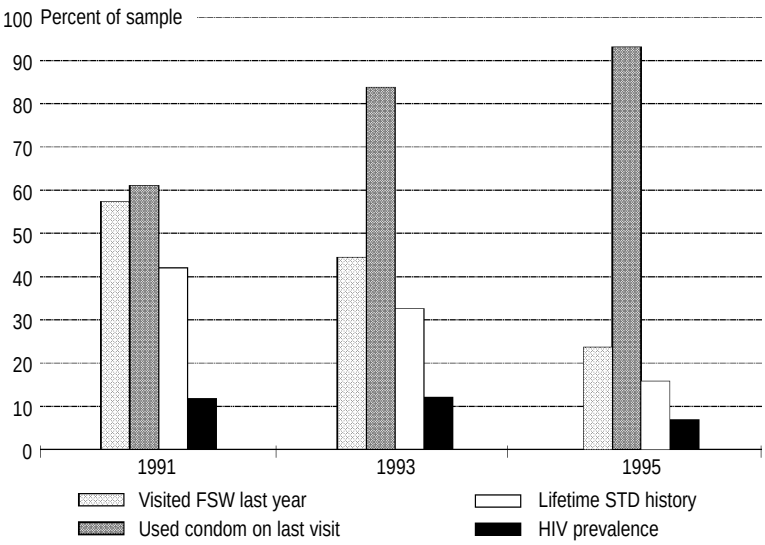


IV.3 Regional and national patterns of change in behaviour and epidemiology

Summary: Regional and provincial behavioural differences are reflected in the epidemiology of HIV and STDs in Thailand. Reported reductions in behavioural risk in conscript cohorts in the north have resulted in lower rates of HIV and reduced lifetime histories of STDs. Changes in the frequency of commercial sex in 9 provinces from behavioural studies show a relationship to reductions in STDs reported to the VD Division. And the findings of the two national behavioural surveys correctly predict the relative ranking of the regions of Thailand in terms of HIV prevalence in the early 1990s.

These cohorts studies provide compelling evidence that self-reported risk behaviours, especially visits to sex workers and failure to use condoms, are closely related to HIV infection on an individual level. Given this relationship, similar correlations would be expected between behavioural and epidemiological patterns on a regional and a national level. This section will explore the relationships seen at regional and national levels between reported behaviours and reported HIV or STD incidence and prevalence. (*Note:* the reader should bear in mind that the following section compares behavioural and HIV/STD data available at the regional and national levels. Because the populations from which the data are collected differ in composition and time, and the relationships between STDs, HIV, and behaviour are complex, the results presented are only intended to demonstrate that the picture presented by behavioural data is consistent temporally and spatially with the epidemiological patterns seen in the HIV and STD epidemics).

Figure 16. Behavioural change and HIV/STD decline in 21-year-old men in the north
Source: Nelson *et al.*, 1996



The sequential cohorts of men enrolled by Nelson *et al.* [1996] in 1991, 1993, and 1995 provide evidence of the effects of behaviour change on epidemiology for young men in the northern region. As Figure 16 shows, from 1991 to 1995, the percentage of men having visited sex workers in the year prior to their enlistment dropped from 57% to 24%, while condom use at the most recent commercial sex visit grew from 61% to 93% among those visiting sex workers. Over the same time frame, the fraction of men reporting any lifetime STD symptoms fell from 42% to 16%, and HIV prevalence went from 11% to 7%.

The delay between the beginning of behaviour change and the fall in prevalence merits further discussion. Although condom use was increasing and commercial sex visits decreasing by 1993, HIV prevalence held steady at 11% to 12%. It was not until the 1995 cohort that a prevalence decline was observed. This results from the cumulative nature of HIV prevalence. Because the median age at first intercourse for Thai men is 18 [Sittitrai *et al.,* 1992a], even those 21 year olds who had adopted consistent condom use by 1993 may have been exposed to and infected with HIV in earlier years. The fact that HIV prevalence in 21 year olds remained stable over this time, while the prevalence in sex workers increased steadily, is an indication that behaviour change was already having an effect. In the absence of such change, a continuing increase in conscript prevalence would have been expected. Perhaps the strongest evidence of the benefits of increasing condom use and decreasing frequency of commercial sex visits was that HIV prevalence of men initiating commercial sex activity after 1992 was only 0.7% compared to 7% for the entire 1995 cohort [Nelson *et al.,* 1996].

The dominant role played by commercial sex in Thai male premarital and extramarital activity and the high percentage of males reporting sex workers as the source of STD infections suggest that a close relationship may exist between patronage of commercial sex establishments and STDs. In an examination of regional patterns of epidemiological and behavioural change, Brown *et al.* [1997] compared the declines in reported commercial sex patronage with drops in cases of STD reported to the VD Division in the 9 randomly selected provinces (2 from each region and Bangkok) in which the Partner Relations and Media Effectiveness surveys had been conducted in 1990 and 1993. A reasonable correspondence was found in most provinces between the reduction in men visiting sex workers in the last year and the observed decrease in annually reported STDs, as shown in Figure 17.

One of the notable features of the Thai epidemic has been its strong regional variation. The upper north has been the most severely affected region, while the north-east has suffered the least impact. Since HIV transmission to males in the early phases of the Thai epidemic occurred predominantly in commercial sexual encounters where condoms were not used, the HIV prevalence in a region should be largely a function of the levels of unprotected commercial sex in the region. Brown *et al.* [1997] calculated the average percentage of Thai males in each region engaging in unprotected commercial sex encounters each year over the period from 1990 to 1993 from the Partner Relations and Media Effectiveness surveys. A comparison of the resulting levels of unprotected commercial sex with HIV prevalence data as obtained from 120,000 male Thai conscripts between 1991 and 1993 [Sirisopana *et al.,* 1996] is shown in Figure 18. In general the behavioural data correctly predicts the relative ranking of HIV prevalence in all regions, although the prevalences for the upper north are much higher than might be expected from the behavioural findings. However, this can be explained by variations in the timing of the start of the regional sub-epidemics. Available epidemiological evidence suggests that the heterosexual epidemic in the north began at least a year or more ahead of the heterosexual epidemic in other parts of the country. As a result, HIV/AIDS awareness and condom use in its initial phases were much lower, allowing prevalence to grow more quickly than it did in the rest of the country where behaviour change was already underway before rapid epidemic growth began.

Figure 17. Percentage decrease in men engaging in commercial sex in the past year compared with percentage decline in reported STDs at government clinics. Provinces are labeled by their region.

Source: Brown *et al.* 1997

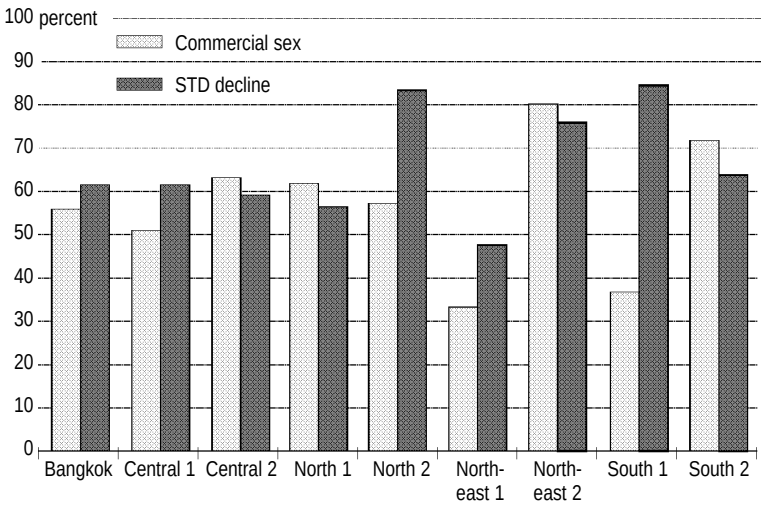
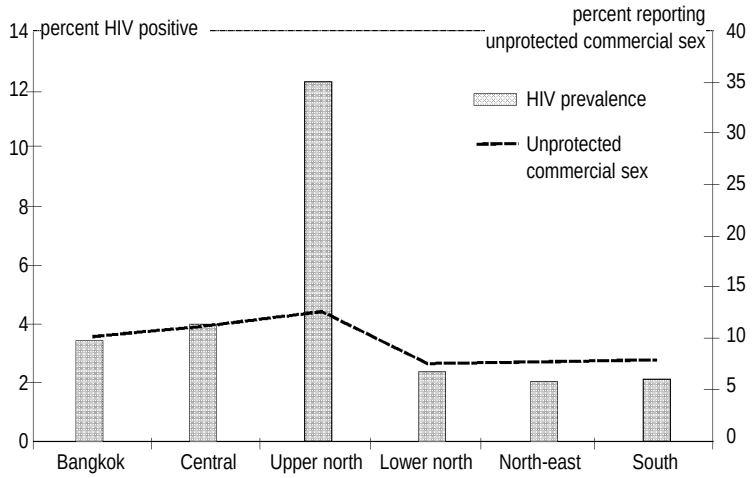


Figure 18. Observed relationship between unprotected commercial sex behaviour and HIV prevalence on a regional basis.

Sources: Brown *et al.,* 1997; Sirisopana *et al.,* 1996



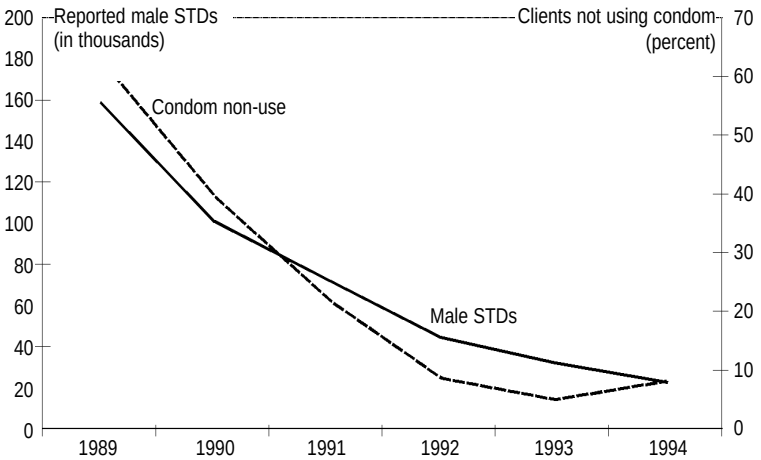
At the national level, the strong contribution of commercial sex to STD transmission is apparent in a comparison of the temporal trends for condom non-use and reported male STDs (see Figure 19). Both have fallen rapidly over the 1989 to 1994 time frame. The slowing of the decline in STDs relative to condom use in later years may result from overreporting of condom use levels, the shift from direct sex sites to indirect sex work sites with less condom use as discussed earlier, or other factors affecting STD reporting.

IV.4 Behavioural change has altered the course of the Thai epidemic

One can take issue with any of the individual studies or correlations presented in the preceding three sections. The study populations are often not easily generalized to the population as a whole. Conscripts, the population most closely studied, are almost entirely a sample of 21 year old males. Male and female sex workers are at extremely high risk of HIV and STDs by virtue of their occupation. In most cases, the epidemiological and behavioural data examined at the regional and national level were not collected from the same populations. However, taken together the cross-sectional, prospective, regional, and national data indicate a strong likelihood of a causal relationship between behavioural change and the changes in HIV/STD incidence and prevalence. The associations of commercial sex and condom use with HIV transmission are strong and show consistent dose–response relationships across a number of different studies. The temporal relationships between risk behaviour and HIV infection are correct, as shown by the cohort studies. The larger scale temporal trends and regional variations in behaviour and epidemiology are consistent with increased condom use and reduced commercial sex activity slowing HIV and STD incidence. Taking this evidence in total, there can be little doubt that behavioural change has been the driving force behind the HIV/STD incidence and prevalence changes observed in the Thai population.

Figure 19. Time trends in condom non-use with direct sex workers and reported national STDs.

Sources: VD Division, Epidemiology Division, MOPH



V. Behavioural change slows the Thai epidemic— A national picture

Armed with knowledge of HIV/STD prevalence and incidence changes over time, reductions in risk behaviour and increases in condom use, and the strong links between them, a picture of the overall dynamics of the early stages of the Thai epidemic can be constructed. The high growth phase of the Thai epidemic began with a rapid increase in HIV prevalence among IDUs in Bangkok in late 1987, which quickly spread to IDUs in the rest of the country. The incidence in IDUs peaked sometime in 1988 or 1989 and dropped back to a low but stable level after that. This incidence decline resulted from a combination of risk reduction in the IDU population, through decreased needle sharing and increased bleaching, and saturation in the population of IDUs still sharing needles.

By 1989, within a year of the outbreak of the IDU epidemic in Bangkok, a parallel heterosexual epidemic began, with its initial focus in the upper north [Mastro *et al.,* 1997]. Assisted by low levels of condom use at that time, high levels of other STDs, and frequent commercial sex patronage, the epidemic grew quickly. By 1990, prevalence in brothel based sex workers was over 40% in many upper northern provinces, and by 1991 prevalence in these same provinces exceeded 10% in 21 year old males. With the high mobility of the Thai population [Larson *et al.,* 1993, Singhanetra-Renard 1994], HIV quickly spread throughout the country. However, even as this rapid spread was occurring, national efforts were rapidly increasing condom use in commercial sex, improving STD care, and discouraging men from visiting sex workers. Thus, even though regional levels of behavioural risk in other parts of the country were not radically different from those observed in the north, changes already underway helped to shield the other regions from the severe impacts seen in the north.

As large numbers of men became infected through commercial sex, they began to transmit HIV to their wives and girlfriends (or future wives in the case of many single men). This transmission, however, occurred at a lower rate than transmission between sex worker and client because other STDs, which increase HIV transmission, are less common in marital sexual contacts [Duerr *et al.,* 1994; Mastro *et al.,* 1994; Mastro and De Vincenzi, 1996]. As a result, the growth of HIV prevalence in pregnant women has lagged that seen in men. But while incidence in men was reduced radically by condom use in commercial sex and decreased visits to sex workers, condom use in married couples did not increase substantially. This explains the continuing growth in prevalence among pregnant women through 1995.

The National Economic and Social Development Board Working Group constructed a model fitting the epidemic through 1994 which took into account changes in condom use in commercial sex over time, decreases in other STD levels, and reductions in visits to sex workers [NESDB, 1994]. The results of their medium intervention scenario are shown in Figures 20 and 21. This scenario assumed: 1) condom use had reached 60% by 1993 and grew to 80% by 1995; 2) STDs dropped another 20% over the same time frame; and 3) a continuing slow reduction in men visiting sex workers occurred from the 10% seen in the Media Effectiveness survey in 1993. While these figures presented are based on a model, they correctly reproduce the epidemiological patterns seen in male conscript and antenatal clinic data through 1994 when they were done.

Several important points should be noted from these figures, which are also supported by the epidemiological record. The major impact of the Thai programme to date has been on risk reduction in commercial sex encounters, reducing male incidence substantially (see Figure 21). Female incidence has fallen much more gradually, as shown by the continuing increase in prevalence in

pregnant women through 1995, because condom use between husband and wife has not increased greatly and many women are still contracting HIV from their husbands. Some incidence also continues among female sex workers because of the high number of commercial sexual partners, inconsistent condom use, and low condom use with non-commercial sexual partners. The continuing role of sex workers as the source of most STDs treated at government clinics shows that condom promotion efforts have not been 100% effective. However, HIV incidence among sex workers has been slowed substantially by condom promotion and improved STD care. If these programmes were not present, prevalences among sex workers would certainly be much higher.

Figure 20. New annual HIV infection, cumulative infections, and current HIV prevalence in the NESDB medium intervention scenario.

Source: NESDB, 1994

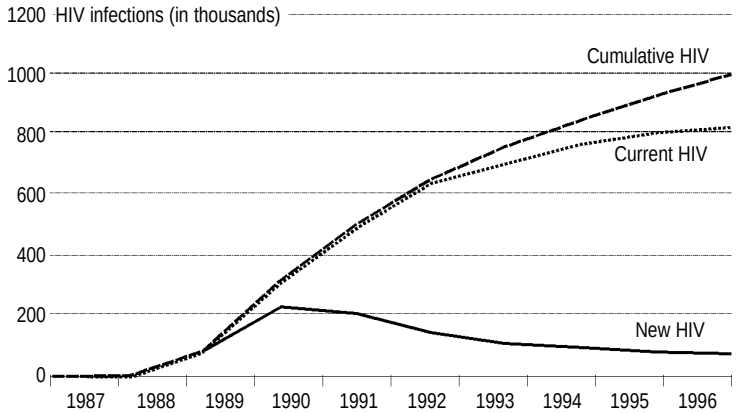
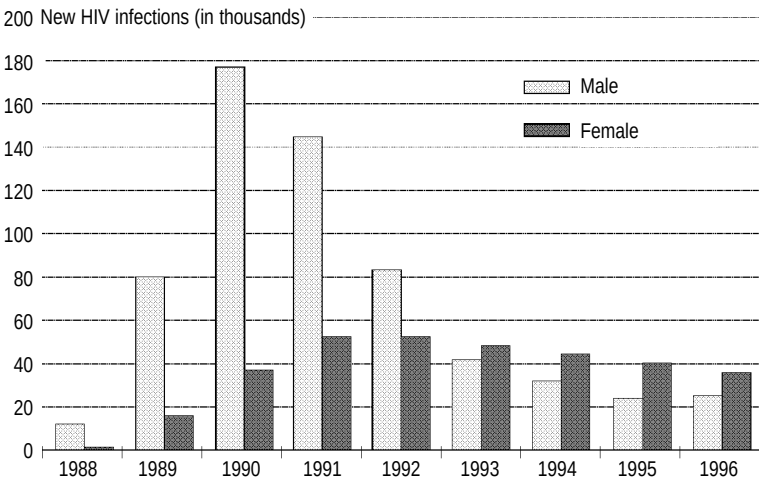


Figure 21. New annual male and female HIV infections in the NESDB medium intervention scenario.

Source: NESDB, 1994



In Figure 20, no HIV prevalence decline as seen in military conscripts is immediately apparent. But if male and female prevalence is examined separately, as in Figure 22, a slight prevalence decline is seen among males. The magnitude of the decline, however, is much smaller than that observed in conscripts. This observation raises an important cautionary note. In terms of the general male population, conscript data overestimates the magnitude of prevalence declines and one must be careful not to over-interpret its meaning. Conscripts are a young population. Those entering service in 1995 have grown up in the shadow of the HIV/AIDS epidemic, many initiating sexual activity only recently. They can only give an indication of the cumulative incidence over the time they have been sexually active, on average 3 years given the median age at first intercourse in Thailand. However, older men in the population will have longer periods of sexual activity and potential HIV exposure, much of it during the period after HIV started rapidly spreading but before condom use in commercial sex became the norm. For example, the conscripts tested in 1991 in the north with 11% prevalence were 26 years old in 1996, but still had *at least* an 11% prevalence since most continued sexual activity after entering the military and comparatively few will have developed AIDS or died this soon after infection. As a consequence, the male population as a whole will not show as rapid a decline in prevalence as seen in sequential cohorts of conscripts.

Some have asked whether factors other than behaviour change may have been responsible for or greatly contributed to the prevalence and incidence declines observed in Thailand [Brody 1996a,b]. Commonly suggested causes of these declines include: 1) saturation of the risk population, that is, almost everyone engaging in risk behaviour has already been infected; 2) natural history of the epidemic, with increasing AIDS morbidity and mortality in an older epidemic, risk behaviours are reduced and prevalence falls through removal of infected individuals from the

population; or 3) demographic changes in the composition of the populations being studied.

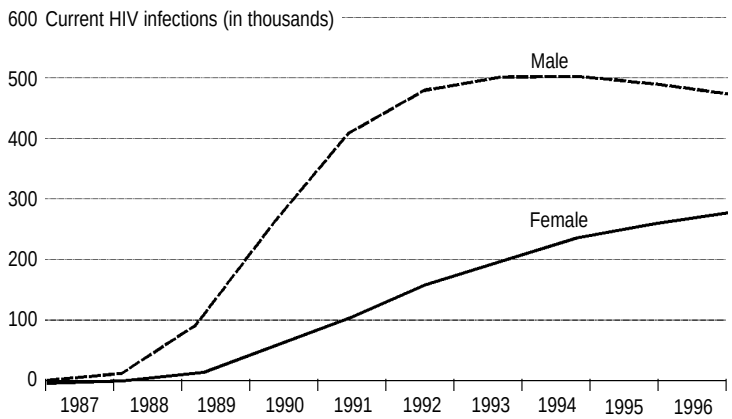
Saturation of risk populations, while it does play a role in sub-populations such as IDUs, is not a viable explanation for slowing of the epidemic in the Thai population at large. Consider males who visit sex workers, one of the highest risk populations in the country as shown by numerous studies. Based on the Partner Relations survey in 1990, the total male risk population between ages 15 and 49 was 3.4 million males who had visited sex workers in the last year. These numbers are based on potential exposure through commercial sex in the last year; cumulative lifetime exposure would produce an even larger risk population. But by even the highest estimates, cumulative male HIV infections in Thailand through 1996 are well below 700,000 [NESDB, 1994]. This is well below the level at which saturation would produce significant incidence declines.

Increased HIV/AIDS related mortality also fails to explain most prevalence and incidence declines. The Thai epidemic grew very rapidly, producing over half a million infections in less than 4 years in the early 1990s. Thus, increases in AIDS mortality in the country as a whole have only become important very recently. While they may be contributing to a slow decline in general population prevalence after 1996, they cannot in any way help to explain the reductions in incidence and prevalence seen in military conscripts between 1991 and 1995. These are populations so young that those infected acquired their infections only recently and will not be experiencing significant AIDS mortality at age 21.

Finally, conscripts, because of the random nature of their selection and their widespread geographic origins, are not subject to major demographic shifts as a population. The declines in HIV prevalence being seen among them are real, not an artifact of sampling or other biases. Widespread behaviour change remains the only explanation for the changes in HIV and STD epidemiology in Thailand which is consistent with the available data.

Figure 22. Prevalence changes in males and females in the NESDB medium intervention scenario.

Source: NESDB, 1994



VI. Practical implications for national policy and programme design in Thailand

VI.1 The evolving Thai epidemic—the need for a dynamic response

In its earliest stages, the Thai epidemic was in one sense epidemiologically simple. It consisted largely of one epidemic in injecting drug users and a separate epidemic among sex workers and their clients. The epidemic in IDUs was essentially self-limiting because of the small size of the IDU population and the rapid adoption of safer injecting practices. The high efficiency of HIV transmission between sex workers and clients quickly made heterosexual commercial sex the major source of new infections [Mastro *et al.,* 1994; Satten *et al.,* 1994]. But the commercial sex epidemic, with most transmission occurring in established and easily located direct sex establishments, was particularly susceptible to structural intervention programs working with establishment owners and sex workers to promote condom use and STD treatment [Rojanapithayakorn and Hanenberg, 1996; Sweat and Denison, 1995]. Once the efficacy of the 100% condom approach was established in a small number of pilot provinces, the Royal Thai government expanded the programme nationwide in less than two years. By taking an open approach to reporting HIV prevalence findings from the sentinel surveillance system, the public was quickly made aware of the dangers of commercial sex. The results have been documented here. Condom use in commercial sex became the norm, numbers of clients were cut in half, new HIV infections in men dropped dramatically, and STDs fell almost 80% nationwide.

However, the Thai epidemic has not been static, it has evolved. As the contribution of direct commercial sex was reduced by the country's efforts, other modes of transmission assumed more visibility and importance. Husband–wife transmission became the dominant route of infection for women. As brothels were increasingly perceived as high risk, commercial sex shifted to indirect sites, many of which were more difficult to identify than brothels. Feelings of safety by the clients at these sites reduced the pressure to use condoms there. Establishment owners at the more indirect sites such as restaurants, feeling pressure from public officials and wishing to avoid identification of their sites as commercial sex establishments, have been less accessible for government condom distribution efforts. Many sex workers operating out of these sites report lack of a condom as the reason they had unprotected intercourse. Studies outlined earlier in this paper have found indications of a growing contribution of sex between men to HIV incidence. The Provincial Sentinel Surveillance for HIV Risk Behaviour also provides hints of low levels of protective behaviour among these men who have sex with other men. Non-commercial premarital and extramarital sex continues at low levels with little consistent use of condoms and its contribution to the epidemic may be growing in importance as indicated by the number of couples in which the wife is HIV positive and the husband is not [Roongpisuthipong *et al.,* 1994]. While prevalence is stable, HIV incidence among injecting drug users continues.

Thus, as it begins its second decade, the Thai epidemic has now entered a new phase. The growth of the epidemic should be much slower in the future owing to the successful efforts of the first decade. But at the same time, the conditions and behaviours responsible for HIV transmission have changed in ways which are increasingly more complex and less directly vulnerable to the programs which have worked so effectively in the past. This means that the approaches for addressing the epidemic must themselves become increasingly sophisticated, reflecting the changes which are occurring. In this situation the role of continuing epidemiological/behavioural research and monitoring becomes even more important to

understanding and responding dynamically and effectively to the changes occurring.

VI.2 Monitoring behavioural and epidemiological change

In reviewing the behavioural and epidemiological data for this report, a number of gaps in knowledge of the current situation have become apparent. Based on this review, several ongoing epidemiological and behavioural monitoring needs can be identified. Meeting these needs may help the Thai National AIDS Programme to respond more effectively to continuing changes in the Thai epidemic. With this in mind, the following recommendations are offered for consideration:

- ***Strengthen the current national epidemiological monitoring systems in order to better monitor trends in the general population, rural areas, and men having sex with men.***

  Because of efforts by the MOPH and the Royal Thai Army, Thailand had one of the earliest and most extensive epidemiological sentinel surveillance systems in the world. It documented the growth of the epidemic nationally and has served as a model for many other countries in the region. However, as the epidemic has become more complex and spread more extensively through the population at large, limitations in the current system are becoming apparent. The system was originally designed to detect the entry of HIV, not to assess its spread through the general population. Adjustments to the system, coupled with focused studies of biases, could improve the ability of the sentinel system to assess what is happening in the Thai population as a whole.

  — *Conduct focused studies to link national Sentinel population prevalences to general population prevalences.* For example, questions remain on interpreting the meaning of HIV prevalence in pregnant women in terms of the general female population [Boisson *et al.,* 1996]. Studies done in Africa have shown that converting sentinel antenatal clinic findings to general population rates is non-trivial. Age variations in fertility, risk behaviour, and population composition must be taken into account. Local studies comparing prevalence in a general population sample with that in an antenatal sample could assist in understanding the biases inherent in the antenatal clinic data and obtaining a clearer picture of what is happening in the overall female population. More detailed analyses of the age distribution of prevalence might also reveal if the declines in prevalence seen in conscripts are also being seen among young Thai women.

  — *Expand age coverage of the general male population in national epidemiological monitoring systems.* While pregnant women have provided some window on what is happening in the general female population, the only general male population sample available is 21 year old conscripts. While studies in conscripts have provided a wealth of data, these men represent an extremely narrow window on epidemiological and behavioural trends in the male population as a whole. For example, as discussed earlier, prevalence declines in conscripts may overestimate prevalence falls in the total adult male population. National behavioural studies have indicated that older men have reduced risk behaviour even more than younger men (see Figures 5 and 6), but this cannot be validated epidemiologically at present as it can with the conscripts. The expansion of the sentinel system to include a broader age range of Thai men would be desirable. A better public understanding of the regional and age distribution of prevalence in the Thai male population would also aid efforts to encourage voluntary HIV testing among married couples to reduce marital transmission.

  — *Expand coverage of rural areas.* The current system has only limited coverage of rural areas since most testing has been done in provincial centers. Some studies, such as those of Maticka-Tyndale, Elkins, and collaborators [Maticka-Tyndale *et al.,* 1994a,b, 1997; Elkins *et al.,* 1997] or of Viravaidya *et al.* [1994a,b] show continuing levels of risk in village populations with very low condom use under some circumstances. Comparison of condom use and

commercial sex patronage in urban and rural populations from the national surveys in 1990 and 1993 also indicate that rural risk may now be higher than urban risk. Expansion of past efforts to obtain rural samples might allow the epidemiological impacts of urban/rural behavioural changes to be observed.

— *Expand national epidemiological monitoring activities for MSM.* While early studies failed to show a substantial relationship between sex between men and HIV infection, more recent studies are detecting an association. This may reflect a growing contribution of MSM to HIV transmission as commercial sex transmission has fallen. However, this cannot be determined at present because no systematic monitoring of seroprevalence in MSM is available outside of small samples of bar workers, who have high turnover and are not representative of the population of MSM. The limited behavioural studies available do show high levels of risk behaviour among Thai MSM, and the Provincial Sentinel Surveillance for HIV Risk Behaviour has reported relatively low levels of condom use in same-sex activities. Male bar workers show high continuing incidence in studies in the north. Outside of major urban centers, little emphasis has been placed on addressing risk in these populations. An integrated plan for formative research, behavioural monitoring, and prevention programme development for MSMs would strengthen the National Programme.

- ***Conduct a comprehensive national programme of behavioural studies to understand, monitor, and respond to behavioural changes in the Thai population.***

As this report makes clear, there have been massive and important changes in Thai sexual behaviour over the last decade. Understanding these changes and redesigning prevention programmes to be effective in the context of these changes requires that the changes be monitored, understood, and addressed. Several ideas for improving the current situation include:

— *Maintain and expand the Provincial Sentinel Surveillance for HIV Risk Behaviour.* Thailand has now implemented the Provincial Sentinel Surveillance for HIV Risk Behaviour in 19 provinces with plans to expand it nationwide. This system fills an important need for tracking behavioural trends at the provincial level and will aid in locating provinces with continuing behavioural risk and in directing prevention programmes. At present the questionnaire obtains the most important data including casual and commercial sex, condom use, recent STD history, and first sexual intercourse. Given the shifts to indirect commercial sex sites, additional detail on where sex services were purchased would be a valuable addition to improve understanding of the level of risk. Further detail might also be gathered on condom use by men who have sex with men, given the extremely low levels reported in the first round.

— *Conduct a national behavioural survey focused on understanding the changes which have occurred in Thai sexual culture in the last 10 years.* Thailand last conducted a national survey of behaviour 4 years ago. Since that time, substantial changes have occurred in sexual behaviour patterns and levels of risk. Another national survey, constructed specifically to address current behavioural concerns, should be undertaken. Over-sampling of adolescents as part of this survey could provide data for comparison with previous surveys and allow trends in adolescent sexuality to be determined. Questions for men might cover areas such as direct and indirect commercial sex, regular partners in commercial sex, sex with other men, alcohol use, more detailed sexual histories, and the determinants of condom use or non-use with different types of partners. For women, questions on casual sex, condom use with partners and changes in attitudes toward commercial sex and casual sex in response to the AIDS epidemic are needed. The questionnaire for this survey would best be designed anew, using qualitative research to understand how the Thai people conceptualize and perceive commercial sex and casual sex today. This research would then be used in

developing a Thai specific questionnaire, which provides for comparison between current and past behavioural data, yet is of sufficient detail about current risks to be of value in developing effective prevention programmes. Given epidemiological evidence for variations in HIV prevalence by socioeconomic level and the influence of travel on risk behaviours, the survey should also gather detailed information on income, occupation, and migrational patterns [Atikij *et al.,* 1996].

– *Conduct qualitative and quantitative studies focused on understanding changes occurring in adolescent sexuality.* None of the studies here gives a clear picture of how the sexual behavior and attitudes of Thai adolescents are changing. Media, the HIV epidemic, and other forces are creating pressure on young single couples to become more sexually active. At the same time, more negative attitudes toward commercial sex have been reported in qualitative studies. The situation is changing and is difficult to quantify at present, but several behavioural studies have found a substantial population of sexually active single Thai women. Serious consideration should therefore be given to undertaking studies of adolescent reproductive health issues, including substantial emphasis on changing sexual behaviour and attitudes, especially among young Thai women.

- ***Strengthen the linkages between national epidemiological and behavioural monitoring systems.***

The studies presented in this report make a convincing case that behavioural change in Thailand has reduced HIV transmission. Showing that programmes change behaviour and consequently reduce new HIV infections is an essential component of building public support to sustain or expand the current budget and activity level of the National AIDS Programme. Demonstrating this to policymakers will be easier if the relationships between the current epidemiological and behavioural monitoring systems are regularly examined, analyzed, and disseminated.

Furthermore, with the comprehensive national systems for epidemiological and behavioral monitoring which now exist, regular examination of the linkages between them could help the National AIDS Programme to respond more effectively to the countrys needs, e.g., by comparing observed provincial epidemiological (HIV and STD) and behavioural data.

For example, anecdotal reports indicate that the extent of perceived risk may vary greatly by region, as exemplified by north-eastern residents who report a sense of safety when having unprotected sex in their own villages [Maticka-Tyndale *et al.,* 1997]. Such perceptions may have serious impacts on the maintenance of safer sex behaviours over time. For example, between 1990 and 1993, men from the north-east reported substantially less reduction in commercial sex than men in other regions of the country. On the other hand, in the north where the epidemic is much more visible, recent reports suggest immense risk reduction has taken place. These regional variations in risk behaviour need to be tracked and considered in directing national resources. Establishing regular regional analyses of the behavioural findings from this system in conjunction with epidemiological sentinel surveillance and VD Division data would provide national and regional policymakers with a better basis for such decision making.

Cohort studies are another effective way to link epidemiological and behavioural data. However, they are expensive and, unless high levels of ongoing HIV or STD transmission are occurring return little new knowledge. The level of current cohort studies in Thai conscripts, IDUs, sex workers, and STD clinic attendees is adequate for Thailand's current needs and for studying those populations still showing substantial seroconversion rates. In other countries, where little is understood of the actual linkages of sexual and injecting drug use behaviours, such studies could be of great benefit.

VI.3 Improving prevention programmes and reducing incidence

The changing epidemiological and behavioural situation also suggests a number of changes in the National AIDS Programme to improve prevention programmes and further reduce incidence. Along these lines, the following recommendations are presented for consideration:

- ***Sustain the successful national 100% condom programme for commercial sex.***

  The considerable contribution of commercial sex to the Thai epidemic has been greatly reduced by the 100% condom programme, expansion of STD prevention facilities, and heightened public awareness. These efforts have been largely responsible for the rapid falls in STDs and HIV incidence observed [Mastro and Limpakarnjanarat 1995]. Given the central role played by commercial sex in the premarital and extramarital sexual activities of Thai men, maintenance of these efforts must remain the National Programmes top priority. Failure to maintain these efforts could result in renewed epidemic growth.

- ***Intensify the 100% condom programme to target more effectively indirect commercial sex establishments.***

  As VD Division data have documented, the number of sex workers has declined little, but they increasingly work out of indirect sites. Workers at some indirect sites, such as restaurants, report much lower levels of consistent condom use than are currently seen in brothels. The 50% condom use in commercial sex reported by male factory workers in the Provincial Sentinel Surveillance for HIV Risk Behaviour is particularly disturbing and may be related to this shift. Several factors may contribute to this lower condom use, for example, lack of self-identification as a sex worker, resistance of the owners to condom distribution, differing perceptions of risk on the part of the clients, or unavailability of condoms. Formative qualitative research to understand these factors, develop ways of enlisting the aid of the owners of the establishment, and implement effective programmes to increase condom use between workers and clients at these sites is urgently needed.

- ***Maintain the current strong national emphasis on STD prevention and treatment, while expanding STD efforts to reach workers at indirect sex establishments.***

  STDs have been reduced greatly on a national scale, in large part owing to the efforts of the Ministry of Health in expanding treatment clinics and aggressively promoting condoms. However, these efforts must also be sustained or STDs may once again increase HIV transmission. Sex workers remain the most common source of STDs, and the observed shifts to indirect commercial sex sites may have important implications for STD transmission. At least one study has shown that workers at these sites are much less likely to receive regular STD checkups or treatment [Brown *et al.,* 1996]. Thus, outreach programmes for women at these sites should be expanded, perhaps in conjunction with condom promotion efforts.

- ***Expand programmes to raise risk awareness and promote condom use in non-commercial premarital and extramarital sexual activities by Thai men and women, especially sexually active single Thai women.***

  Past prevention efforts have left many Thais with the mistaken belief that HIV risk is only associated with commercial sex, leaving many vulnerable to infection through non-commercial sexual activities. It is clear that condom use in non-commercial premarital and extramarital relationships remains comparatively low. This results in part from traditional Thai attitudes toward such sexual activities by women and from public perceptions of the inappropriateness of condom use in relationships. Both the Bangkok Behavioural Sentinel Surveillance and the Provincial Sentinel Surveillance for HIV Risk Behaviour have reported between 5% to

15% of the unmarried young women surveyed are sexually active with very low levels of consistent condom use. Programmes to raise risk awareness and promote condom use by these sexually active single women and their sexual partners need to be developed and implemented.

- ***Strengthen needle cleaning and needle sharing reduction programmes among injecting drug users.***

  With the reductions in commercial sex risk, injecting drug use may now be producing a significant portion of new HIV infections in males. Prevention programmes among IDUs have been fairly effective to date, but incidence continues at 5% to 10% per year. Research to identify determinants of continuing risk and to reach new IDUs with prevention messages can help to reduce this rate. These programmes must identify those responsible for the ongoing incidence and focus on risk reduction through abstinence, decreases in needle sharing, and use of clean injecting equipment.

- ***Strengthen prevention programmes to reach MSM, especially in rural areas.***

  MSM may now also be producing a substantial portion of new HIV infections, yet little effort has been focused on prevention activities for them. National programmes should develop mechanisms for reaching these men, many of whom are bisexual and may not self-identify as homosexual. Effective approaches for reaching these men need to be identified, perhaps by education efforts through peer networks, incorporation of same-sex prevention materials into school curriculums, or development of small media incorporating same-sex prevention messages into more general HIV education material so they could be obtained without identifying oneself as an MSM.

As the Thai epidemic enters its second decade, the behavioural and epidemiological situation has become increasingly complex. The relative contribution of various forms of risk behaviour is changing dynamically with time. In these conditions, improved epidemiological and behavioural monitoring systems assume an even more critical role in formulating, directing and evaluating new strategies and more effective responses.

It is also important for the public and policymakers to realize that the reductions in incidence seen do not mean that the epidemic is over. As this report shows, the reduction in commercial sex transmission in direct sites has created a more complex landscape, with multiple important modes of transmission including indirect commercial sex, injecting drug use, casual sex, and men having sex with men. Failure to sustain the reduction successes in the commercial sex sector or to properly address these other modes of transmission could result in the epidemic resuming its rapid growth. One must not lose sight of the fact that over 2% of the Thai adult population is infected with HIV. With these high prevalences, HIV will quickly take advantage of new avenues to spread.

Fortunately Thailand has a long history of pragmatically adjusting its response and is sure to recognize the importance of refining its systems so as to continue the prevention successes of the first decade of its HIV/AIDS epidemic. Building on its considerable research base and modifying existing surveillance systems in the country to meet evolving needs, Thailand will continue to be an important resource and example for other countries in the region.

APPENDIX A – BIBLIOGRAPHY

AIDSCAP. *Application of a Behavioural Surveillance Survey Tool*. AIDSCAP Asia Regional Office, Family Health International, Bangkok, 1995.

Archavanitkul K, Guest P. *Migration and the Commercial Sex Sector in Thailand*. IUSSP Seminar on AIDS Impact and Prevention in the Developing World, Annecy, France, December 1993.

Atikij B, Lohsomboon P, Limpakaranjanarat K, Weniger B. HIV Prevalence in Upper Socioeconomic Level Hospital Patients, 1991–1993. *South-east Asian Journal of Tropical Medicine and Public Health,* 1996; **27:**449–451.

Beesey A, Atthamessara R, Tan-ud S. *The Behaviour and Attitudes of People Self-Treating Sexually Transmitted Diseases: A Study in Rural Northern Thailand*. Unpublished report for AIDSCAP and PATH.

Beyrer C, Eiumtrakul S, Celentano D *et al.* Same-sex behaviour, sexually transmitted diseases and HIV risks among young northern Thai men. *AIDS,* 1995; **9:**171–176.

Beyrer C, Brookmeyer R, Natpratan C *et al*. Measuring HIV-1 incidence in Northern Thailand: Prospective Cohort Results and Estimates Based on Early Diagnostic Tests. *Journal of Acquired Immune Deficiency Syndromes,* 1996; **12:**495–499.

Boisson E, Nicoll A, Zaba B, Rodrigues L. Interpreting HIV Seroprevalence Data from Pregnant Women. *Journal of Acquired Immune Deficiency Syndromes,* 1996; **13:**434–439.

Boonchalaksi W, Guest P. *Prostitution in Thailand.* Bangkok: Mahidol University, IPSR Pub No. 171, 1994.

Brody S [1996a]. Risk factors for HIV-1 seroconversion may not be what they seem. *Journal of the American Medical Association,* 1996; **275:**543–544.

Brody S [1996b]. Decline in HIV infections in Thailand. *New England Journal of Medicine,* 1996; **335:**1998–1999.

Brookmeyer R, Quinn T, Shepherd M, Mehendale S, Rodrigues J, Bollinger B. AIDS epidemic in India: a new method for estimating current human immunodeficiency virus (HIV) incidence rates. *American Journal of Epidemiology,* 1995; **142:**709–713.

Brookmeyer R, Quinn T. Estimation of current human immunodeficiency virus incidence rates from a cross-sectional survey using early diagnostic tests. *American Journal of Epidemiology,* 1995; **141:**166-172.

Brown T, Sittitrai W. *Estimates of Recent HIV Infection Levels in Thailand*. Thai Red Cross Society Research Report No. 9, Programme on AIDS, September 1993.

Brown T, Sittitrai W, Vanichseni S, Thisyakorn U. The recent epidemiology of HIV and AIDS in Thailand. *AIDS,* 1994; **8** (suppl. 2):S131–S141.

Brown T, Sittitrai W. *The Impact of HIV on Children in Thailand*. Thai Red Cross Society Research Report, Programme on AIDS, June 1995.

Brown T, Sittitrai W, Phadungphon C, Carl G, Sirimahachaiyakul W, Jittangkul D, Komatsu R. *Risk Factors for Non-condom Use in Commercial Sex Contexts in Thailand.* Presented at the XIth International Conference on AIDS, Vancouver, July 1996 [abstract no. Tu.C.2660].

Brown T, Komatsu R, Sittitrai W, Thongthai V, Chamratrithirong A, Nguamprapasum N. *Geographic Variations in Risk Behaviour and Their Relationship to Regional Sub-epidemics*. In press, 1997.

Carr J, Sirisopana N, Torugsa K *et al.* Incidence of HIV-1 Infection Among Young Men in Thailand. *Journal of Acquired Immune Deficiency Syndromes,* 1994; **7:**1270–1275.

Celentano D, Nelson K, Suprasert S *et al.* Behavioural and sociodemographic risks for frequent visits to commercial sex workers among northern Thai men. *AIDS,* 1993; **7:**1647–1652.

Celentano D, Akarasewi P, Sussman L *et al.* HIV-1 infection among lower class commercial sex workers in Chiang Mai, Thailand. *AIDS,* 1994, **8:**533–537

Celentano D, Nelson K, Suprasert S, Eiumtrakul S, Galai N, Kuntolbutra S, Wright N, Theetranont Choti. Dynamics of Risk Behaviour for HIV Infection Among Young Thai Men. *Journal of Acquired Immune Deficiency Syndromes,* 1995, **10:**477–483.

Celentano D, Nelson K, Suprasert S, Eiumtrakul S, Tuvaltana S, Kuntolbutra S *et al.* [1996a]. Risk Factors for HIV-1 Seroconversion Among Young Men in Northern Thailand. *Journal of the American Medical Association,* 1996; **275:**122–127.

Celentano D, Nelson K, Suprasert S *et al.* [1996b]. Epidemiologic Risk Factors for Incident Sexually Transmitted Diseases in Young Thai Men. *Sexually Transmitted Diseases,* 1996, **23:**198–205.

Chompootaweep S, Yamarat K, Poomsuwan P, Dusitsin N. *A Study of Reproductive Health in Adolescence of Secondary School Students and Teachers in Bangkok.* Institute of Health Research, Chulalongkorn University, September 1988.

Choopanya K, Vanichseni S, Des Jarlais D *et al.* Risk factors and HIV seropositivity among injecting drug users in Bangkok. *AIDS,* 1991; **5:**1509–1513.

Choopanya K, Des Jarlais D, Vanichseni S, Raktham S, Friedmann P. *Risk factors for HIV seroprevalence among IDUs in Bangkok, 1989 vs. 1993.* Xth International Conference on AIDS, Yokohama, August 1994 [abstract no. PC0125].

Cohen C, Duerr A, Pruithithada N *et al.* Bacterial vaginosis and HIV seroprevalence among female commercial sex workers in Chiang Mai, Thailand. *AIDS,* 1995; **9:**1093–1097.

Des Jarlais D, Choopanya K, Vanichseni S *et al.* AIDS Risk Reduction and Reduced HIV Seroconversion among Injection Drug Users in Bangkok. *American Journal of Public Health,* 1994; **84:**452–455.

Des Jarlais D, Friedmann P, Hagan H, Friedman S. The Protective Effect of AIDS-Related Behavioural Change among Injection Drug Users: A Cross-National Study. *American Journal of Public Health,* 1996; **86:** 1780–1785.

Division of Epidemiology. First sentinel surveillance June 1989. *Weekly Epidemiology Survey Report (Thailand),* 1989; **20:**376–389.

Duerr A, Xia Z, Nagachinta T, Tovanabutra S, Tansuhaj A, Nelson K. *Probability of male-to-female HIV transmission among married couples in Chiang Mai, Thailand.* Xth International Conference on AIDS, Yokohama, August 1994 [abstract no. 105C].

Elkins D, Maticka-Tyndale E, Kuyyakanond T, Miller P, Haswell-Elkins M. Toward Reducing the Spread of HIV in north-eastern Thai Villages: Evaluation of a Village-Based Intervention. *AIDS Education and Prevention,* 1997; **9:**49–69.

Ford N, Kittisuksathit. Destinations unknown: the gender construction and changing nature of the sexual expressions of Thai youth. *AIDS Care,* 1994; **6:**517–531.

Ford N, Kittisuksathit S. *Youth Sexuality: The Sexual Awareness, Lifestyles and Related-Health Service Needs of Young, Single, Factory Workers in Thailand.* IPSR Publication No. 204, Mahidol University, 1996.

Fordham G. Whisky, Women and Song: Men, Alcohol and AIDS in Northern Thailand. *Austrian Journal of Anthropology,* 1995; **6:**154–177.

Gray J, Dore G, Li Y, Supawitkul S, Effler P, Kaldor J. HIV-1 infection among female commercial sex workers in rural Thailand. *AIDS,* 1997; **11:**89–94.

Hanenberg R, Rojanapithayakorn W, Kunasol P, Sokal D. Impact of Thailand's HIV-control programme as indicated by the decline of sexually transmitted diseases. *Lancet*, 1994; **344:**243–245.

Havanon N, Bennett A, Knodel J. *Sexual Networking in A Provincial Thai Setting.* AIDS Prevention Monograph Series Paper No. 1, FHI, AIDSCAP, Bangkok, 1992.

Havanon N, Bennett A, Knodel J. Sexual Networking in Provincial Thailand. *Studies in Family Planning*, 1993; **24:**1–17.

The HIV/AIDS Collaboration Thailand. *1995 Annual Report*, Nonthaburi, 1996.

Im-Em W. *Sexual relations and AIDS in Chiang Mai villages.* Presented at the XIth International Conference on AIDS, Vancouver, July 1996 [abstract no. Tu.D.2707].

Jugsudee A, Tanormklom S, Junlananto P, Chitapong A, Mason C, Markowitz L, Kangwalklai K. *HIV-1 Seroprevalence Among Young Adult Populations in Thailand, 1990-1995.* Presented at the XIth International Conference on AIDS, Vancouver, July 1996 [abstract no. Mo.C.1519].

Khamboonruang C, Beyrer C, Natpratan C *et al.* [1996a]. *HIV incidence in adults in Northern Thailand.* XIth International Conference on AIDS, Vancouver, July 1996.

Khamboonruang C, Beyrer C, Natpratan C, Keawvichit R, Wongworapat K, Eiumtrakul S, Celentano D, Nelson K *et al.* [1996b]. Human Immunodeficiency Virus Infection and Self-Treatment for Sexually Transmitted Diseases Among Northern Thai Men. *Sexual Transmitted Diseases*, 1996; **23:**264–263.

Kilmarx P, Limpakarnjanarat K, Uthaivoravit W, St. Louis M *et al. Declining prevalence of gonorrhea (GC) and chlamydia (CT) in female sex workers (FSW), Chiang Rai, Thailand.* XIth International Conference on AIDS, Vancouver, July 1996 [abstract Mo.C.440].

Kitayaporn D, Uneklabh C, Weniger B *et al.* HIV-1 incidence determined retrospectively among drug users in Bangkok, Thailand. *AIDS*, 1994; **8:**1443–1450.

Kitayaporn D, Kaewkungwal J, Bejrachandra S, Rungroug E, Chandanayingyong D, Mastro T [1996a]. Estimated rate of HIV-1 infectious but seronegative blood donations in Bangkok, Thailand. *AIDS*, 1996; **10:**1157–1162.

Kitayaporn D, Vanichseni S, Mastro T, Raktham S, DesJarlais D, Wasi C, Kampanartsanyakorn C, Sujarita S, Heyward W [1996b]. *HIV-1 positivity and willingness to participate in a prospective cohort of injecting drug users (IDUs) in Bangkok, Thailand.* XIth International Conference on AIDS, Vancouver, July 1996 [abstract no. We.C.461].

Knodel J, Pramualratana A. *Prospects for Increased Condom Use in Marital Unions in Thailand.* University of Michigan, PSC Research Report No. 95–337, March 1996.

Knodel J, VanLandingham M, Saengtienchai C, Pramualratana A. *Thai Views of Sexuality and Sexual Behaviour.* University of Michigan, PSC Research Report No. 96–363, March 1996.

Koetsawang S, Ford N. *An Investigation into the Psycho-Social Factors Influencing Condom Use among Female Sex Workers in Thailand.* Bangkok: Usa Press 1993.

Komatsu R, Sittitrai W, Brown T *et al. Diversity in the Commercial Sex Industry in Bangkok, Thailand.* Presented at the XIth International Conference on AIDS, Vancouver, July 1996 [abstract no. Tu.C.2661].

Kunawarawak P, Beyrer C, Natpratan C *et al.* The epidemiology of HIV and syphilis among male commercial sex workers in northern Thailand. *AIDS*, 1995; **9:**517–521.

Larson A, Elkins D, Maticka-Tyndale E *et al. Migration and Sexually Transmitted Infections in Rural North-east Thailand.* IUSSP Seminar on AIDS Impact and Prevention in the Developing World, Annecy, France, December 1993.

Limanonda B, Chongvatana N, Tirasawat P, Auwanit W. *Summary Report on The Demographic and Behavioural Study of Female Commercial Sex Workers in Thailand.* IPS, Chulalongkorn University, October 1993.

Limanonda B, van Griensven G, Chongvatana N *et al.* Condom Use and Risk Factors for HIV-1 Infection among Female Commercial Sex Workers in Thailand (letter to the editor). *American Journal of Public Health,* 1994; **84:**2026–2027.

Limpakarnjanarat K, Mastro T, Yindeeyoungyeon W *et al.* [1993a]. *STDs in female Prostitutes in Northern Thailand.* Presented at the IXth International Conference on AIDS, Berlin, 1993 [abstract PC–C10–2820].

Limpakarnjanarat K, Mastro T, Utaivorawit V, Korattana S, Young N, Weniger B [1993b]. *Management of Chlamydia and Gonorrhoea in a Cohort of Female Prostitutes in Northern Thailand.* IUVDT Conference, Chiang Mai, 1993.

Limpakarnjanarat K, Mastro T, Saisorn S *et al. Incidence of HIV-1 subtype E in a cohort of female prostitutes in Northern Thailand.* Yokohama abstract PC0365, 1994.

Limpakarnjanarat K, Mastro T, Korattana S *et al. HIV incidence and AIDS mortality in a cohort of female prostitutes in Chiang Rai, Thailand.* Chiangmai abstract B104, 1995.

MacQueen KM, Nopkesorn T, Sweat MD, Sawaengdee Y, Mastro T, Weniger B. Alcohol consumption, brothel attendance, and condom use: normative expectations among Thai military conscripts. *Medical Anthropology Quarterly,* 1996; **10:**402–423.

Mangclaviraj Y, Chaisilwattana P, Siriwasin W, Roongpisuthipong A, Shaffer N. *Risk factors and characteristics of HIV+ antenatal women, Bangkok Thailand. Bangkok Perinatal HIV Transmission Study.* Presented at the Xth International Conference on AIDS, August 1994, Yokohama [abstract no. PC0162].

Markowitz L, Sirisopana N, Chitwarakorn A, Siraprapasiri T, Julvanichpong W, Charonwatanachokchai A, Palanuvej T, Siriwongrangsun P, Mason C. *Enrollment and Baseline Characteristics of Person in a Study of HIV-1 Incidence in Thailand.* Presented at the XIth International Conference on AIDS, Vancouver, July 1996 [abstract no. Mo.C.1512].

Mason C, Markowitz L, Kitsiripornchai S *et al.* Declining prevalence of HIV-1 infection in young Thai men. *AIDS,* 1995; **9:**1061–1065.

Mastro T, De Vincenzi I. Probabilities of sexual HIV-1 transmission. *AIDS,* 1996; **10**(suppl A):S75–S82.

Mastro T, Limpakarnjanarat K. Condom use in Thailand: how much is it slowing the HIV/AIDS epidemic? *AIDS,* 1995; **9:**523–525.

Mastro T, Satten G, Nopkesorn T *et al.* Probability of female-to-male transmission of HIV-1 in Thailand. *Lancet,* 1994; **343:**204–207.

Mastro T, Kunanusont C, Dondero T, Wasi C. Why do HIV-1 subtypes segregate among persons with different risk behaviours in South Africa and Thailand. *AIDS,* 1997; **11:**113–116.

Maticka-Tyndale E, Haswell-Elkins M, Kuyyakanond T, Kiewying M, Elkins D [1994a]. A research-based HIV intervention in north-east Thailand. *Health Transition Review,* 1994; **4**(suppl): 349–367.

Maticka-Tyndale E, Kiewying M, Haswell-Elkins M, Kuyyakanond T, Anursornteerakul S, Chantapreeda N, Choosathan R, Sornchai S, Theerasobhon P, Supornpun A, Siriwattanametanont J, Elkins D [1994b]. Knowledge, Attitudes and Beliefs About HIV/AIDS Among Women in north-eastern Thailand. *AIDS Education and Prevention,* 1994; **6:**205–218.

Maticka-Tyndale E, Elkins D, Haswell-Elkins M, Rujkarakorn D, Kuyyakanond T, Stam K. Contexts and Patterns of Mens Commercial Sexual Partnerships in north-eastern Thailand: Implications for AIDS Prevention. *Social Science and Medicine,* 1997; **44:**199–213.

Morris M, Pramualratana A, Podhisita C, Wawer M. The relational determinants of condom use with commercial sex partners in Thailand. *AIDS,* 1995; **9:**507–515.

Morris M, Podhisita C, Wawer M, Handcock M. Bridge populations in the spread of HIV/AIDS in Thailand. *AIDS*, 1996; **10:**1265–1271.

Ministry of University Affairs. *Bibliography of AIDS Research in Thailand.* Ministry of University Affairs, Bangkok, September 1995.

Mugrditchian D, Benjarattanaporn P, Chitwarakorn A, Rojanapithayakorn W. *STD Trends in Bangkok: A Case for Cautious Optimism in the Fight Against AIDS.* IUVDT Conference, Chiangmai, 1992.

Natpratan C, Nantakwang D, Beyrer C, Kunawararak P, Gunhom C, Celentano D, Nelson K, Khamboonruang C. Feasibility of Northern Thai Factory Workers as Participants in HIV Vaccine Trials. *South-East Asian Journal of Tropical Medicine and Public Health*, 1996; **27:**457–462.

Nelson K, Celentano D, Suprasert S, Wright N *et al.* Risk Factors for HIV Infection Among Young Adult Men in Northern Thailand. *Journal of the American Medical Association*, 1993; **270:**955–960.

Nelson K, Beyrer C, Natpratan C *et al.* [1994a]. Preparatory Studies for Possible HIV Vaccine Trials in Northern Thailand. *AIDS Research & Human Retroviruses*, 1994; **10**(suppl 2):S243–S246.

Nelson K, Suriyanon V, Taylor E *et al.* [1994b]. The incidence of HIV-1 infections in village populations of northern Thailand. *AIDS*, 1994; **8:**951–955.

Nelson K, Celentano D, Kuntolbutra S [1994c]. Reply to VanLandingham (letter). *Journal of the American Medical Association*, 1994; **272:**1478.

Nelson K, Celentano D, Eiumtrakol S *et al.* Changes in Sexual Behaviour and A Decline in HIV Infection Among Young Men in Thailand. *New England Journal of Medicine*, 1996; **335:**297–303.

NESDB Working Group, Projections for HIV/AIDS in Thailand: 1987–2020. *NESDB*, Bangkok, November 1994.

Nopkesorn T, Mastro T, Sangkharomya S *et al.* [1993a]. *HIV-1 Seroconversion in a Cohort of Young Male Conscript in Northern Thailand.* Presented at the IXth International Conference on AIDS, Berlin, 1993 [abstract no. PO–C11–2832].

Nopkesorn T, Mastro T, Sangkharomya S *et al.* [1993b]. HIV infection in young men in northern Thailand. *AIDS*, 1993; **7:** 1233–1239.

Office of Population Technical Assistance. *Summary Report of 5 Rounds of Behavioural Surveillance in Bangkok.* Bangkok, 1996.

Phanuphak P, Poshyachina V, Un-eklabh T, and Rojanapithayakorn W. *HIV Transmission Among Intravenous Drug Abusers.* Presented at the Vth International Conference on AIDS, Montreal, 1989 [abstract T.G.O.25].

Phiromsawat S, Pothong S, Pongtha S, Pongsthorn T. Coital Experiences among Thai Male Teenagers in Technical School and High School in Bangkok. *Journal of the Medical Association of Thailand*, 1988; **71**(suppl.2):51–53.

Podhisita C, Wawer M, Pramualratana A, Kanungsukkasem U, McNamara R. Multiple Sexual Partners and Condom Use Among Long-Distance Truck Drivers in Thailand. *AIDS Education and Prevention*, 1996; **8:** 490–498.

Pritchard W, Machima K, and Panitchpakdi P. *Knowledge, Attitudes, Practice (KAP) of Contraception and AIDS Prevention among Dormitory Resident University Students in Bangkok.* PDA Report, October 1991.

Puthikanon K, Dangsupa P, Ratanavaraha C. *A Study of Knowledge and Preventive Behaviour against AIDS among a High-Risk Group in Lampang Province.* Northern Regional Epidemiology Center, Lampang, 1990.

Raktham S, Des Jarlais D, Choopanya K, Vanichseni S, Friedmann P. *Unsafe sexual behaviour among injecting drug users in Bangkok.* Presented at the XIth International Conference on AIDS, Vancouver, July 1996 [abstract no. Tu.C.2519].

Ramasoota T. Four Years Follow-up of the Impact of AIDS and Intensive Health Education on the Control of Sexually Transmitted Diseases in Thailand. *South-East Asian Journal of Tropical Diseases and Public Health*, 1991, **22:**489–498.

Rehle T, Brinkmann U, Siraprapasiri T *et al.* Risk Factors of HIV-1 Infection among Female Prostitutes in Khon Kaen, North-east Thailand. *Infection,* 1992; **20:**328–331.

Rojanapithayakorn W, Hanenberg R. The 100% Condom Program in Thailand - Editorial Review. *AIDS,* 1996; **10:**1–7.

Roongpisuthipong A, Siriwasin WQ, Chiayakul P, Bhiraleus P, Laosakkitiboran J, Shaffer N, Mastro T. *Husband HIV discordance among HIV-infected pregnant women, Bangkok, Thailand.* Presented at the Xth International Conference on AIDS, Yokohama, August 1994 [abstract no. 103C].

Rothman K. *Modern Epidemiology.* Boston: Little, Brown and Company, 1986.

Rungpao S, Pruithithada N, Yutabootr Y *et al.* Condom breakage during commercial sex in Chiang Mai, Thailand. *Contraception,* 1993; ***48:***537–547.

Rugpao S, Wongchak T, Beyrer C, Khamboonruang C, Yutabootr Y, Celentano D, Nelson K. Multiple condom use and decreased condom breakage and slippage in Thailand. *Journal of Acquired Immune Deficiency Syndromes,* 1997; **14:**169–173.

Sakondhavat C [1991a]. *Promoting Condom-Only Brothels Through Solidarity and Support for Brothel Managers (August 1990–April 1991).* Unpublished report, Khon Kaen University, October 1991.

Sakondhavat C [1991b]. Training of Brothel Managers to Implement Condom Only Policies (A Preliminary Report). *Thai AIDS Journal,* 1991; **3:**80–84.

Sakondhavat C, Bennett T, Oliver R [1991c]. *Promoting Condom-Only Brothels Through Solidarity and Support for Brothel Managers.* AIDSTECH Report, August 1991.

Satten GA, Mastro TD, Longini IM. Modeling the female-to-male per-act HIV transmission probability in an emerging epidemic. *Statistics in Medicine,* 1994; **13:**2097–2106.

Sawaengdee Y, Isarapakdee P. *Ethnographic Study of Long Haul Truck Drivers for Risk of HIV Infection.* AIDS-TECH report, May 1991.

Sawanpanyalert P, Ungchusak K, Thanprasertsuk T, Akarasewi P. HIV-1 seroconversion rates among female commercial sex workers, Chiang Mai, Thailand: a multi cross-sectional study. *AIDS,* 1994; **8:**825–829.

Sawanpanyalert P, Yanai H, Kituswannakul S, Nelson K. An Estimate of the Number of Human Immunodeficiency Virus (HIV)-Positive Blood Donations by HIV-Seronegative Donors in a Northern Thailand HIV Epicenter. *Journal of Infectious Diseases,* 1996; **174:**870–873.

Singhananetra-Renard A. *Population Movement and the AIDS Epidemic in Thailand.* IUSSP Seminar on Sexual Subcultures and Migration in the Era of STD/AIDS, Bangkok, February-March 1994.

Siraprapasiri T, Thanprasertsuk S, Rodklay A *et al.* Risk factors for HIV among prostitutes in Chiangmai, Thailand. *AIDS,* 1991; **5:**579–582.

Siraprapasiri T, Foy H, Kreiss J, Pruithitada N, Thongthub W. Frequency and Risk of HIV Infection Among Men Attending a Clinic for STD in Chiang Mai, Thailand. *South-East Asian Journal of Tropical Medicine and Hygiene,* 1996; **27:**96–101.

Sirisopana N, Torugsa K, Mason C *et al.* Correlates of HIV-1 Seropositivity Among Young Men in Thailand. *Journal of Acquired Immune Deficiency Syndromes,* 1996; **11:**492–498.

Sittitrai W, Brown T. Risk factors for HIV infection in Thailand. *AIDS,* 1994; **8**(suppl 2):S143–S153.

Sittitrai W, Phanuphak P, Barry J, Brown T [1992a]. *Thai Sexual Behaviour: A Report on the 1990 Survey of Partner Relations and Risk of HIV Infection in Thailand.* Thai Red Cross Society Research Report, Programme on AIDS, November 1992.

Sittitrai W, Sakondhavat C, Brown T [1992b]. *A Survey of Men Having Sex with Men in a North-eastern Thai Province.* Thai Red Cross Society Research Report No. 5, Programme on AIDS, June 1992.

Sittitrai W, Brown T, Sakondhavat C. Levels of HIV risk behaviour and AIDS knowledge in Thai men having sex with men. *AIDS Care,* 1993; **5:**261–271.

Sittitrai W, Phanuphak P, Roddy R [1994a]. *Male Bar Workers in Bangkok: an Intervention Trial.* Thai Red Cross Society Research Report no. 10, Programme on AIDS, Bangkok, 1994.

Sittitrai W, Phanuphak P, Barry J, Brown T [1994b]. A survey of Thai sexual behaviour and risk of HIV infection. *International Journal of STD & AIDS,* 1994;, **5:**377–378.

Sittitrai W, Brown T, Sirimahachaiyakul W, Jittangkul D, Phadungphon C, Carl G, Komatsu R. *Changes in the Distribution of Sex Work Settings Over Time in Bangkok, Thailand.* Presented at the XIth International Conference on AIDS, Vancouver, July 1996 [abstract no. Tu.C.2642].

Somseta S, Wacharapiyanone S. *Knowledge and Practice of Risk Behaviour Among Motorcycle Drivers in Songkhla Urban Area*. Presented at the XIth International Conference on AIDS, Vancouver, abstract, 1996.

Sonjai A, Chuengprasert N, Pechthanom L, Ratanasuwan W, Suwangool S. The Prevalence of HIV Infection and the Knowledge of AIDS Among Thai Laborers at Siriraj Hospital between 1994 and 1995. *Siriraj Hospital Gazette,* 1997; **49:**205–211.

Suriyanon V, Wanapirak C, Srisomboon J *et al. The association of STD with HIV transmission from HIV positive male blood donors to their regular female partners.* Presented at the XIth International Conference on AIDS, Vancouver, July 1996 [abstract Tu.C.2689].

Suwangool S, Sonjai A, Seriapinan S, Janyapoon K, Sivayahtorn A. HIV Infection in Male Patients Attending a Sexually Transmitted Disease Clinic. *Journal of the Medical Association of Thailand,* 1992, **75:**293–298.

Suwanagool S, Sonjai A, Ratanasuwan W *et al.* Risk Factors for HIV Infection Among Thai Laborers During 1992-1993. *Journal of the Medical Association of Thailand,* 1993; **76:**663–671.

Suwanagool S, Chaiyakul P, Ratanasuwan W *et al.* HIV-1 Infection among Low Income Women Attending A Siriraj Sexually Transmitted Disease Clinic: Socio-demographic Differentials. *Journal of the Medical Association of Thailand,* 1995; **78:**355–361.

Swaddiwudhipong W, Chaovakiratipong C, Siri S, Lerdlukanavonge P [1990a]. Sociodemographic characterisitics and incidence of gonorrhoea in prostitutes working near the Thai-Burmese border. *South-East Asian Journal of Tropical Medicine and Public Health,* 1990; **21:**45–52.

Swaddiwudhipong W, Nguntra P, Chaovakiratipong C *et al.* [1990b]. Effect of Health Education and Condom Promotion on Behavioural Change among Low Socioeconomic Prostitutes in Mae Sot, Tak, Thailand. *South-East Asian Journal of Tropical Medicine and Public Health,* 1990; **21:**453–457.

Sweat M, Denison J. Reducing HIV incidence in developing countries with structural and environmental interventions. *AIDS,* 1995; **9**(suppl A):S251–S257.

Thanprasertsuk S, Ungchusak K, Chokevivat V, Pinichpongse S [1991a]. *Three methods of condom usage assessment among female sex workers, Thailand.* Presented at the VIIth International Conference on AIDS, Florence, June 1991 [abstract no. M.D.4059].

Thanprasertsuk S, Ungchusak K, Chokevivat V, Pinichpongse S, Chantaras P [1991b]. Condom usage rate in sex workers, June 1990. *Thai AIDS Journal,* 1991; **3:**54–60.

Theetranont C, Suprasert S, Matanasarawoot A *et al.* Seroprevalence of HIV Antibodies and Risk Factors in Healthy Young Males from Upper North Thailand. *Journal of the Medical Association of Thailand,* 1994; **77:**288–292.

Thongthai V, Guest P. *Thai Sexual Attitudes and Behaviour: Results from a Recent National Survey.* Presented at Gender & Sexuality in Modern Thailand, ANU, July 1995.

Traisupa A, Teerathum C, Tharavanich S, Saengsue S. Seroprevalence of antibody to human immunodeficiency virus HIV-1 in a high-risk group in 4 provinces with tourist attractions. *Thai AIDS Journal,* 1990; **2:**57–63.

Tungphaisal S, Chandeying V, Sutthijumroon S, Krisanapan O [1989a]. KAP on Sexual Behaviour, Contraception, and STD Prevention among Hat Yai Teenagers. *Thai Journal of Obstetrics and Gynecology,* 1989; **1:**109–114.

Tungphaisal S, Krisanapan O, Chandeying V [1989b]. KAP Study of Contraception in Prince of Songkhla University Students. *Songkhla Medical Journal,* 1989; **7:**341–250.

Uneklabh C, Phutiprawan T. *Prevalence of HIV infection among Thai drug dependents.* Presented at the IVth International Conference on AIDS, Stockholm, June 1988 [abstract 5524].

Ungchusak K, Thanprasertsuk S, Aharasewi P *et al. Factors Associated with HIV-1 Infection Among Women in Brothel Prostitution, Chiangmai, Thailand.* Division of Epidemiology, Ministry of Public Health and PCMO Office, Chiangmai, 1990.

Ungchusak K, Rehle T, Aiemsukwat C *et al. HIV and other sexually transmitted diseases among sex workers and technical students in north-east Thailand.* Presented at the XIIIth International Conference on AIDS, Amsterdam, July 1992 [abstract no. ThC 1559].

Ungchusak K, Rehle T, Thammapornpilap P *et al.* [1996a]. Determinants of HIV Infection among Female Commercial Sex Workers in North-eastern Thailand: Results from a Longitudinal Study. *Journal of Acquired Immune Deficiency Syndromes,* 1996, **12:**500–507.

Ungchusak K, Sangwonloy O, Rujivipat V *et al.* [1996b]. *First HIV Sentinel Behaviour-Surveillance Among Male and Female Factory Workers in Thailand, 1995.* Presented at the XIth International Conference on AIDS, Vancouver, July 1996 [abstract no. Mo.D.1705].

Van Griensven G, Limanonda B, Chongwatana N *et al.* Socio-economic and demographic characteristics and HIV-1 infection among female commercial sex workers in Thailand. *AIDS Care,* 1995; **7:**557–565.

Vanichseni S, Sonchai W, Plansringarm K *et al.* [1989a]. *Second seroprevalence survey among Bangkoks intravenous drug addicts (IVDA).* Presented at the Vth International Conference on AIDS, Montreal, June 1989 [abstract TGO23].

Vanichseni S, Plansringarm K, Sonchai W, Akarasewi P, Wright N, Choopanya K [1989b]. First seroprevalence survey of intravenous drug users in Bangkok, Thailand. *Thai AIDS Journal,* 1989; **1:**75–82.

Vanichseni S, Wright N, Akarasewi P, Pokapanichwong W, Taylor D, Choopanya K [1989c]. *Case-control study of HIV positivity among male intravenous drug addicts (IVDA) in Bangkok.* Presented at the Vth International Conference on AIDS, Montreal, June 1989 [abstract no. W.G.P.19].

Vanichseni S, Sakuntanaga P *et al. Results of three seroprevalence studies for HIV in IVDU in Bangkok.* Presented at the VIth International Conference on AIDS, San Francisco, June 1990 [abstract FC105].

Vanichseni S, Wongsuwan B, Choopanya K, Jayavasu J [1991a]. Risk behaviours of the HIV infected IVDUs. *Thai AIDS Journal,* 1991; **3:**72–79.

Vanichseni S *et al.* [1991b]. *Patterns of change of risk behaviours of IDUs in Bangkok.* First National AIDS Conference in Thailand, March 1991.

Vanichseni S, Choopanya K, Des Jarlais D. HIV Testing and Sexual Behaviour Among Intravenous Drug Users in Bangkok, Thailand. *Journal of Acquired Immune Deficiency Syndromes,* 1992; **5:**1119–1123.

Vanichseni S, Des Jarlais D, Choopanya K *et al.* Condom use with primary partners among injecting drug users in Bangkok, Thailand and New York City, United States. *AIDS,* 1993; **7:**887–891.

Vanichseni S, Des Jarlais D, Choopanya K, Raktham S, Friedmann P. *Sexual risk behaviour among injecting drug users in Bangkok, 1989 vs. 1993.* Presented at the Xth International Conference on AIDS, Yokohama, August 1994 [abstract no. PC0121].

Vanichseni S, Choopanya K, Friedmann P, Raktham S. *Estimated HIV Incidence among Injecting Drug Users in Bangkok: Implication for a Vaccine Trial.* Presented at the IIIth International Conference on AIDS in Asia and the Pacific, Chiangmai, September 1995 [abstract PA813].

Vanichseni S, Kitayaporn D, Mastro T, Kampanartsanyakorn C, Raktham S, Sujarita S, Des Jarlais D, Wasi C, Esparza J, Heyward W. *HIV-1 incidence and follow-up in a prospective cohort of injecting drug users (IDUs) in Bangkok, Thailand.* Presented at the XIth International Conference on AIDS, Vancouver, July 1996 [abstract no. Th.C.421].

VanLandingham M, Grandjean N. *Some Cultural Underpinnings of Male Sexual Behaviour Patterns in Thailand.* IUSSP Seminar on Sexual Subcultures and Migration in the Era of STD/AIDS, Bangkok, February–March 1994.

VanLandingham M, Suprasert S, Sittitrai W, Vaddhanaphuti Chayan, Grandjean N. Sexual Activity Among Never-Married Men in Northern Thailand. *Demography,* 1993; **30:**297–313.

VanLandingham M, Suprasert S, Sittitrai W [1995a]. Two Views of Risky Sexual Practices Among Northern Thai Males: the Health Belief Model and the Theory of Reasoned Action. *Journal of Health and Social Behaviour,* 1995; **36:**195–212.

VanLandingham M, Knodel J, Saengtienchai C, Pramualratana A [1995b]. *Friends, Wives, and Extramarital Sex in Thailand: A Qualitative Study of Peer and Spousal Influence on Thai Male Extramarital Sexual Behaviour and Attitudes.* University of Michigan, Research Report No. 95–328, March 1995.

VanLandingham M, Knodel J, Saengtienchai C, Pramualratana A. *In the Company of Friends: Peer Influence on Thai Male Extramarital Sex.* University of Michigan, Research Report No. 96–260, February 1996.

Venereal Disease Division. *Annual Report for 1995.* Ministry of Public Health, Thailand, Bangkok, 1996.

Viravaidya M, Obremskey S, Lamsam S *et al.* [1994a]. *Economic and Social HIV/AIDS Prevention Strategies for Northern Thai Women: Operations Research.* Factory Worker Results Research Report No. 2, PDA/TRC, December 1994.

Viravaidya M, Obremskey S, Lamsam S *et al.* [1994b]. *Economic and Social HIV/AIDS Prevention Strategies for Northern Thai Women: Operations Research.* Village Research Results Research Report No. 1, PDA/TRC, December 1994.

Visrutaratna S, Lindan C, Sirhorachai A, Mandel J. “Superstar” and “model brothel”: developing and evaluating a condom promotion program for sex establishments in Chiang Mai, Thailand. *AIDS,* 1995; **9**(suppl 1):S69–S75.

Wasserheit J. Epidemiological Synergy: Interrelationships between Human Immunodeficiency Virus Infection and Other Sexually Transmitted Diseases. *Sexually Transmitted Diseases,* 1992; **19:**61–77.

Wawer M, Podhisita C, Kanungsukkasem U *et al.* Origins and Working Conditions of Female Sex Workers in Urban Thailand: Consequences of Social Context for HIV Transmission. *Social Science and Medicine,* 1996; **42:**453–462.

Weniger B, Limpakarnjanarat K, Ungchusak K *et al.* The epidemiology of HIV infection and AIDS in Thailand, *AIDS,* 1991; **5**(suppl 2):S71–S85.

Weniger B. Experience from HIV incidence cohorts in Thailand: implications for HIV vaccine efficacy trials. *AIDS,* 1994; **8:**1007–1010

Xenos P, Pitaktepsombati P, Sittitrai W. Partner Patterns in the Sexual Behaviour of Unmarried, Rural Thai Men. *Asian and Pacific Population Forum,* 1993; **6:**104–117.

Table of Contents

I. Introduction and overview

I.1 The beginnings of the Thai HIV/AIDS epidemic 5

I.2 An expanded response and its effects 6

I.3 Exploring the linkage of HIV/STD declines to behavioural change 6

II. Epidemiological trends in HIV and other sexually transmitted diseases

II.1 National HIV and STD monitoring systems 8

II.2 National time trends and geographical variations in HIV and STDs 8

II.3 Changes in HIV and STD incidences over time as seen in specific populations 10
- II.3.a Conscripts 10
- II.3.b Female sex workers 11
- II.3.c Injecting drug users 11
- II.3.d Men having sex with men 12
- II.3.e STD clinic attendees 13
- II.3.f General population 13

II.4 Overall trends in HIV incidence 13

III. Evidence of behavioural change in Thailand

III.1 Time trends and geographical variation in sexual risk—Behaviour from national surveys 15
- III.1.a The Survey of Partner Relations and Risk of HIV Infection 15
- III.1.a.1 Behavioural variation by gender 15
- III.1.a.2 Behavioural variation by urban/rural residence, education, and region 16
- III.1.b The Survey on the Effectiveness of AIDS Media on Behaviour and Values 16
- III.1.b.1 Overall risk behaviour reduction 16
- III.1.b.2 Trends in non-commercial casual sex behaviour 17
- III.1.b.3 Continued low condom use in casual sex 18
- III.1.b.4 Regional variations in behavioural change 18

III.2 Changes in behaviour in Bangkok and the provinces 19
- III.2.a The Bangkok Behavioural Surveillance System 19
- III.2.b The Provincial Sentinel Surveillance for HIV Risk Behaviour 20

III.3 Changes in behaviour over time as seen in specific populations 20
- III.3.a Conscripts 20
- III.3.b Female sex workers and their clients 21
- III.3.b.1 Condom use—Direct sex workers and clients 21
- III.3.b.2 Condom use—Indirect sex workers and clients 22
- III.3.b.3 Clients per night and numbers of sex workers 23
- III.3.b.4 Client choice of type of sexual establishment 23
- III.3.c Injecting drug users 25
- III.3.d Men having sex with men 25
- III.3.e Other population sub-groups 26

III.4 Overall trends in risk behaviour 26

IV. Linking behavioural change to the trends in HIV and STDs

IV.1 Finding the Links—Cross-sectional studies 28
- IV.1.a Behavioural factors influencing infection in men 28
- IV.1.a.1 Commercial sex 28
- IV.1.a.2 History of STDs 29
- IV.1.a.3 Sex with non-commercial casual sex partners 29

IV.1.a.4 Having sex with other men 29
IV.1.a.5 Condom use 29
IV.1.a.6 Other factors 30
IV.1.b Behavioural factors influencing infection in women 30
IV.1.b.1 Sex workers: Client numbers 30
IV.1.b.2 Sex workers: Duration of employment 31
IV.1.b.3 Sex workers: Condom use 31
IV.1.b.4 Sex workers: Other STDs 31
IV.1.b.5 Sex workers: Mobility and other factors 31
IV.1.b.6 General female population: Sex with husbands and boyfriends 31
IV.1.c Behavioural factors influencing infection in IDUs 32

IV.2 Establishing the links—Seroconversion studies 33
IV.2.a Behavioural risks for seroconversion among conscripts 33
IV.2.b Behavioural risks for seroconversion among sex workers 36
IV.2.c Other studies linking condom use and STDs 36
IV.2.d Behavioural risks for seroconversion among IDUs 37

IV.3 Regional and national patterns of change in behaviour and epidemiology 38

IV.4 Behavioural change has altered the course of the Thai epidemic 40

V. Behavioural change slows the Thai epidemic—A national picture 40

VI. Practical implications for national policy and program design in Thailand

VI.1 The evolving Thai epidemic—The need for a dynamic response 44

VI.2 Monitoring behavioural and epidemiological change 45

VI.3 Improving prevention programmes and reducing incidence 48

Appendix A **Bibliography** 51

Appendix B **Risk factors for HIV infection**

Univariate odds ratios for males infected with HIV–Table B-1 61

Univariate odds ratios for females infected with HIV–Table B-2 62

Univariate relative risks for HIV infection–Table B-3 63