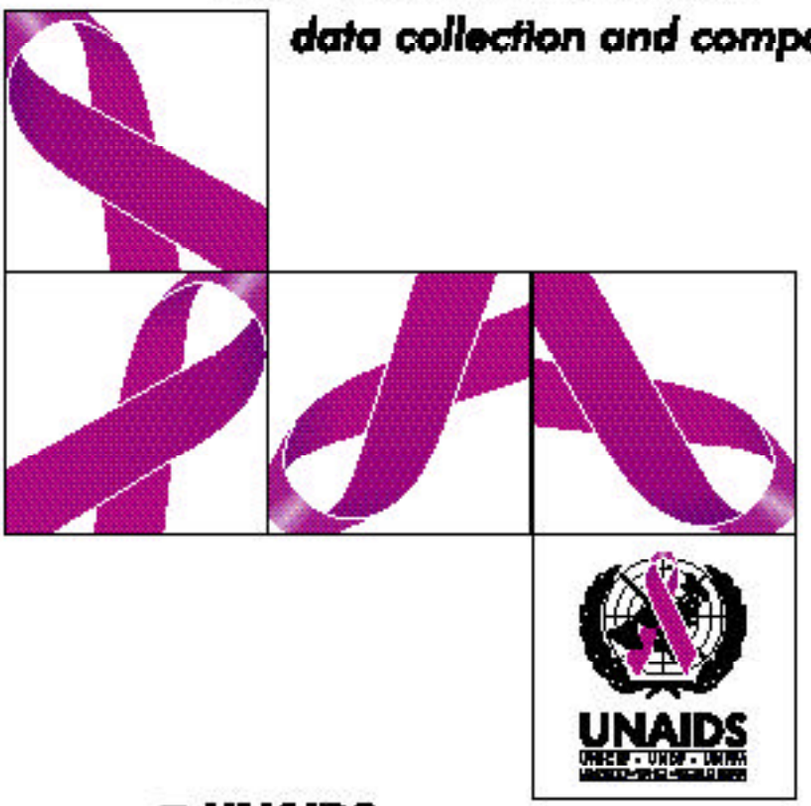
Connecting lower HIV infection rates with changes in sexual behaviour in Thailand:

data collection and comparison



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Case study

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Connecting lower HIV infection rates with changes in sexual behaviour in Thailand: data collection and comparison

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Introduction

Since the early days of the AIDS pandemic, people have talked about the need to change behaviours in order to slow the spread of HIV. Yet it has rarely been clearly demonstrated that behavioural change on a national scale actually does change the course of the epidemic. Epidemiologists and behavioural scientists have often found it difficult to track the spread of HIV across different populations and geographic areas. They have found it even more difficult to track the behaviours that fuel the epidemic. Perhaps the greatest challenge of all has been to establish links between behaviour and the spread of HIV on a national scale, and, more importantly, to show that changes in behaviour really can lead to reductions in the rate of new infections.

Policy-makers, the general public and communities affected by the epidemic need to see that investment in promoting behavioural change has paid off, not just in reducing risk behaviour but in cutting the number of new infections. A clear link between behavioural change and declining infection rates translates into clear support for continued prevention efforts.

Few countries are able to draw the link between behaviour and HIV infection as unambiguously as Thailand. This case study looks at the tools Thailand uses to track both the virus and the behaviours related to it. It describes trends in infection and behaviour recorded in Thailand, and shows links between the two. The case study also points to the importance of continued tracking of behaviour and infection to keep up with a constantly changing epidemic.

Full references for papers cited in this case study are listed in UNAIDS *Best Practices* Collection Key Material: "The relationship of HIV & STD declines in Thailand to behavioural change: a synthesis of existing studies".

HIV in Thailand—the early days

HIV was first recorded in Thailand in the mid-1980s among men who had sex with other men. Health officials began to track other vulnerable populations such as injecting drug users (IDUs) and sex workers, but found little evidence of HIV infection. Then, in early 1988, ongoing surveys at a hospital in Bangkok sounded an alarm. Less than 1% of drug injectors tested at the end of 1987 were HIV positive; half a year later that proportion had soared to over 30%.

At the same time, surveys among sex workers around the country began to show low levels of infection. The Ministry of Public Health reacted quickly by establishing a national sentinel surveillance system. By mid-1989, this system found HIV in all 14 provinces with sentinel sites; among sex workers in the northern city of Chiangmai, infection was running at a shocking 44%. As the system expanded to all provinces the following year, reports of HIV infection among sex workers and their clients—men being treated for sexually transmitted diseases (STDs)—came in from province after province. Antenatal clinics in about one-third of Thailand's 73 provinces also found HIV infection in some pregnant women.

Warning signals and a quick response

In 1989, as evidence of a heterosexual HIV epidemic mounted, Thailand carried out a national survey of sexual behaviour. It showed that a high proportion of men had sex before and outside

marriage, mostly with sex workers. The results of this survey were widely publicized; government officials and the general public were made aware that Thailand might well be headed for a major HIV epidemic.

Again, the government and society reacted quickly. The Prime Minister took direct responsibility for the National AIDS Committee, and the state decided to finance a comprehensive response. By 1996, the government was spending US$ 80 million a year on education, prevention, care and impact alleviation.

Many communities, including those living with HIV, as well as private business, contributed to the national effort. Among the most dynamic responses was that of the sex work community, which took action under pressure from state authorities. To reduce transmission in what the evidence suggested was a focal point for infection in Thailand, brothel owners and sex workers began to enforce a policy of 100% condom use. At the same time, free condoms were provided by the government for commercial sex and television and radio spots stressed that men should use condoms with prostitutes.

Thailand's efforts resulted in behavioural change, and that behavioural change can be strongly linked to a decrease in new infections.

Epidemiological information

Sources of information

Thailand established a **sentinel surveillance system** for HIV in 1987, early in the epidemic. Beginning in 14 provinces and rapidly expanded across the country, the system was able to determine levels of infection in various vulnerable and general population groups: sex workers, male STD patients and IDUs as well as pregnant women and blood donors.

Another important source of epidemiological information is the anonymous-unlinked testing of 60,000 21-year-old men chosen each year as **military recruits**. Selection of recruits is by lottery, so the group is relatively representative of young men across the country.

Data about **other STDs** also offers useful corroborating information about HIV, since these diseases are largely transmitted by sexual activity. If people are curtailing or modifying the behaviours that expose them to HIV—principally unprotected sex with partners whose sexual history may include risk behaviour—we would expect to see a drop in new cases of other STDs as well as of HIV.

Data on HIV gathered through cross-sectional monitoring—that is, testing of a certain population at single points in time—can be validated with longitudinal **cohort studies** that follow individuals over time to determine how many become infected within a certain period. In Thailand, such studies are available for a number of different groups, including repeat blood donors.

What these sources show

- **Overall levels of infection**

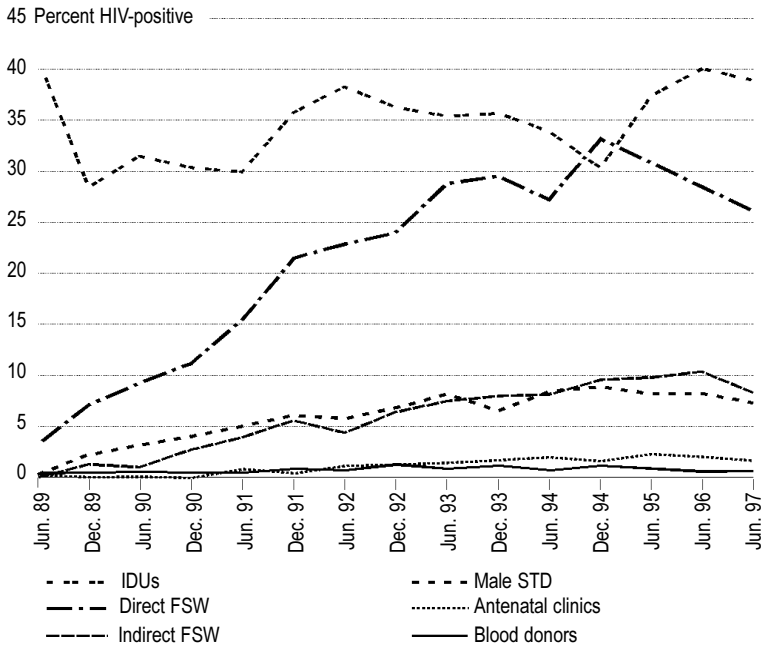
Sentinel surveillance and other sources of cross-sectional information give a picture of HIV prevalence—the proportion of people testing positive at any one time. Because HIV is an incurable chronic disease, infected people may stay in the tested population for long periods of time. That means that prevalence

figures will include people who were infected as many as 10 years ago, and therefore will be slow to reflect changes in incidence, or new infections.

Figure 1 shows HIV prevalence in various groups followed in sentinel surveillance. HIV infection in female sex workers in brothels has climbed steadily until by 1995 nearly one-third of brothel workers tested were HIV positive. Sex workers working "indirectly" from restaurants, bars, karaoke lounges, etc., have seen infection level off at around 12%, about the same rate as for male STD patients, who generally report that they are clients of sex workers. In blood donors and pregnant women, rates have remained relatively low, but even so, over 2% of pregnant women nationally were testing positive in mid-1995.

Infection rates remain largely unchanged in IDUs, over one-third of whom were already infected when sentinel surveillance began. When a prevalence rate is stable it does not mean there are no new infections, but rather that there is one new infection for every person dying or dropping out of the testing group. Since the epidemic among IDUs is a decade old, it is reasonable to assume that many of those infected early in the epidemic are now dying. The stable prevalence figures may, therefore, conceal considerable levels of new infection, and indeed studies over the years have found 5% to 10% of IDUs become infected with HIV each year.

Figure 1. HIV prevalence from sentinel serosurveillance, Thailand, 1989–1997
Source: Epidemiology Division, Ministry of Public Health, Thailand



First signs of a decline in HIV

Although the data gathered from annual testing of military conscripts are also cross-sectional, they tell us rather more than ordinary surveillance data do. A different group of 21-year-olds is tested each year; from this we can easily determine trends in prevalence in that age group.

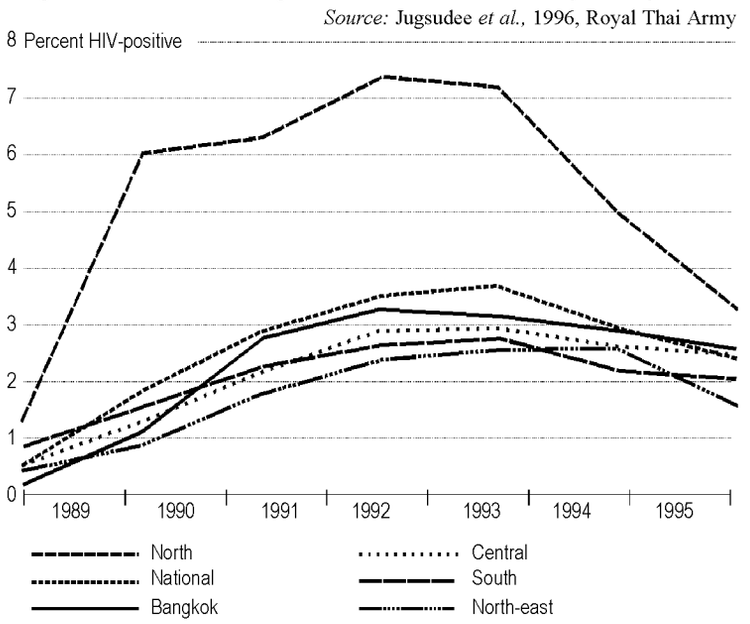
The average age at first sex for young Thai men is 18, so it is reasonable to assume that many of the conscripts have been sexually active for only a few years. In this young group, HIV prevalence

figures will therefore reflect sexual behaviour in the few years before the testing date, and changes over time are likely to reflect changes in risk behaviour in recent years.

Figure 2 shows that nationally fewer 21-year-old conscripts were infected in 1995 than in the peak years of 1992–93, and that this was especially true of the heavily-infected northern region.

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

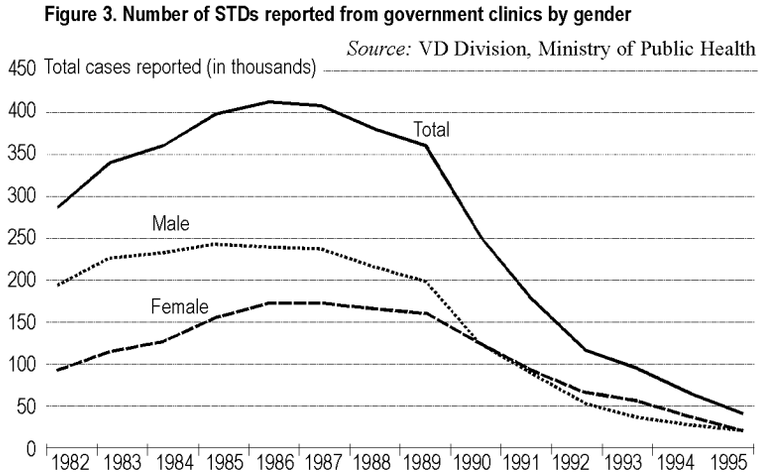
Source: Jugsudee *et al.*, 1996, Royal Thai Army



Since other sexually transmitted diseases are curable, reported cases of new STD are a more reliable indicator of sexual risk behaviour in the recent past than HIV prevalence data, which may reflect risk behaviour of a decade or more in the past. In Thailand, STD prevalence data are available only for people who seek treatment at government clinics; the sizeable private sector client base is not included. While the data shown in Figure 3 are therefore incomplete, they suggest strongly that unprotected sex with high-risk partners is on the decline.

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

Source: VD Division, Ministry of Public Health



■ **New infections declining**

The most convincing evidence of recent changes in levels of infection comes from longitudinal cohort studies that measure the rate of new infections, or incidence. Such studies follow people over time, calculating how many people become infected for each year (or month) they are followed. Incidence rates are normally expressed in terms of the number of new infections per 100 "person years" or 100 "person months" of follow-up. Among conscripts in the north, new HIV infections fell from 3.2 per 100 person years in 1991 to just 0.3 per 100 person years in 1995. Other STDs also fell in this group, by a margin similar to that reported by government clinics as seen in Figure 3. This finding suggests that the drop in STD rates seen at government clinics is real and not a result of people's seeking treatment elsewhere.

Among sex workers, HIV seroconversion rates were far higher, although several studies have shown that new infections among sex workers are also declining. In one rural area in the north, the rate of new infections rose from 12 per 100 person months in 1989 and 1990 to 17 in 1991, before falling back to 9 per 100 person months in 1992 and 1993. Note that incidence rates for sex workers were often given in person months because new infections, especially during the first years of the Thai epidemic, were occurring rapidly. These continuing infections show the importance of consistent condom use. While overall 90% of sexual contacts may be protected, those sex workers who do not use condoms with all of their clients and other sexual partners may still quickly become infected with HIV.

Encouragingly, new STD infections among sex workers have shown an even sharper drop than HIV, and are again in line with government clinic data.

Figure 1 showed significant differences in overall levels of HIV infection between brothel-based and indirect sex workers. These are confirmed by large differences in recorded new infection in these two groups—29 new infections per 100 person years of follow-up for brothel workers in one northern study in 1993, against 0.9 new infections among indirect sex workers.

Information for other groups is less readily available—HIV incidence among male sex workers in gay bars in the north was shown to be consistently high at around 12 per 100 person years between 1989 and 1994. However this may not be generalized to all men who have sex with men because gay bar workers are at elevated risk of HIV infection and also are predominantly heterosexual in Thailand, often visiting female sex workers. Repeat testing of individual blood donors has shown a drop from 1.7 infections per 100 person years between 1989 and 1990 to 0.5 by 1994. This may, however, reflect a growing reluctance to give blood among people whose behaviour puts them at risk of HIV infection.

Behavioural information

Sources of information

National surveys of knowledge about HIV and AIDS and sexual and other risk behaviours were conducted in 1990 and 1993. The first questioned over 2800 men and women aged between 15 and 49 selected randomly from across the country. The second, which used a similar sampling frame and asked similar questions, collected information from close to 4100 respondents. The surveys were specifically designed for comparability, so their results can be compared to give a picture of changing attitudes and behaviours over time.

A behavioural surveillance system was established in Bangkok in 1993. This system, which works rather like a sentinel surveillance system for HIV infection, questions different people drawn from a defined population at regular intervals to get a picture of trends in behaviour over time. In Bangkok, the system tracks behaviour among blue-collar and white-collar workers and vocational students of both sexes, male STD patients, pregnant women and sex workers. Since 1995, another national behavioural surveillance system has been implemented in 19 provinces where it tracks behaviour among military conscripts, factory workers, students and pregnant women. Both systems look at behaviour among 15- to 29-year-olds. This age group has a higher rate of partner change than people in their 30s and 40s, so more risk behaviour may be expected in the surveillance population than was reported in national survey data.

Cohort studies have been used to track behaviour by following individuals in various populations and recording their reported behaviours. These studies exist for military conscripts, sex workers, IDUs and some others.

What these sources show

Between the first and second national behavioural surveys, many sections of Thai society became involved in the national response to HIV. Information about the epidemic was widely available, education campaigns were common and condom use was actively promoted, especially in brothels. The effect of these campaigns can be seen in reported changes in risk behaviour between 1990 and 1993.

▮ Non-marital sex

While 28% of all 15- to 49-year-old men and 1.7% of all women reported non-marital sex in 1990, the figures dropped to 15% of men and just 0.4% of women by 1993. The proportion of men saying they had visited a sex worker in the past year fell to 10% in 1993 from 22% in 1990. Among younger Thais the evidence of behavioural change is even more pronounced. For example, commercial sex in the preceding year fell from 57% in the northern conscript cohort of 21-year-olds enrolled in 1991 to 24% in the cohort enrolled four years later. A decrease of similar magnitude was seen between 1993 and mid-1996 in the Bangkok behavioural surveillance data.

Despite these gains, a significant portion of the population in some occupations or geographic regions still engages in high-risk behaviour. For example, the national behavioural surveillance found that close to one-third of young male factory workers in the provinces said they had paid for sex in the past year. Furthermore, 15% of young female factory workers reported casual sex in the last year, a higher level than among similar workers seen in Bangkok.

▮ Condom use

Reported condom use has risen dramatically in commercial sexual encounters, but far less dramatically in non-commercial ones. Over 70% of clients of sex workers said they always used a condom in the 1993 national survey, nearly twice as many as the 36% who said that in 1990. Some 93% of northern conscripts questioned in 1995 about condom use at their last commercial sexual encounter reported using protection, up from 61% four years earlier. In Bangkok's behavioural surveillance, brothel-based sex workers have for four years reported condom use with non-regular clients at around 90%.

Indirect sex workers have been harder to reach with condom promotion schemes. In several studies, condom use for indirect sex workers is lower than for brothel workers. In one study, consistent condom use among restaurant-based sex workers was below 50%. Some indication of increases in condom use at indirect sites have been seen, e.g., the Bangkok surveillance system has tracked a steady rise in condom use in indirect commercial sex.

However, there is also evidence that men are shifting away from brothels towards indirect sex sites in the belief that these are "safer". In the late 1980s, half of Bangkok's sex workers were based in brothels. By the mid-1990s, that proportion had shrunk to one-third.

Thailand's high reported rates of condom use have been questioned, even though reported condom use tallies fairly well with distribution and sales of condoms in the country. Researchers posing as sex work clients have shown that they are, in fact, overstated, but the margin is not large. However, significant differences are seen in condom use with regular as against non-regular clients. In one study, sex workers who reported 90% condom use when calculated over the last three sexual encounters reported only about 70% consistent condom use over the whole of the preceding week. Much of this difference between overall and consistent condom use is attributed to much lower condom use with clients that these women see regularly.

Condom use appears to be lower among men from rural areas, and among men with limited education. In the national behavioural surveillance in the provinces, only half the men reporting commercial sex said they had always used a condom, again indicating that many men continue to take risks with at least some of their partners.

Condom use is also commonly reported as low with casual partners, by both men and women. It is rarely over 30%, and in the provincial surveillance system just 6% of women reporting casual sex say they consistently use condoms. Among married women, condom use at last sexual encounter remains well below 10%. Although very few behavioural data are available for men who have sex with other men, the national behavioural surveillance finds low condom use in sex between men.

Drug injecting

Behavioural surveys among Bangkok's drug users show a dramatic early drop in sharing of equipment, from 66.5% in 1989 to 24% two years later. It seems, however, that some of those gains may have been eroded, with mid-1995 surveys showing 43% of injectors sharing equipment.

Linking epidemiological patterns with behaviour

The data from Thailand show that HIV infection rates are falling, and they show that behaviour is changing. It remains to connect those two trends. Using the Thai data, we can investigate such links in three steps. This case study seeks to:

- identify which behaviours are related to HIV infection;
- follow those behaviours over time to see whether they lead to infection or protect from it;
- demonstrate that regional and national patterns of behaviour correctly predict patterns of infection, both geographically and over time.

Identifying risk behaviour—cross-sectional studies

An examination of cross-sectional data will help establish what behaviours are linked with HIV infection. By looking at who is infected at a given time and comparing their characteristics and behaviours with those of people who are not infected, epidemiologists can establish that certain factors or behaviours are correlated with higher levels of infection. They usually express their findings in terms of odds ratios of infection: the ratio of the likelihood of getting the disease if one engages in a certain behaviour to the likelihood of getting it if one does not engage in that behaviour. An odds ratio of 4 (i.e., 4:1) means that a person with the characteristic or behaviour under investigation is four times as likely as someone without that characteristic to be infected, while an odds ratio of 0.5 means they are half as likely.

▮ Commercial sex

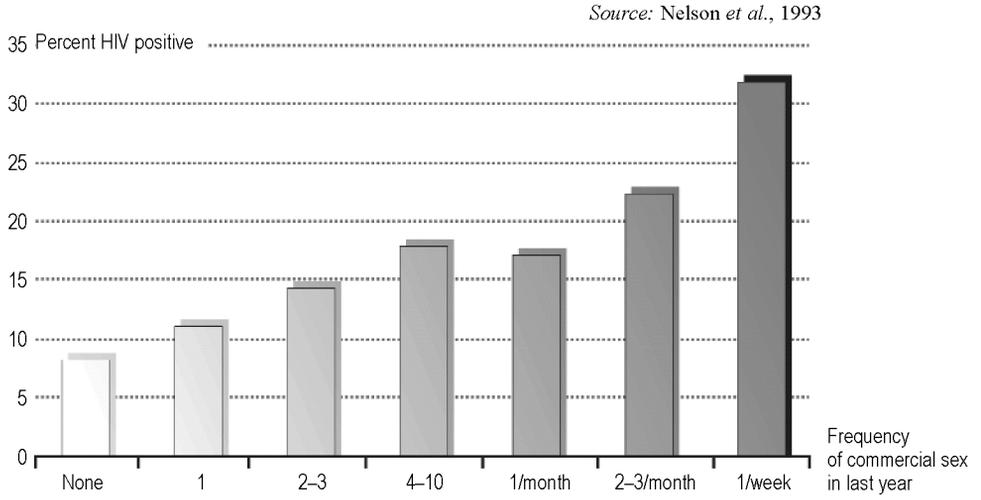
The behaviour most closely associated with HIV infection in Thai studies is a history of commercial sex, which has an odds ratio of between 3.6 and 13.6 across studies.

In one study, shown in Figure 4, the percentage of military conscripts testing positive for HIV rose in almost direct proportion to the number of times they had visited sex workers in the preceding year.

For sex workers, there is a strong correlation between number of clients per day and HIV infection. One Chiangmai study detected HIV levels of 4% in women with one client a day, as against 62% in women with six or more clients a day.

Figure 4. Percentage of conscripts testing HIV positive, by the number of visits to sex workers in the preceding year

Source: Nelson *et al.*, 1993



▮ STDs

A history of other STDs, which is independently related both to commercial sex and to HIV infection, was also shown to be associated with odds ratios for HIV infection ranging from 2.3 to 13.4 in men. There are two reasons for this: biologically those with other STDs have an increased probability of contracting or transmitting HIV (the role of STD-induced genital ulcers as well as non-ulcerative STD as cofactors in sexual transmission is well established); and they are frequently individuals with many sexual partners, which increases the risk of having a partner with HIV.

Condom use

Logic would suggest that condom use would be associated with lower rates of HIV infection. But in studies done early in the epidemic the reverse was true: men with higher rates of condom use had higher HIV infection levels. This may be because the men most likely to use condoms were also those more likely to have had a long history of risk behaviour. Since use of condoms only became common in Thailand around 1991 or 1992, many of the more sexually active men were infected before they started using condoms on a regular basis. This exposes a serious weakness in cross-sectional studies: while they ask about recent behaviour (usually condom use in the past year), they are detecting infections that may have occurred over many years —including times before condom use was adopted. In recent studies, completed after condom use had been common for several years, the expected relationship of increased condom use with lower HIV prevalence has emerged. In addition, numerous cohort studies, which follow uninfected individuals over time and thus are examining both recent behaviours and recent infections, have also demonstrated the protective effects of condom use.

Other factors

For other factors, such as levels of casual sex or male-male sex, it is hard to establish clear relationships between risk behaviour and infection in cross-sectional studies. This is at least in part because it is hard to disentangle these behaviours from other contributors to risk. For instance, men who have sex with other men or who have casual partners have sometimes been found to be more likely also to visit female sex workers.

A high proportion of HIV-infected women in the general population report no risk behaviour other than having sex with their husbands. Interestingly, one strong association found in one study is between freedom from HIV infection and the ability to communicate about sex with partners. Nearly three-quarters of uninfected women say they can discuss sex openly with their partners, whereas only 15% of infected women feel able to hold such discussions.

For IDUs, sharing equipment after the start of injection is significantly correlated with higher levels of HIV. A history of imprisonment is also a risk factor; whether that is due to in-prison drug use or sexual activity or to a change in attitudes toward high-risk behaviour following incarceration is not known.

Cross-sectional surveys can, then, give some indication of behaviours associated with higher levels of infection. But they cannot easily establish which factor causes the other. Further, some relationships can appear to be the reverse of what might be expected, because they are confounded by other factors, as is seen in the discussion of condom use.

To investigate these links more clearly, longitudinal cohort studies are needed.

Following risk behaviours to infection—cohort studies

Epidemiologists use several criteria to establish that a certain exposure or behaviour leads to a disease. These include:

- strength of association: the stronger the association (correlation) between the exposure and the disease reflected in the odds ratio (relative risk of infection), the more likely the relationship is to be causal;

- **dose-response relationship:** if a greater "dose" of exposure correlates with a greater likelihood of disease, it is likely that the exposure caused the disease;
- **consistency:** similar results across different study designs and different populations are a sign that a relationship is likely to be causal;
- **temporal relationship:** obviously, for a behaviour to cause a disease or result in disease transmission, it must precede the disease.

As we have seen, based on the first three criteria, cross-sectional studies have gone a long way to establish the link between higher risk of HIV and greater sexual risk behaviour, at least as far as sex with sex workers is concerned. The essential fourth criterion is more difficult to establish with cross-sectional studies, especially in the case of a chronic incurable infection such as HIV, in which risk behaviour may have preceded the discovery of the outcome by many years. Temporal relationships can, however, be investigated in cohort studies.

A longitudinal cohort study follows a group of people over time. These people are not infected at the outset: the degree of their exposure to infection (in the case of HIV, their risk behaviours) is recorded at the start of the study and throughout the follow-up period. Infection is recorded, and the behaviours of those who become infected are compared with the behaviours of those who do not become infected.

Commercial sex

For military conscripts who began the study HIV negative, the single most important factor correlated with seroconversion was visits to sex workers. In one study, men who had visited a sex worker in the six months between HIV tests were 5.2 times as likely to become infected as those who did not; in another study clients of sex workers were 3.6 times as likely to seroconvert. This establishes that visits to sex workers occurs in the same relatively short time periods as seroconversion, showing a strong association between exposure and infection, and suggesting as well that visits to sex workers precede seroconversion. One of the studies also showed a strong dose-response relationship, with a higher number of visits to a sex worker in the preceding six months greatly increasing the odds of infection both with HIV and with other STDs.

Condom use

In cohort studies among conscripts, condom use during commercial sex clearly protected against infection. One study showed that a client who used condoms in fewer than half of his visits to sex workers was 6.4 times more likely to become infected than a man using condoms in more than half his visits. Another study, shown in Table 1, reported that the more frequently a client used condoms during commercial sex, the less likely he was to seroconvert or to contract other STDs.

Table 1. Seroconversion and STD incidence rates for men using condoms in commercial sex

Source: Celentano *et al.*, 1996

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

It is worth noting, however, that even men reporting consistent condom use had relatively high rates of seroconversion, suggesting they may have been over-reporting correct and consistent use.

Male sex workers who had never used condoms were nearly five times as likely to become infected with HIV as those who had (ever) used condoms. However, longitudinal studies of female sex workers have not reported conclusive data on condom use. One study looking at condom use among sex workers found no protective effect against HIV despite their reported use with 90% of clients. However, as mentioned earlier, when the number of sexual partners is high, consistency of condom use is critical and some sex workers make frequent exceptions for regular clients or regular partners. When condom use is truly consistent, benefits are seen. For example, series of cross-sectional studies in indirect sex workers conducted by the Bangkok behavioural surveillance system shows a close match between falling rates of STD symptoms and consistent use of condoms.

Drug injecting

Cohort studies among drug injectors are rare. One retrospective cohort study confirmed that ceasing to share equipment lowered the risk of becoming infected with HIV. It confirmed, too, the observation made in cross-sectional studies that HIV-negative IDUs who had gone to prison were more likely to contract HIV than those who had not been incarcerated.

Comparing national patterns

Cohort studies have, then, confirmed evidence seen in cross-sectional studies indicating that the Thai epidemic has been driven predominantly by risky sexual behaviour. They have also confirmed that the number of new infections dropped in people who cut down on risky sexual behaviour or never started it.

Consistent links in the north

Because HIV status can reflect risk taken many years before, behavioural change will not translate instantly into lower HIV prevalence. Even with that in mind, a pattern of lower risk behaviour and HIV prevalence is compellingly drawn by a study of 21-year-old military conscripts in the severely affected northern region of Thailand. As Figure 5 shows, less commercial sex and greater use of condoms was followed by lower STD and HIV rates across the northern region. In an attempt to understand how much HIV infection in 21-year-olds is related to risk behaviour engaged in before the start of behavioural change, the same study looked separately at infection rates in those of the 1995 cohort of conscripts who began their sexual lives after 1992 (when the 100% Condom Use Campaign was in force). The study found that these men were only one-tenth as likely to be HIV positive as men in the cohort as a whole.

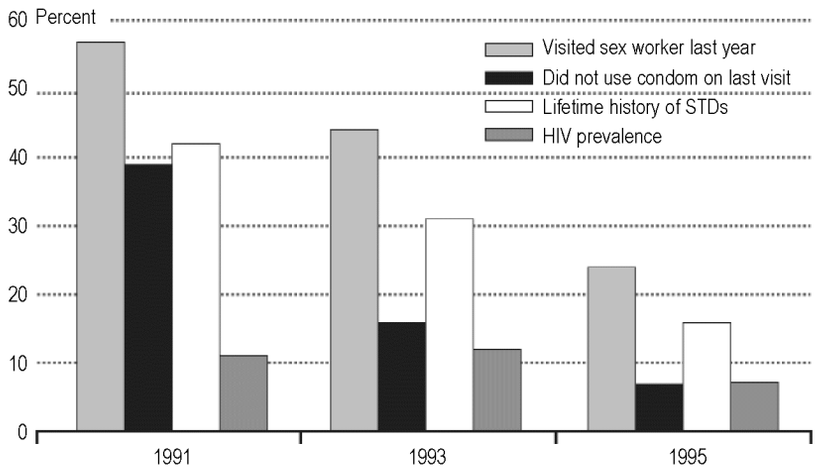
Other comparisons of data from independent sources also confirm that STD and HIV prevalence mirror behaviour across the country:

- The decline in STD rates reported from government clinics in nine randomly selected provinces largely mirrored the decline in the number of commercial sex encounters reported in surveys in those same provinces.

- As non-use of condoms with commercial sex workers became less common across the country throughout the early 1990s, so did the number of cases of STDs reported by government clinics (see Figure 6).
- HIV prevalence in conscripts from various regions reflected the levels of unprotected commercial sex reported by men in those regions, except in the north.

Figure 5. Behavioural change and HIV/STD decline among 21-year-old men in the north

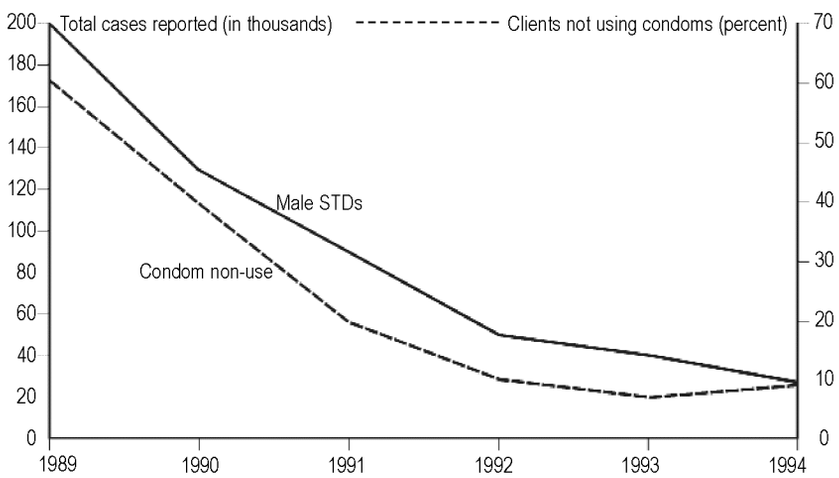
Source: Nelson *et al.*, 1996



In the north, HIV prevalence was far higher than the level predicted by levels of unprotected commercial sex. It is worth noting that the epidemic in the north appears to be older than that in other areas of Thailand, perhaps due to greater incidence of injecting drug use in that region. The virus began spreading widely before behavioural change became common. In other provinces, by contrast, people began adopting safe behaviours before the virus began its explosive growth. Indeed, it is very encouraging to note that in Thailand, behavioural change in most areas occurred long before the effect of the epidemic (in terms of AIDS-related deaths) was seen.

Figure 6. STD rates decline along with non-use of condoms

Source: VD Division, Epidemiology Division, Ministry of Public Health, Thailand



Keeping track of a dynamic epidemic

Thailand has done an exceptional job both of tracking the epidemic and of attacking its roots. As the evidence gathered in this case study clearly shows, the biggest risk behaviour for HIV infection in Thailand—unprotected sex with a sex worker or the clients of sex workers—is on the decline. As a result, rates of new HIV infections and other STDs are also declining.

But the epidemiology of HIV is dynamic; closing off one avenue of transmission by changes in behaviour has the effect of driving the virus in different directions, to other routes of transmission. As unprotected commercial sex recedes, other risky behaviours will contribute an increasing proportion of new infections. Behavioural surveillance is beginning to point towards some possible routes of continued transmission. They include:

- a shift to indirect commercial sex, where condom use is lower and harder to promote than in brothels;
- casual sex, with continuing very low levels of condom use;
- inconsistent condom use by sex workers with regular clients and partners;
- continued unprotected sex between men and their male partners;
- continued risk behaviour among drug injectors, including possible risk behaviour in prison.

These behaviours, and the individuals who engage in them, are far harder to identify than was the case with the brothel-based commercial sex that fuelled the epidemic in its early years. To understand shifts in risk behaviour and to identify appropriate responses, Thailand will need to expand monitoring and surveillance in these areas.

Conclusion

The methods and results of individual studies may be disputed. However, taken together, and particularly when data from different sources are compared, the implications of Thailand's exceptional efforts to track the epidemic and the behaviours that lead to it are clear:

- high levels of unprotected sex with sex workers were followed by a boom in HIV infection;
- a national effort to promote safe behaviour was followed by a drop in visits to sex workers and an increase in condom use;
- those changes in behaviour have been rewarded by a decrease in STDs and new HIV infections.

The body of evidence gathered by Thailand's epidemiological and behavioural information systems and widely publicized in the country and abroad has been a vital tool in reducing the further spread of HIV. It has allowed for the design of appropriate programmes to slow the spread of the disease. It has generated political and public support for funding of those programmes. It has created awareness among those whose behaviour put them and their partners at risk. Most importantly, it has enabled Thailand to demonstrate convincingly to its own people and the world that adopting safe behaviours can change the course of the epidemic on both a personal and a national scale.

Why this is a Best Practice Case Study

This case study is a UNAIDS Best Practice because it demonstrates an approach to the collection and use of epidemiological and behavioural data that has been fruitful in making a persuasive case for the connection between decreased HIV infection rates and the adoption of safer behaviour on the part of individuals. It meets four of the Best Practice criteria: effectiveness, ethical soundness, relevance and sustainability.

- **Effectiveness:** The primary objective of the case study was to demonstrate a definite link between the epidemiological data showing declining HIV infection rates and behavioural data showing widespread adoption of safer behaviour with regard to commercial sex and use of condoms. This study provided strong evidence to demonstrate that link.

- **Ethical soundness:** All the studies reported here received the ethical approval of the Ministry of Health, the Ministry of Defence (i.e., for military conscripts) and ethical review committees in several universities. The ethical requirements of the WHO guidelines on anonymous unlinked sentinel surveillance of HIV infection were strictly applied in Thailand. In carrying out surveys on sexual behaviour and HIV and STD prevalence, special attention was given to issues of informed consent and confidentiality. Questionnaire forms, laboratory forms and database entries only contained identity numbers and not names.

- **Relevance:** The comparative epidemiological and behavioural analysis undertaken supports the main goals of UNAIDS: it makes a clear contribution to the prevention, control and reduction of impact of HIV/AIDS. By helping to demonstrate the positive effect of behavioural change on the course of the epidemic, it provides a useful communications tool for future public awareness campaigns everywhere. It also gives support to public health officials hoping to undertake activities similar to the 100% Condom Use campaign and other prevention programmes in their countries.

- **Sustainability:** The costs of maintaining HIV surveillance and long-term studies on sexual behaviour are reasonable, once the basic mechanisms are in place. Thailand's HIV surveillance system has been in operation for more than 10 years, and two national surveys on sexual behaviour have been done. There is thus a good deal of high quality local expertise in these two areas. So it is feasible, in addition to being desirable, to continue to track the relationship between behaviour and epidemiological trends. There is also a clear commitment on the part of the Thai government to continuing this work: the government, along with numerous international and bilateral agencies, have pledged their ongoing support.