

# Chapter 6

## Chapter highlights

- Factors fueling epidemic growth vary widely from one Asian country to the next, as they often do even within a single country (especially in the cases of large countries such as China and India).
- One of the key factors that determines the start of a heterosexual HIV epidemic in all Asian countries—but especially in those where client turnover in commercial sex is relatively low—is an external “booster”. Most commonly, this “kick-start” is provided by IDUs.
- It is important to provide prevention services to a large proportion of IDUs *before* HIV prevalence rises. Expanded prevention efforts that delay HIV epidemics among IDUs can also buy valuable time to put in place prevention programmes for clients and sex workers.
- While factors such as drug injecting may be key in “kick-starting” an epidemic, the rate of growth and ultimate severity of HIV epidemics in the Asian context is determined by the buying and selling of sex. In Thailand and Cambodia, both increases in condom use during commercial sex and reductions in the proportion of men who buy sex have reduced HIV transmission.
- Where HIV prevalence and the risk of transmission are relatively low, programmes do not need to aim for “zero risk”. An epidemic will stop growing if the risk of exposure in a specific sub-population is brought down below a certain “threshold” needed to sustain the ongoing spread of the virus.



## Chapter 6: What next? Epidemic dynamics in the Asian context

Chapter 1 outlined the typical progression of Asian epidemics: rapid growth of HIV infection among IDUs, followed by epidemic growth among women, men and transgenders who sell sex and the people (usually men) who buy it. Men infected in these higher-risk activities often pass the infection on to their lower-risk female partners. Those women, as well as women infected in higher-risk activities, may then pass the virus on to their children.

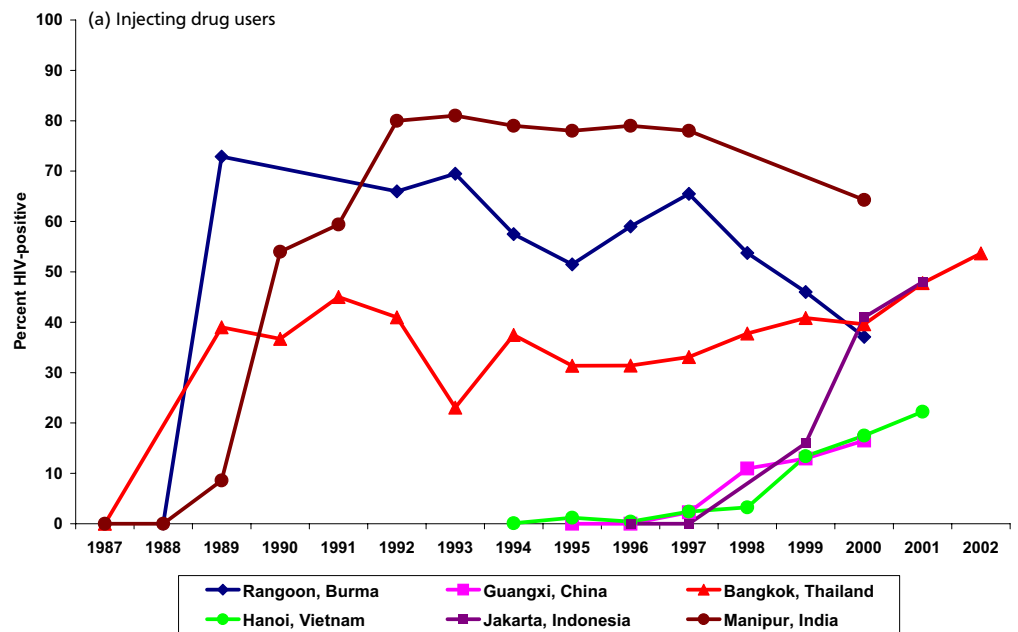
The size of the various populations involved in the epidemic varies widely across Asia. In a handful of countries and regions, drug injectors may outnumber sex workers. But by far the largest group of people drawn into the epidemic are the male clients of sex workers and their regular female sexual partners (in particular their current or future wives). In a rare survey of the general population in Thailand, up to 22% of young men reported buying sex regularly before vigorous HIV prevention programmes began. (Sittitrai, Phanuphak et al 1994) In other Asian settings where this has been measured, between 2% and 15% of men in groups representing the general population report being clients of sex workers, as shown in Figure 12 (on page 38).

The speed and severity with which the pattern described in Chapter 1 is playing itself out varies widely across the region. Some countries were hit early and hard—for example,

**Cambodia, Myanmar** and Thailand, along with some **Indian** states (such as Manipur, Maharashtra, and Tamil Nadu,) and **Yunnan, in China**. Others are only now starting to experience more rapidly expanding epidemics, many of them literally taking off in only the past five years or so. They include **Indonesia, Nepal, Vietnam**, and many other provinces in China. **Figure 36** illustrates this wide variation in the timing of rapid epidemic growth in IDUs and sex workers around the region. Some countries, even today, remain at extremely low levels of HIV prevalence—including **Bangladesh, East Timor, Japan, Laos, Pakistan, the Philippines and South Korea**.

In general, those countries where IDU epidemics exploded in the late 1980s or early 1990s are the same countries where the epidemic among sex workers and clients grew earlier and more rapidly. In countries where IDU epidemics only took off in the mid-or late 1990s, the sex worker epidemics seem to be growing more gradually. This raises two questions. Firstly, why do these wide variations in the timing and rapidity of HIV epidemics around the region occur. And secondly, what is the future of HIV epidemics in the countries of Asia?

Besides the customary claims that traditional values and religion act as “shields” against the epidemic, a number of epidemiological explanations have been proposed:



- variations in the levels and intensity of risk behaviours (including commercial sex, premarital and extramarital sex, needle-sharing, anal sex, etc.);
- differences in the strength of linkages among various at-risk populations (for example, the fraction and frequency of IDUs who visit sex workers, sex workers who inject, MSM who visit female sex workers, the size of networks of at-risk individuals, etc.);
- varying adoption of preventive behaviours (condom use with different partner types, safe injecting practices, etc.); and
- the timing of the introduction of HIV in at-risk populations; and other biological factors (levels of other STIs that facilitate HIV transmission, different transmission probabilities by HIV subtype, circumcision, etc.).

The other factors were seen to have a modifying effect on the epidemic, but the ultimate severity of the epidemic was determined by the extent of heterosexual risk.

An ecological analysis of those countries with more severe epidemics at the time supported this selection of factors. In both **Thailand** and **Cambodia**—two of the hardest-hit Asian countries—it was estimated that one-fifth or more of adult males were visiting sex workers each year and sex workers had many clients per night. To test the hypothesis, a model incorporating the major factors outlined above was developed. (Saidel, Des Jarlais et al 2003) Known as the Asian Epidemic Model, it was able accurately to reproduce over ten years of epidemiological trends in IDUs, sex workers, and the general population, based on observed trends in behaviours in both Cambodia and Thailand. The model

These factors vary widely from one Asian country to the next, as they often do even within a single country (especially in the cases of large countries such as China and India).

One careful analysis in 1998 (Chin, Bennett et al 1998) proposed that while any of these factors could be important, a smaller subset was more critical, namely:

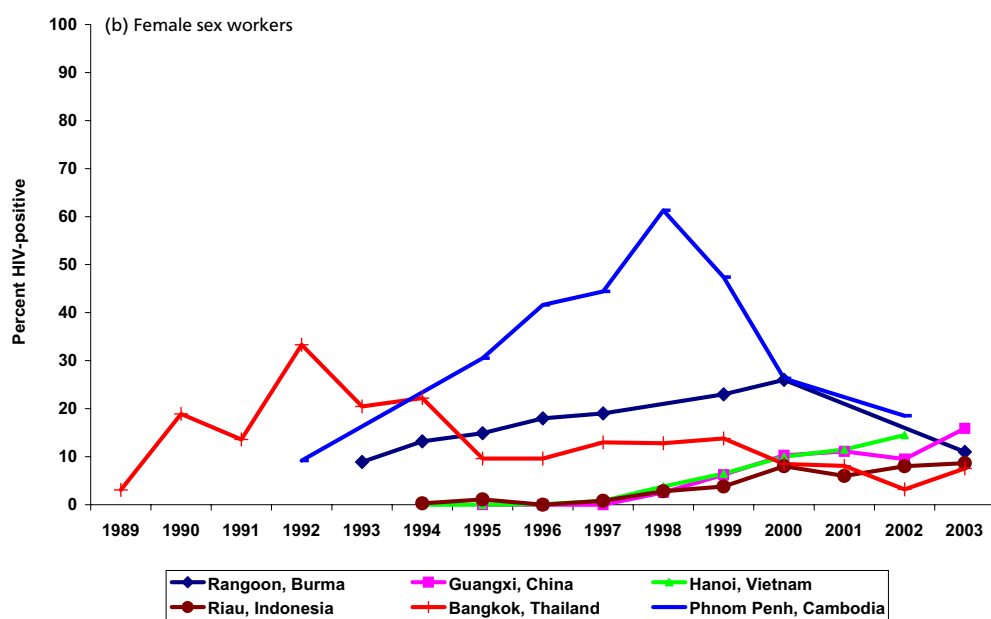


Figure 36. Extreme variability is seen in the timing and the rate of growth of epidemics among injecting drug users and female sex workers in different places in Asia (a) Injecting drug users (b) Female sex workers

The timeframes and pace of epidemics vary widely

(Source: National surveillance reports)

has since been fitted to other regions, as well. (Cambodian Working Group on HIV/AIDS Projection 2002) In general, this work validates the assumption that while other factors such as drug injecting may be key in kick-starting an epidemic, the rate of growth and ultimate severity of HIV epidemics in the Asian context is determined by the buying and selling of sex.

*While factors such as drug injecting may be key in “kick-starting” an epidemic, the rate of growth and ultimate severity of HIV epidemics in the Asian context is determined by the buying and selling of sex.*

The model therefore can be used to explore how the epidemic might develop in the different countries of Asia. In a country such as Thailand, where HIV was introduced in 1985 and where there was a significant population of IDUs, the epidemic takes off rapidly. (Thai Working Group on HIV/AIDS Projection 2001) **Figure 37** shows that if behaviours in Thailand had remained as they were in the early 1990s (with condoms used in only one-third of commercial sex contacts and by one-fifth of men visiting sex workers), a severe epidemic would have developed very quickly, with approximately 15% of the adult population living with HIV. Why did this not happen? A glance at Figure 9 (on page 34) offers a clue. Following vigorous, nation-wide prevention efforts, condom use in commercial sex quickly shot up to around 90%. On top of that, the proportion of men visiting sex workers plummeted to half

its former levels. So, instead of fitting the frighteningly high red curve shown in Figure 37, Thailand’s epidemic has followed the green curve.

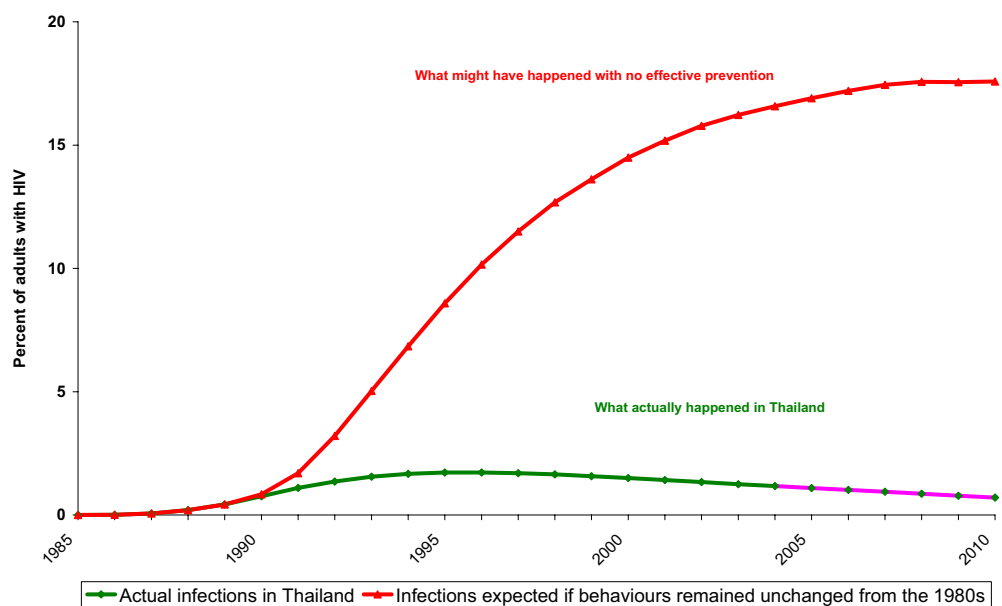
The situation in Cambodia was similar, but the start of the epidemic was delayed a few years because injecting drug use was not a significant factor. (Cambodian Working Group on HIV/AIDS Projection 2002) In Cambodia, the presence in the early 1990s of United Nations peacekeepers from high-prevalence countries, as well as refugees returning from high-prevalence areas of northern Thailand may have provided the “kick-start” to the country’s mainly heterosexual epidemic. (In Thailand, a similar “kick-start” had been provided by IDUs.)

In Thailand and Cambodia an exceptionally large proportion of men appear to buy sex. What about countries, such as **China**, **Indonesia** or **Vietnam**, where a smaller percentage of men visit sex workers? How might their epidemics evolve? **Figure 38** shows the possible growth patterns of the epidemic in a scenario where the size of the client population (men buying sex from) is reduced to approximately 10% of adult males and an epidemic among IDUs took hold in the mid-1990s. In this scenario, while explosive growth still occurs among the IDUs (due to the efficiency of needle-borne HIV transmission), the epidemic in sex workers and the wider population grows much more slowly. By 2004 approximately 4% of the sex workers would have HIV, while HIV

Figure 37. The growth of the epidemic as a percentage of adults with HIV in a country where roughly 20% of men visited sex workers, sex workers had two clients per night, and condoms were used in one-third of sex work contacts.

What might have been in Thailand: the epidemic in the absence of effective prevention programmes

(Source: Wiwat Peerapatapanokin and Tim Brown, using Asian Epidemic Model)



prevalence in the wider population would be roughly 0.2%. This scenario produces curves that closely resemble observed trends in Indonesia, Vietnam and in parts of China. At first glance, the trends do not appear to be particularly frightening.

But what happens over a longer period, beyond 2004? **Figure 39** reproduces the trends shown in Figure 38, up to the red line. It then leaves behaviours unchanged, and draws the trends further into the future. Now, the epidemic doesn't seem so "minor". By 2010, prevalence among sex workers would have reached 10%, almost 1% of the adult male population would be living with HIV (most of them current or former clients of sex workers), and prevalence in women would be growing gradually.

Such slow, steady growth may prove particularly insidious. Even six years hence, when prevalence among males is approaching 1%, prevalence among sex workers would be only 10% and roughly 0.2% of pregnant women would be testing positive. This would not necessarily ring alarm bells in the minds of many decision-makers, but it would result in a substantial care burden a decade later. In a country of 70 million people this would translate into about 37,000 clients and 10,000 wives being infected with HIV in the year 2010 alone, and almost 15,000 people would develop serious illness and die that year unless treated. In addition, the annual numbers of new infections

and deaths would accelerate quickly. If the epidemic is allowed to grow unchecked, by 2030 approximately 5% of adult males and 2% of adult females would be living with HIV.

It is important to stress that these are not deliberately alarmist scenarios. The model used to generate these scenarios draws on data that describes actual levels of risk behaviour currently being observed in many parts of Asia. For that very reason, however, we should regard them as "worst case" scenarios. Why? Because there is no reason to allow current levels of risk behaviour to stay unchanged. Asian countries that have put their minds, their money and their workforces to the task have managed to make serious dents in risk behaviour, turning epidemics around. Instead of rising to 15% prevalence as they might have in the absence of national prevention efforts, Thailand's epidemic peaked below 2% in 1996 and Cambodia at 3.3% in 1998.

### Learning from one another: averting IDU epidemics early on

One of the key factors that determines the start of a heterosexual HIV epidemic in all Asian countries—but especially in those where client turnover in commercial sex is relatively low—is an external "booster". This booster is occasionally provided when heterosexuals from higher HIV prevalence areas move into settings

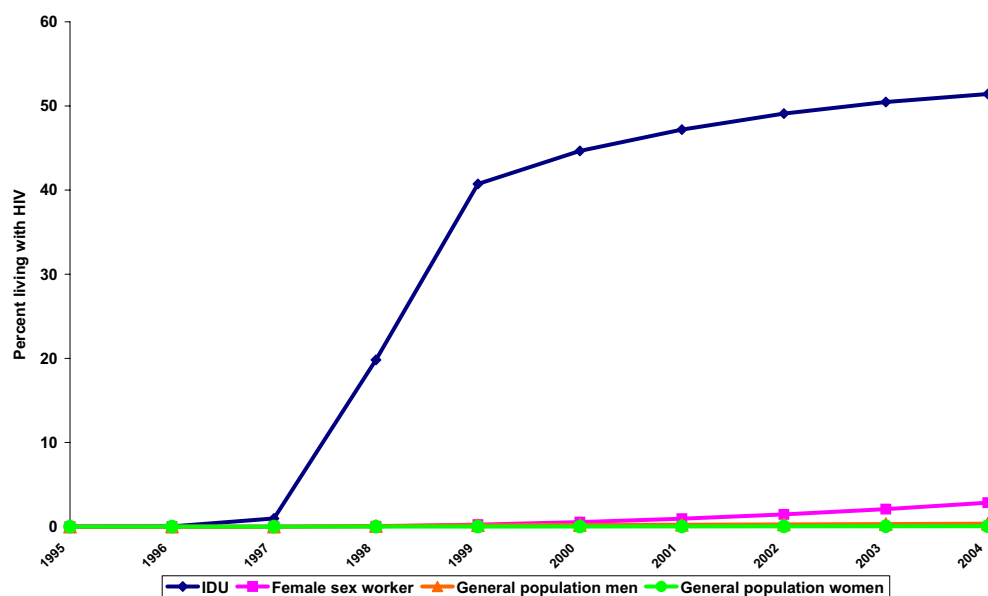


Figure 38. The growth of the different components of the epidemic in a country, such as China or Vietnam, where one-tenth of men visit sex workers, sex workers have one client per night, condom use stays at about 30% of commercial sex acts, and it is assumed that an IDU epidemic started in 1995.

In the short term, HIV epidemics in Asia may barely be visible in the population as a whole

(Source: Wiwat Peerapatanapokin and Tim Brown, using Asian Epidemic Model)

where HIV prevalence is lower (as happened, for example, with foreign peacekeepers in **Cambodia** and **East Timor**, and **Thai** fishermen in the Indonesian province of Papua). More commonly, however, the “kick-start” is provided by injecting drug users. Because injecting drug users have sex (and many buy and sell it, as described in Chapter 3), they can introduce the virus into a heterosexual population, creating a “critical mass” of infection which then becomes self-sustaining within commercial sex networks.

**Figure 40** looks at the HIV epidemic in the **Indonesian** capital Jakarta, a city of some eight million people. The blue line on the graph follows the actual course of the epidemic in the city until 2003. Beyond that point, HIV infection rates are projected into the future on the assumption that risk behaviours among drug injectors, among male, female and transgender sex workers, and among clients of sex workers do not change from the levels observed in surveillance in 2003.

The first thing this model shows is that we can expect a very rapid expansion of the epidemic in Jakarta in this decade. The second thing it shows is that, by the end of the decade, around one-third of all HIV infections in the city will be among drug injectors. But the most important finding of the model shown in Figure 40 is shown by the purple line at the bottom. That represents the development of the epidemic in Jakarta if there had been no

HIV infections among drug injectors: *there would have been virtually no epidemic.*

The entire area shaded in yellow in Figure 40 represents sexually transmitted HIV infections which originated at some point in the sharing of unsafe drug-injecting equipment. The virus might have been passed on to non-injecting woman by her injecting boyfriend, or to a client who contracted the virus from a sex worker who was infected by an earlier client who used drugs. If that client had always used a clean needle when injecting drugs, the entire chain of transmission could have been avoided. If effective HIV prevention services had been available for a large proportion of IDUs in Jakarta from the early 1990s, when drug injecting began to become common, the HIV epidemic in the city would probably have remained at almost unmeasurably low levels for many years.

*If effective HIV prevention services had been available for a large proportion of IDUs in Jakarta from the early 1990s, when drug injecting began to become common, the HIV epidemic in the city would probably have remained at very low levels for many years.*

This illustrates the importance of providing prevention services to a large proportion of IDUs before HIV prevalence rises, as **Bangladesh** and **Pakistan** are trying to do. Expanded prevention

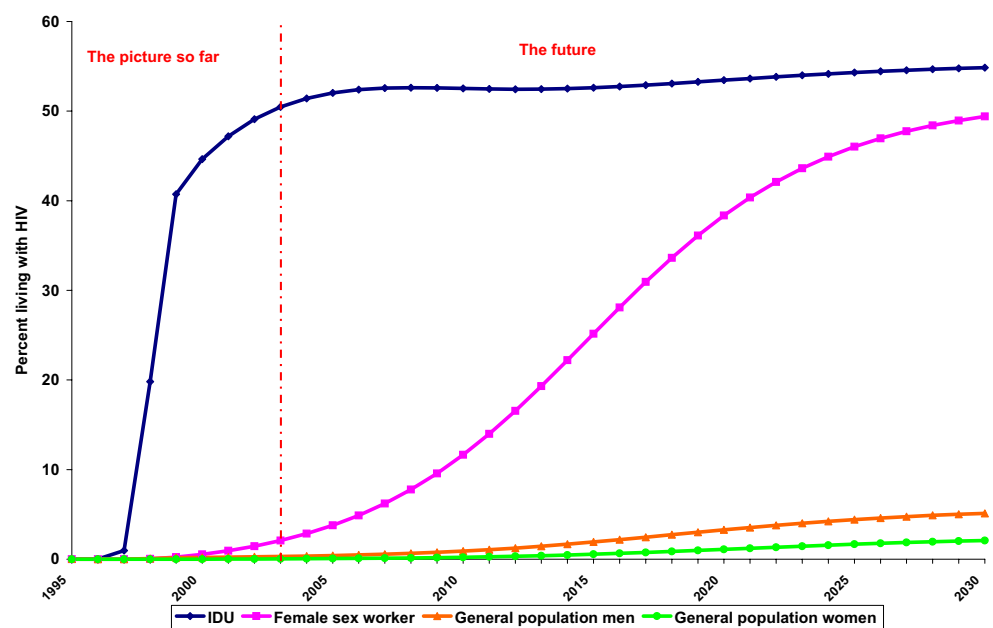


Figure 39. If behaviours do not change, apparently “mild” epidemics become more severe in a couple of decades. Over the longer term, the picture can change dramatically. (Source: Wiwat Peerapatanapokin and Tim Brown, using Asian Epidemic Model)

efforts that delay epidemics among IDUs can also buy valuable time to put in place prevention programmes for clients and sex workers. Much of the “booster effect” depends on onward sexual transmission of HIV through commercial sex and other sexual networks. If condom use in those encounters is already high by the time HIV takes off among IDUs, then the virus is denied the conditions that favour onward spread through sexual networks. It is worth noting that the sexual epidemic in Thailand remains relatively contained despite ongoing high incidence among IDUs. This is because condoms are used most of the time by IDUs in their casual encounters, as well as throughout heterosexual networks.

**How much is enough? “Threshold” levels of condom use**

The fact that high levels of condom use can break the link between an IDU-driven epidemic and a sexually driven epidemic raises an interesting issue: how much condom use is “high enough”? Most prevention programmes focusing on sexual transmission aim to get everyone to use condoms in all non-marital sex. At the individual level, consistent condom use is certainly the safest way of protecting a person against HIV and STIs if that person has sex (particularly with partners who are likely to have other partners, such as sex workers and

their clients). However, from a population point-of-view, the same does not necessarily hold.

The two most important variables that dictate the likelihood of HIV transmission through sex are firstly, the likelihood that an infected and an uninfected person will have sex, and, secondly, the likelihood that HIV will be transmitted from the infected to the uninfected person during sex.

*It is important to provide prevention services to a large proportion of IDUs before HIV prevalence rises, as Bangladesh and Pakistan are trying to do. Expanded prevention efforts that delay HIV epidemics among IDUs can also buy valuable time to put in place prevention programmes for clients and sex workers.*

The first variable is determined by HIV prevalence in the population, as well as by patterns of sexual mixing. The second is determined by the type of sex (anal sex is more risky than vaginal sex, for example), by condom use, and by physical factors, such as the presence of other STIs (which make it easier for HIV to pass from one body into another) or male circumcision (which makes it more difficult).

An epidemic will stop growing if the risk of exposure in a specific sub-population is brought down below a certain “threshold” needed to sustain the ongoing spread of the virus. Where background HIV prevalence is low, the likelihood of an infected person encountering an uninfected person is already low. Altering the second variable—by increasing condom use and

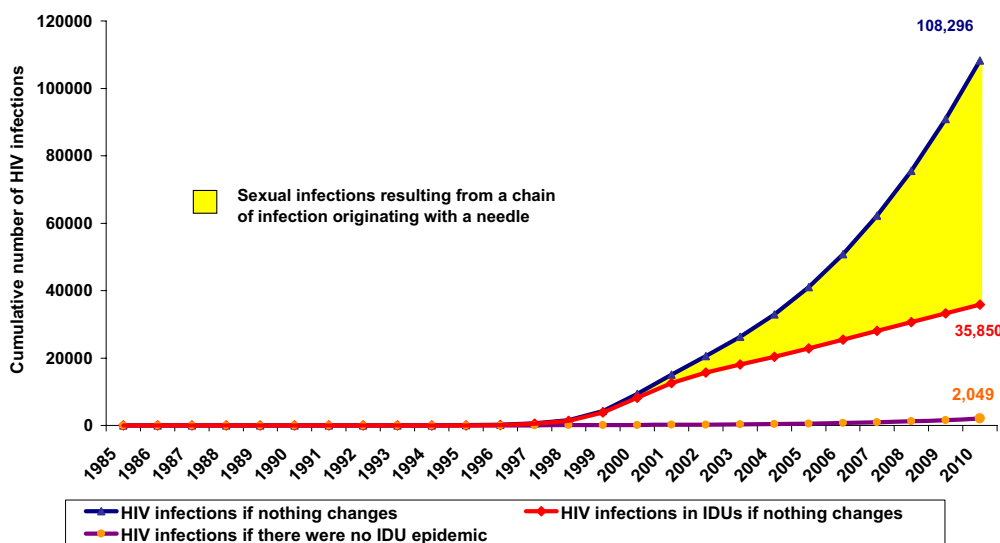


Figure 40: HIV prevalence in Jakarta, Indonesia, with and without IDUs. Actual data to 2003, and projections with behaviour unchanged from 2003 levels

Most sexual infections in Jakarta would never have occurred if there had not been a “seed” infection transmitted through drug injection

(Source: Elizabeth Pisani, using Asian Epidemic Model)

by treating other STIs effectively—will further reduce the likelihood of transmission. If prevention interventions get going before HIV prevalence rises to high levels in a population, then those interventions do not need to reach 100% consistent condom use in order to keep a lid on the epidemic. The higher the HIV prevalence is in any group of sex workers and clients, the higher the levels of condom use must be to contain and, eventually, to reverse the epidemic.

*Where HIV prevalence and the risk of transmission are relatively low, programmes do not need to aim for “zero risk”.*

In situations where HIV prevalence and the risk of HIV transmission per exposure are both high, such as among IDUs in many Asian countries, the likelihood that a person will contract or pass on the infection in any risky act is very high. This means programmes for IDUs in these areas have to be implemented on a scale and with a consistency that enables them to never share needles, and to use condoms each time they have sex. But where HIV prevalence and the risk of transmission are both lower, programmes do not need to aim for “zero risk”.

Figure 41 shows how even modest increases in condom use from a average baseline of 30% (a level currently witnessed in some of the countries that are in the growth phase of their epidemics) can result in significant reductions in HIV infections.

Under the conditions used for this modelling, if condom use reaches just 50%, it can

stabilise the growth of the epidemic. And if it rises higher, it can turn the epidemic around. Note that 50% condom use means 50% of all acts of commercial sex are protected by condoms. It does *not* mean that 50% of all sex workers and clients must use condoms every time they buy or sell sex. Neither does it mean that there should be 50% condom use at last sex among some limited number of sex workers who have been reached by prevention programmes in one or two cities. It means that one in two of every act of commercial sex undertaken in every corner of the country on every day of the year must be protected by condoms. Of course, models are not reality. The crucial test will be the actual HIV programmes that are mounted. But models can help illustrate where prevention efforts should be concentrated for maximum impact.

To some, this discussion might seem heretical. The suggestion that prevention programmes should settle for anything less than 100% condom use might be construed as sending “mixed signals” that could undermine prevention efforts. There is no doubt that individuals need to understand that only consistently safe behaviour can protect them from infection with HIV and other STIs. But from a public health point of view, it is also important to understand the underlying dynamics of HIV epidemics, because it affects the distribution of resources and the effectiveness of a response.

Figure 41. Effect of increasing condom use on overall adult HIV prevalence in a country where 10% of men buy sex

In certain circumstances, even modest increases in condom use can lead to significantly fewer HIV infections

(Source: Wiwat Peerapatapanokin and Tim Brown, using Asian Epidemic Model)

