

Original Article

HIV/AIDS Acquisition and Transmission in Bangladesh: Turning to the Concentrated Epidemic

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(Received July 9, 2008. Accepted January 13, 2009)

SUMMARY: A seventh round behavioral and serological surveillance found that the HIV epidemic had remarkably increased to 7% among intravenous drug users (IDU) in Central Bangladesh, indicating the urgent need to increase prevention. The main purposes of this study were to find out, by collecting data and the necessary information from sero-surveillances, published reports, and articles, what the prevalence of HIV/AIDS is, and what the acquisition and transmission routes are. In addition, trends in HIV-related risk behaviors among recognized high risk groups were observed, and estimations and projections of HIV transmission up to the year 2020 presented. The Estimation and Projection Package was used to estimate and project HIV transmission. The study results reveal that Bangladesh is a low prevalence country which is turning into one with a concentrated epidemic due to the high HIV prevalence rate of IDU (7%) among the most-at-risk groups. Within this at-risk population, IDU have the highest prevalence rate of HIV transmission, followed by female sex workers, clients of sex workers, and men who have sex with men. If the transmission rate continues to increase, the situation will be uncontrolled. Therefore, there is an urgent need for a comprehensive prevention program to control the spread of HIV.

INTRODUCTION

In South Asia, the HIV epidemic is quite heterogeneous in its dynamics and scope. Bangladesh borders India and Myanmar and is in close proximity to Nepal, countries where the epidemic is severe. India alone has more than half (2.5 million) of all the people living with HIV/AIDS in Asia, with a prevalence rate of 0.36% (1). Bangladesh is considered to be at risk for a large-scale HIV epidemic because of the variety and gravity of risk factors which cause the spread of HIV. In Bangladesh, the first HIV case was detected in 1989, and since then the cases have been steadily increasing, as have all the potential risk factors. The HIV prevalence in the general population appears low (<0.2%), and is estimated as <1% in all risk groups except for injecting drug users (IDU) (7%) (2). However, modeling studies show that an uncontrolled HIV epidemic among drug injectors can accelerate the sexual epidemic and lead to a far greater number of sexually transmitted infections (STI) (3). Although the exact number of HIV cases is not known, by December 1, 2007, 1,207 cases of HIV had been confirmed; of these people, 365 had developed AIDS and 123 had died, a much higher number than in previous years (2). In Bangladesh, surveillance for HIV infection is conducted annually among the population groups most vulnerable to HIV infection. Since 1998, the Government of Bangladesh has been conducting surveillance (known as 2nd generation surveillance) for HIV (1-5) which includes serological and behavioral surveillance; 2nd generation surveillance attempts to capture the potential diversity of HIV

distribution by classifying an epidemic into low, concentrated, and generalized categories, and sampling population groups based on the epidemic situation in the country. On behalf of the Government of Bangladesh, the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) has conducted the serological component for each of the rounds, while other organizations have conducted behavioral surveillance. Surveillance is conducted among population groups that are most vulnerable to HIV infection. They include male and female sex workers, transgender persons (hijra), IDU, men who have sex with men (MSM), clients of sex workers such as "babus", who are regular partners of female sex workers in brothels, patients with symptoms of STI, and transport workers, including truckers, rickshaw pullers, launch workers, and dockworkers. Among the types of surveillances conducted, 7th round sero-surveillance provides an exact picture of the rising prevalence of HIV, the high prevalence of active syphilis, and the high prevalence of risky sexual and injecting behaviors among the recognized high risk groups (Tables 1-3). These indicate both the likelihood of incomplete reporting and the potential for a rapid growth in the epidemic. In the absence of a comprehensive case reporting system, Bangladesh has more HIV cases than officially reported. Limited facilities for sentinel surveillance and voluntary counseling and testing, as well as the social stigma and discrimination attached to HIV, contribute to an understatement of the real incidence of HIV. In addition to the risks posed by sexual and other behaviors among particular groups of people, a range of structural factors heighten the vulnerability of Bangladesh's general population to an HIV epidemic. In reality, Bangladesh is near the bottom of most league tables ranking global development indicators, which include widespread poverty and inequality, a high level of adult illiteracy, the low social status of women, the trafficking of women into the commer-

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Table 1. Knowledge and behavior indicators for Bangladesh, 2005 and 2007

| Indicator | Population group | Indicator value (%) | |
|--|--------------------|---------------------|------|
| | | 2005 | 2007 |
| % of young women and men aged 15-24 who both correctly identify ways of preventing the sexual transmission of HIV and who reject major misconceptions about HIV transmission | Males | NA | 24.1 |
| | Females | NA | 20.6 |
| | All (15-24) years | NA | 22.3 |
| % of most-at-risk group of population who both correctly identify ways of preventing the sexual transmission of HIV and who reject major misconceptions about HIV transmission | FSW | 24.0 | 30.8 |
| | Male CSW | 28.2 | 29.6 |
| | MSM | 13.2 | 27.3 |
| | IDU | 14.3 | 20.2 |
| | All risk groups | 17.0 | 25.9 |
| % of young women and men aged 15-24 who have had sexual intercourse before the age of 15 | Males | NA | 4.0 |
| | Females | NA | 0.8 |
| | All (15-24) years | NA | 2.3 |
| % of women and men aged 15-49 who have had sexual intercourse with more than one partner in the last 12 months | Females | NA | NA |
| | Males | NA | 17.5 |
| % of women and men aged 15-49 who had more than one sexual partner in the past 12 months reporting the use of a condom during their last sexual intercourse | Females | NA | NA |
| | Males | NA | 35.2 |
| % of female and male sex workers reporting the use of a condom with their most recent new client | FSW | 30.9 | 66.7 |
| | Male CSW | 44.1 | 43.7 |
| % of men reporting the use of a condom the last time they had anal sex with a male partner | MSM | | |
| | Commercial sex | 49.2 | 29.5 |
| | Non-commercial sex | 37.0 | 24.3 |
| % of injecting drug users reporting the use of a condom the last time they had sexual intercourse | Male IDU | | |
| | Commercial sex | 23.6 | 44.3 |
| | Non-commercial sex | 18.9 | 30.5 |
| | Female IDU | | |
| | Commercial sex | 78.9 | 54.8 |
| % of IDU reporting the use of sterile injecting equipment the last time they injected | Male IDU | 51.8 | 33.6 |
| | Female IDU | 60.0 | 73.8 |

Source from reference (37).

FSW, female sex workers; CSW, commercial sex workers; MSM, men who have sex with men; IDU, injecting drug users; NA, not available.

Table 2. Impact indicators for Bangladesh, 2005 and 2007

| Indicator | Population group | Indicator value (%) | |
|---|------------------|---------------------|------|
| | | 2005 | 2007 |
| % of most-at-risk population who are HIV infected | Female CSW | 0.3 | 0.2 |
| | Male CSW | 0.0 | 0.7 |
| | MSM | 0.4 | 0.2 |
| | Male IDU | 4.9 | 7.0 |
| | Female IDU | – | 0.8 |
| | All risk groups | 0.6 | 0.9 |

Source from references (2) and (20).

Abbreviations are in Table 1.

Table 3. Infection levels among most-at-risk groups for the populations

| Surveillance round | Year | No. tested | HIV (%) |
|--------------------|-----------|------------|------------|
| 1 | 1998-1999 | 3,886 | < 1% (0.4) |
| 2 | 1999-2000 | 4,634 | < 1% (0.2) |
| 3 | 2000-2001 | 7,063 | < 1% (0.2) |
| 4 | 2002 | 7,877 | < 1% (0.3) |
| 5 | 2004 | 10,445 | < 1% (0.3) |
| 6 | 2005 | 11,029 | < 1% (0.6) |
| 7 | 2006 | 10,368 | < 1% (0.9) |

Source from reference (11).

cial sex industry, high infant and maternal mortality, high population mobility, including rural-urban, interstate, and international labor migration, and cultural impediments against discussing or addressing sexual issues.

Biological markers for STIs such as hepatitis C, which is transmitted through blood, are very high in some of the key vulnerable groups, including commercial sex workers (CSW) and IDU. Women who inject are often involved in commercial sex, which heightens their risk of acquiring HIV, and they are thus more likely than their male counterparts to be infected with sexually transmitted diseases (STD). STIs are low in the general population, but are higher in the bridging population groups, such as truckers, and higher yet in CSW. Mobile population groups such as truckers and migrant workers are at high risk for contracting HIV infection (4). Chan and Khan (5) suggested a likely association between HIV risk factors in IDU and other groups, such as MSM. Passive case reporting suggests that another population group is more vulnerable to HIV may be migrant returning from jobs overseas or through cross-border traffic to regions of high prevalence (Table 4). In this regard, Gazi et al. (6) has identified boatmen as a bridging population of HIV/AIDS between the high-prevalence country of Myanmar and the low prevalence country of Bangladesh. All these potential factors fuel the rise in HIV acquisition and transmission. Consequently, the HIV transmission rates among the risk groups as well as the general population is increasing steadily, even while it is remarkably decreasing in some Asian countries (1). If this situation continues, Bangladesh will face a crisis that, as a developing country, it does not have the resources to tackle; it will be unable to mitigate the harmful impact of widespread HIV/AIDS, and will especially be unable to afford the medication costs. Even if only 1% of the general population be-

Table 4. Size estimates of most-at-risk groups in Bangladesh and average estimated number of population living with HIV/AIDS (PLHA) in each group, 2004

| Most-at-risk group | Size estimate low | Size estimate high | Average estimate of PLHA |
|---|-------------------|-------------------------------|--------------------------|
| Injection drug users | 20,000 | 40,000 | 444 |
| Male CSW and MSM | 40,000 | 150,000 | 450 |
| Brothel-based CSW | 3,600 | 4,000 | 55 |
| Street-based CSW | 37,000 | 66,000 | 453 |
| Hotel-based CSW | 14,000 | 20,000 | 128 |
| Clients of female CSW | 1,882,080 | 31,368,000 | 1,882 |
| Transgender | 10,000 | 15,000 | 62 |
| Returnee external migrant | 268,000 | 536,000 | 3,015 |
| National total most risk groups | 2,274,680 | 39,678,000 | 6,489 |
| National total population at lower risk ¹⁾ | 1,191,559 | 2,012,375 | 1,188 |
| Estimated national total average number of the PLHA | | 7,677 | |
| National range PLHA: ~700 - 19,000 | | National average PLHA: ~8,000 | |

Source from reference (8).

¹⁾: Partners of members of most-at-risk group for populations, tuberculous patients, and blood transfusion recipients.

comes infected with HIV, there will be 1.5 million people infected. Therefore, there is a pressing need to take steps to prevent this from occurring. The specific objectives of this study were to give a comprehensive, up-to-date overview of HIV/AIDS in Bangladesh by finding out what the current acquisition and transmission routes are as well as to examine the trends in HIV related risk behaviors among recognized high risk groups. Estimations and projections of HIV transmission up to the year 2020 are provided, and recommendations presented for future interventions. It is the authors' hope that this study will be helpful to government policy makers and non-government organizations (NGO) as well as to researchers.

MATERIALS AND METHODS

The data was collected from behavioral and serological surveillances and reports published by UNAIDS, WHO, ICDDR,B, and in journals. The updated UNAIDS/WHO Estimation and Projection Package (EPP, 2007) (7) was used to provide the future predictions of HIV transmission in Bangladesh up to the year 2020. The software EPP is generally used to estimate and project the national HIV/AIDS epidemic in a particular country. National HIV epidemics are usually composed of multiple epidemics in different populations and different geographic areas. To reflect this, one of the fundamental principles underlying EPP is that epidemic curves can be developed separately for different populations and then combined to produce a single epidemic curve which estimates HIV prevalence at a national level. They do contain HIV trend data and population characteristics, along with a mathematical curve that fits through those HIV trends. Also, the estimates produced by EPP can be exported to Spectrum (another UNAIDS/WHO Epidemic Software), and used to develop further estimates of the impact of the HIV epidemic. EPP uses available surveillance data to estimate the trends over time of the adult prevalence of HIV at the national level for either concentrated or generalized epidemics. In this study, EPP was used to estimate the trend for a concentrated epidemic. Because of the rapid spread of HIV in one defined subpopulation (IDU), but is not well-established in the general population, most often more than one subpopulation (CSW, clients of CSW, and MSM) with higher risk and HIV prevalence is consistently over 5% in IDU. EPP estimates

the trends over time of HIV prevalence by fitting an epidemiological model to the surveillance data provided by HIV sentinel surveillance systems. Modeling and projections has been determined that a model with four parameters is well suited to fitting HIV epidemic curves. Briefly, the four parameters are:

t_0 —the start year of the HIV/AIDS epidemic, r —the force of infection, f_0 —the initial fraction of the adult population at risk of infection, and Φ —the behavior adjustment parameter. A large value of r will cause the prevalence to rapidly increase, while a small value will cause it to increase slowly. The parameter f_0 determines the peak level of the epidemic curve. The parameter Φ determines how the proportion of new entrants in the adult population who are at risk of HIV infection changes over time. If Φ is negative, people reduce their risk in response to the epidemic and the curve shows a sharper prevalence decline after the peak. If Φ is zero, the proportion at risk remains constant, and the prevalence declines after the peak as people die. If Φ is positive, the risk actually increases over time, and the prevalence falls less quickly or stabilizes at a high level.

Risk group populations and their sexual behaviors: Youth (15-24 years) comprise almost one-sixth of the total population of Bangladesh, and are at particular risk of contracting HIV and STIs because of their limited access to sexual and reproductive health information and services. Youth are infected and transmit HIV to the general population through sexual contact and sharing needles. A nationally representative survey of youth was conducted in 2005 by ICDDR,B; Australasian Centre for Policing Research (ACPR) and the Population Council in order to better understand the extent of young peoples' knowledge about HIV and their use of condoms (8). The study results found a generally low level of knowledge about HIV transmission and prevention (22.3%) among both young males and females. In addition, about 22% of unmarried males reported having premarital sex, with one in four reporting visiting a CSW, and half reporting that they did not use condoms.

There are a number of factors that place susceptible groups in Bangladesh at high risk for a rapid increase in HIV infection, an increase that would, by extension, lead to an expanded epidemic of HIV in the general population and other at-risk groups. Within these groups, there is a disproportionate burden of diseases, including STDs. While the underlying social

determinants of health such as poverty, poor access to medical care, low-level of nutritional status, illiteracy, and a poor health care structure are the most likely root causes of these diseases, the more proximal causes include low condom use, a high number of sexual partners, and relatively low HIV-related knowledge and awareness. Only the testing for HIV in donated blood can indicate the HIV prevalence in the general population. In reality, the population at risk in Bangladesh is potentially huge (Table 4). The 2004 estimation of HIV prevalence among risk groups was 0.3%, but in 2007, it was three times greater (0.9%) (Table 3). Almost all sero-surveillance surveys have focused on known at-risk groups such as IDU, CSW, clients of CSW, MSM, heroin smokers, and mobile populations, although several of these populations have posed the most threat to the entire population. The National Surveillance for HIV in Bangladesh also found that a large proportion of transport workers reported having both commercial and non-commercial sex partners, and that condom use was very low (2). In this study, the most-at-risk groups for the populations were identified as IDU, CSW, clients of CSW, and MSM. These four types of populations have very high HIV transmission rates, and the prevalence of HIV among these populations is the primary reason why Bangladesh is so vulnerable (Tables 2-4 and Figure 2).

IDU: IDU are driving the HIV epidemics in many countries, and account for almost a third of new infections outside Sub-Saharan Africa (1). Across the estimated 13 million IDU globally, there is great variation in drug use patterns, behaviors and contexts. The National Assessment of the Situation

and Response to Opioid/Opiate Drug Use in Bangladesh (NASROB) first documented the changing patterns in drug use and the introduction of heroin in the mid-1980 (9). By the 1990s, injecting drug use had become more common in Dhaka and Rajshahi (10), and NASROB found the majority of districts surveyed had IDU and heroin smokers. The risk of an impending concentrated HIV epidemic among IDU has been documented in a city in central Bangladesh, where HIV prevalence rose dramatically from 1.7 to 7% in 6 years (Figure 1). Sharing injection paraphernalia is common; 86% in Central A and 63% in Southeast D borrowed needles in the past week in 2003-2004 (11). This was evidently caused by the common practice of using contaminated injecting equipment; 67% of injectors reported using unsafe injection practices (2). The epidemic in IDU is largely confined (10%) to one neighborhood in Dhaka, which can be considered to be the epicenter. There are significant potential factors for sexual spread to the remainder of the population, as IDU engage in more risky sexual behaviors and crimes than non-IDU. IDU are also mobile, traveling from one city to another and sharing injection equipment in different cities. Thus, mobility is another major factor that increases the risk of acquiring and spreading HIV infection. Clearly, IDU networks overlap with other large at-risk populations, such as CSW and their clients. Of particular concern is the fact that there are about 50,000 drug addicts in the country, and many of them are beginning to share injection syringes and needles. Figure 2 clearly explains the HIV transmission and acquisition routes among the risk groups, as well as why HIV infection is transmitted so easily among IDU. The accuracy of the 2004 size was estimated of 25,000-40,000 IDU, which is 0.05% of the country's adult population (Table 4). The 7th round sero-surveillance found that 63% of female IDU ($n = 135$) were current CSW and 9.9% had active syphilis. Of those, 0.8% were HIV positive. More than 80% of the male drug users reported sex with multiple partners (12). An HIV prevention program in Dhaka found that after one year, 78% of a cohort of 3,200 IDU continued stably exchanging needles and syringes, but their rate of reported condom use in commercial sex encounters remained disturbingly low (13). Group hire sex was also common among IDU, with up to one in six (8.0-17.7%) reporting having engaged in group sex (14). Group sex may be encouraged by financial constraints, with male clients pooling

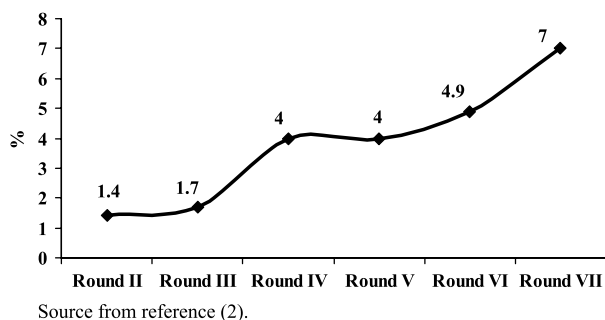


Fig. 1. HIV Prevalence among injecting drug users, Bangladesh, 1999-2006.

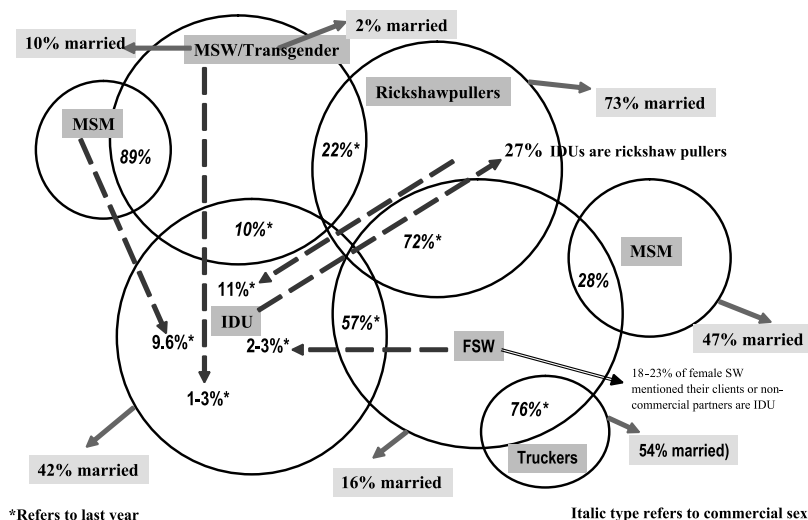


Fig. 2. Potential spread of HIV from most risk groups for the general population in Dhaka City, Bangladesh according to the 4th round sero-surveillance. Abbreviations are in Table 1.

money to share a female CSW (15). It is a particularly risky activity, for men take the additional risk of being exposed to the semen of other men, and the woman is likely to experience trauma and abrasion (16). Among 505 'drug addicts' studied in Dhaka, those who were HIV positive (3.7%) were mainly IDU, and every IDU with HIV reported sharing needles. Those drug users with HIV were also more likely to report unprotected sex (76.4%), multiple sex-partners (87.1%), and the presence of an STI (64.2%) (17). Of the IDU registered with the Cooperative for Assistance and Relief Everywhere (CARE)-Bangladesh (3,900-4,400), an NGO, 55% were reported to be married. IDU are encouraged to bring their spouses to the drop-in center (DIC) for STI management, but there is no formal contact-tracing program.

The 5th and 7th round sero-surveillances found that IDU were at elevated risk of acquiring and transmitting HIV, also through unsafe sex practices. Very little is known about female IDU in Bangladesh, but anecdotal evidence suggests that they are hidden, and are very vulnerable to HIV through both their injection sharing and sexual risk behaviors. The special vulnerability of female IDU was highlighted by the 2006 ICDDR,B cohort study. Beyond their vulnerability to HIV through unsafe injection and sexual risk behavior, female injectors reported more anal sex and serial sex with multiple partners, as well as other hazardous experiences, such as being victims of sexual violence or being jailed (15). Once HIV enters this community, the female IDU are likely to bridge the epidemic to the general population. The 5th round sero-surveillance noted that heroin smokers also engaged in significant risk behaviors, in that more than one-third (34.4%) of them had also injected in the last 6 months, and almost all (96.3%) shared their syringes. In addition, many sexually active heroin smokers engaged in unprotected commercial sex (73.6% had sex with female CSW in the previous month, and condom use was only 3.8%) and had multiple sexual partners (the reported median number of partners was 4). Although the 7th round sero-surveillance indicated that many of the risk behaviors of heroin smokers had been significantly reduced, the still high level of needle sharing (72.6%) was a major concern.

CSW: There is a great deal of gender violence and inequality in Bangladesh society, which is largely male dominated, and women and girls are therefore at additional risk of contracting HIV. For many reasons, Bangladesh supports a large-scale commercial sex industry. The total number of CSW is unknown, but a 1995 estimate reported around 100,000 female CSW in the country (18), and the number may reach 150,000 in 2007. Unfortunately, relatively little has been reported on the levels of commercial sex outside Dhaka, although it is known that much of the sex with prostitutes is unprotected sex, and that most married men who patronize prostitutes continue to have sex with their wives (19). Khan and Arefeen (9) reported that police registration-of-prostitutes statistics show there is a significant number of prostitutes in all of the larger towns, including Dhaka, Chittagong, Khulna, Rajshahi, Mymensingh, and others. There are only 15 registered brothels, but hundreds operate as part of a hidden sex industry, and many of the prostitutes working in these brothels are treated inhumanely. All other sex-working venues, e.g., hotel-based sex work (HSW), street sex work (SSW), or residential-based sex work (RSW) are clearly illegal in Bangladesh. These CSW register their names with a magistrate, signing an affidavit that they are entering the profession of their own will, are over 18 years of age and have no

alternative way of making a living. However, in reality they have often become CSW in response to poverty and other problems in their families. Police are allowed to raid brothels often in order to remove the women under 18 years or to search for criminals.

Female CSW from Bangladeshi cities close to India and Myanmar frequently cross borders to sell sex. From cities in the region labeled as Northwest-K1, about 70% of the female CSW had crossed into another country for sex work (20). A study of 867 female CSW in brothels in Kolkata, India, identified that nearly 20% were from Bangladesh (21). In addition, the estimated number of women and girls trafficked annually out of the country is 10,000-20,000. Some reports have indicated that 40,000 children from Bangladesh are involved in prostitution in Pakistan. There is also significant internal movement within the country to urban centers for the same purposes. The brothel-based sex work (BSW) and HSW in Bangladesh report an average of 18.8 and 44.0 clients per week, respectively, which is among the highest turnover of clients anywhere in Asia (22). Moreover, riskier forms of sexual intercourse are fairly common. Almost one in five CSW reported anal sex with new or regular clients in the past week, and, except among BSW, group sex was common, reported by 47-63% of all the CSW (14). Inconsistent condom use is also common, which increases the vulnerability of the workers to contracting HIV and other STDs. A study on BSW found that only 36% of sex acts had been protected by a condom during the last working day, and only 3.7% of female CSW had used condoms consistently during their last two working weeks (23). A study conducted among SSW ($n = 269$) in Dhaka found that overall, 84% were positive for at least one STI pathogen (24), and another study among BSW ($n = 439$) in four brothels found 67.4% were positive for at least one cervical and/or vaginal infection (25). The lower rate of condom use is a combined result of clients' dislike of condoms, lack of knowledge, low risk perceptions, and poor situational availability of condoms. Offering a condom to a client is a major trigger for violence, and contributed to around 36% of all the violence experienced by BSW (26). Safer sex practices are even more difficult for SSW, as the level of harassment is substantial. Accordingly, condom use is reported to be lower among SSW compared to other venues (27). The sero-surveillances conducted in 2003-2004 and 2006-2007 show there has been a marked recent increase in condom use among female CSW, but little change among male CSW and a remarkable decrease among MSM. However, the fact that many female CSW serve a large number of clients raises some doubt about how reliable their recall of condom use might be, and how consistent their condom use is.

Clients of CSW: The clients of female CSW include transport workers as truckers, dock workers, their helpers and cleaners, and rickshaw pullers; uniformed forces, young people, working children, women in domestic work or in the workplace setting and in particular female garment-workers, internal and international migrants, slum-dwellers, and tribal people. However, surveillances and individual studies have concentrated their efforts only on rickshaw pullers, truckers, slum dwellers, and students. A survey of sexual behaviors among men in rural populations found that one-fifth of all men and one-third of unmarried men reported paying for commercial sex at least once in their life-time (28) and a similar picture in urban areas was seen. An average 30-40% surveyed and sentinel sites reported buying sex in the previous year from female CSW with inconsistent condom use (<15%).

In the Northwest of Dhaka, over 60% also reported non-commercial sex, while 35-40% in Central and Southeast Dhaka did (11). A study in Dhaka ($n = 388$) found that 54% of the subjects (truck drivers/helpers) had relations with at least one commercial CSW in the past year, and their mean number of sexual partners in the previous year was 4.6; in addition, premarital and extramarital sex was common, often with CSW (29). Of these subjects, only 31% had used a condom, and most had used condoms only once or occasionally. However, the sample was not randomly recruited and the participants were from only one truck stand. The data were collected through self-reports in oral interviews, so responses may have been influenced by perceived social desirability. It is estimated that there are about 0.3 million rickshaw pullers in Dhaka City alone (30), but the actual number may be 0.7 million including workers from other cities who travel to Dhaka and often sex with the CSW there. Such migration patterns can lead to sex ratio imbalances in both cities and rural areas. Many of these rickshaw pullers have migrated from rural areas and have left their wives behind. In a study of 1,000 randomly chosen rickshaw pullers in Dhaka, more than 30% visited a brothel on a regular basis, and 22% had a history of STIs (31). Among the married rickshaw pullers, 35% had been practicing extramarital sex, and only 8% regularly used condoms. The 4th round sero-surveillance identified that only 4-15% of rickshaw pullers reported condom use during their last sex act, but students were among the three most common groups of clients seen by CSW.

MSM and transgender: MSM and hijra are often overlooked as a high-risk population for their infection activities in Bangladesh. The role of MSM in the spread and transmission of HIV has not been well studied, and is limited by a number of factors. Simple identification of a male as 'homosexual' overlooks many social and general issues that may contribute to MSM behavior (32). Also, male-to-male sex in Bangladesh is an offense under section 377 of the Bangladesh penal code (33). MSM in Bangladesh are at increased risk for HIV infection due to sexual behavior, including low condom use, association with IDU (5) and blood sales. The sero-surveillance data indicate that infection has reached significant proportions in certain high risk groups and may soon spread to other groups, especially MSM. Trends from other settings suggest that HIV will spread among these high risk groups before spreading to the general population. An NGO, as part of its community-based STI/HIV intervention, claimed that it reached a total of 1,454 MSM and male CSW between July 2000 and June 2001 (34). The 5th round sero-surveillance found around 45% of male CSW both from Central-A and Southeast-A of Dhaka City reported condom use in commercial sex with new clients in the past week. Khan et al. (35) have outlined the vulnerability of female sex partners of MSM. Half of the MSM surveyed in a port city in 2000 performed unsafe anal sex with females, including their wives. They often do not disclose their MSM practices to their female partners.

Transgender persons are traditional transvestites or transsexuals from the Indian subcontinent. Some are born phenotypically male, and some are said to have ambiguous genitalia. Traditionally, those who are born with ambiguous genitalia have their external genitalia removed surgically and become eunuchs. They wear women's clothing, and usually behave like women. An NGO working with this group estimated around 5,000 transgender live in Dhaka City alone (36). Most of them work as CSW and practice receptive anal sex (32).

Transgender persons reported a very high average number of clients that they had unprotected sex with. In the 5th round surveillance, almost all transgender persons (99%) were reported to have sold sex in the last week, but only 17% of these reported condom use. In keeping with these data, transgender persons had the highest rate of active syphilis (10.4%) among all the groups in the 4th round sero-surveillance, and the proportion that reported condom use in the last sex act with clients (3.4%) in the 3rd round survey.

RESULTS AND DISCUSSION

Bangladesh is unique among the countries in South Asia in that it has most of the known risk factors for a large-scale HIV epidemic, but no evidence that such an epidemic is evolving. Many Bangladeshis explain this low level in terms of the predominantly Muslim composition of the society and Islam's teaching that sex should be confined to marriage. However, the exact reason why HIV infection is currently concentrated in Central A of Dhaka is unknown, but probable explanations include rural-urban migration patterns, the concentration of poverty and joblessness in the central city slums, and the greater availability of injecting drugs and a wider sharing network. Injecting drug use behaviors have been found throughout the country, but, HIV infections are not found at all sites. Therefore, the response has been focused mainly on where active infections have been documented. The epidemiology of HIV infection in other countries suggests that increasing rates of HIV in higher-risk populations can precede an epidemic in the general population. The available data from 7th round of national surveillances for HIV in Bangladesh represents the most complete information for high risk groups (Tables 1-4). It shows a fairly low, but rising, level of knowledge about HIV, but because the population is large, the rise in knowledge is as yet insufficient. Female CSW were the best informed, with 31% reporting correct knowledge, and IDU were the least well informed, with only 20% reporting correct knowledge. High population mobility within the country and beyond its borders has resulted in an increase in vulnerability to HIV and AIDS, particularly among young people. The average scores for the most-at-risk population groups included in the 7th round sero-surveillance was 25.9%, up from 17% in 2004, but a fairly low figure nonetheless. The prevalence of reproductive tract infections (RTIs) and STIs among females in the general population and among female CSW in Bangladesh is not well documented, although these infections are increasing tremendously. The link between HIV and other STDs is exacerbated in Bangladesh because of the paucity of effective and affordable treatment options and also because STIs and STDs are associated with a sense of shame and embarrassment; in addition, medication costs are a concern. The increase in chlamydial infection, which rarely shows clear symptoms, is also of grave concern. The increasing prevalence of HIV among IDU may predict a more general increase of HIV in the Bangladesh population over the next several years. Although Bangladesh is a low prevalence country for HIV/AIDS, all the factors that lead to rapid spread of infection and thus to an epidemic are present. These factors include high-risk behavior, lack of awareness, very mobile populations, and being surrounded by high HIV prevalent countries. Periodic surveillance of recognized high risk groups shows that HIV prevalence has been increasing steadily. In Dhaka City, HIV prevalence in one subset of a high risk group has crossed to

the level of a concentrated epidemic (7%). The high prevalence of sexual risk behaviors among IDU and CSW and their clients is alarming. Females are at risk of a major HIV epidemic from both infection sharing and sexual risk behavior, and sex workers who are also IDU appear especially vulnerable. Although a small increase in condom use and a reduction in syphilis have been seen among subsets of the most at-risk populations in recent years, these gains are clearly not sufficient to reduce the threat of a possible HIV epidemic. Once HIV is established in the risk groups, it will spread to the general population because the spread is determined by how risky people's sexual behavior is.

Estimations and projections of HIV/AIDS transmission up to the year 2020 in Bangladesh only through the risk groups are presented in Table 5 and Figures 3 and 4. The projections have shown a steady increase in the number of HIV/AIDS. The total number of HIV/AIDS among the entire population of Bangladesh may in fact be double that of the projected prevalence among the most-at-risk groups. All the populations among the risk groups have been considered in this estimation and projection. The average prevalence rates of the risk group populations were shown to be lower than the prevalence rates in Central Bangladesh. The reason for this is that in some cities, the HIV prevalence rates of the subsets of the most-at-risk groups in these cities are nearly zero. Moreover, the government along with a large number of NGOs have given top priority to working to prevent HIV in the risk groups and in the general population. To complement the efforts of the government, approximately 385 NGOs are actively involved with anti-HIV/AIDS work, primarily doing prevention. There is an NGO network of over 180 NGOs called the STI/AIDS Network. Their continued efforts in this regard are remarkable, and are the reason why the total number of HIV/AIDS is not comparatively high given the huge population of Bangladesh. Among the most-at-risk groups, IDU are the most vulnerable to HIV/AIDS, and the numbers of IDU affected have been gradually increasing, as is clearly shown in the curve i in Figure 3 and curve iii in Figure 4, followed by sex workers (curve ii in Figure 3 and curve ii in Figure 4), clients of sex workers (curve iii in Figure 3 and curve i in Figure 4), and MSM (curve iv in Figure 3 and curve iv in Figure 4). The \mathcal{R}_0 values for all the risk groups are positive, which means their transmission rates are increasing monotonically over time. However, the situation is more com-

plex than these values indicate, because there is a surprisingly high level of commercial sex and intravenous drug use, and a significantly high level of STDs within the country. The results show that the most contributing factor is sex work among the wide population. The reason is people from rural areas who have commercial sex while in cities and towns will become infected, and a fraction of these persons will subsequently infect other partners in the rural population. Thus, Bangladesh adjoins the Asian region with severest AIDS epidemic.

The actual epidemiological picture of Bangladesh is incomplete due to the lack of published comprehensive sero-surveillance data. Bangladesh is now at a critical moment, in that if actions are taken to control HIV transmission among

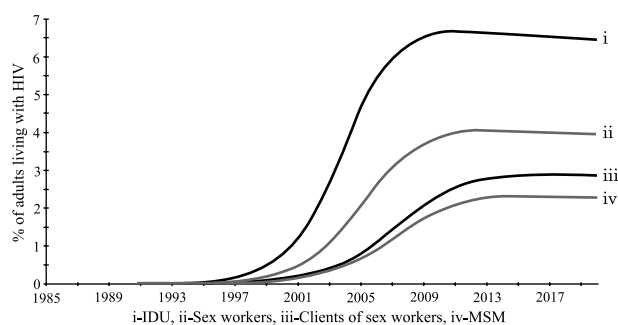


Fig. 3. Transmission rates of the most-at-risk groups for the populations up to 2020 in Bangladesh.

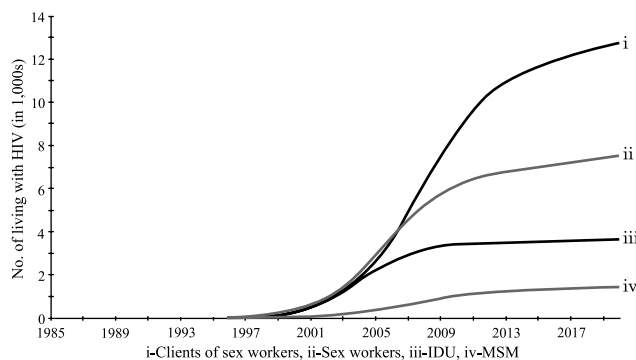


Fig. 4. Number of living with HIV of the most-at-risk groups for the populations up to 2020 in Bangladesh.

Table 5. HIV prevalence and rates among the most-at-risk groups for the populations of Bangladesh

| Year | HIV of most risk group | Rate of IDU | HIV of IDU | Rate of MSM | HIV of MSM | Rate of clients CSW | HIV of clients CSW | Rate of CSW | HIV of CSW |
|------|------------------------|-------------|------------|-------------|------------|---------------------|--------------------|-------------|------------|
| 2005 | 8,160 | 4.61 | 2,250 | 0.67 | 320 | 0.79 | 2,642 | 2.04 | 2,948 |
| 2006 | 10,602 | 5.40 | 2,668 | 0.91 | 445 | 1.07 | 3,684 | 2.59 | 3,805 |
| 2007 | 13,084 | 5.95 | 2,975 | 1.18 | 590 | 1.40 | 4,913 | 3.07 | 4,606 |
| 2008 | 15,453 | 6.33 | 3,200 | 1.46 | 743 | 1.75 | 6,235 | 3.45 | 5,276 |
| 2009 | 17,545 | 6.54 | 3,340 | 1.71 | 890 | 2.07 | 7,527 | 3.71 | 5,788 |
| 2010 | 19,277 | 6.62 | 3,420 | 1.92 | 1,019 | 2.34 | 8,680 | 3.88 | 6,158 |
| 2011 | 20,653 | 6.66 | 3,474 | 2.08 | 1,123 | 2.54 | 9,634 | 3.97 | 6,423 |
| 2012 | 21,695 | 6.65 | 3,498 | 2.18 | 1,204 | 2.69 | 10,378 | 4.02 | 6,614 |
| 2013 | 22,489 | 6.63 | 3,523 | 2.25 | 1,265 | 2.78 | 10,941 | 4.03 | 6,760 |
| 2014 | 23,082 | 6.58 | 3,531 | 2.28 | 1,310 | 2.83 | 11,362 | 4.03 | 6,878 |
| 2015 | 23,556 | 6.56 | 3,552 | 2.30 | 1,345 | 2.86 | 11,682 | 4.02 | 6,978 |
| 2016 | 23,945 | 6.52 | 3,567 | 2.30 | 1,373 | 2.87 | 11,936 | 4.00 | 7,070 |
| 2017 | 24,314 | 6.50 | 3,588 | 2.30 | 1,397 | 2.87 | 12,158 | 3.98 | 7,170 |
| 2018 | 24,669 | 6.49 | 3,615 | 2.29 | 1,419 | 2.86 | 12,357 | 3.97 | 7,278 |
| 2019 | 25,028 | 6.47 | 3,636 | 2.28 | 1,440 | 2.85 | 12,551 | 3.97 | 7,401 |
| 2020 | 25,388 | 6.48 | 3,676 | 2.27 | 1,462 | 2.84 | 12,735 | 3.96 | 7,515 |

Abbreviations are in Table 1.

the high risk groups, particularly IDU, a large-scale sexual epidemic may still be avoided. Female IDU are comparatively more vulnerable to HIV through their infection and sexual risk behaviors, and sex workers who are also drug users appear especially vulnerable because of their dual activity. In contrast, the prevalence of HIV among CSW has always been reported as being below 1%. The current low prevalence is the consequence of the failure to detect a more widespread epidemic. HIV is showing an increasing trend among recognized risk groups, and the high prevalence of risky behaviors by these groups could counterbalance the prevention efforts that have been implemented. For the most at risk groups, projects on risk behaviors, anthropological studies, epidemiological studies, and STI and virological studies need to be conducted among IDU, migrants, CSW, and other vulnerable groups including fishermen, smugglers, and ethnic minorities. To prevent a major epidemic from occurring, Bangladesh must implement a multi-faceted strategy. By concentrating on groups most vulnerable to infection, the onset of the epidemic can be prevented, or, if an epidemic begins, it can be prevented from escalating. A longer term generalized epidemic can be avoided by working with the general population, and by providing care and support to those already infected. It is critical for a comprehensive prevention program to be implemented that includes not only education but condom promotion. In addition, effective management of all STIs, a screening program for migrant workers, the contribution of both behavioral and serological components of HIV surveillance to cover the remaining high risk groups, with due consideration to the consistency of the surveillance indicators. Initiatives are also needed to develop pre-departure and post-departure programs for international migrants. Finally, increased coordination among intervening agencies would help ensure comprehensive prevention programs and equitable coverage. The range and quality of responses to HIV risk need further improvement. The expansion of surveillance to cover the remaining high-risk groups, and continuation of both components of the sero-surveillance, with the use of consistency of methodology, are important. Supportive care for HIV positive persons, more voluntary counseling and testing, and consideration of public health-oriented services for CSW are other pressing issues that need immediate attention. Steps such as these could help prevent the immense suffering and economic cost that high rates of HIV would bring to Bangladesh.

ACKNOWLEDGMENTS

The authors are very grateful to the Matsumae International Foundation, Japan for granting a Visiting Research Fellowship to complete this study. Thanks also go to the editor and referee for their valuable comments and criticism, which led to a greatly improved revision of this paper.

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