National AIDS Programme
Department of Health
Ministry of Health

Report from the Technical Working Group on Estimation and Projection of HIV and AIDS in Myanmar

Content

Acknowledgments

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Abbreviations

AIDS	:	Acquired Immuno-Deficiency Syndrome
ANC	:	Antenatal Clinic
ART	:	Antiretroviral Therapy
BSS	:	Behavioral Surveillance Survey
CSW	:	Commercial sex worker
EPP	:	Estimation and Projection Package
HIV	:	Human Immuno Deficiency Syndrome
IDU	:	Injecting Drug Users
MSM	:	Men having Sex with Men
NAP	:	National AIDS Programme
NGOs	:	Non-government Organizations
PLHIV	:	People Living with HIV/AIDS
PMCT	:	Prevention of Mother and Child Transmission
STD	:	Sexually Transmitted Disease
STI	:	Sexually Transmitted Infection
SGS	:	Second Generation Surveillance
TB	:	Tuberculosis
UNAIDS	:	Joint United Nations Programme on HIV/AIDS
UNDP	:	United Nations Development Programme
UNICEF	:	United Nations Children Fund
VCCT	:	Voluntary Confidential Counseling and Testing
WHO	:	World Health Organization

1. Background

Since 1997, country specific estimates of the burden of HIV infection in Myanmar have been published with the support of UNAIDS and WHO on a regular basis. The estimates are derived from the results of annual round of sentinel surveillance in line with WHO and UNAIDS Second Generation Surveillance (SGS) strategy. The methods and assumptions used for HIV estimates have been improved based on increased knowledge of the HIV epidemic and its dynamics in different populations. The development of these methods has been guided by recommendations of the UNAIDS Reference Group on Estimates, Modelling and Projections. Over the past few years specific software programmes have been developed, including the Workbook and the Estimation and Projection Package (EPP) to generate an epidemic curve of the HIV epidemic, based on sentinel HIV sero-surveillance data. Another software package (Spectrum) uses the epidemic curve as an input, and generates estimates of prevalence, incidence, and AIDS-related mortality, as well orphans. Some of the Spectrum outputs are used as denominators for Monitoring and Evaluation indicators for PMCT and Care. These software packages have been used by UNAIDS and WHO to produce HIV estimations and projections. Selected national country epidemiologists and analysts, including those from Myanmar, have received initial training in the use of these tools in both the 2005 and 2007 rounds of training workshops. All three software packages have recently been updated incorporating new evidence from research and adding new features for impact indicators.

This report presents the new HIV estimations and its demographic impact analysis based in a workshop that reviewed the data available from the previous HIV estimation workshop, which was held in September 2005 and HIV data for the years 2005 and 2006. The initial discussions were based in the draft estimates produced during the estimates training held in Bangkok in April 2007.

The United Nations family (WHO, UNDP, UNICEF, UNAIDS) has played an important role in the development of surveillance in Myanmar. In the past five years the UN has provided technical guidance through various means, financial and material support to the activities needed to conduct HIV surveillance in Myanmar.

2. Objectives

The goals of the workshop were:

1. To develop a national consensus on HIV estimates and demographic impact analysis with stakeholders and partners in Myanmar
2. To identify gaps and needs to improve HIV surveillance in Myanmar in the line of second generation surveillance principles

The workshop's more specific expected outcomes were :

- To present the newly improved methods and tools for estimates, HIV projections, and demographic impact analysis to colleagues in Myanmar
- To review country experiences with HIV surveillance and how well they have met data needs for Myanmar

- To develop preliminary estimates use these estimations to calculate the demographic impacts of HIV and AIDS in Myanmar

3. Current HIV/AIDS surveillance system in Myanmar

This section explains the different data sources available for HIV/AIDS/STI surveillance in Myanmar and a summary of the main surveillance results available.

3.1 HIV/AIDS Surveillance

The first case of HIV infection was reported in Myanmar in 1988 and the first AIDS case in 1991. AIDS reporting is currently based on the 1985 WHO clinical definition. HIV infected cases as well as AIDS cases are reported in the system by the health services and public health laboratories. The system is computerized and the basic variables of age, sex and residence, are collected.

By December 2006, 69,872 cumulative HIV cases (among blood donors and suspected hospitals patients) and 12,213 AIDS patients had been reported to the MOH. The majority (68%) of reported cases of both AIDS and HIV are attributed to heterosexual transmission. According to the National AIDS Programme a marked gradient of HIV/AIDS is evident as AIDS reported cases are mapped out by geographical areas, with the lowest rates in the western part of the country and the highest in the eastern part. The male to female ratio has changed from almost 8 to 1 in 1994 to 2.2 to 1 in 2006, showing a steady increase in the proportion of women being infected over the last years. It should be noted however that the AIDS case reporting is relatively low compared to estimated number of AIDS cases. The male to female ratio is derived from the AIDS reported cases thus it may not be representative.

3.2 HIV Sentinel Surveillance

In 1991, an HIV sentinel surveillance system was established in 9 sites. It was subsequently expanded to contain 21 sentinel sites in 2000. In 2001, it was further expanded to 27 sites with the addition of behavioural surveillance in all sites. The groups with high risk behaviour targeted were the female sex workers (FSW) in 2 sites, injecting drug users (IDUs) in 5 sites and male and female patients with Sexually Transmitted Infections (STI) in 30 sites and 8 sites respectively until 2004. Since then female STI patients are no longer sampled. Among the lower risk groups, the pregnant women, blood donors and the military recruitees are also included in sentinel surveillance in 32 sites and 2 sites respectively. Sentinel sites were selected according to its epidemiologically sound criteria, and sample sizes are appropriately managed. Manuals and standard procedures for HIV sentinel surveillance have been put effort to improve the quality of HIV surveillance in recent year.

Sentinel surveillance was carried out twice a year in each of the 21 sites until 1999. In 2000 following WHO/UNAIDS recommendations the period for surveillance was shifted to once a year. The targeted sample size is 100 persons for each high risk group and 200 for each of the low risk group for each site, except for the military recruits where 600 conscripts from each site are selected. There has been also

incorporated HIV testing among TB patients in 9 sites that provides some information for monitoring HIV impact. For HIV testing, strategy II as proposed by WHO is being used and national guidelines stipulate anonymous unlinked testing.

The methodology used for HIV surveillance is service-based. Drug users are referred from rehabilitation or drug treatment centres. Sex workers and STD patient samples are collected from government AIDS/STD clinics. Maternal and Child Health clinics are common places for collection of pregnant women. Military recruitees are sampled in the two main training centres in the country. The method to collect samples is sequential until the total sample size is reached or the time for surveillance (usually six weeks) expires.

Blood safety has been one of the prioritized activities of the NAP. According to the NAP between 85 to 90% of the blood transfused in the country is tested for HIV. Untested blood units are only likely to be transfused in remote rural areas in an extreme medical emergency. The NAP use blood donors as sentinel group. The prevalence rate in the sentinel group in 2006 was 0.38%. It has been estimated that about 200,000 blood units are transfused every year in the country. Central National Blood Bank of Yangon General Hospital found a prevalence of 0.29% among blood donors and in Mandalay general hospital the prevalence of blood donor found to have 0.5%. Seventy percent of the blood donations are from voluntary donors (the rest come from relatives of patients and other "replacement" donors) and most of the donors are men.

Table 1 presents the summary of HIV surveillance results for the month of March since 1992. The results must be interpreted with some caution. Sentinel surveillance systems were designed to evaluate trends over time in specific sites; samples sizes of approximately 250-300 are needed for more comprehensive epidemiological analysis. The pooling of samples into a single national figure obscures regional differences. The sentinel surveillance data confirm the rise in infection rates from the East to the West of the country reportedly observed in HIV and AIDS case reporting.

3.2.1 Issues in biological surveillance

Currently, HIV surveillance is conducted upon the sentinel groups of blood donors, military recruits, pregnant women, new tuberculosis patients, male sexually transmitted infection patients, female sex workers, men having sex with men, and injecting drug users in 34 townships throughout the country. The methodology of sampling is consecutive sampling of those coming to public and the international non-government organizations owned clinics. NAP has tried to lessen any inconsistencies by bilateral quality assurance surveys, refresher trainings and field visits. However, it is hard to judge from current data how representative people in the sentinel sample are of any other population. The lack of information in inclusion or exclusion criteria over the last 15 years and its variability may have an impact on the results. The inclusion of more socio-demographic variables in reporting of sentinel groups representing the general population might contribute a great deal analysis and interpretation of data effectively and specially the location of residence urban versus rural.

Another issue is geographic coverage for some of the populations. For example, sex worker sampled only in two sites in Yangon and Mandalay, and injecting drug users are based on 6 sites around the country. Given the large size and epidemiological diversity of Myanmar, this cannot be assumed to be representative of national figure. Other groups, e.g., male STI patients and pregnant women covered more sites and sample size are increased to 150 and 400 respectively for these groups. However, it has a limitation to interpret and compare with the data from different public health settings.

Table 1: Percent of sentinel surveillance populations testing positive for HIV in Myanmar, Month of March 1992-2006

Population	March 1992	March 1993	March 1994	March 1995	March 1996	March 1997	March 1998	March 1999	March 2000	March 2001	March 2002	March 2003	March 2004	March 2005	March 2006
Male STD (%)	11.88%	6.90%	5.70%	7.10%	7.70%	8.90%	7.05%	8.37%	7.06%	7.96%	6.49%	6.01%	3.23%	4.07%	4.86%
Male STD (N)	909	1402	1866	1795	1634	1780	1971	2006	1984	2652	2789	2713	2758	2803	2920
Female STD (%)	6.55%	3.10%	4.80%	5.00%	4.00%	8.20%	5.64%	8.82%	11.57%	12.45%	12.07%	9.09%	6.10%		
Female STD (N)	870	635	651	497	672	613	674	850	752	932	787	693	705		
CSW (%)	4.30%	9.00%	16.80%	18.00%	21.50%	25.00%	29.00%	26.00%	38.00%	33.50%	32.32%	31.35%	27.50%	31.98%	33.50%
CSW (N)	162	201	191	194	200	200	200	200	200	200	198	185	200	197	200
IDU (%)	62.80%	74.30%	71.40%	54.50%	66.50%	54.10%	56.19%	50.92%	62.69%	40.92%	24.13%	37.86%	34.41%	43.20%	42.46%
IDU (N)	374	389	437	530	388	431	420	434	268	347	315	243	401	488	398
Pregnant women (%)	1.80%	1.40%	1.60%	1.30%	1.30%	1.50%	1.88%	2.65%	2.15%	2.24%	2.13%	1.64%	1.75%	1.32%	1.54%
Pregnant women (N)	599	1028	2048	2648	2990	3000	3085	3205	3581	5183	5264	5654	5530	5812	5710
Blood donors (%)	0.33%	0.51%	0.49%	0.58%	0.71%	0.71%	0.60%	0.90%	1.03%	1.14%	1.23%	1.23%	0.84%	0.73%	0.38%
Blood Donors (N)	31687	29879	10401	9262	8680	8555	9482	8841	7740	6648	6202	5596	5808	6561	5855
New military recruits (%)	0.00%	0.40%	0.50%	0.50%	0.40%	0.50%	2.50%	1.76%	1.42%	1.83%	2.00%	2.09%	1.60%	1.33%	1%
New military recruits (N)	1105	1200	1192	1159	1198	1200	1200	1191	1200	1200	1200	1199	1187	1200	1200

STD: Sexually Transmitted Disease ;IDU: Injecting Drug users

3.3. Laboratory

The laboratory issues regarding HIV surveillance were not examined during this mission. According to previous reports WHO recommended strategy II for HIV surveillance has been used for in Myanmar. Samples are collected at the sites and National Health Laboratory, Yangon and Public Health Laboratory, Mandalay performed VDRL and HIV antibody. According to NAP, the validation of quality control exists for both national reference laboratories.

3.4. STI Surveillance

Surveillance of Sexually Transmitted Infections (STI) is based on passive report by the health services of the MOH. The syndronmic approach has been adapted in the country and medical officers and basic health staffs up to rural health centers have been trained. STI case reports at this level are therefore based on syndronmic diagnosis. However in the 36 townships with AIDS/STD Control Teams etiological reporting is used within the National Health Information System (NHIS). Syphilis tests are performed for STI patients as well as pregnant women. The prevalence of syphilis among primagravida and multigravida women in the central women's hospital in Yangon was 1.47% and 1.99% respectively in 2006 as presented in figure 5.

3.5. Behavioral surveillance

Until recently, behavioural surveillance has been extremely limited. The first attempt at population-based surveillance of sexual behaviour and condom use among sex workers took place in 27 townships in 2000. Female sex worker were also asked about knowledge and attitudes towards condom were explored. But some questions were asked circumspectly because of cultural norms. However, the behavioural surveillance had started as an integral part of the HIV surveillance system since 2000. In 2003 the NAP conducted a second round of behavioural surveillance to assess the knowledge, attitudes and behaviours of both the general population and youth with regards to HIV/AIDS transmission and prevention at seven sites in Myanmar. A total of 9678 individuals (4631 males and 5047 females) were interviewed. Of these, 35% were youth aged 15-24 years. Although 91% of the population had heard about HIV/AIDS, only 35% knew about methods of HIV prevention and barely 27% were able to correctly reject the common misconceptions about HIV transmission. The youth, women and the least education had the lowest knowledge about HIV prevention. Only a quarter of the population sought treatment for sexually transmitted disease (STD) symptoms; a large proportion of these consulted a private practitioner or took self treatment and only 15% visited a government hospital for STD treatment. About 7% of men had sex with a non-regular partner; nearly two-thirds of them had unprotected sex (only 54% men used condom consistently with a commercial sex worker and 18% with a casual acquaintance). Above all, 7% of the men engaged in high risk behaviours in the past year.

In addition, the international non-governmental organizations (INGOs) of interest conduct regularly behaviours surveys among different populations for monitoring of program activities and impact of interventions. Some data were shared and discussed during the working groups discussions and presentations.

There have also been some surveys in groups at higher risk for HIV such as sex workers or IDUs. But while behavioural research does exist in a number of groups with risk behaviour, the samples have rarely been systematic and these studies have not been repeated in order to measure trends in behaviour over time. Moreover there is limited sharing of information regarding the results of these studies.

Ad hoc surveys among drug users and sex workers, including those in treatment or detention, suggested very high levels of risk behaviour in some groups but with an increase consistent condom use among sex workers and decreasing needle sharing in some locations. Men who have sex with men have also reported high levels of unprotected anal sex with multiple partners.

4. Methods

The workshop was conducted as follows:

- Day 1:
    - An introduction to the tools (UNAIDS Workbook, UNAIDS Estimation and Projection Package, and Spectrum), followed by discussion of methodologies to be used for projection and estimation of demographic impacts.
    - Presentation of the assumptions made using the workbook, population size and HIV prevalence levels of infection among different populations.
    - Presentation of the results of the process, wit the HIV epidemic curves for different populations and its demographic impact followed by discussion of the findings and their relevance to programming.
- Day 2:
    - working groups discussions for each population group to review assumptions, parameters used and results.
    - Presentation of working groups discussions and general discussion for each topic.
    - Small technical working group to incorporate the groups discussions and produce final results and workshop report

At the workshop, the agreement was reached on the methodology to be used. The basic steps were:

1. First review surveillance data for each of the key populations, noting any important trends. If increasing or declining trends were observed, further data sources were to be analysed to determine if the finding was consistent.

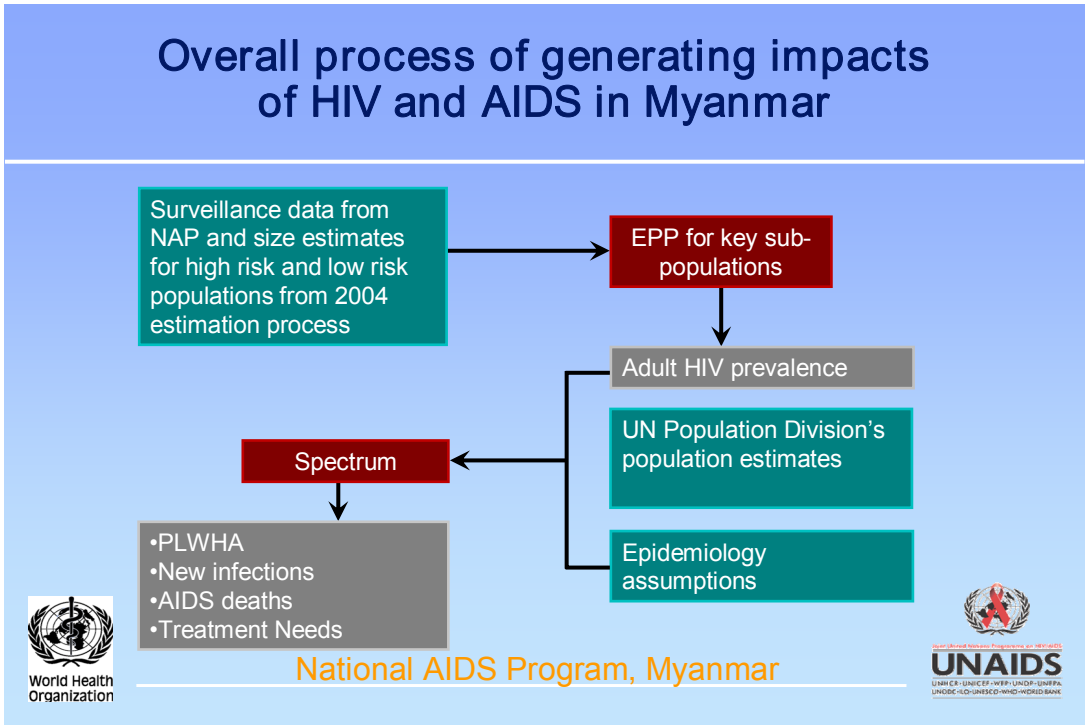
2. Second, generating EPP curves for each key sub-population (injecting drug users, clients and female sex workers, men sex with men, low risk men and low risk women. EPP 2005's feature for accumulating HIV-positive former members of at-risk populations was used to account for men who had stopped injecting or visiting sex workers frequently. Based in the each population HIV epidemic curve, a national HIV epidemic curve was estimated.

3. The results were fed into Spectrum, along with estimates of mother-to-child transmission and antiretroviral program coverage. An uncertainty analysis was calculated based in the low and high range of population sizes estimated for different population groups.

4. Impacts were generated from Spectrum. These included: numbers of adults and children living with HIV and AIDS, deaths, AIDS cases, pregnant women needing PMTCT programs, and antiretroviral demands over time.

The methods and tools used to estimate the demographic impact were the ones presented during the first day of the workshop *(Methods and tools for HIV/AIDS estimates, edited by H. Ward. N. Walker and P Ghys STI journal August 2005 Vol 80 Sup I*). These have been continuously refined and improved over time by UNAIDS and WHO. The baseline data used for inputs was the data provided by the HIV surveillance system in Myanmar and the sizes of key populations from the estimations workbook for HIV produced in 2007 in Myanmar. EPP and Spectrum were then used for projection and assessment of the demographic impact of HIV/AIDS in the country. Figure 1 presents a summary of the methods used to estimate the impact and produce these draft preliminary results.

Figure 1. The process of generating projections and HIV impacts in Myanmar



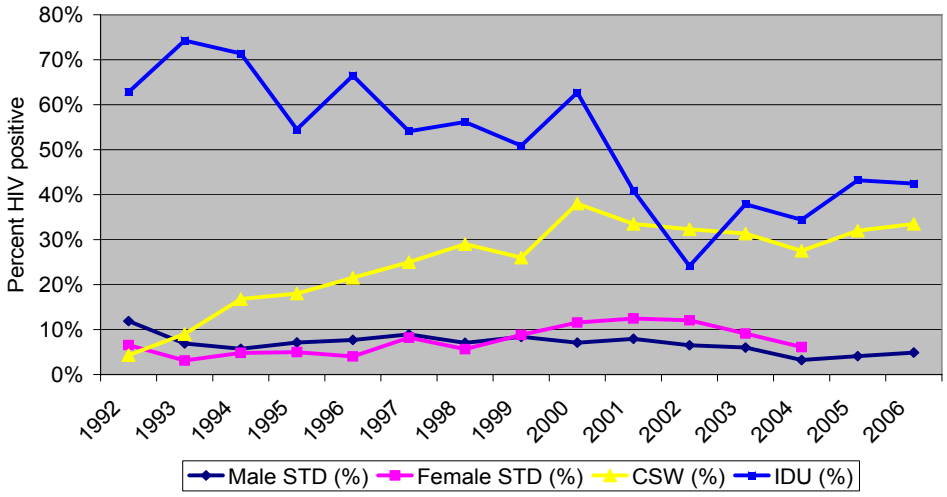
The populations included were: injecting drug users, clients and sex workers, men who have sex with men, low risk males and female. As there is no available HIV prevalence data among men having sex with men and clients of sex workers trends of male STI patients was adjusted to use as a proxy to estimate the trends of HIV infection in these population groups.

5. Results

5.1 HIV surveillance trends

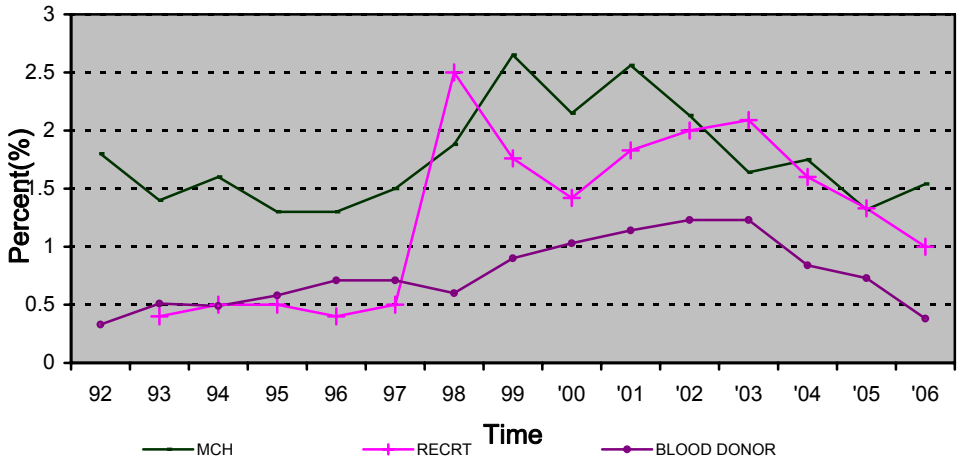
The working team observed the trends among populations with higher risk behaviours, sex workers and injecting drug users have been declining for the last few years but stabilized for the last two surveillance rounds as presented in figure 2. Most key groups were showing downward trends up to 2004 such as female sex workers (Yangon and Mandalay), female and male STI patients. Patterns of decline in sex workers & male and female STI patients showed similar trends at different areas.

Figure 2. HIV surveillance trends among male, and female STI patients, female sex workers and injecting drug users 1992-2006



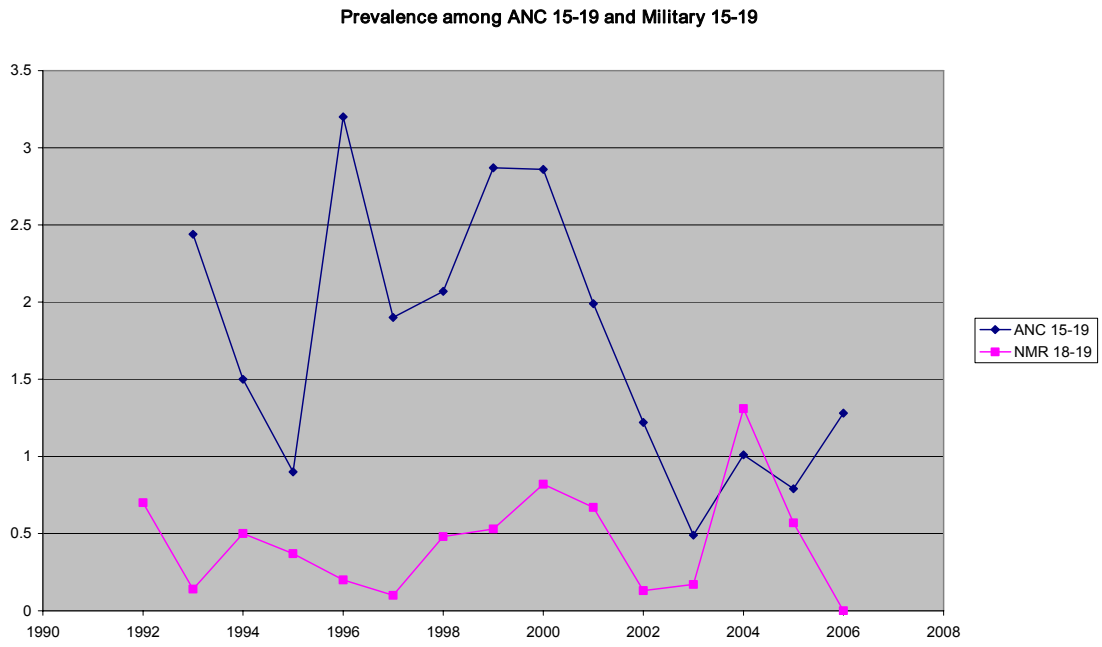
Declining trends have been observed in population groups with lower risk behaviour like pregnant women, and new military recruits as presented in Figure 3. HIV screening is also performed regularly among blood donors, but this population group is difficult to interpret as some are replacement donors selected by family members, others are voluntary donors, and health services are now applying their own selection criteria. Thus it has significant limitations compared to other groups.

Figure 3. HIV prevalence among pregnant women, new military recruits and blood donors (1992-2006)



The working team recognized that the trends were in good agreement among the different populations, but there are limitation of data on the geographic and sample size of several groups. Accordingly, they sought for corroborating evidence of declines in incidence and prevalence from other sources. Young people in particular, because they have been sexually active for relatively short periods of time, provide a good proxy for incidence, that is, numbers of new infections occurring in a year. Thus, a further analysis by age breakdown of young pregnant women (15-19) and young military recruits (18-19) was undertaken (see Figure 4). These two younger population groups also showed similar downward trends in the last few years, indicating that incidence among younger Myanmar appears to be falling. However, the last surveillance round for young pregnant women has shows an increase, and therefore needs to be followed up to understand whether other factors (changes in sampling methodology or surveillance sites) may explain this recent increase in apparent prevalence. More consistent declining trend is observed in the potential new recruits, but there is little information available about the methods used to collect this data.

Figure 4. HIV prevalence trends among young pregnant women and young military recruits (1992-2006)



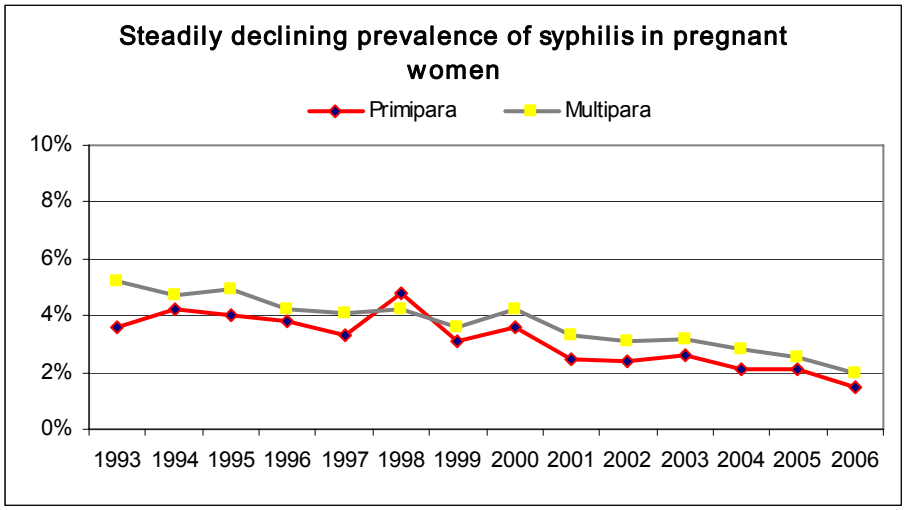
As time shortage for the WHO/UNAIDS mission occurred, they did not concentrate on the scope of its terms of reference to analyze the behavioral data. However during the data review process it was brought to the discussion table that there are several independent survey sources from NAP, the UN and the INGOs that have reported that 60% consistent condom use for sex workers and its clients. This relatively high reported consistent use of condoms is validated by the fact that the number of condoms distributed in the country raised from (according to the National AIDS Programme and Population Services International-Myanmar (PSI) an estimated total distribution from less than 3 million per year in 1996 to more than 49 million in 2006. In moderate risk settings like Myanmar, such levels of condom use by sex workers and clients may be sufficient to explain the

declining trends observed in the surveillance data. The number of condoms distributed in the country may be sufficient to explain the trends if they are being used primarily by target populations with high levels of risk behaviour.

Additional information was available from harm reduction programs. In 2006 about 1.9 million syringes were distributed in the different locations with a needle exchange programme increasing from 200,000 in 2003. The services providers offer a range of services from outreach and peer education to the provision of STI treatment and methadone maintenance therapy. There has been a further increase of drop-in centres catering for drug users reported. An additional 3 drop-in centres have opened their doors in 2006 bringing the total to 19 centres. Under the methadone maintenance therapy, about 264 IDU are receiving treatment.

Sexually transmitted disease (Syphilis) prevalence data also supports this interpretation of declining risk. There has been a decline in syphilis trends in both pregnant women of primipara and multipara (see Figure 5). These trends are comparable with the data from INGOs among female sex workers.

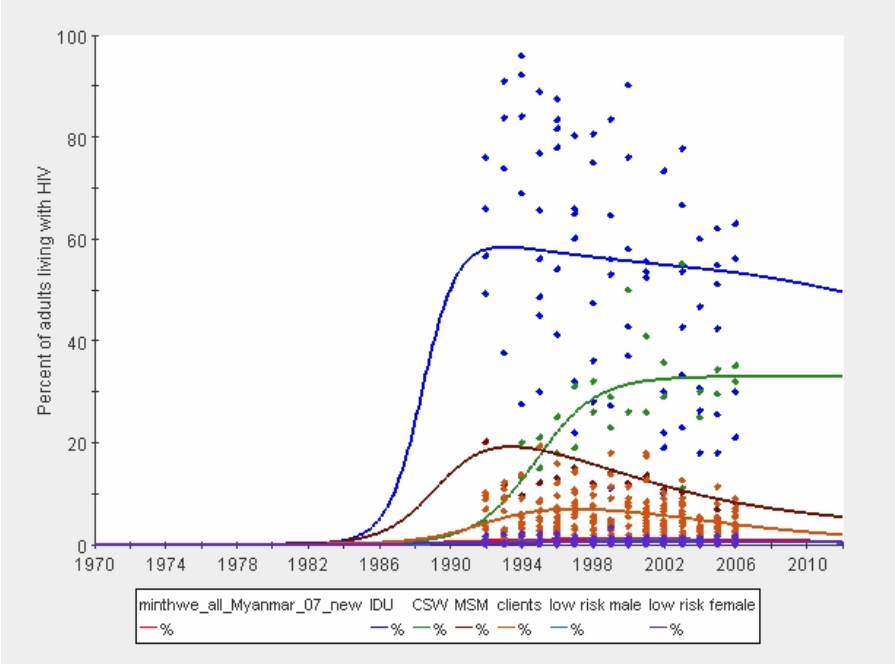
Figure 5. Declining prevalence of syphilis among pregnant women (1993-2006)



5.2 Epidemic curve and Demographic impact

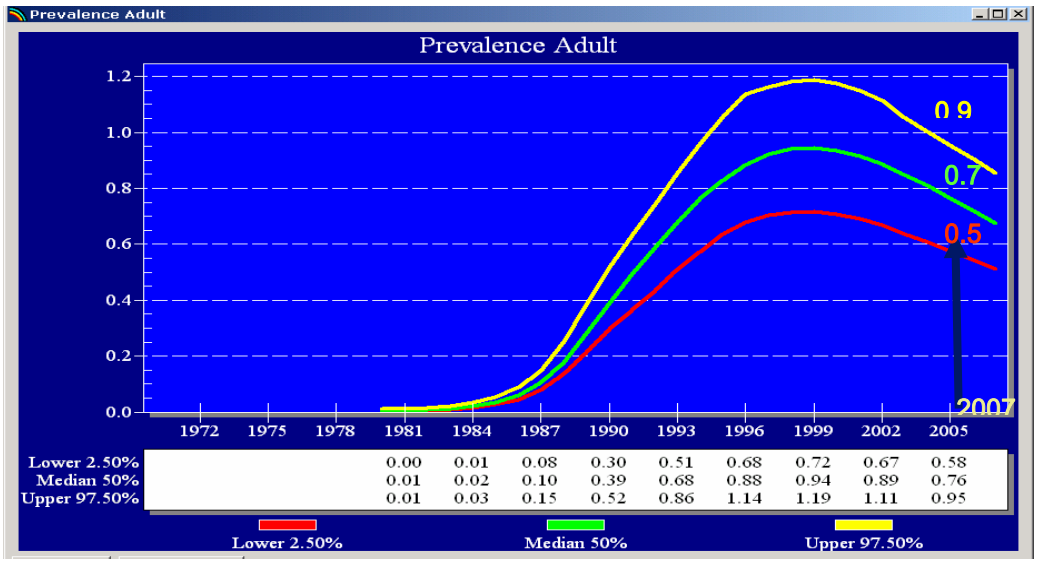
The prevalence trends for each of the populations discussed above were put into EPP along with the high and low size estimates which was received from the estimation exercise done in Bangkok, 2007. The resulting fits are shown in Figure 6.

Figure 6. Prevalence fits to Myanmar surveillance data in EPP for specific population groups



These epidemic curves were calibrated even though the limitation of the HIV surveillance data had taken into account and some assumptions were made upon the regional experience if there was no available data in the country. Then an uncertainty analysis was done by using the low and high range of such populations with the uncertainty of population sizes. The result was that prevalence range in Myanmar is between 0.5 and 0.9% for adult population with an estimated middle range of 0.7% as shown in Figure 7.

Figure 7. Ranges for national HIV prevalence trend (in percent HIV+) obtained from high and low population estimates



The green curve(middle one) represents a preliminary estimate for the national HIV prevalence curve in Myanmar. However, this curve needs to be interpreted with caution and much more in-depth analysis is needed in the future to determine its validity. Several key assumptions have gone into generating this curve, any of which may be wrong upon more careful examination. These assumptions and the issues regarding them that need to be explored include:

- *Geographic limitations of surveillance data*. Although the fit assumes the surveillance data is nationally representative, it must be recalled that data for both female sex workers and IDUs is based on the various studies in Myanmar. An surveillance system with greater geographical coverage on these populations has to be expanded. Many more data must be added by comparing with the data from INGO or other ad hoc studies on HIV prevalence among these populations for consistency with national trends. It would also be valuable to do a study comparing HIV rates among female STI patients with sex workers in numerous parts of the country, as well as analyzing the behaviour of women attending these clinics. This would give some indication of whether female STIs can serve as a proxy for HIV prevalence among sex workers.

- *Sizes of the key populations*. These have been assumed here to be the sizes for each population used in doing the 2006 national estimate. The national curve is composed of a set of curves for individual population (FSW, client, IDU, etc.). These trends of individual group showed peak at different times in different patterns as seen in Figure 6. If the size of any of these populations was not accurately estimated in the 2006 process, the national result may be off both in qualitative shape and quantitative values. Thus, more careful consideration of the size of these key contributing populations is needed.

- *Absence of HIV prevalence data on MSM and clients in the projections*. These two population groups contributing to epidemics in neighbouring countries, Myanmar may have found similar situation. Due to a lack of HIV prevalence data, proxy HIV prevalence data was used from male STI patients that can represent somehow these two key populations. There is evidence of high HIV prevalence in MSM in neighbouring countries.

- *ANC data and distribution of population in the country:* HIV prevalence for ANC are derived mostly from 32 townships in the country. While there is a good geographical representativeness of this population, most of the general population in Myanmar reside in rural areas (70%), thus a correction factor based in regional information was applied to this large population. However, there is still a need to collect information in HIV prevalence among rural women.

With these limitations, a more comprehensive process needs to be undertaken in the future. It is also need to validate surveillance trends taking into consideration on the regional coverage of surveillance data, the accurate assessment of the sizes of key populations, the available behavioural data, and information on MSM for both in the projections and in a comprehensive national response. Vigilant review is also needed to determine whether the downward trend of prevalence from the year of 2000 onwards has to be consistent with trends in behavioural data.

5.3 Impact Results

The results produced by the epidemic curve estimated with EPP were fed into the Spectrum software in order to estimate demographic and health impacts in Myanmar. The outputs of Spectrum are the standard indicators published by UNAIDS and WHO. The main outcomes are presented here. The mid point of HIV prevalence range was used to calculate the impact of HIV infection in the country but a summary table presenting the overall ranges is presented in the final tables.

The number of people infected with HIV in the country is approximately 240,000 including adults and children with an estimated 0.67% adult prevalence (0.5- 0.9%).

Figure 8: Mid point estimated prevalence 15 to 49 years old in Myanmar

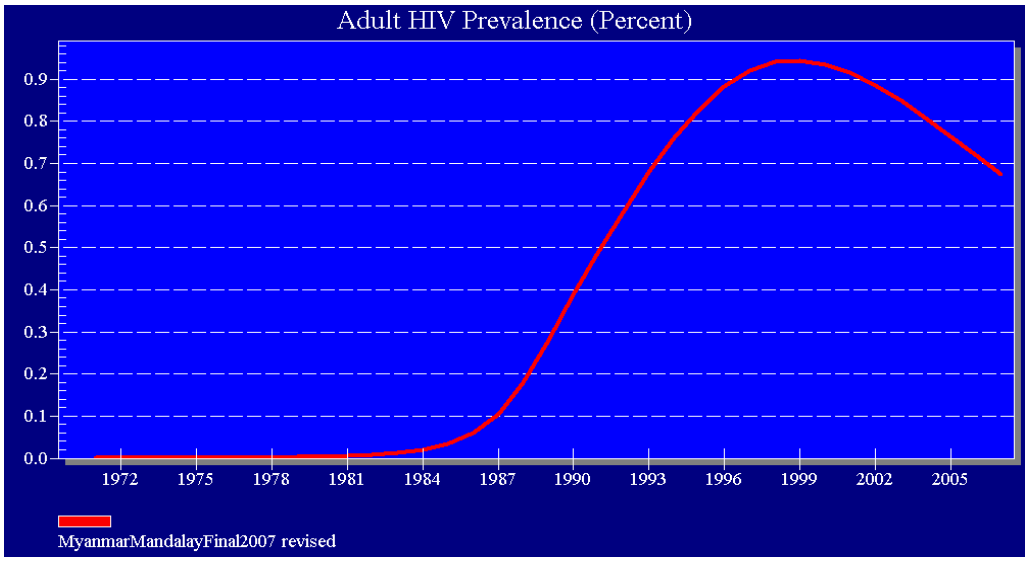
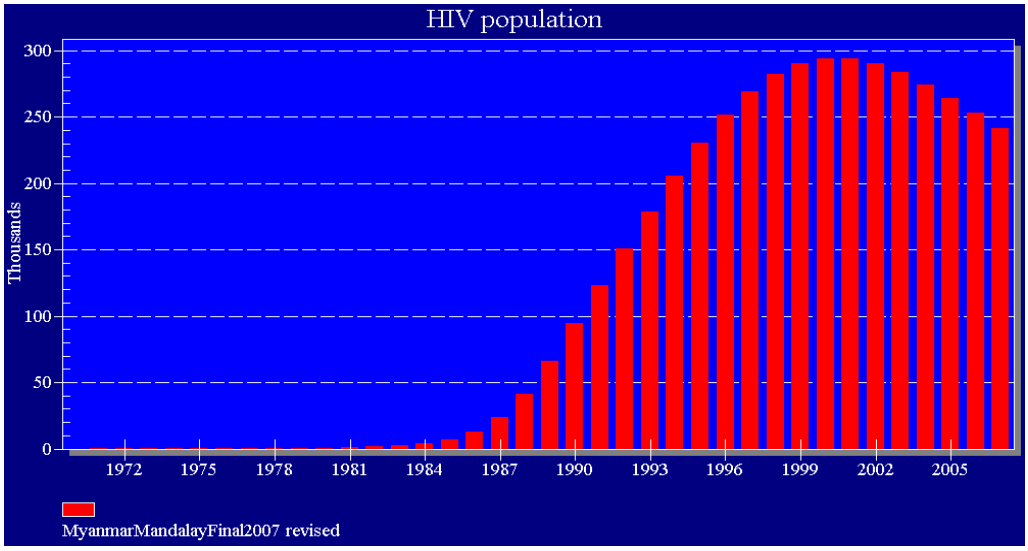
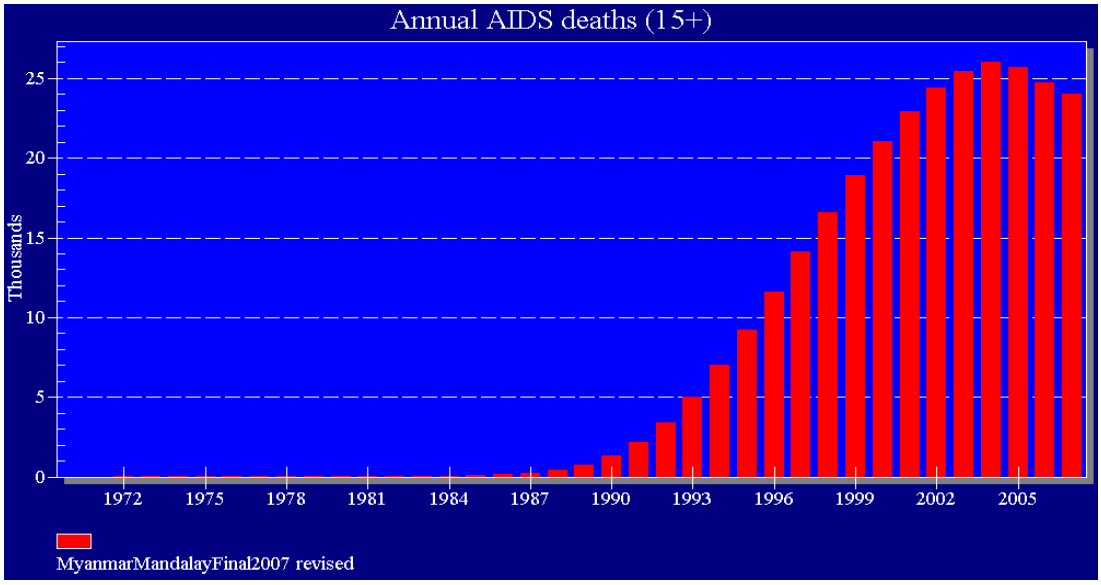


Figure 9: Estimated number of people living with HIV in thousands in Myanmar over time



Although the HIV surveillance trends are declining in certain groups, the current burden of symptomatic illness is increasing rapidly at present. Figure 10 shows that burden of HIV related deaths peaked at almost 25,000 a year in 2005 and remain quite high for the next several years. This must be due to AIDS takes on average 11 years after infection with HIV to develop, meaning that Myanmar is now seeing AIDS cases in people who were infected in the past when prevalence was higher. This number will tend to decline slowly as prevalence in the country, which will also seem to be declining slowly over time as seen in Figure 8.

Figure 10: Number of AIDS deaths in thousands over time in Myanmar



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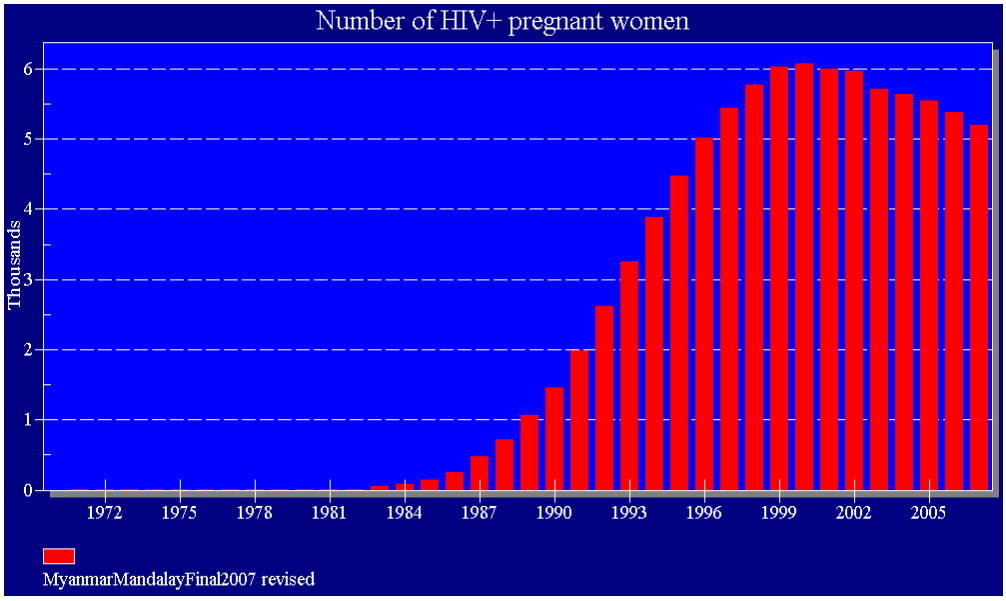
The HIV/AIDS epidemic in Myanmar is more prevalent among men over the last 10 years, with male to female ratio declining from 8 to 1 in 1994 to 2.2 to 1 in 2006. Thus it

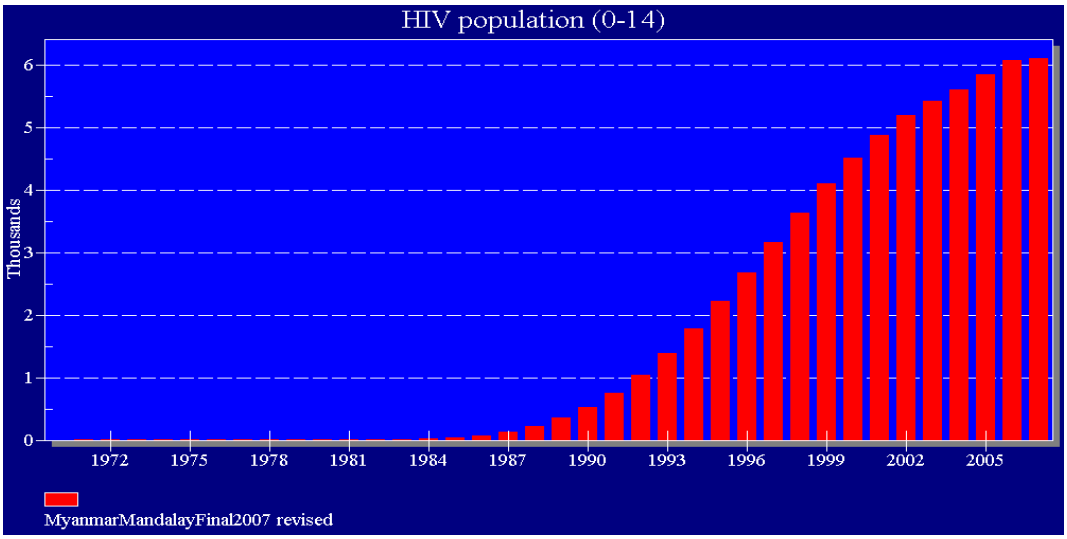
is evident that the number of women infected has been increasing rapidly. These women are largely the married partners of current and former clients, injecting drug users, and men who have sex with men. Applying the fertility rate to these women it is possible to estimate the number of women who are pregnant and HIV infected. Figure 11 presents the estimated number of pregnant women who carry the HIV virus about 5,000 in 2007.

Figure 11. Number of HIV positive pregnant women in thousands in a year



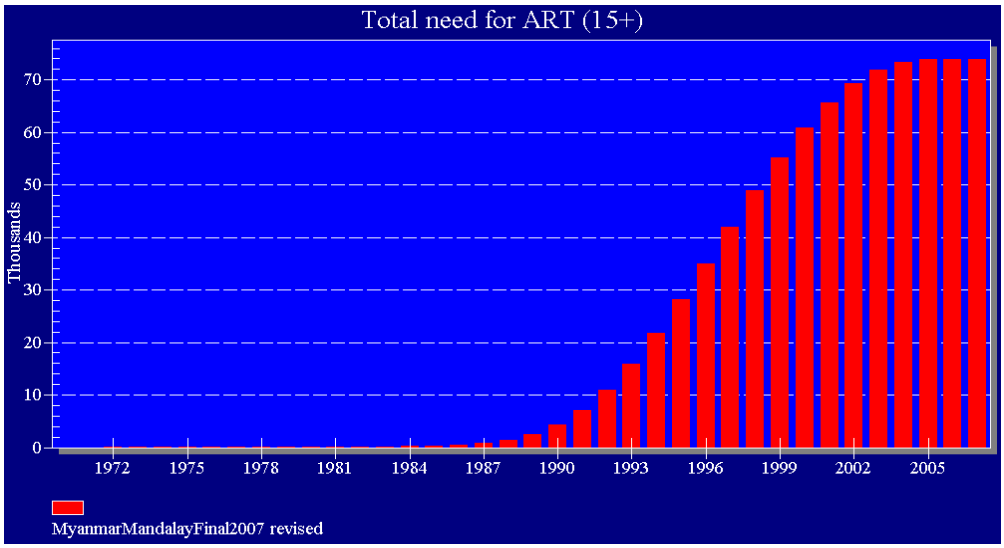
Many of these women will pass HIV on to their newborn children, even with the expansion of PMCT programs expected to occur in Myanmar. Figure 12 shows the number of such HIV-positive children expected to be born each year. This number increases over time both because of the number of HIV-positive women infected has increased in the last few years, as seen in Figure 11, but also because it is assumed that most of these women will receive nevirapine or ARV to reduce mother-to-child transmission.

Figure 12. Number of children in thousands living with HIV



Almost all the developing countries have recently started ART programs as ART has become more accessible in resource-limited countries. Estimates of the number of people needing ARV in a given year are based on the WHO ART guideline recommendations 2003. WHO recommends that in resource limited settings HIV infected adults and adolescents should start ART therapy when the infection has been confirmed and there are signs of clinical advanced disease (HIV disease stage IV, regardless of CD4 cell count; stage III with CD4 cell count below 350 cells per mm^3) or laboratory evidence of severe immuno-suppression (CD4 cell count below 200 per mm or, if not available, lymphocyte count below 1200 mm^3 with symptomatic disease). Using these criteria the number of people needing ART in Myanmar is about 66,000 for 2007 (including those already in treatments by 2007) as shown in Figure 13. As programmes for ARV increase coverage, the need for ART will increase as more people will survive to AIDS.

Figure 13. Number of people in thousands in need of ART in a specified year



Summary tables

The following tables present the summary results of the impact of HIV infection in the estimated demographic and health impacts in Myanmar using the methods described above.

Table 2: Summary of HIV impacts on adults 15 an older

Adults 15-49 Summary - Total					
	2004	**2005**	**2006**	**2007**	**2008**
Myanmar Mandalay 15.08.2007					
HIV population					
Total	**249,286**	**238,514**	**226,945**	**214,932**	**202,996**
Males	159,799	149,071	138,381	127,936	117,339
Females	89,487	89,443	88,564	86,996	85,657
Adult prevalence	0.81	0.76	0.72	0.67	0.63
New HIV infections					
Total	**17,707**	**15,779**	**13,873**	**12,667**	**11,557**
Males	9,862	7,696	6,609	6,084	4,777
Females	7,845	8,083	7,264	6,583	6,780
Adult HIV Incidence	0.06	0.05	0.04	0.04	0.04
Annual AIDS deaths					
Total	**22,836**	**22,448**	**21,519**	**20,864**	**19,927**
Males	16,491	15,921	14,988	14,262	13,355
Females	6,345	6,527	6,531	6,602	6,571
Total need for ART					
Total	**64,796**	**65,035**	**64,840**	**64,572**	**64,157**
Male	46,471	45,817	44,870	43,886	42,805
Female	18,324	19,218	19,970	20,686	21,351
Total number receiving ART					
Total	**425**	**2,214**	**5,451**	**7,886**	**10,274**
Male	306	1,565	3,796	5,431	6,990
Female	119	649	1,654	2,456	3,284
Number in need of first line therapy					
Total	**64,796**	**65,035**	**64,840**	**64,572**	**64,157**
Male	46,471	45,817	44,870	43,886	42,805
Female	18,324	19,218	19,970	20,686	21,351
Number newly needing first line therapy					
Total	**17,921**	**17,228**	**16,281**	**15,712**	**14,911**
Male	12,573	11,876	11,010	10,411	9,663
Female	5,347	5,351	5,271	5,300	5,248
Number receiving first line therapy					
Total	**425**	**2,214**	**5,451**	**7,886**	**10,274**
Male	306	1,565	3,796	5,431	6,990
Female	119	649	1,654	2,456	3,284
Number receiving second line therapy					
Total	0	0	0	0	0
Male	0	0	0	0	0
Female	0	0	0	0	0
Unmet need for first line therapy					
Total	**64,370**	**62,820**	**59,389**	**56,686**	**53,883**
Male	46,165	44,252	41,074	38,456	35,815
Female	18,205	18,568	18,315	18,230	18,067

Table 3: Summary of HIV impacts on child 14 and younger

Child 0-14 Summary - Total						
	2003	**2004**	**2005**	**2006**	**2007**	**2008**
MyanmarMandalay15.08.2007						
HIV population						
Total	**5,425**	**5,607**	**5,852**	**6,078**	**6,114**	**6,173**
Males	2,767	2,860	2,985	3,100	3,118	3,148
Females	2,658	2,747	2,867	2,978	2,996	3,025
New HIV infections						
Total	**1,462**	**1,425**	**1,381**	**1,309**	**1,254**	**1,210**
Males	749	730	708	670	642	620
Females	713	695	674	638	612	590
Annual AIDS deaths						
Total	**1,164**	**1,172**	**1,077**	**1,034**	**1,148**	**1,074**
Males	594	599	550	528	586	549
Females	569	573	527	506	562	525
Children needing cotrimoxazole						
Total	**11,938**	**12,099**	**12,172**	**12,189**	**12,167**	**12,053**
Male	6,103	6,184	6,221	6,230	6,218	6,159
Female	5,835	5,914	5,951	5,960	5,949	5,894
Children receiving cotrimoxazole						
Total	0	0	0	0	0	0
Male	0	0	0	0	0	0
Female	0	0	0	0	0	0
Children needing ART						
Total	**1,371**	**1,383**	**1,391**	**1,495**	**1,644**	**1,661**
Male	700	706	710	763	840	848
Female	671	676	680	731	805	813
Children receiving ART						
Total	0	0	136	317	329	432
Male	0	0	0	67	157	163
Female	0	0	0	65	151	156
Mothers needing PMCT	**4,852**	**4,793**	**4,715**	**4,577**	**4,412**	**4,288**
Mothers receiving PMCT	**194**	**405**	**629**	**969**	**1,018**	**1,088**

5.4 Limitations and Caveats

As pointed out earlier, the results are based strictly on prevalence trends and sizes, either of which may not be completely representative nationally. If the surveillance trends are wrong or geographically limited and not nationally representative, they may not accurately represent the national situation. If the population sizes not correct for each key population, the contribution of that group is not assessed correctly. Therefore much more careful analysis needs to take place over the next several months to validate that the assumptions made here are indeed correct for Myanmar. However, these are also the best estimates that are possible with the available information in the country.

It should also be emphasized that tools like the EPP/Spectrum combination cannot explore prevention program impacts in key sub-populations. More careful and complete analysis of both prevalence AND behavioral trends is needed. This can be done with a variety of methods, including simple spreadsheets and/or more complex models such as AEM. However, for Myanmar given the current limitations in data, spreadsheet approaches are more likely to be of value.

6. Conclusions and Recommendations

6.1 Conclusions Regarding the HIV Epidemic in Myanmar

Interpret these conclusions with the level of uncertainty analysis conducted taking into account the limitations of data available. These conclusions and the results on which they are based are very preliminary – they require careful validation and cross-checks of epidemiological and behavioural data in a more integrated fashion in the near future.

- *Surveillance data is showing slow declines in HIV prevalence in most key populations in Myanmar over the last few years but with some stabilization in 2005 and 2006*
- *Models fit to this data would imply that prevalence peaked in 2000 and has been slowly declining since then*. However, such projections for the future are based on a surveillance system with limited geographic scope and size estimates that may not be accurate, thus further careful analysis and validation of this finding is needed, as well as more careful analysis by geographic sub-regions. Furthermore, in a declining epidemic, the rate of decline is very difficult to ascertain, and projections with both slower and faster declines can fit the data through the present. As a result the projections for the future may not be accurate, and should be interpreted cautiously.
- *Examination of the Spectrum outputs shows that the slow decline since 2000 is largely explained by the large number of deaths of people with HIV who were infected earlier in the epidemic*. Current new HIV infections appear to be roughly stable at 10,000 to 14,000 new infections per year implying substantial room for implementing more effective prevention efforts. The fact that deaths are higher than the number of new infections explains the slow decline seen in HIV prevalence (current infections).
- *Roughly 70,000 (including old and new persons needing treatment) people in Myanmar are currently in need of antiretroviral care and this number will increase overall for the next several years as more people are put under ART*. Delivery of this care will require substantial expansion of medical capacity for managing HIV.
- *Roughly 4,000 to 6,000 HIV-positive women will give birth annually, creating a high demand for PMCT programs.* This will produce a steadily declining number of children born with HIV if PMTCT programs are expanded, but an average of 1,500 children are in need of ART in 2007.
- *Myanmar needs to build the capacity to undertake an ongoing process of integrated analysis of epidemiological, behavioural and response data to allow the country to correctly assess HIV trends, set program directions, and evaluate the impact of programmatic efforts at the national level*.

6.2 Recommendations

Recommendations in key areas can be summarized as follows:

6.2.1 For Improving HIV/AIDS/STI surveillance

Biological surveillance for HIV and STI

- *Military conscripts*. The additional information has to be collected for exemple primary location of residence in the last year and age. More information is needed on sampling methodology and the procedures of data collection.

- *HIV among STI clinic attendees*. To provide a more complete picture of HIV infection among STI clinic attendees and to address difficulties in meeting sample size requirements, it is necessary to define a surveillance protocol that includes the private clinics in a systematic fashion.

- *Antenatal women*. Collecting additional variables, e.g., parity, urban or rural residence, etc., provide useful insights into the prevalence situation and proceed with integrating these variables into the analysis.

- *Antenatal women*. In the report of pregnant women, data must be included not only cumulative HIV prevalence, but prevalence by 5-year age groups. For younger age groups, this serves as an effective proxy for incidence of youth.

- *Female sex workers*. Need to expand sites collecting data from female sex workers to give wider geographic coverage and consider shifting to a community based sample frame instead of using STI clinics.

- *Urban/rural differentials*. More effort needs to go into exploring differences of the HIV trends between urban and rural areas of Myanmar. It is quite conceivable that HIV epidemics may be spreading into remote areas, however the lack of surveillance in these areas makes it impossible to detect. Careful attention needs to pay to both prevalence and behaviors in the rural parts of the country to determine the need for more extensive prevention efforts in those area.

Behavioral surveillance

- *General population survey quality control*. Conduct an external evaluation of the general population surveillance undertaken by township AIDS/STD Teams to improve methodology and data collection.

- *General population instruments*. Expand general population questionnaires to gather some limited additional data (e.g., type of site where sex work was last purchased or condom use at last sex with a sex worker) that assists in the direction and evaluation of effective local programs.

- *Higher risk male populations*. Identify and implement behavioural surveillance among higher risk male population in some sites. These might include truck

drivers, fisherman or other populations where higher levels of risk behaviour have been documented. Such efforts might be most productively undertaken in close collaboration with agencies such as PSI that are already targeting such individuals.

- *Youth*. Expand behavioural surveillance to include a sample of higher risk youth.

- *Sex workers*. For sex workers, explore the possibility of community based sampling for behavioural surveillance (involvement of the sex workers themselves, mapping to develop a sample frame, random site selection and random sampling within sites) in townships where local authorities are more understanding of the need to slow HIV transmission instead of taking punitive measures against sex workers. Seek to gather information in the townships with 100% condom promotion and analyse this data. It may also prove worthwhile to test out the integrated behavioural and biological surveillance methodologies being developed in other places.

- *Men having Sex with Men*. Implement behavioural surveys in populations of men having sex with men (MSM) in two sites using a community based sampling approach with involvement of MSM to provide a clearer picture of risk among MSM. This will help to engage the MSM community for future prevention activities.

- *Injecting drug users*. Revisit the questionnaires being used for injecting drug users and strengthen them to gather program relevant information on needle exchange and sexual activity.

Analysis and Data Use

- *In-country capacity for integrated analysis of epidemiological, behavioral and response data needs to be developed*. Given the sparsity of HIV prevalence data, effective interpretation of this data and its use to guide programs depends to a great extent on the ability to properly interpret this data and correlate it with ongoing and changing levels of risk behaviour. It is also essential that this be done with attention to programmatic inputs so that determinations can be made of the overall effectiveness of specific programs. WHO, UNAIDS and others should support the National AIDS Program in providing training in this type of analysis and the use of this data in guiding programming.

- *Undertake a more comprehensive analysis of geographic patterns of HIV prevalence and incidence*. The current data may not be nationally representative given large variations in HIV from one part of Myanmar to the other. The NAP and its collaborators should undertake a careful analysis of geographic patterns and trends, attempting to correlate these with local behavioural data. Use should be made of existing data from ad hoc studies and international partners. This will be most effective if the NAP and the partners engage in a collaborative analysis that will help both to guide programs, rather than working independently. Where necessary additional ad hoc data should be collected, and analysis of gaps in available data should guide what additional information is gathered.

- *Gather and synthesize other relevant information*. Conduct an annual desk review and synthesis of newly released or conducted behavioral and seroprevalence studies. Maintain an updated bibliography of such data sources and their origins.

- *Annual data use workshop*. Conduct an annual data use workshop, building off the findings of the desk review. This workshop should focus on the uses of the data at national program, prevention program and local levels, with an emphasis on ensuring advocacy and implementation of appropriate policies and programs.

- *Use improved behavioural data to evaluate prevention efficacy*. Ensure that behavioural data collection systems gather the basic information needed to evaluate the impact of the current combined prevention responses on behaviour. Use both epidemiological and behavioural data to evaluate the efficacy of current prevention efforts.

- *Use data to prepare improved estimates and impact assessments*. Planning for prevention needs and the future burdens created by the AIDS epidemic requires careful and realistic assessment of the past, current and future trends in the epidemic. Undertake a regular consensus building process in which epidemiological and behavioral data are carefully analyzed to estimate the past and current number of infections in the country, project future trends and impacts of the epidemic, and assess future needs for care and impact mitigation activities.

7. The way forward

As mentioned in the recommendations, Myanmar would benefit from building national capacity to analyze epidemiological, behavioral and response information in a more integrated fashion. While the surveillance system is providing useful data, questions remain on geographic coverage, representativeness of the populations under surveillance, and whether the data truly represents the national situation. Furthermore, increasing emphasis is being placed today on determining programme effectiveness, and assessing this requires careful analysis to critically evaluate epidemiological and behavioral changes and their relationship to programmatic efforts. Doing a more integrated analysis on a regular basis would:

- Help to keep these coverage issues and data gaps in the foreground, which can lead to improvements in data systems.
- Put the epidemiological data in a behavioural context. Comparing the epi trends with reported behavioural trends can help to validate the epi data or to determine its drawbacks and limitations.
- Assist in evaluating the overall effectiveness of the national program. For example, right now, there are real questions of whether the decline observed is related to increases in condom use resulting from programmes such as the 100% condom programme.
- Increase understanding of the epidemic in Myanmar and help in determining the most effective ways to use available resources, that is, assist in directing efforts to the populations and programmes most likely to reduce the largest numbers of infections.
- Lead to a stronger response.

Tools and processes to address this have been completed or are underway in a number of places. Three that might provide constructive ideas for Myanmar to adapt into a local context are:

- Undertaking a more detailed geographic analysis of the epidemiology of HIV in Myanmar and exploring the relationships of this epidemiology to behavior change.
- Using an incidence spreadsheet to evaluate which programmes in which populations will be most effective in reducing new infections.
- Undertake a full integrated analysis and advocacy process similar to what is being done in several other countries.

Each of these will be briefly discussed here. The Annex contains documents describing parts of these processes and giving more information for the interested reader. Should Myanmar decide to undertake an adaptation of any of these processes, WHO and UNAIDS should stand ready to provide technical assistance to national counterparts.

Using incidence spreadsheets to identify source of new infections - Adapting ideas from the paper "Back to Basics" (Pisani et al. 2003), UNAIDS has recently developed an incidence spreadsheet to determine where most new infections in a country arise. This spreadsheet takes population sizes, behaviors, levels of protection, and HIV prevalence as inputs and allows the user to determine the relative contributions of different sub-populations to new infections in a country (see Table 4 and Figure 14). A manual has been developed for this spreadsheet and is attached in the Annex.

If one knows the coverage and effectiveness of HIV prevention programs, it is possible to make two runs with this spreadsheet (one with the intervention in place, one without). Comparing these two runs yields the program impacts, that is, the effect that these programs can have on new infections in the country. This will require collecting, critically evaluating, and then inputting:

- Behavioral data such as the size of each group, the number of sexual or needle sharing acts in each risk category, and levels of protective behavior (condom use or clean needle use).
- Biological data including the HIV prevalence in the various groups, the probability of transmission per risk act (which is set from the literature and need not be adjusted), and the levels of other STIs in the population.
- Programmatic data including coverage of programmes and the effectiveness of the programmes in producing behavior change.

Table 4. UNAIDS incidence spreadsheet showing the various inputs required

Myanmar	entire country
Region adult (15-49) population:	28,003,251
% Urban population:	30%
Urban adult population:	8,400,975
Year	2007

Method used to calculate number of low risk infections	
Select one:	Method A: Partners of high risk Method B: ANC data applied to low risk women

1. Populations at higher risk (PHR)

Names of higher risk population groups	Population Size Estimate		HIV prevalence Estimate (%)		Estimates of adults living with HIV/AIDS				Average number of adults living with HIV	Female statistics		
	Low estimate	High estimate	Low	High	(Low Population x Low Prevalence)	(Low Population x High Pre-valence)	(High Population x Low Pre-valence)	(High Population x High Prevalence)		Percent (%) female in risk group	Number of women living with HIV	Percent (%) who are women
IDU	60,000	90,000	35.00%	63.00%	21,000	37,800	31,500	56,700	**36,750**	0.5%	184	
MSM	200,000	280,000	5.00%	20.00%	10,000	40,000	14,000	56,000	**30,000**	0.0%	-	
Female sex workers	40,000	80,000	10.00%	25.00%	4,000	10,000	8,000	20,000	**10,500**	100.0%	10,500	
Male clients of female sex workers	840,098	1,400,163	2.30%	3.50%	19,322	29,403	32,204	49,006	**32,484**	0.0%	-	
Ex CSW clients	1,392,086	2,088,130	1.18%	1.77%	16,420	24,630	24,630	36,945	**25,656**	0.0%	-	
Ex-IDUs	46,983	70,474	12.56%	18.84%	5,902	8,853	8,853	13,280	**9,222**	0.0%	-	
Optional HR3					-	-	-	-	**-**		-	
Optional HR4					-	-	-	-	**-**		-	
Sub-total PHR	**2,579,167**	**4,008,766**			**76,644**	**150,686**	**119,187**	**231,930**	**144,612**		**10,684**	**7.4%**

2. Populations at lower risk (PLR) that are not already included in PHR

Method A: Partners of high risk populations	Population Size Estimate		HIV prevalence Estimate (%)		Estimates of adults living with HIV/AIDS				Average number of adults living with HIV	Female statistics		
	Low estimate	High estimate	Low	High	(Low Population x Low Prevalence)	(Low Population x High Pre-valence)	(High Population x Low Pre-valence)	(High Population x High Prevalence)		Percent (%) female in risk group	Number of women living with HIV	Percent (%) who are women
Partners of IDU					-	-	-	-	-		-	
Female partners of MSM					-	-	-	-	-	100.0%	-	
Partners of clients of female sex workers					-	-	-	-	-	100.0%	-	
Optional LR1					-	-	-	-	-		-	
Optional LR2					-	-	-	-	-		-	
Optional LR3					-	-	-	-	-		-	
Sub-total	-	-			-	-	-	-	-		-	**0.0%**

Method B: ANC data applied to low risk women	Population Size Estimate		HIV prevalence Estimate (%)		Estimates of adults living with HIV/AIDS				Average number of adults living with HIV	Female statistics		
	Low	*High*	Low	High	(Low Population x Low Prevalence)	(Low Population x High Prevalence)	(High Population x Low Prevalence)	(High Population x High Prevalence)		Percent (%) female in risk group	Number of women living with HIV	Percent (%) who are women
Urban female low risk pop	4,176,353	4,188,398	0.50%	1.50%	20,882	62,645	20,942	62,826	**41,824**			
Rural female low risk pop	9,744,823	9,772,928	0.10%	0.50%	9,745	48,724	9,773	48,865	**29,277**			
Sub-total	**13,921,176**	**13,961,326**			**30,627**	**111,369**	**30,715**	**111,691**	**71,100**		**71,100**	**100.0 %**
No Risk Population	**10,033,159**	**11,502,909**										
Sub-total PLR	**13,921,176**	**13,961,326**							**71,100**		**71,100**	**0.0%**

3. Total number of adults living with HIV

		Average number of adults living with HIV	Female statistics		
			Percent (%) female in risk group	Number of women living with HIV	Percent (%) who are women
REGIONAL TOTAL		**215,712**		**81,784**	**37.9%**

REGIONAL OUTPUTS:

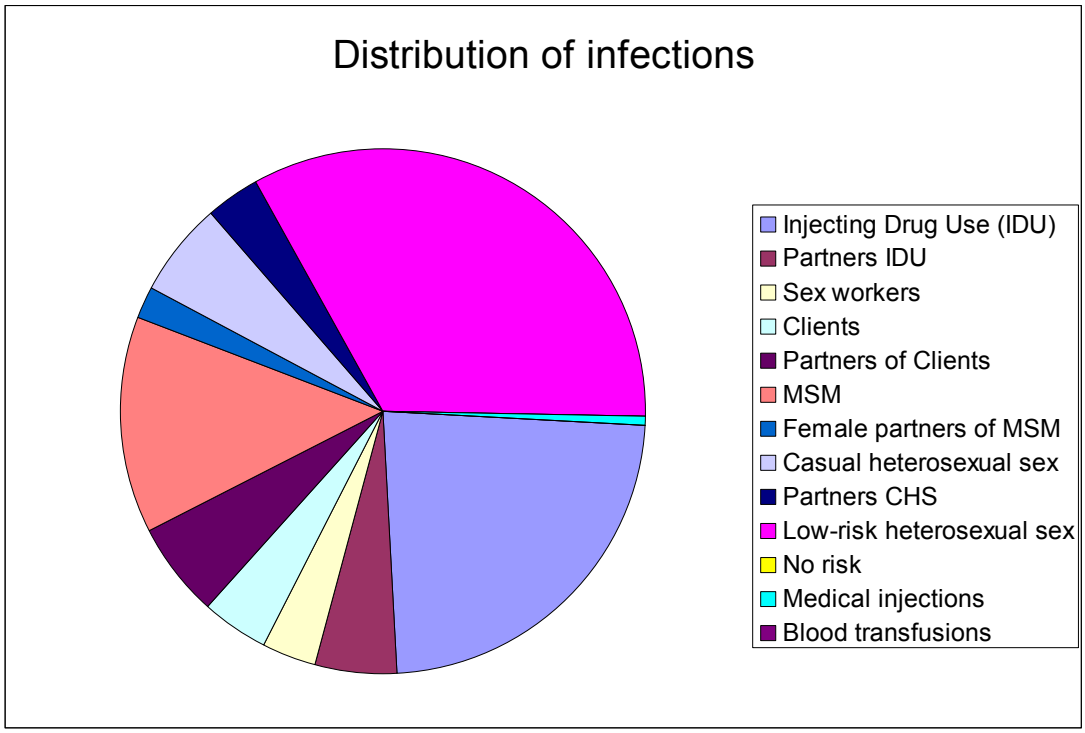
Region:	**entire country**
Year:	**2007**
Number of adults (15-49) LWH:	**215,712**
Number of women (15-49) LWH:	**81,784**
Percent adult (15-49) prevalence (%):	**0.7703%**
Percent of LWH who are female (%):	**37.9%**
Percent of total LWH that are IDU (%):	**17.0366%**

Notes/Comments:	

CONSISTANCY CHECK:

Higher risk population size estimates	% behaviour	Check
IDU among adult population	0.27%	**ok!**
MSM among men	1.71%	**Unusually LOW value!**
Female sex workers among women	0.43%	**ok!**
Clients of female sex workers among men	8.00%	**ok!**

Figure 14. Contribution of different forms of risk to new infections in various countries prepared with the UNAIDS incidence spreadsheet



While comparatively simple, this process can provide extremely valuable information on where programmes should focus for maximum impact. If done in an inclusive, collaborative fashion, the partners in the process will all be able to better target and evaluate where they should place their own programme emphasis to have the greatest effect on the number of new HIV infections in the country.

Integrated analysis and advocacy – the A^2 process - The final process is a much more comprehensive and structured process currently being done in Bangladesh, China, Thailand and Vietnam, known as integrated analysis and advocacy, or A^2 for short. This is an inclusive process that involves various partners in critically using existing data to better understand local epidemics, identify and fill gaps in data systems, use models to determine the most effective alternative responses, and then advocate with policymakers to put them into action. It involves undertaking the following steps:

1. *Collection and synthesis* of the full range of existing biological, behavioral, programmatic, policy, and resource allocation information relating to HIV and AIDS in a country
2. *Extraction of key trends in HIV, STD, behaviors, policy and programmatic responses* to develop an understanding of the epidemic's past evolution in the country
3. *Highlighting of and strategic planning to fill gaps* in knowledge and data and address weaknesses in data/surveillance systems
4. *Preparation of locally relevant estimates, models and projections* and their validation using existing tools including the UNAIDS Workbooks, the UNAIDS Estimation and Projection Package, the Asian Epidemic Model and the GOALS model
5. *Use of the data and resulting models to analyze past and current responses* for relevance and effectiveness

6. *Application of these models to evaluate and cost alternative strategies* for prevention and care to determine their respective impacts and benefits
7. *Strengthening advocacy champions* to advocate for improved prevention and care services including affected communities
8. *Proactive advocacy and support for the use of available data and strategy analyses* as part of an aggressive strategy of promoting more appropriate

Throughout this process, researchers, programme managers, policymakers and others are involved at each stage. They help in obtaining and organizing existing information, in identifying and filling data gaps, in building the models and intervention scenarios based on them, and on implementing the policy and programme conclusions in the field. This process seeks to use existing knowledge to drive programmes and policies in directions that will have the greatest impact on the epidemic. The process and its objectives are described more fully in the A^2 background document attached in the Annex.

Any of these 3 processes would be valuable to undertake in Myanmar and could contribute to improved understanding of the national epidemic. However, doing any of them effectively will involve collaboration and sharing of information among the people with various types of epidemiological, behavioral, and programmatic information for each of the key populations contributing to the epidemic. This will allow each partner to come to a clearer understanding of the Burmese HIV epidemic and the best ways they can contribute to combating it. An important part of any of these processes should also be identifying gaps and weaknesses in the data so that these gaps can be plugged and the weaknesses addressed with improved data collection systems. This will contribute substantially to improving second generation HIV surveillance in Myanmar.

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