BỘ Y TẾ
CỤC PHÒNG, CHỐNG HIV/AIDS

MINISTRY OF HEALTH
VIET NAM ADMINISTRATION OF HIV/AIDS CONTROL

ƯỚC TÍNH VÀ DỰ BÁO NHIỄM HIV/AIDS TẠI VIỆT NAM NĂM 2007 - 2012

Hà Nội, tháng 4/2009

Viet Nam HIV/AIDS
Estimates and Projections
2007 - 2012

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This report is published by Family Health International (FHI/Vietnam) with funding from the U.S. President's Emergency Plan for AIDS Relief (PEPFAR) through the United States Agency for International Development (USAID), under USAID Cooperation Agreement No. 486-A-00-06-00009-00.

VIET NAM HIV/AIDS ESTIMATES AND PROJECTIONS

2007 - 2012

Ha Noi 4/2009

PREFACE

During the last 20 years since the first case of HIV detected in 1990, Viet Nam has endeavored to provide comprehensive interventions targeting the HIV epidemic and care and treatment services for people living with HIV and AIDS. As of December 2008, a reported 138,000 people nationwide are living with HIV, 29,500 of which are suffering from AIDS, and 41,000 lives have been lost from AIDS related illnesses. However, more concerning is evidence that suggests the HIV infection rate is higher than the number of cases presently reported and managed.

Despite notable past successes, HIV/AIDS prevention and control in Viet Nam continues to demand a multifaceted approach. While the overall national incidence rate shows signs of decline, new infections continue to be detected, concentrating in high risk populations such as injecting drug users, female sex workers and their clients, and men who have sex with men. The increasing number of HIV infected people needing antiretroviral therapy in all provinces across the country is becoming a great challenge for the health sector specifically and society in general.

To support HIV/AIDS program planning, the Ministry of Health has carried out HIV/AIDS estimates and projections since 2003 based on recommendations of the UN Reference Group on Estimates, Modeling and Projections. Results from the 2003 estimates and projections provided a foundation for the National Strategy on HIV/AIDS Prevention and Control in Viet Nam up to 2010, with a Vision to 2020.

In 2007 and 2008, the Viet Nam Administration of HIV/AIDS Control (VAAC) in the Ministry of Health collaborated with national and international partners to conduct a second round of Estimates and Projections in Viet Nam in 2007-2008, which optimized the use of existing data to obtain updated HIV epidemiologic data. This report was prepared with the intention of providing colleagues with information on the process and methodologies of estimates and projections, as well as the most updated data on HIV/AIDS in Viet Nam to 2012. It is my pleasure to present this report on behalf of the Ministry of Health, and it is my hope that the report will serve as a reference for HIV/AIDS programming in Viet Nam.

I would like to thank the experts, Ministry of Health officials, and members of the technical working group from the following organizations not only for their invaluable support of this project, but also for their contribution to HIV/AIDS prevention and control in Viet Nam: VAAC and other Ministry of Health departments, the National Institute of Hygiene and Epidemiology, UNAIDS, WHO, PEPFAR, FHI, and East-West Center, among other organizations not named here.

Ha Noi, April 18, 2009

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ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
AIM	AIDS Impact Model
ANC	Antenatal Care
ARV	Antiretrovirus
ART	Antiretroviral Therapy
CDC	US Centers for Disease Control and Prevention
DFID	UK Department for International Development
DOLISA	Department of Labor, Invalids and Social Affairs
EPP	UNAIDS Estimation and Projection Package
EWC	East-West Center
FHI	Family Health International
FSW	Female Sex Worker
HIV	Human Immunodeficiency Virus
IBBS	HIV/STI Integrated Biological and Behavioral Surveillance
IDU	Injecting Drug User
MOH	Ministry of Health
MOLISA	Ministry of Labor, Invalids and Social Affairs
MSM	Men who have Sex with Men
NIHE	National Institute of Hygiene and Epidemiology
PEPFAR	US President's Emergency Plan for AIDS Relief
PLHIV	People Living with HIV
PMTCT	Prevention of Mother to Child Transmission
STI	Sexually Transmitted Infection
TWG	Technical Working Group
UNAIDS	The Joint United Nations Programme on HIV/AIDS
USAID	US Agency for International Development
VAAC	Viet Nam Administration of HIV/AIDS Control
VCT	Voluntary Counseling and Testing
WHO	World Health Organization

EXECUTIVE SUMMARY

A second round of estimates and projections was conducted in 2007 to estimate future burden and impacts of HIV/AIDS in order to inform national programs anticipating prevention and care needs in Viet Nam. Similar to the 2003 estimates and projections process, seroprevalence data, population size estimates, and pertinent data from ad hoc studies were entered into the Estimation and Projection Package (EPP) Version 3.0 R9 to generate low, medium, and high scenarios of the HIV epidemic. The epidemic curves generated by EPP were then combined with antiretroviral therapy (ART) and prevention of mother to child (PMTCT) data into a second modeling program, SPECTRUM Version 3.14, for further estimates of prevalence, treatment needs, and AIDS related mortality, among other important data presented in this report. National and region-specific outcomes were generated for the 1990-2012 period in Viet Nam and apply to both the general and high risk populations nationwide.

KEY OUTCOMES AND DISCUSSION

National HIV infection estimates

The medium scenario shows an estimated 220,000 people nationwide infected with HIV in 2007, which is 0.26% of Viet Nam's adult and children population. With new infections and increased access to antiretroviral (ARV) treatment, which prolongs life for those infected, the number of people living with HIV is expected to increase to 254,000 (0.29%) in 2010 and 280,000 (0.31%) in 2012. However, incidence rates have declined over time, peaking in 2000 at 67 new infections per 100,000 people and dropping to 39 per 100,000 people by 2007. HIV continues to infect more men than women. The number of men living with HIV in 2007 was 3.0 times higher than women, although the ratio will decrease to 2.6 by 2012 as a result of increased transmission from infected men to their wives and regular sex partners. Children less than 15 years old make up a small number of PLHIV, with 3,750 infected in 2007. However, their number infected will proportionately increase substantially to 5,700 in 2012, necessitating immediate availability of early infant diagnosis in order to provide them needed timely care and treatment. PMTCT must be expanded to prevent more children from becoming infected as the number of pregnant women increases from 4,100 in 2007 to 4,800 in 2012. In 2007, less than 40% of infected pregnant women received ARV prophylaxis or treatment.

HIV estimates for most at risk populations

National HIV prevalence among injecting drug users (IDU) is projected to stabilize at 30% in the 2007 to 2012 period. HIV infection stabilizes also in the provinces and cities with older epidemics, including Can Tho, Ho Chi Minh City, and Quang Ninh, but at rates surpassing the national average, at 45%, 55% and 56%, respectively. Stabilizing rates do not mean prevention programs can be scaled back. On the contrary, they indicate ongoing transmission needing to be stopped by effective prevention measures. There is evidence also of rapidly rising prevalence in newer epidemics among IDUs in the northwestern provinces of Viet Nam where intensified intervention is critical before rates reach the same level as in urban centers and older epidemics.

Female sex workers (FSW) are the second highest infected risk population with national rates slightly increasing from 9% in 2007 to 9.3% in 2012. Similar to the IDU population, rates for urban centers, including Can Tho, Ho Chi Minh City, and Hai Phong, are higher than the national average by 2012. Research in these provinces has shown high levels of injecting drug use among FSWs and that HIV infection in this group is closely associated with drug injection practices. Prevention targeting FSWs must be comprehensive and include injecting drug use interventions, as well as care and treatment for those infected.

Leveling HIV infection rates are also seen for clients of sex workers and men who have sex with men (MSM). A stabilizing 2% prevalence among sex clients from 2007 implies a steady rate of new infections, with the exception of the northwest provinces and Can Tho, where prevalence will continue to increase over time and in An Giang and Ha Noi where the reverse is observed and rates are decreasing. Likewise, national prevalence for MSM will remain 2% in the 2007-2012 period, although more studies on this population are needed since data used for estimates and projections is limited to a few MSM studies in a couple of urban cities. Given many uncertainties around the MSM population size and social networks in Viet Nam, and with experiences from other countries, HIV spread in MSM may unexpectedly reach high prevalence in a very short period. High prevalence in Ho Chi Minh City (5.4%) and Ha Noi (3.8%) should be evidence enough for national programs to establish interventions to monitor and reach MSM with safe practices messages and care. The same can be said of sex clients, whose lower prevalence is overshadowed by the fact that the large number of men in this population poses substantial transmission risks of HIV and STIs to their partners.

ART needs and its impact on the epidemic

A projected 65,500 infected adults will need access to ARV treatment in 2010. If 75% of these adults receive ARV treatment by 2012, the number of AIDS related deaths would rapidly decline. For instance, without access to ARVs, the number of deaths would have

been 11,300 instead of 7,860 in 2007. It is important to note also that the life prolonging effect of ART causes prevalence rates to remain high, so more people will be in need of HIV care and treatment. Continued scale-up of care and treatment services is required to support the growing number of people in need of ART support.

DATA USE AND LIMITATIONS

Estimates and Projections is not a straightforward process and relies as much on technical program input as it does on existing data. The Viet Nam Technical Working Group (TWG) on HIV Estimates and Projections undertook careful and in-depth review and validation of surveillance data to generate epidemic curves, but incomplete and poor quality surveillance data, combined with limited program data, increase uncertainty of the trends. Nonetheless, more data points for each population (i.e., general male, general female, IDU, FSW, MSM, sex clients) and cluster (provinces grouped together based on epidemic likeness and geographic closeness) were available in the 2007 estimates and projections than in the 2003 process. As a result, in the 2007 process, appropriate adjustments could be made to sentinel surveillance data, and the generated national epidemic curve differed from the estimates from 2003. Specifically, from the 2007 process, national HIV prevalence in 2010 is 0.29%, whereas the 2003 process estimated 0.54%.

There is potential data disagreement between the HIV/AIDS Estimates and Projections report and official provincial prevalence reports for those provinces which are their own clusters in EPP, such as Hai Phong, Ha Noi, Ho Chi Minh City, Can Tho, An Giang, etc. Sentinel surveillance is the main source of prevalence data for both provincial reports and Estimates and Projections. Adjustments were made to sentinel surveillance data entered into EPP based on the TWG's review of sentinel surveillance methodologies to minimize inaccuracy caused by known sampling errors. Adjustment factors varied, but an example is adjusting trends higher or lower based on reliability of community and center-based sentinel surveillance data, or based on the prevalence obtained through the Integrated Biological and Behavioral Surveillance, which had data utilized more scientifically rigorous methodologies to ensure that the study sample represents the study population and which controlled for study biases in the analysis.

The final set of results is a product of consensus among the researchers, technical programs, and administrators of HIV/AIDS programs in the Ministry of Health and its bilateral and multilateral partners. National estimates and projections are useful for monitoring the movement of HIV throughout Viet Nam's diverse populations and geographic regions over time. Yet the estimates and projections cannot be used alone to show program impact without supplemental evidence from prevention, care, and treatment program data. Further analysis of Viet Nam's epidemic using the Asian Epidemic Model and GOALS

Model would benefit the programs since these models are tailored to Asian epidemics and can provide additional program cost-benefit analysis in addition to epidemic curve generation. For any modeling activity, whether using EPP or AEM, there needs to be intensified, coordinated effort to improve surveillance and program data quality and obtain population size estimates for high risk groups, as these are key factors for reliable estimates in Viet Nam.

FUTURE ESTIMATES AND PROJECTIONS

A third round of Viet Nam estimates and projections will take place in 2009 and use updated versions of EPP and SPECTRUM. The timing coincides with the second round of Integrated Biological and Behavioral Surveillance, which will provide valuable input data to more accurately generate epidemic curves and assess program impact. Plans are also underway to collect population size estimates, which would significantly increase the certainty and confidence in the results.

Chapter I
INTRODUCTION

Past HIV/AIDS estimates and projections in Viet Nam have provided invaluable data on the epidemic and future burden of HIV for program planning and evaluation. The 2003 HIV/AIDS estimates and projections process based on case reporting and sentinel surveillance data showed the number of people living with HIV climbing from 121,000 in 2000 to 215,000 in 2003 and 263,000 in 2005. Since that time, Viet Nam has rapidly scaled up HIV prevention, care and treatment programs. International bilateral and multilateral aid agencies have injected large amounts of technical and financial assistance with the goal of curtailing new HIV infections, largely concentrated in high risk groups. The continued investment in HIV prevention demands updated estimates and projections to better inform policy decisions and program planning and determine the level of impact that interventions have had on national HIV infection rates.

The 2007 estimates and projections process shares the same objectives as the 2003 round: to produce the best scientific and reliable current estimate for HIV infections and to project future trends that are realistic and consistent with available data. The process is both a critical data analysis activity using the most up-to-date HIV modeling software and a consensus building exercise with key stakeholders. With the quality and availability of data varying across programs and regions, assumptions must be made for geographic and population-specific prevalence data used to ascertain HIV infection levels and trends. Adjustments to prevalence measured in the surveillance system were determined through careful review of primary data and triangulation of multiple sources. HIV sentinel surveillance data were analyzed for consistency and representativeness and corroborated with ad-hoc studies and facility-based data. Since evidence-based population size estimates were still unavailable at the time of analysis, current governmental estimates of injecting drug user and commercial sex worker population sizes were used to project the low scenario of HIV and multiplied by factors calculated from projects' mapping exercises of most-at-risk populations for the high scenario. For populations less closely studied in Viet Nam, including men who have sex with men (MSM) and male clients of sex workers, published data from neighboring countries, such as Thailand, with similar epidemics in the Southeast Asian region were used.

Applying the same assumptions and criteria across years helps ensure reliable rates and trends. Yet whether or not past adjustment factors are still applicable to today's epidemic is a concern which data reviewers could not address alone. Reaching informed consensus between the observed data as analyzed by researchers, the government

of Viet Nam, and the international community for both input and output data was critical. The Viet Nam Technical Working Group on HIV Estimates and Projections was established to bring together as many of the key stakeholders as possible, including the Viet Nam Administration of HIV/AIDS Control (VAAC), the National Institute of Hygiene and Epidemiology (NIHE), and bilateral and multilateral partners, to review and analyze datasets. Feedback from a wider audience within the government of Viet Nam and among the international community were sought to ensure the estimates and projection results reflect the epidemic observed on the ground.

This report presents results from the 2007 round of estimates and projections for the 1990-2012 period in Viet Nam, along with the data sources and assumptions used to generate these estimates, which resulted from a thorough process of data review, analysis, and stakeholder buy-in. Data review and cleaning commenced in June 2007, computer generation of estimates were completed in March 2008, and stakeholder review and consensus required an additional year. The outcomes presented in the report apply to both the general and high risk populations nationwide. Data specific to each cluster of provinces and cities are included in the Appendices.

Chapter II
DEVELOPING HIV/AIDS EPIDEMIOLOGICAL MODELs

As was done in the 2003 estimates and projections process, two scenarios were prepared for the 2007 process, namely a low scenario and a high scenario. The decision to prepare two scenarios was made because of uncertainties around the population sizes of high risk groups in Viet Nam. The medium scenario was calculated by averaging the low and high scenarios.

In each scenario, the country was divided into 17 geographical regions, also known as clusters. (There were 11 clusters in the 2003 process.) The criteria for establishing clusters remained similar to the 2003 process. Provinces and cities that had similar epidemiological patterns and which were geographically contiguous were grouped into the same cluster. In the 2007 round, with more data available, closer attention was paid than in 2003 to ensuring that all provinces in a cluster had similar epidemic start times and epidemiological patterns in the various surveillance populations, requiring more clusters than were used in 2003.

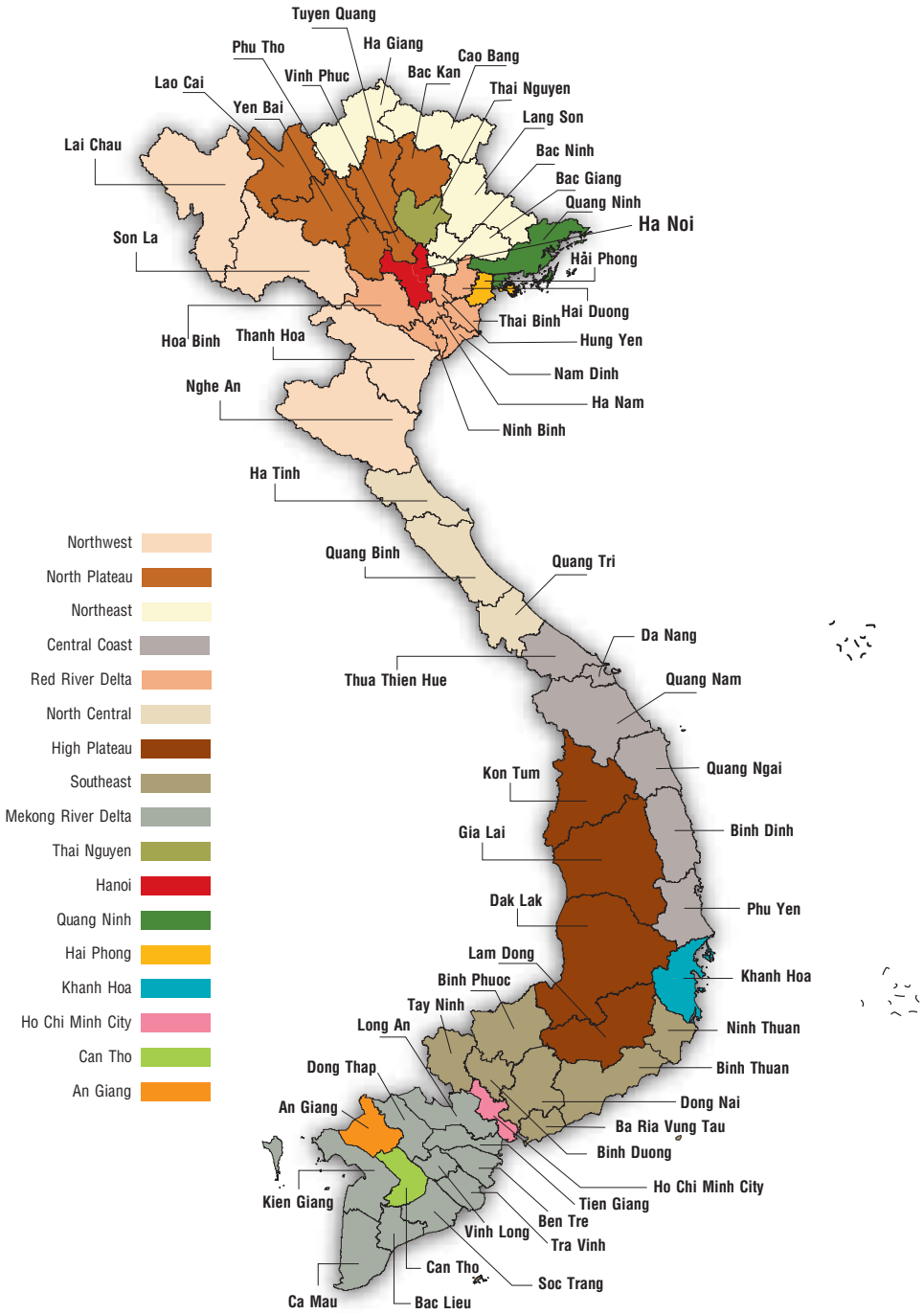
Because data for men who have sex with men (MSM) is limited, one cluster with three sub-populations was used for the MSM epidemic nationwide. The three subpopulations include MSM in Ha Noi, MSM in Ho Chi Minh City and MSM in other provinces and cities, where the few prevalence measurements available indicate much lower prevalence than in the two largest cities.

In each scenario and for every cluster (except those clusters established for the MSM population), HIV infections were calculated for five key populations as follow:

- ***Injecting drug users (IDUs).*** Although there is some evidence showing declining risky injecting behavior, 2006 sentinel surveillance data show HIV prevalence remaining high among IDUs in many provinces, e.g., 65% in Hai Phong and 55% in Quang Ninh. In most clusters, a single IDU epidemic was used. However, with new injecting drug users entering the population, several provinces showed evidence of two IDU sub-epidemics: one among older IDUs who have injected drugs over a long period of time, starting in the mid 1990s, and another more recent epidemic among a younger group who recently started injecting. In clusters where there was evidence of this in the data, two IDU epidemics were fit.

- ***Female sex workers (FSWs).*** Multiple sex partners and other sexually transmitted diseases put these women at higher risk of HIV infection. HIV prevalence among FSWs are over 10% in many provinces and cities and continue to rise in other provinces. In Ho Chi Minh City, where injecting drug use by FSWs is strongly associated with their HIV status, HIV infections were calculated for two distinct FSW sub-groups: injecting and non-injecting FSWs.
- ***Clients of female sex workers.*** Besides placing themselves at elevated risk for HIV, men who visit sex workers accelerate the spread of HIV to other populations. In Viet Nam, IDUs and clients of FSWs spread HIV/STI to their regular sex partners, such as their wives or girlfriends not engaging in sex work or injecting drug use.
- ***General population of males who are not currently IDUs or clients of FSWs.*** Often men do not remain injecting drug users or clients of sex workers permanently. However, if they contract HIV before stopping injecting or visiting sex workers, then they contribute to HIV in the current general male population. This component of the projections therefore includes former IDUs or former clients of FSWs, some of who are HIV positive and add to the HIV prevalence in the general male population.
- ***General population of females.*** This includes women not currently engaged in injecting or sexual risk behaviors. This population also includes former FSWs and partners of high risk males, a number of who already are infected and contribute to the HIV prevalence among pregnant women.

Regional and provincial/city clusters used for HIV/AIDS estimates and projections in Viet Nam



Chapter III

ASSUMPTIONS ON POPULATION SIZES, SEROPREVALENCE AND COVERAGE OF TREATMENT PROGRAMS

Population size estimates

For the low scenario, the following assumptions were made about the size of each of the key populations:

- ***Injecting drug users (IDUs).*** MOLISA reported numbers of drug users in 2006 were applied to the low scenario. An estimated 85% of the MOLISA reported drug users practice injecting drug use.

In some clusters (Ho Chi Minh City, Khanh Hoa and the Central Coast), epidemiological data showed two epidemics among injectors - an older epidemic in the mid 1990s and a newer epidemic starting in the late 1990s. This explains the fall and subsequent rise in surveillance data for IDUs in those clusters. Integrated Biological and Behavioral Surveillance (IBBS) data were used to determine the proportion of older injectors (who had injected for 5 years or longer). This percentage was multiplied with the total number of IDUs to obtain the number of injectors from the older epidemic.

- ***Female sex workers (FSWs).*** MOLISA estimates in 2006 were used as the low value.
- ***Clients of female sex workers.*** There are no studies with reliable data on the prevalence of general male population in Viet Nam. Similar to the 2003 estimates and projections round, 5% of male aged 15-49 are assumed to be current clients of female sex workers for the low scenario.
- ***Men who have sex with men (MSM).*** There is also no direct estimate on the size of the MSM population in Viet Nam. Studies in Asia suggest that 1% to 3% of the male population 15 or older has practiced same-sex behavior in the last year. Because Ha Noi and Ho Chi Minh City are the principal economic, social, and cultural centers in Viet Nam, the number of MSM in these provinces are thought to be much higher than in other provinces. For the low scenario, it was assumed that 1% of male 15 years or older in Ha Noi and Ho Chi Minh City are MSM. In other provinces, this figure is 0.5%.
- ***General male population (including former IDUs and clients of FSWs).*** The size of this general male population was calculated by subtracting the low estimate of the number of current IDUs, the low estimate of clients of sex workers and the low

estimate of MSM from the total male population 15 years or older. For Ho Chi Minh City, Khanh Hoa and the Central Coast clusters, IDUs from the mid 1990s epidemic who were still alive were also subtracted from the general male population.

- ***General female population.*** The number of general women was calculated by subtracting the low estimate of the number of current sex workers from the total number of women 15 years or older.

For the ***high scenario***, the following assumptions were made about the size of each of the key populations:

- ***Injecting drug users (IDUs).*** The high estimate was obtained by applying a multiplier to MOLISA estimates for individual provinces and cities. The multiplier, which varies by province, was determined by examining data from activities which mapped IDUs in projects supported by the World Bank and DFID (mapping data in 2007 were available for 32 provinces and cities). The numbers of IDUs from these sources were compared with those from MOLISA to define the multiplier. Because World Bank and DFID intervention services target mainly "hot-spots", where IDUs are concentrated, the services are estimated to reach 60% to 70% of the IDU population in the provinces. Given the uncertainty of coverage data and to provide a slightly higher estimate, an assumption was applied across all clusters that World Bank and DFID supported projects sites reach 50% of all IDUs. For example, DFID outreach workers reported having contacted approximately 1,753 IDUs in Lang Son, which when assuming 50% coverage, yields an estimate of 3,506 IDUs (1753 x 2) for the whole province. The mapping-based estimate is 3.6 (3,506 ÷ 977) times higher than the MOLISA reported 977 IDUs in Lang Son, so 3.6 is the multiplier for the medium scenario and 6.2 for the high scenario in this province.
- ***Female sex workers (FSWs).*** MOLISA estimates were tripled for the high estimates of FSWs.
- ***Clients of sex workers***. The high estimate was set at 10% of adult males in the 15-49 age group.
- ***Men who have sex with men (MSM)***. The high size estimates for MSM were established at 3% in Ha Noi and Ho Chi Minh City and 1.5% in other provinces.
- ***General male population (including former IDUs and clients of FSWs).*** As in the low scenario, this was calculated by subtracting the high estimate of the number of current clients, the high estimate of the number of current IDUs and high estimate of MSM size from the total male population 15 years or older .
- ***General female population.*** The number of general women was calculated by subtracting the high estimate of the number of current sex workers from the total female population15 years or older.

Estimating HIV seroprevalence in each population

HIV sentinel surveillance data is the primary data source for trends used in the 2007 estimates and projections process. Sentinel surveillance data collected up to 2007 in 40 provinces were reviewed and examined carefully through field visits and discussions with surveillance staff. Gaps, outliers and epidemiological improbable trends in sentinel surveillance data were identified during this process and used as exclusion criteria during data review and cleaning. Based on information provided by local surveillance staff, the following criteria were applied during data cleaning:

- All data points with a sample size smaller than 30 were excluded.
- Samples which excluded previously known HIV positive participants were rejected. Sentinel surveillance data extracted from VCT records were excluded. In certain provinces and cities, using VCT data may underestimate the prevalence among risk groups since people who already know their positive status do not visit VCT sites. On the other hand, prevalence may be overestimated in other provinces or cities where ARV program has been scaled up and VCT clinics serve as screening points or where those with risk behavior are being actively encouraged to seek screening as part of prevention efforts.
- Samples were removed if it was unclear who was included in the surveillance group or if methods applied did not capture correct members of risk populations. For example, hotel/restaurant-based FSW samples were excluded because it was clear in many provinces that low risk women who did not sell sex were being captured at high numbers in the surveillance samples.
- Samples collected in prisons were eliminated because of the possibility of their inclusion of individuals from other provinces and the inability to verify the samples' sources.
- Also considered to have affected the validity of HIV trend data is the inconsistency in sampling methods over time. If the change in sampling method show significant influence on the surveillance data for any year, that data point was excluded. Decisions on these exclusions were made through discussions with provincial surveillance staff and the technical working group.

Other data sources such as HIV case reporting, VCT data and other cross-sectional studies were used to validate sentinel surveillance data.

According to the national sentinel surveillance protocol, half of the IDU and FSW samples should be collected in rehabilitation centers (also known as 05, 06 centers) and half from the community. These sampling designs may be biased in reflecting overall HIV prevalence in these groups because the proportion of FSWs or IDUs who have resided or are residing in rehabilitation centers is not necessarily 50%. IBBS data derived

from community-based samples and estimated population sizes were used to make adjustments to the proportions in community and rehabilitation centers. Specifically, IBBS results for the proportion of FSWs and IDUs reported to have ever been in the rehabilitation centers and the HIV prevalence rates among these groups were used to determine the weights for adjustments.

The following are estimates of the prevalence rates among each population used in the 2007 HIV/AIDS estimates and projections process:

- ***Injecting drug users (IDUs).*** Prevalence trends were calculated from the combined rehabilitation center and community sentinel surveillance. The prevalence was then adjusted downward by 6% in Ha Noi, 5% in Hai Phong, 15% in Quang Ninh, 17% in An Giang, 7% in Can Tho and 11% in other provinces based on the relative proportions in rehabilitation camps and community in the IBBS sample. In Ho Chi Minh City, carefully reviewed and adjusted trends among IDUs from the Analysis and Advocacy project (A2) were applied with no further adjustment.
- ***Female sex workers (FSWs).*** Because prevalence rates among the sex worker population as a whole (both community and rehabilitation center) were not sufficiently reliable, trend data from rehabilitation centers alone were used with a downward adjustment of HIV prevalence by 16%. The adjustment factor was calculated as follow: the IBBS prevalence for all provinces (omitting An Giang because of its unique epidemic among FSW) at 13.72% for street-based sex workers (SSW) and 4.44% for karaoke-based sex workers (KSW) were multiplied with the proportion of SSW and KSW (55.6% and 44.4% respectively) in the IBBS sample, producing a weighted average prevalence of 9.60%. The adjustment factor was then obtained by dividing this average prevalence rate by the expected center-based prevalence.
- ***Clients of sex workers.*** Prevalence rates among male STI patients were used as prevalence among clients of sex workers, and these were adjusted downward by 20% (multiplied by 0.8). This was based upon reviews of models in Ho Chi Minh City and Thailand comparing the prevalence rates in STI patients with estimated prevalence in clients.
- ***Men who have sex with men (MSM).*** Because sentinel surveillance data are not available for this group, four ad hoc study data points were put together to generate the HIV trend for this group in Ho Chi Minh City with downward adjustment of 30%. IBBS data showed that prevalence among MSM was approximately 70% of the unadjusted prevalence. The IBBS used a more reliable and representative sampling method, called respondent driven sampling, than the ad hoc studies, which used convenient sampling methods more likely to capture visible and groups at higher risk of HIV infection without any adjustment. These MSM prevalence points were further adjusted for prevalence rates among MSM in Ha Noi and in other provinces.

The adjustment factors were calculated using the ratio between the general male population HIV prevalence in Ho Chi Minh City to the general male population prevalence in other provinces. In Ha Noi, the adjustment factor was calculated using the ratio between MSM prevalence in Ho Chi Minh City and Ha Noi in IBBS.

- ***General female population.*** Sentinel surveillance data for urban pregnant women were used since most sentinel sites were urban. The technical working group reviewed and screened data collection forms in many provinces and cities to identify data actually collected from rural areas. A review of PMTCT data across two years in Ho Chi Minh City, where district-level data were available, showed that HIV prevalence for rural pregnant women is approximately one-half of the urban prevalence. Based on this observed ratio, but also through examining effects of different urban/rural prevalence ratio on the outputs (e.g. the female / male ratio and the number of HIV infected children needing treatment), the prevalence ratio of the urban to rural pregnant women was adjusted to 0.70. Subsequently, based on age structures of HIV among women at ANC and in the general population, a downward adjustment of 0.62 was applied to the prevalence for the general female population which combined both urban and rural data. Finally, these values were used to calculate overall prevalence in general female weighted for sizes of urban and rural females.

For the general male population, ideally one would like to apply the military recruit prevalence to males in the 15 years of age or older age range. However, this would introduce double counting since some of these military recruits may be current clients of sex workers or injecting drug users who are already counted in the populations outlined above. Therefore, prevalence was not directly estimated for this group. Instead, turnover rates, or the average duration of time an individual engages in high risk activities, were determined for IDUs and clients of FSWs, who upon leaving these risk groups contribute to the prevalence rate in the general male population. The UNAIDS Estimation and Projection Package turnover feature was then used to calculate the number of HIV positive ex-IDUs and ex-clients in the general male population.

Estimating the number of people living with HIV and ART and PMTCT needs

In Viet Nam since 2005, there has been rapid scale-up of care and ARV treatment programs for HIV infected people. Starting from 2,670 cases receiving treatment in 2005, as many as 16,212 infected persons received treatment at the end of 2007 (according to data from VAAC). In the 2007 HIV/AIDS estimates and projections process, it was assumed that by 2012, about 75% of adults (age 15 and older) in need of treatment would have access to ARV treatment and that around 55% of adults in need of 2nd line ARV treatment regimen would be given 2nd line ARV treatment.

It was also assumed that 2,300 children will receive ART by 2010 and 3,000 children by 2012. For input data on the number of ARV drugs used to prevent mother to child transmission between 2002 to 2007, values were estimated through triangulating historical data and anecdotal information from VAAC and the MOH led multi-agency PMTCT subcommittee and from annual reports generated by the US President's Emergency Plan for AIDS Relief (PEPFAR) and Supply Chain Management System project, which procures and delivers ARVs to PEPFAR funded clinics. It was also assumed that 63% and 75% of HIV positive pregnant women will receive ARVs to prevent mother to child transmission in 2010 and 2012 respectively and that the use of two drug combination (ZDV + single dose NVP) and three drug combination (HAART for those who are eligible) will gradually replace the use of single dose nevirapine.

Chapter IV

CACULATING HIV INCIDENCE, PREVALENCE AND TRENDS FOR VIET NAM USING THE UNAIDS ESTIMATION AND PROJECTION PACKAGE (EPP) AND SPECTRUM

Once prevalence trends were finalized, they were entered into the UNAIDS Estimation and Projection Package 2007 edition (EPP, Version 3.0 R9), and two sets of projections were prepared: the low scenario and the high scenario. The prevalence trends for each population groups in each of the 17 clusters were entered into EPP as separate projections. EPP then combined these individual projections in order to calculate the national adult population HIV prevalence curve for Viet Nam.

The adult population HIV prevalence in Viet Nam exported from EPP, together with other data (e.g. adult and pediatric ARV treatment, PMTCT), were then entered into SPECTRUM (Version 3.14), developed by USAID/Health Policy Initiative, to calculate the historical and future HIV incidence, numbers of people living with HIV, AIDS deaths, numbers orphaned by AIDS, and needs for ARV treatment and PMTCT. SPECTRUM, a computer program with the AIDS Impact Model (AIM) built in, projects both epidemiological and social impacts of HIV/AIDS from input data on HIV prevalence and treatment coverage[1]. Assumptions about other HIV/AIDS characteristics can also be entered for variables such as the survival period from HIV infection to AIDS death, age and sex distribution of infections, and the rate of perinatal transmission.

For Viet Nam, adult prevalence estimates obtained from EPP were key input data for estimating HIV incidence and projecting future impact. Since incidence rates fluctuate over time with changing levels of program coverage, HIV incidence could be best estimated up to 2007. Input data from EPP included also the estimated number of AIDS patients on ART projected to increase in the next 5 years, as described earlier. Population statistics from the General Statistics Office of Viet Nam were used to adjust population sizes set in SPECTRUM. Default values were used where data is unavailable for Viet Nam. Figure 1 shows a visual of data inputs and outputs generated by AIM.

[1] USAID/Health Policy. AIM: A computer program for making HIV/AIDS projections and examining the demographic and social impacts of AIDS

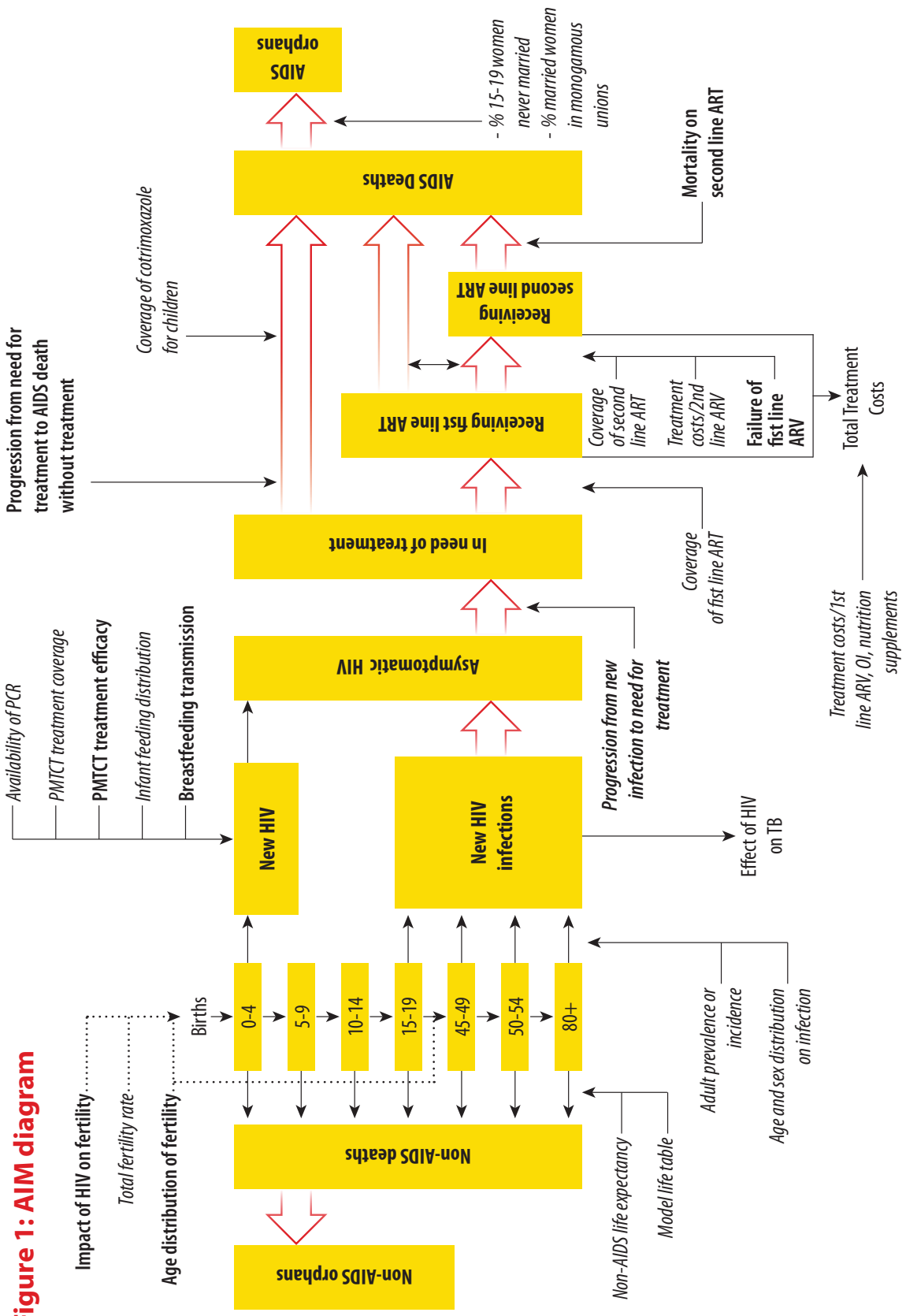
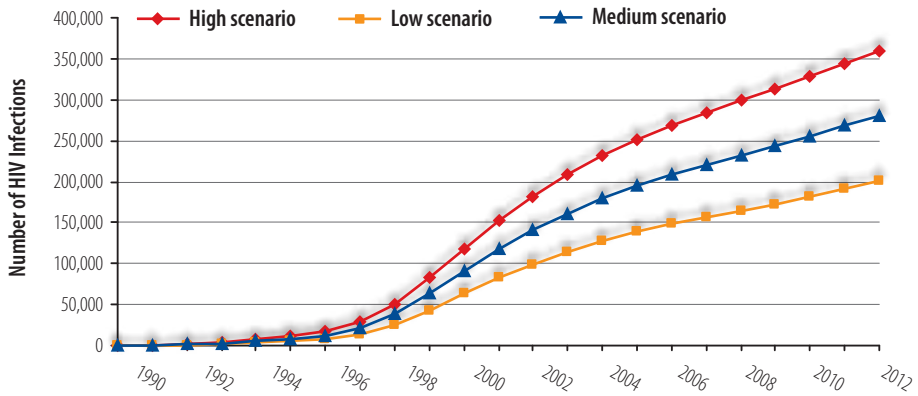


Figure 1: AIM diagram

Chapter V
RESULTS

Graph 1: *Number of people living with HIV in Viet Nam 1990 - 2012: Low, medium and high scenarios (includes adults and children)*

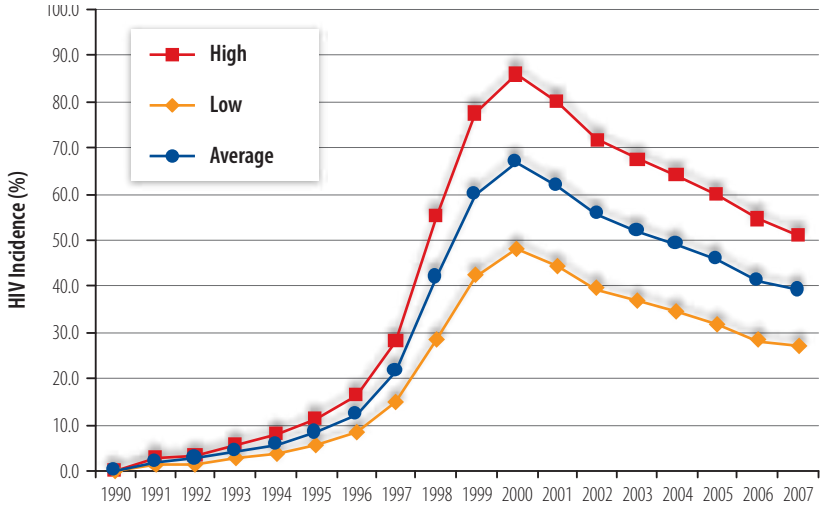


In 2007, there were an estimated 220,000 people living with HIV in Viet Nam. By 2010, there will be 254,000 people living with HIV and the number will reach 280,000 by 2012. Graph 1 shows the increasing trend of number of HIV infected cases in Viet Nam with 3 categories of scenarios: low, medium and high. The number of people living with HIV (PLHIV) in Viet Nam in 2007 is estimated at 220,422 (high scenario: 283,596; low scenario: 157,248). By 2012, the number of HIV infected cases would have an increased by about 60,000 cases, reaching 280,000 HIV cases (high scenario: 360,106, low scenario: 200,119). This increase reflects the impact of ARV treatment programs in keeping people alive. The reduction in the number of AIDS related deaths, along with concurrent new HIV infections, will cause the number of PLHIV to rise over time and require sustainable and on-going expansion of HIV/AIDS prevention, care and treatment programs for at-risk populations and their sexual partners.

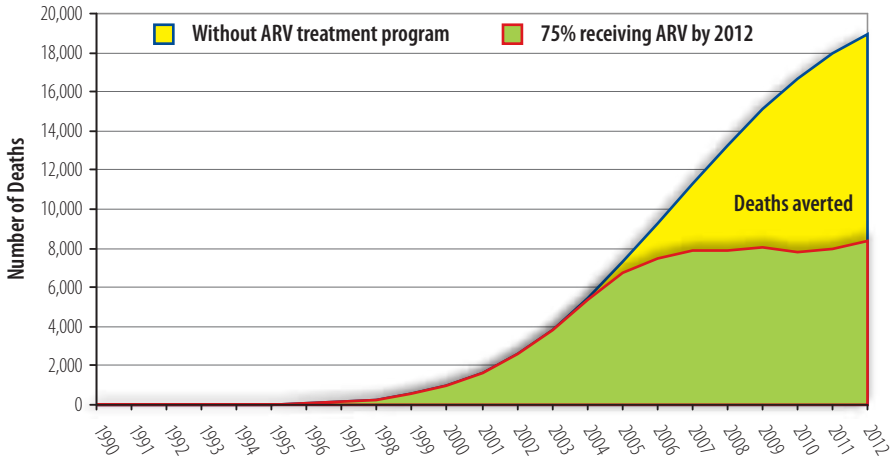
HIV incidence among adults (age 15-49) in Viet Nam has declined since it peaked in 2000 at 67 per 100,000 population (Graph 2). By 2007 the rate of new infections substantially decreased so that an estimate of only 39 new infections occurred in a population of 100,000 people. The period of incidence decline coincides with rapid expansion of HIV prevention programs by the government of Viet Nam and international and nongovernmental partners. Future incidence will be influenced directly by the level at which HIV prevention interventions are maintained and intensified, and for Viet Nam's concentrated epidemic, these interventions will need to target those risk behaviors that are driving the spread of HIV. Harm reduction interventions aimed at stopping

transmission through the use of unclean needles and equipment, for instance, will keep down the number of new infections in the injecting drug user population, which as later demonstrated in this report, has the highest HIV prevalence among all populations at risk. Care must be taken, however, in interpreting HIV incidence rates. The majority of the decline in incidence may have resulted from saturation of the IDU and FSW epidemics in most regions of Viet Nam, rather than from program impact. Decline in incidence at the provincial level, particularly An Giang and Ho Chi Minh City, may be attributable to interventions, but proper interpretation of program impact requires thorough analyses of behavioral and programmatic data.

Graph 2: *HIV incidence among adults (age 15 - 49, per 100,000 people) 1990 - 2007: Low, medium and high scenarios*

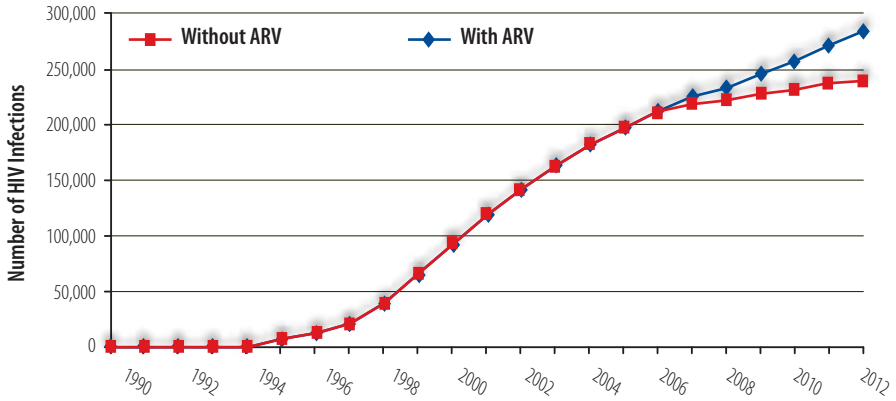


Graph 3: *Number of annual deaths caused by AIDS among people 15 years and older in Viet Nam 1990 - 2012: Impact of ARV treatment program*



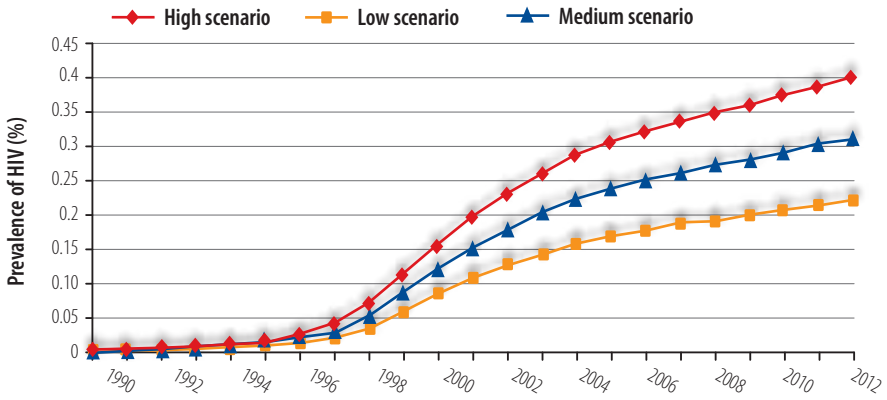
The number of deaths caused by AIDS will rapidly decline during 2007-2012 with continued scale-up of HIV/AIDS treatment. Assuming that 75% of adults who are in need of treatment will be given ARV drugs in Viet Nam in 2012, the rapid scale-up of ART programs will result in a projected large number of AIDS related deaths averted, as shown by the shaded area in Graph 5. In 2007 there were about 7,860 deaths caused by AIDS. If there had been no ARV treatment program available in Viet Nam, this number would have been around 11,300 people (Graph 3). However, the number of deaths will depend greatly on the actual coverage and quality of HIV/AIDS treatment services.

Graph 4: *Number of people living with HIV in Viet Nam 1990 - 2012 with and without widespread ART programs*



If 75% of people living with HIV in need of treatment receive ARV by 2012, the number of people living with HIV will increase by approximately 45,000 people. With strong implementation and expansion of treatment programs providing antiretroviral drugs, AIDS related deaths are reduced and people with HIV live longer. Therefore, the number of PLHIV would be smaller if ART were not available. The lower line in Graph 4 shows the number of HIV infected cases in Viet Nam (medium scenario) if ARV treatment programs had not existed. In contrast, as a result of ART having been provided from early in the decade to the end of 2007, the estimated number of people living with HIV is higher, by approximately 5,700 people, than in the absence of ARV treatment programs. The difference in the number of PLHIV due to ART provision will reach approximately 45,000 by 2012 if coverage of treatment continues expanding to the 75% coverage level.

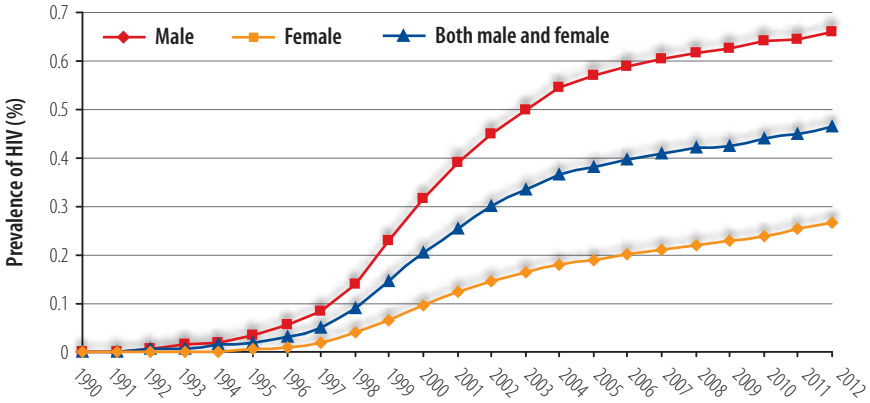
Graph 5: *Prevalence of HIV infection as percent of population living with HIV in Viet Nam 1990 - 2012: Low, medium and high scenarios (includes adults and children)*



The estimated HIV seroprevalence among the Vietnamese population in 2007 was 0.26%. The projected HIV seroprevalence in Viet Nam will be 0.29% in 2010 and 0.31% in 2012. Similar to the number of HIV infected cases, HIV prevalence in the community will continue to increase in the coming years. The estimated prevalence among the Vietnamese population (all ages) meets the target prevalence of below 0.30% among the general population by 2010, an objective established in the National Strategy for HIV/AIDS Prevention and Control in Viet Nam up to 2010. However, attention should be paid to the fact that the 0.29% prevalence rate could only be reached with sustained and strengthened implementation of intervention programs. Graph 5 shows that the number of HIV infected people (and the overall seroprevalence) will continue to grow, highlighting the need to continue providing and expanding comprehensive intervention programs to contain the epidemic.

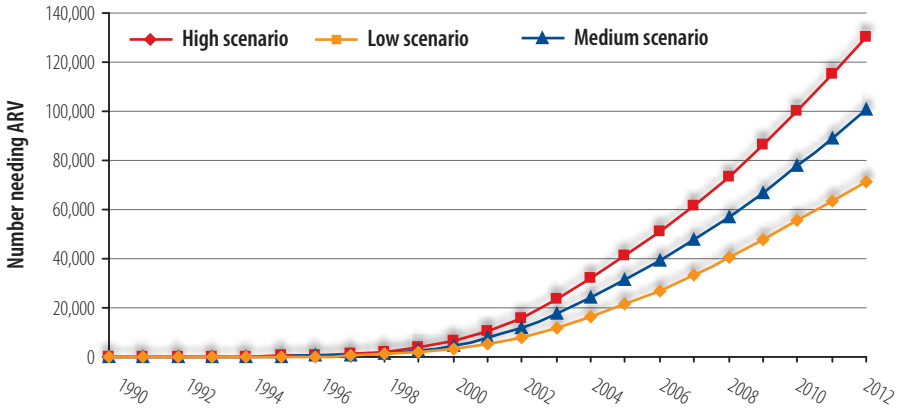
The estimated prevalence in adults (age 15-49), as opposed to both adult and children, will be 0.44% in 2010 and 0.47% in 2012 in the medium scenario for both men and women (Graph 6). The prevalence in male adults will reach 0.66% in 2012, which will be 2.5 fold higher than that of female adults (0.27%).

Graph 6: *Prevalence of HIV infection in adults (age 15 - 49) in Viet Nam 1990 - 2012: Disaggregated by sex*

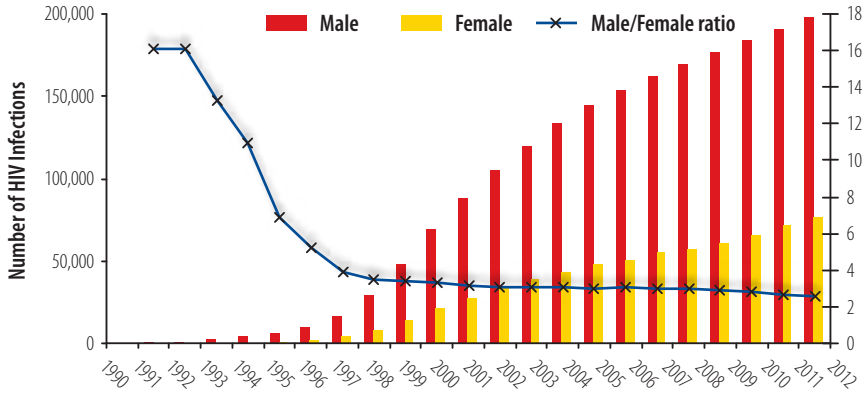


There will be 65,500 HIV infected adults (15 years and older) needing ARV treatment by 2010. Graph 7 shows the number of PLHIV (15 years and older) in need of treatment and care in Viet Nam in low, medium, and high scenarios. Approximately 65,000 HIV infected people will be in need of treatment by 2010 and 82,000 people by 2012. This will require a growing workforce and more resources to meet the high demands for drugs, supplies and equipment to treat HIV and related infections in Viet Nam over long durations. With the rapid increase in the number of people in need of treatment and assuming treatment coverage for 75% of people needing ART, there is unquestionable need to expand HIV screening, detection and management. VCT clinics are currently available in focus provinces and cities. Yet in order to reach the target of providing treatment for 75% of people in need, VCT services must be established in more provinces and cities as treatment facilities are expanded.

Graph 7: *Number of adults age 15 and older living with HIV in need of ARV treatment in Viet Nam 1990 - 2012: Low, medium and high scenarios*

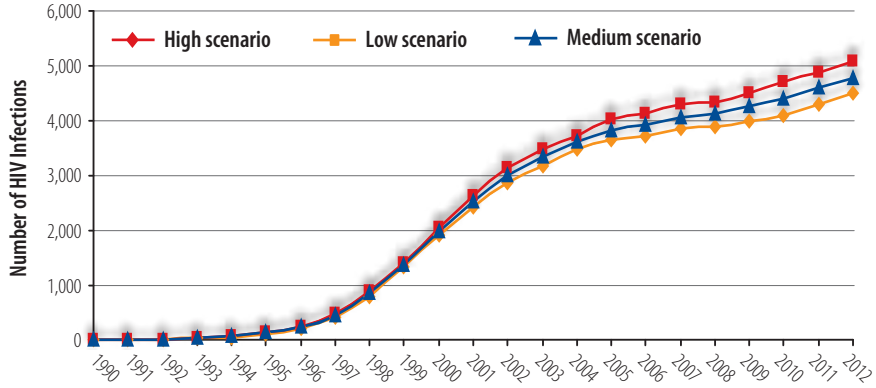


Graph 8: *Number of adults age 15 and older living with HIV by sex and male/female ratio in Viet Nam 1990 - 2012*



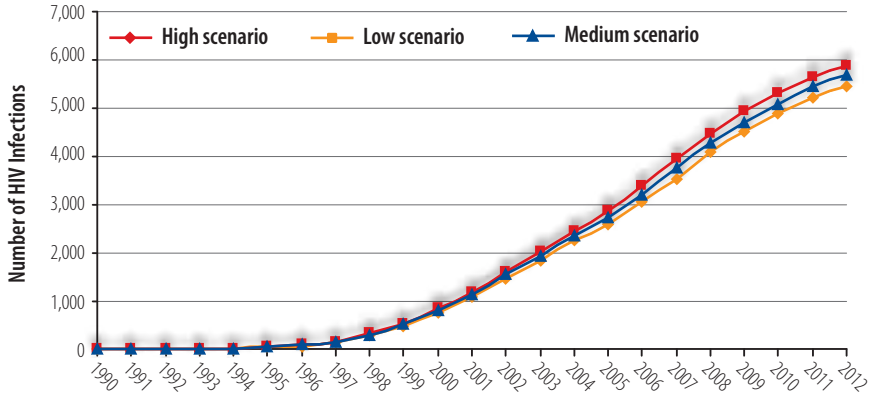
The ratio between HIV infected male adults and HIV infected female adults will gradually decrease in the coming period. In 2007, the number of male adults (age 15 and older) living with HIV was 3.0 times higher than the number of female adults. However, the male/female ratio will gradually decrease to 2.6 by 2012 with approximately 198,000 HIV infected male adults and 76,700 HIV infected female adults (Graph 8). One of the reasons for the increase in women living with HIV is transmission from HIV infected males to their regular sex partner. This is also demonstrated in Graph 9, which shows the estimated number of HIV positive pregnant women in Viet Nam between 1990 and 2012. At the same time, it should also be noted that men continue to account for a major proportion of the number of PLHIV and new HIV infections.

Graph 9: *Number of pregnant women infected with HIV in Viet Nam 1990 - 2012: Low, medium and high scenarios*



The number of HIV positive pregnant women in Viet Nam will continue to increase to about 4,800 women by 2012. Of these, the number of women needing prevention of mother to child HIV transmission (PMTCT) services is approximately 4,100. This situation highlights the need for expanded prophylactic interventions to prevent mother to child infection, with VCT and sex partner counseling services playing an important role in identifying women in need of PMTCT services.

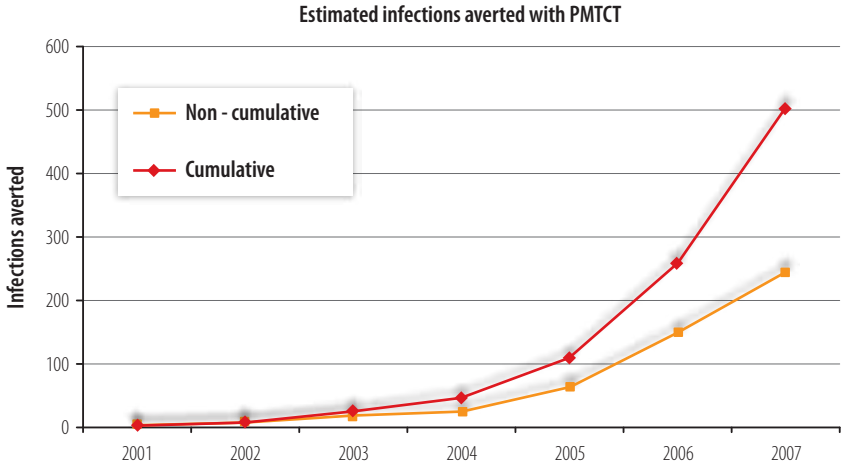
Graph 10: *Number of children (age 0 - 14) living with HIV in Viet Nam 1990 - 2012: Low, medium and high scenarios*



By 2010, a projected 5,100 children will be living with HIV/AIDS. This figure will increase to 5,700 by 2012 (Graph 10). Compared with the 3,750 children living with HIV in 2007, these estimates suggest a significant increase in the number of children who will need care and treatment services in the next five years. WHO issued new recommendations in 2008 to provide ARV treatment to all children with confirmed HIV infection whose age is 12 months or less regardless of their immunological or clinical condition. While implementation of the new recommendations will require investments to make early infant diagnosis available, it is estimated that a significant proportion of children living with HIV will require ARV treatment.

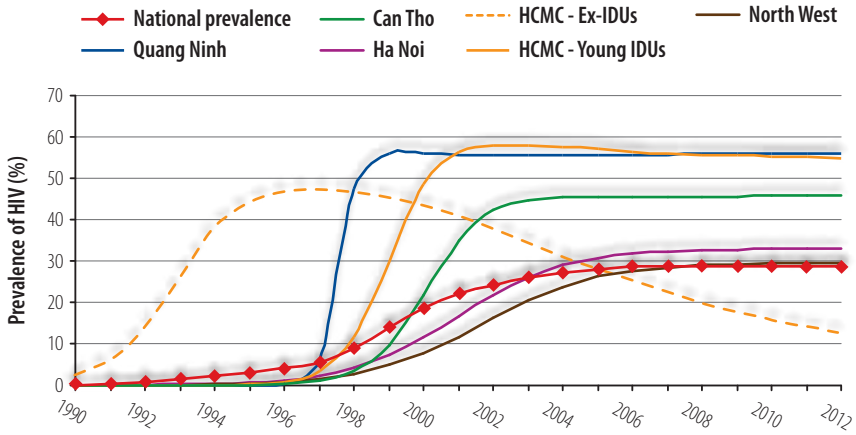
Similar to ARV treatment programs, PMTCT programs have prevented a cumulative 500 infections at the end of 2007, as shown in graph 11.

Graph 11: *Number of new infections averted with prevention of mother to child transmission in Viet Nam by 2007*



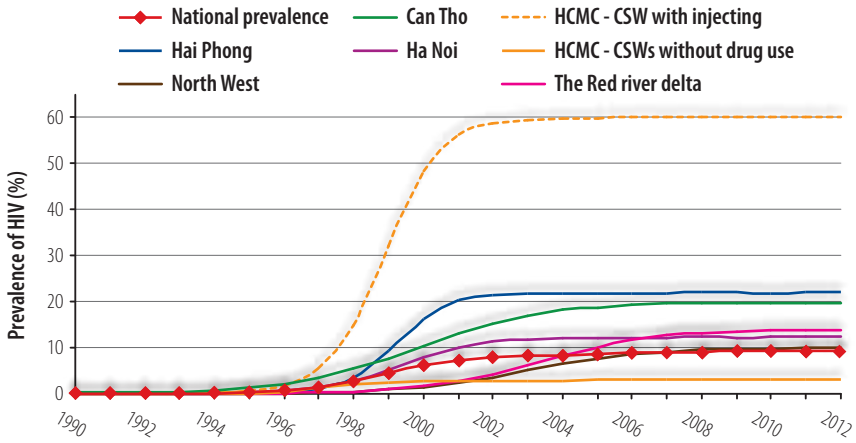
During 2007 - 2012, HIV prevalence among IDUs stabilizes yet remains at a high 30% rate. Graph 12 shows HIV trends among IDUs nationally and in several focus cities and provinces. Seroprevalence at the national level is approximately 30% and appears to stabilize through to 2012. However, in certain provinces and cities, HIV prevalence among IDUs remains at very high levels (Quang Ninh 56%, Ho Chi Minh City 55%, Can Tho 45% by the year 2012). In addition, ***the epidemic among IDUs in the Northwestern region (including Son La, Lai Chau, Dien Bien and Thanh Hoa) is rapidly rising*** even though its onset came later than in other regions. Unless comprehensive intervention measures are soon scaled up, the epidemic in the Northwestern region may mirror those in large urban cities and rapidly rise. In addition, ad hoc studies suggest alarming high HIV rates among IDUs in Son La, but which were not included in the development of the epidemiological model for IDUs in this region because HIV sentinel surveillance is not conducted, and data therefore not available, in Son La.

Graph 12: *HIV prevalence among IDUs in Viet Nam 1990 - 2012: National prevalence and prevalence in focus regions*

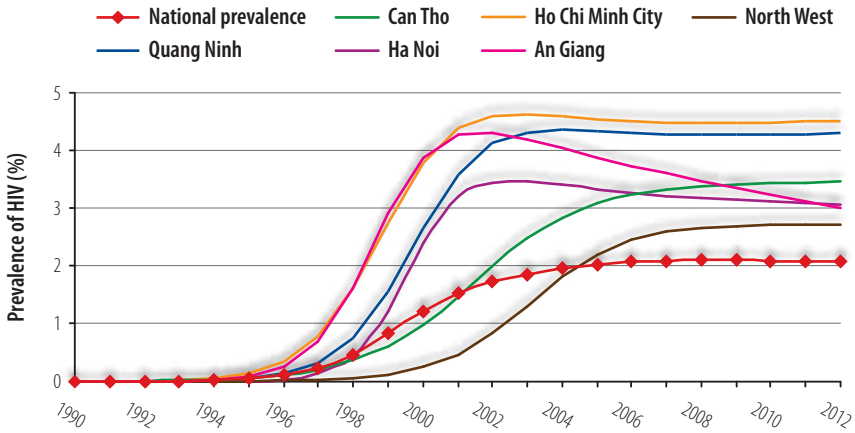


Approximately 9% of FSWs across the country were living with HIV in 2007, and there will be a slight increase to 9.3% by 2012. Graph 12 shows the general prevalence among FSWs in Viet Nam and in several focus provinces and cities. Despite the relatively stable national prevalence rate, the province-specific trends for FSWs are either remaining at high levels (in Hai Phong, Ho Chi Minh City and Can Tho) or increasing in the coming years (as in the Northwestern area or in the Red River delta). IBBS and other survey data show that high HIV infection among FSWs is closely associated with drug injecting practices. Unfortunately, except for HCMC, data is insufficient to model separately the epidemics among drug-injecting FSWs. The provinces and cities with high HIV prevalence among FSWs should continue to carry out ad hoc studies and improve surveillance to track and address drug use in this population.

Graph 13: *HIV prevalence among FSWs in Viet Nam 1990 - 2012: National prevalence and prevalence in focus regions*



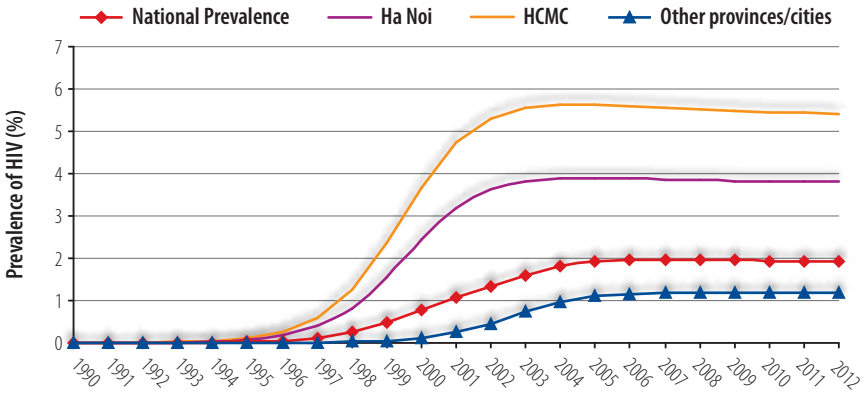
Graph 14: *HIV prevalence among clients of sex workers in Viet Nam 1990 - 2012: National prevalence and prevalence in focus regions*



An estimated 2% of clients of FSWs were living with HIV in 2007. The rate stabilizes through the next 5 years (Graph 14), implying a constant rate of new infections among clients. Although there is increasing prevalence in a few provinces and cities, particularly in the Northwestern region and Can Tho, the trend decreases in other provinces, including An Giang and Ha Noi. Such declines must be interpreted cautiously since they were projected using sentinel surveillance data for STI patients and therefore may not accurately reflect the true prevalence in the client population. Also, it should be noted that while the prevalence in this group may only be of order 2%, the large number of clients of sex workers in the population, estimated at 7.5% of adult men, will result in large numbers of sex clients becoming infected with HIV. These men pose a substantial risk of transmission of HIV and STIs also to their regular sex partners, requiring strong prevention efforts targeting clients of sex workers.

HIV prevalence among MSM in Viet Nam remains at 2% during 2007 - 2012. HIV prevalence among MSM in Ho Chi Minh City and Ha Noi, at 5.4% and 3.8%, respectively, are higher than the national. Other provinces and cities have rates stabilizing around 1%. It should be noted, however, that very few studies have been conducted to obtain prevalence rates for MSM, who are not included in the HIV sentinel surveillance system in Viet Nam. The estimates and projections for this group therefore may not reflect the real situation, which may be either more or less serious. Given increasing prevalence among MSM in other parts of Asia, surveillance and risk behavioral monitoring of these men should be expanded alongside strengthened prevention efforts.

Graph 15: *HIV prevalence among MSM in Viet Nam 1990 - 2012: National prevalence and prevalence in focus regions*

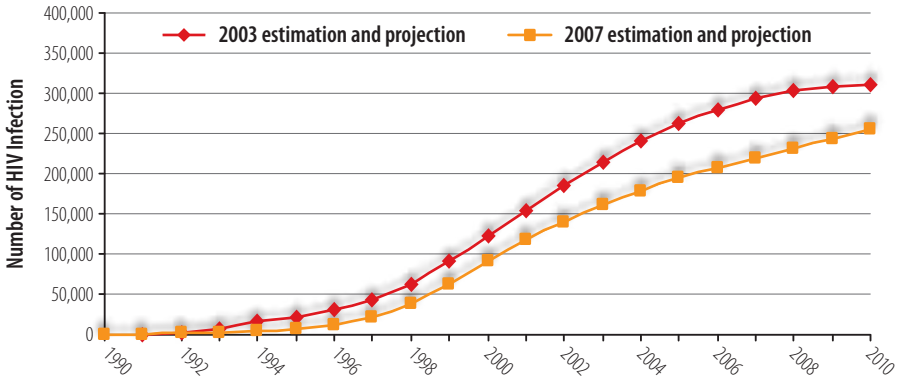


A comparison of results from the two HIV/AIDS estimates and projections rounds, in 2003 and 2007, in Viet Nam is presented in Graph 16. The 2007 process resulted in a HIV infections number which is 70,000 less than the number produced in 2003. There are various possible explanations for this difference:

- Prevention and intervention programs have either stabilized or reduced the prevalence rate in a number of provinces and cities. This explanation is based on two factors: 1) the prevalence rate has not increased (but has decreased) in many provinces, cities and regions, or among different groups; 2) since 2004, HIV interventions have been widely implemented in Viet Nam under the leadership of the Ministry of Health in collaboration with international partners, including PEPFAR, World Bank, DFID, and GFATM.
- Data inputs used for the 2007 estimates and projections process were more complete and comprehensive than those used in the 2003 process. Sentinel surveillance data collected up to 2006 were used for this estimates and projections process (while in the 2003 process, sentinel surveillance data were available only up to 2002). The more comprehensive data available in this round allowed the technical working group to make more appropriate adjustments. For instance, results from studies using a more random sample of sex workers were available for adjusting sentinel surveillance data to produce trends that are closer to the real prevalence among FSWs.
- Population sizes varied between the two rounds. Programmatic data available in 2007 were used to adjust MOLISA population size estimates. The overall curve for 2007 is lower, indicating that adjustments to both the prevalence and population sizes had affected the estimated national curve.
- Software packages, i.e. EPP and SPECTRUM, were upgraded between the two rounds.

The true cause for data discrepancy between the two HIV/AIDS estimates and projections rounds is difficult to pinpoint given multiple factors involved. It is most likely that all are contributing factors and that effective HIV intervention programs have played a substantial role in reducing incidence.

Graph 16: *HIV/AIDS estimates and projections in Viet Nam in 2003 and 2007*



Chapter VI

CONCLUSIONS FROM THE 2007 HIV/AIDS ESTIMATES AND PROJECTIONS PROCESS

1. By 2007, there were 220,000 people living with HIV and AIDS in Viet Nam. By 2010, there will be 254,000 people living with HIV and AIDS, and this number will reach 280,000 by 2012.

2. The national HIV prevalence (including adults and children) will be 0.29% in 2010 and will rise to 0.3% by 2012. Adult HIV prevalence (age 15 - 49) is estimated at 0.44% in 2010 and 0.47% in 2012. HIV prevalence will reach 0.66% in male adults 0.27% in female adults in 2012.

3. HIV incidence among adults (age 15 - 49) peaked in 2000 at 67 new infections per 100,000 people. After this peak, incidence rates steadily decline to 39 per 100,000 people in 2007, giving evidence to the success of prevention efforts.

4. There will be approximately 65,500 people living with HIV (15 years and older) in need of ARV treatment in 2010.

5. Care and treatment programs in Viet Nam have had positive impact. If expanded to reach 75% of those in need, appropriate care and treatment services which include ARV therapy will reduce the number of annual deaths by 10,600 by 2012.

6. However, because HIV/AIDS treatment prolongs life, a rise in the number of people living with HIV is expected. Human and financial resource needs for ART in the next 5 years will be much greater.

7. The male/female HIV infection ratio will gradually decrease, reaching 2.5 by 2012. This suggests more HIV spread from infected IDUs and clients to their spouses or regular sex partners. Men will continue to account for the majority of PLHIV and new HIV infections.

8. There will be 4,800 HIV positive pregnant women in 2012, of which 4,200 will need PMTCT services.

9. Among high risk populations, IDUs have the highest HIV rates. Overall prevalence among this group stabilizes, but will remain at a high 30% in the coming years. In a number of provinces, cities, and regions, HIV prevalence rates among IDUs will increase.

10. Approximately 9% of FSWs will be living with HIV in 2007 and 9.3% in 2012. The HIV epidemic among FSWs will stabilize, although there will be an increase in HIV infection among FSWs in certain provinces and cities, especially where FSWs inject drugs. Injecting drug practice among FSWs remains a key factor for HIV infection in provinces and cities with high HIV prevalence among FSWs.

11. Approximately 2% of MSM will be living with HIV from 2007 to 2017. Despite the low prevalence, the large number of men in this group will significantly affect the HIV trend in Viet Nam. It should also be noted that this is based on much more limited data than trends in the other groups, so there may be a rapid upward HIV trend among MSM in certain regions of Viet Nam.

12. Although the HIV epidemic among high risk populations across the country has begun to stabilize, the number of new infections caused by transmission from high risk men to their spouses or regular sex partners will steadily rise.

13. In the Northwestern region, in spite of insufficient data, the HIV epidemic, rising from the IDU HIV epidemic, is projected to increase rapidly in all groups.

14. There are multiple explanations for the differences in the results from the 2003 and 2007 HIV/AIDS estimates and projections processes, including the effect of widely implemented intervention programs, difference in size estimates, more complete and comprehensive data available in 2007, and improvements made to the modeling software packages.

Chapter VII
RECOMMENDATIONS

1. Estimates and projections should be regularly updated as prevention, care and treatment programs change over time and new and improved sentinel surveillance data and size estimates become available. Updated estimates and projections are needed for effective HIV/AIDS planning and policy development.

2. With new HIV infections still occurring, evidence-based comprehensive HIV prevention programs need to be intensified and scaled up, particularly interventions targeting most-at-risk populations, including:
   a. Prevention programs for high risk groups (IDUs, FSWs, clients of sex workers, and MSM). Although trends are stabilizing among at-risk groups, prevalence remains at high rates, implying ongoing transmission between high risk individuals and to their spouses or other sexual partners. Attention must be paid to areas such as the Northwestern region where late epidemic onsets with rapid increase in prevalence are seen. More resources should be allocated for these regions. Provision of condoms and clean needles and syringes are effective prevention measures among high risk groups, especially when implemented as part of comprehensive harm reduction programs. Drug treatment programs to reduce drug injecting frequency can also prove to be effective HIV prevention among IDUs.
   b. Prevention of STI transmission from high risk males (IDUs, MSM, and clients of sex workers) to their spouses and regular sex partners should be prioritized to reduce HIV transmission and serious health consequences of STI infection.

3. Advance preparation of infrastructure and resources to provide care and treatment for HIV and related opportunistic infections is required for the growing number of people in need, which will increase greatly by 2012. Care and treatment programs should be scaled up in more provinces and cities in order to achieve national targets and reach the number of averted deaths as presented in this report.

4. An estimated 3,460 women were in need of PMTCT in 2007, and yet coverage was low, with only 38% of HIV infected pregnant women estimated to have received ARV prophylaxis or treatment. Expansion of comprehensive PMTCT programs and sufficient allocation of resources for HIV testing and counseling services are needed for women attending antenatal care.

Chapter VIII

RECOMMENDATIONS ON IMPROVING QUALITY AND SUPPLEMENTING DATA FOR EPIDEMIC REVIEW AND ASSESSMENT

1. Improve data quality of Viet Nam HIV sentinel surveillance by:
   - Ensuring strict adherence to the sentinel surveillance protocol, with attention paid to unified sampling methods, correct sentinel site selection, and proper identification of subjects.
   - Increasing monitoring and technical assistance during field implementation.
   - Conducting regular training courses on monitoring and field supervision for provincial staff.

2. Review sentinel surveillance sites and consider including other provinces and cities with observed dynamic changes in the HIV epidemic.

3. Conduct systematic size estimation of high risk populations in Viet Nam, including IDUs, FSWs, clients of sex workers and MSM. Data from MOLISA and program mapping currently is used for HIV estimates and projections. However, sound scientific methods should be applied to verify, monitor and/or analyze changes in the sizes of at-risk populations in a systematic manner.

4. Conduct studies among the male population at large and among clients of sex workers to:
   - Determine the proportion of men who visit sex workers.
   - Determine HIV prevalence among clients of sex workers.

5. Continue expanding MSM study sites.

6. Data from the first round of IBBS was broadly applied in the 2007 HIV/AIDS estimates and projections process. Yet having been collected at only one point in time, IBBS data cannot produce trends for risk behaviors and new infections. Data from the second round of IBBS will be important to update the epidemic status and produce future estimates and projections.

7. Routine programmatic data should be more frequently reviewed and summarized to monitor the epidemic and assess coverage of prevention, care and treatment programs. Measures should be applied to ensure routine reporting data quality (especially for ART and PMTCT data), including clear indicator definitions, standardizing reporting procedures, data management trainings, facilitative supervision and data verification activities.

Appendix

APPENDIX I: Low estimates of population sizes used in HIV/AIDS Estimates and Projections 1990 - 2012 in Viet Nam

CLUSTERS	TOTAL	MALE	URBAN FEMALE	RURAL FEMALE	IDUS	CLIENTS OF FSWS	FSWS	MSM
North West	5,415,362	2,597,015	300,061	2,336,478	27,496	138,863	1,564	13,886
North Plateau	3,277,001	1,589,727	244,129	1,339,529	9,303	84,605	1,245	8,460
North East	2,962,081	1,431,515	175,041	1,266,100	4,927	76,002	896	7,600
Thai Nguyen	800,850	390,202	94,135	287,825	5,366	20,930	300	2,093
Hai Phong	1,244,300	604,328	221,446	378,547	3,597	32,165	1,000	3,217
Quang Ninh	761,465	382,935	173,277	181,406	1,191	20,324	300	2,032
Red River Delta	7,963,991	3,810,972	425,013	3,491,009	12,997	202,326	1,441	20,233
North Central	1,753,898	854,918	123,730	724,540	542	45,262	379	4,526
Central Coast	4,455,802	2,182,635	604,021	1,539,231	1,178	115,557	1,401	11,556
Khanh Hoa	744,823	366,706	140,631	214,890	502	19,438	550	1,944
High Plateau	3,045,212	1,527,240	422,494	1,003,902	1,274	80,874	1,341	8,087
South East	5,004,483	2,466,663	709,632	1,678,033	3,718	130,708	2,660	13,071
An Giang	1,505,387	727,210	170,100	563,800	1,090	38,534	800	3,853
Can Tho	905,594	411,406	234,203	234,342	936	21,817	708	2,182
Mekong River Delta	9,615,020	4,640,502	810,724	3,886,299	4,290	245,756	2,874	24,576
Ha Noi	2,263,848	1,094,546	648,121	432,932	15,777	59,060	1,600	11,812
Ho Chi Minh City	4,281,478	1,990,335	1,819,111	310,807	17,049	107,078	10,000	21,416

APPENDIX II: High estimates of population sizes used in HIV/AIDS Estimates and Projections 1990 - 2012 in Viet Nam

CLUSTERS	TOTAL	MALE	URBAN FEMALE	RURAL FEMALE	IDUS	CLIENTS OF FSWS	FSWS	MSM
North West	5,415,362	2,399,608	299,436	2,333,975	58,267	277,726	4,692	41,659
North Plateau	3,277,001	1,481,601	243,631	1,337,537	15,904	169,210	3,735	25,381
North East	2,962,081	1,324,294	174,682	1,264,667	20,945	152,004	2,688	22,801
Thai Nguyen	800,850	363,583	94,015	287,345	6,869	41,859	900	6,279
Hai Phong	1,244,300	561,041	221,046	376,947	8,286	64,331	3,000	9,650
Quang Ninh	761,465	354,021	173,157	180,926	5,716	40,648	900	6,097
Red River Delta	7,963,991	3,543,310	424,436	3,488,704	37,867	404,653	4,323	60,698
North Central	1,753,898	795,203	123,579	723,933	5,942	90,525	1,137	13,579
Central Coast	4,455,802	2,040,969	603,460	1,536,990	4,398	231,115	4,203	34,667
Khanh Hoa	744,823	337,399	140,411	214,010	5,018	38,875	1,650	5,831
High Plateau	3,045,212	1,428,917	421,957	1,001,757	2,548	161,748	4,023	24,262
South East	5,004,483	2,299,294	708,568	1,673,777	14,238	261,416	7,980	39,212
An Giang	1,505,387	679,879	169,780	562,520	2,179	77,069	2,400	11,560
Can Tho	905,594	383,354	233,920	233,209	2,808	43,634	2,124	6,545
Mekong River Delta	9,615,020	4,339,252	809,574	3,881,701	10,633	491,512	8,622	73,727
Ha Noi	2,263,848	989,776	647,481	430,372	37,864	118,120	4,800	35,436
Ho Chi Minh City	4,281,478	1,817,694	1,815,111	294,807	34,097	214,156	30,000	64,247

APPENDIX III: HIV prevalence among IDUs 1990 - 2012 by cluster of provinces (1)

CLUSTERS	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Ha Noi	0.0	0.1	0.1	0.2	0.4	0.7	1.4	2.5	4.3	7.3	11.5	16.7	21.8
North West	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.3	0.6	1.2	2.2	4.0
North Plateau	0.0	0.1	0.1	0.2	0.3	0.6	0.9	1.4	2.3	3.5	5.2	7.5	10.2
North East	0.0	0.2	0.3	0.5	0.7	1.0	1.5	2.2	3.2	4.7	6.8	9.7	13.1
Thai Nguyen	0.1	0.2	0.4	0.6	1.0	1.6	2.6	4.1	6.2	9.3	13.3	17.9	22.7
Hai Phong	0.0	0.0	0.0	0.0	0.1	0.3	1.7	7.7	26.5	50.9	60.4	62.1	62.1
Quang Ninh	0.0	0.0	0.0	0.0	0.0	0.0	0.2	6.3	47.3	55.9	55.8	55.8	55.6
Red River Delta	0.1	0.1	0.2	0.4	0.7	1.2	2.2	3.9	6.6	10.3	14.6	18.7	21.8
North Central	0.0	0.0	0.0	0.0	0.0	0.0	0.4	2.0	6.8	14.0	17.3	17.8	17.7
Central Coast	0.2	0.6	1.2	2.5	4.6	7.2	9.5	11.5	14.1	16.8	17.9	18.0	17.7
Khanh Hoa	0.9	2.4	5.9	10.5	14.5	17.0	19.2	21.9	26.1	31.2	36.1	39.4	41.1
High Plateau	0.1	0.2	0.6	1.8	5.1	11.3	18.0	21.6	22.8	22.9	22.7	22.5	22.3
South East	0.0	0.0	0.1	0.5	2.4	7.9	13.6	15.3	15.4	15.3	15.2	15.1	15.1
Mekong River Delta	0.0	0.0	0.1	0.2	0.4	1.1	2.9	6.8	12.9	18.6	21.7	22.8	22.9
An Giang	0.1	0.1	0.2	0.4	0.8	1.5	2.8	4.9	8.2	12.5	17.0	20.6	22.8
Can Tho	0.0	0.0	0.0	0.0	0.0	0.1	0.3	1.2	3.6	9.8	21.9	35.0	42.3
Ho Chi Minh City	0.5	1.4	3.4	6.6	9.6	11.3	12.3	14.2	20.1	33.6	47.3	52.5	53.1

APPENDIX III: HIV prevalence among IDUs 1990 - 2012 by cluster of provinces (2)

CLUSTERS	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ha Noi	26.1	29.0	30.8	31.8	32.4	32.6	32.8	32.9	33.0	33.1
North West	6.4	8.9	11.0	12.4	13.3	13.8	14.1	14.4	14.7	14.9
North Plateau	13.0	15.8	18.1	19.7	21.0	21.7	22.2	22.5	22.7	22.9
North East	16.7	19.9	22.6	24.4	25.4	25.7	25.1	24.2	22.8	21.2
Thai Nguyen	27.0	30.5	33.1	34.8	36.0	36.7	37.1	37.4	37.6	37.8
Hai Phong	61.9	61.7	61.6	61.5	61.6	61.7	61.8	61.9	62.0	62.1
Quang Ninh	55.6	55.6	55.6	55.7	55.7	55.8	55.9	55.8	55.8	55.9
Red River Delta	23.8	25.0	25.5	25.8	26.0	26.1	26.2	26.3	26.4	26.4
North Central	17.2	16.8	16.1	15.7	15.4	15.1	14.8	14.5	14.3	14.0
Central Coast	17.2	16.5	15.7	14.8	14.0	13.3	12.7	12.1	11.7	11.4
Khanh Hoa	41.1	39.3	36.9	34.7	33.0	31.6	30.5	29.6	29.0	28.5
High Plateau	22.1	22.0	22.0	22.1	22.2	22.2	22.3	22.3	22.4	22.4
South East	15.1	15.1	15.2	15.3	15.4	15.4	15.5	15.5	15.5	15.5
Mekong River Delta	22.7	22.4	22.1	22.0	21.9	21.9	21.9	22.0	22.0	22.1
An Giang	23.6	23.3	22.3	20.7	18.9	17.1	15.2	13.6	12.0	10.7
Can Tho	44.7	45.4	45.5	45.5	45.5	45.6	45.6	45.7	45.8	45.8
Ho Chi Minh City	52.2	51.0	49.8	48.6	47.5	46.6	45.8	45.2	44.7	44.3

APPENDIX IV: HIV prevalence among FSWs 1990 - 2012 by cluster of provinces (1)

CLUSTERS	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Ha Noi	0.0	0.0	0.0	0.1	0.1	0.2	0.6	1.3	2.8	5.1	7.8	10.0	11.2
North West	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.3	0.5	0.9	1.5	2.4	3.6
North Plateau	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.3	0.5	0.9	1.4	2.2
North East	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.4	0.9	1.6	2.5	3.0	3.5
Thai Nguyen	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.4	0.7	1.1	1.8
Hai Phong	0.0	0.0	0.0	0.0	0.0	0.1	0.2	1.0	3.4	9.2	16.4	20.4	21.6
Quang Ninh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.8	1.1	1.8	2.5	2.5
Red River Delta	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.3	0.5	0.9	1.6	2.6	4.2
North Central	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3
Central Coast	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.4	0.5
Khanh Hoa	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.4	1.0	2.2	3.4	3.8	3.9
High Plateau	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.8	1.3	1.9	2.3	2.5
South East	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.7	1.3	2.0	2.5	2.7	2.8
Mekong River Delta	0.0	0.0	0.1	0.2	0.3	0.5	0.7	1.2	1.8	2.6	3.5	4.4	5.2
An Giang	0.0	0.0	0.0	0.2	0.6	1.5	3.5	6.6	9.2	10.6	10.8	10.8	10.7
Can Tho	0.2	0.2	0.3	0.5	0.8	1.3	2.1	3.5	5.4	7.8	10.4	13.1	15.4
Ho Chi Minh City	0.0	0.0	0.0	0.0	0.0	0.1	0.5	1.2	2.1	2.6	2.7	2.8	2.8

APPENDIX IV: HIV prevalence among FSWs 1990 - 2012 by cluster of provinces (2)

CLUSTERS	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ha Noi	11.8	12.1	12.1	12.2	12.2	12.3	12.3	12.3	12.3	12.3
North West	5.0	6.5	7.7	8.6	9.1	9.5	9.7	9.8	9.9	10.0
North Plateau	3.4	4.6	5.8	6.7	7.4	7.9	8.1	8.2	8.4	8.4
North East	3.6	3.7	3.6	3.7	3.7	3.7	3.7	3.8	3.7	3.7
Thai Nguyen	2.8	3.8	5.1	6.7	7.9	8.7	9.2	9.7	9.8	10.0
Hai Phong	21.8	21.8	21.9	21.9	21.9	22.0	22.0	22.0	22.0	22.0
Quang Ninh	2.8	2.8	2.7	2.7	3.0	2.9	2.8	2.8	2.8	2.7
Red River Delta	6.2	8.3	10.1	11.7	12.6	13.1	13.6	13.8	13.8	13.8
North Central	0.3	0.3	0.5	0.8	0.8	1.3	1.5	2.0	2.7	3.3
Central Coast	0.8	0.9	0.9	1.0	1.1	1.0	1.1	1.1	1.0	1.1
Khanh Hoa	4.0	3.9	4.1	4.0	3.9	4.0	4.0	4.1	4.0	3.9
High Plateau	2.6	2.6	2.6	2.6	2.6	2.7	2.6	2.6	2.7	2.6
South East	2.8	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
Mekong River Delta	5.7	6.2	6.4	6.5	6.6	6.7	6.7	6.8	6.8	6.8
An Giang	10.4	10.2	9.9	9.8	9.5	9.2	9.0	8.8	8.5	8.3
Can Tho	17.1	18.3	18.8	19.4	19.6	19.6	19.8	19.7	19.8	19.8
Ho Chi Minh City	2.9	2.9	3.0	3.0	3.1	3.1	3.1	3.2	3.2	3.2

APPENDIX V: HIV prevalence among clients of FSWs 1990 - 2012 by cluster of provinces (1)

CLUSTERS	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Ha Noi	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	1.2	2.4	3.2	3.5
North West	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.5	0.8
North Plateau	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2
North East	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.3	0.5	0.7	0.9
Thai Nguyen	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.3	0.6	0.9
Hai Phong	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.8	2.4	3.9	4.3	4.2	4.1
Quang Ninh	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.3	0.8	1.6	2.6	3.6	4.1
Red River Delta	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.3	0.7	1.1	1.4	1.6
North Central	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Central Coast	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.4	0.6	0.7	0.7
Khanh Hoa	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.4	0.9	1.4	1.8
High Plateau	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.6	0.8	0.8
South East	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.5	0.7	0.8
Mekong River Delta	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.4	0.7	1.0	1.4	1.8	2.2
An Giang	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.7	1.6	2.9	3.9	4.3	4.3
Can Tho	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.4	0.6	1.0	1.5	2.0
Ho Chi Minh City	0.0	0.0	0.0	0.0	0.1	0.1	0.3	0.8	1.6	2.8	3.8	4.4	4.6

APPENDIX V: HIV prevalence among clients of FSWs 1990 - 2012 by cluster of provinces (2)

CLUSTERS	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ha Noi	3.5	3.4	3.3	3.3	3.2	3.2	3.1	3.1	3.1	3.1
North West	1.3	1.8	2.2	2.5	2.6	2.7	2.7	2.7	2.7	2.7
North Plateau	0.2	0.3	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.6
North East	1.1	1.3	1.5	1.6	1.6	1.6	1.6	1.5	1.4	1.3
Thai Nguyen	1.4	2.0	2.7	3.3	3.9	4.2	4.5	4.6	4.7	4.8
Hai Phong	3.9	3.7	3.6	3.4	3.2	3.1	2.9	2.7	2.6	2.4
Quang Ninh	4.3	4.4	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Red River Delta	1.6	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
North Central	0.1	0.2	0.2	0.3	0.4	0.5	0.7	0.9	1.2	1.6
Central Coast	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Khanh Hoa	1.9	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1
High Plateau	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
South East	0.9	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.7
Mekong River Delta	2.4	2.6	2.7	2.8	2.8	2.8	2.9	2.9	2.9	2.9
An Giang	4.2	4.0	3.9	3.7	3.6	3.5	3.3	3.2	3.1	3.0
Can Tho	2.5	2.8	3.1	3.2	3.3	3.4	3.4	3.4	3.4	3.5
Ho Chi Minh City	4.6	4.6	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5

APPENDIX VI: Summary data of HIV/AIDS estimates and projections (1)

Number of PLHIV (All ages, Male and Female)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
High	118,602	152,045	181,397	208,017	231,570	251,800	268,899	283,596	298,581	312,704	327,779	344,532	360,106
Low	63,504	82,390	98,881	113,752	126,918	138,192	147,907	157,248	164,262	172,409	180,994	190,795	200,119
Medium	91,053	117,218	140,139	160,885	179,244	194,996	208,403	220,422	231,422	242,557	254,387	267,664	280,113
Number of PLHIV (All ages, Male)	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
High	96,425	122,634	145,153	166,496	185,416	200,153	213,857	223,903	235,899	245,484	255,766	265,750	275,770
Low	42,693	55,039	65,634	75,552	83,837	91,369	97,919	103,562	107,690	112,533	117,647	121,025	125,461
Medium	69,559	88,837	105,394	121,024	134,627	145,761	155,888	163,733	171,795	179,009	186,707	193,388	200,616
Number of PLHIV (All ages, Female)	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
High	22,177	29,410	36,244	41,522	46,154	51,647	55,042	59,693	62,682	67,219	72,013	78,782	84,335
Low	20,811	27,351	33,247	38,200	43,082	46,824	49,988	53,686	56,572	59,876	63,347	69,771	74,658
Medium	21,494	28,381	34,746	39,861	44,618	49,236	52,515	56,690	59,627	63,548	67,680	74,277	79,497
Number of PLHIV (Age 15+, Male and Female)	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
High	117,777	150,854	179,799	206,009	229,140	248,947	265,526	279,643	294,099	307,775	322,465	338,882	354,215
Low	62,750	81,296	97,416	111,911	124,680	135,590	144,851	153,702	160,188	167,901	176,117	185,588	194,670
Medium	90,264	116,075	138,608	158,960	176,910	192,269	205,189	216,673	227,144	237,838	249,291	262,235	274,443
Male/Female ratio of PLHIV (Age 15+, Male/Female)	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
High	4.41	4.23	4.07	4.08	4.10	3.95	3.97	3.84	3.86	3.75	3.65	3.46	3.35
Low	2.07	2.03	1.99	2.00	1.97	1.98	1.99	1.96	1.93	1.91	1.89	1.76	1.70
Medium	3.24	3.13	3.03	3.04	3.03	2.97	2.98	2.90	2.90	2.83	2.77	2.61	2.53

APPENDIX VI: Summary data of HIV/AIDS estimates and projections (2)

HIV prevalence (%, All ages, Male and Female)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
High	0.153	0.193	0.227	0.257	0.282	0.303	0.319	0.332	0.345	0.356	0.369	0.383	0.395
Low	0.082	0.105	0.124	0.141	0.155	0.166	0.175	0.184	0.190	0.196	0.204	0.212	0.220
Medium	0.118	0.149	0.176	0.199	0.218	0.234	0.247	0.258	0.267	0.276	0.286	0.297	0.308
HIV prevalence (%, Age 15 - 49, Male and Female)	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
High	0.270	0.330	0.390	0.430	0.470	0.490	0.510	0.530	0.540	0.550	0.570	0.580	0.600
Low	0.140	0.180	0.210	0.240	0.260	0.270	0.280	0.290	0.300	0.300	0.310	0.320	0.330
Medium	0.205	0.255	0.300	0.335	0.365	0.380	0.395	0.410	0.420	0.425	0.440	0.450	0.465
HIV prevalence (%, Age 15 - 49, Male)	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
High	0.440	0.540	0.620	0.690	0.750	0.780	0.810	0.830	0.850	0.860	0.880	0.890	0.910
Low	0.190	0.240	0.280	0.310	0.340	0.360	0.370	0.380	0.380	0.390	0.400	0.400	0.410
Medium	0.315	0.390	0.450	0.500	0.545	0.570	0.590	0.605	0.615	0.625	0.640	0.645	0.660
HIV prevalence (%, Age 15 - 49, Female)	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
High	0.100	0.130	0.150	0.170	0.190	0.200	0.210	0.220	0.230	0.240	0.260	0.270	0.280
Low	0.090	0.120	0.140	0.160	0.170	0.180	0.190	0.200	0.210	0.220	0.220	0.240	0.250
Medium	0.095	0.125	0.145	0.165	0.180	0.190	0.200	0.210	0.220	0.230	0.240	0.255	0.265
AIDS death (All ages, Male and female)	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
High	1,307	2,109	3,285	4,870	6,827	8,716	9,957	10,906	10,019	10,316	9,887	10,126	10,608
Low	714	1,149	1,776	2,614	3,644	4,457	4,559	4,402	5,528	5,474	5,418	5,630	5,869
Medium	1,011	1,629	2,531	3,742	5,236	6,587	7,258	7,654	7,774	7,895	7,653	7,878	8,239

APPENDIX VI: Summary data of HIV/AIDS estimates and projections (3)

Cumulative AIDS death (All ages, Male and female)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
High	3,061	5,170	8,455	13,325	20,152	28,868	38,824	49,730	59,749	70,065	79,952	90,078	100,686
Low	1,640	2,790	4,566	7,180	10,824	15,282	19,841	24,242	29,771	35,244	40,662	46,291	52,160
Medium	2,351	3,980	6,511	10,253	15,488	22,075	29,333	36,986	44,760	52,655	60,307	68,185	76,423
PLHIV (Age 15+) in need of ARV treatment	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
High	6,225	10,235	15,938	23,236	31,811	41,212	51,159	61,727	73,111	86,057	100,111	115,175	130,007
Low	2,959	4,991	7,948	11,800	16,392	21,506	27,044	33,305	40,628	48,037	55,540	63,363	71,086
Medium	4,592	7,613	11,943	17,518	24,102	31,359	39,102	47,516	56,870	67,047	77,826	89,269	100,547
HIV+ pregnant women in need of ARV for PMTCT	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
High	1,738	2,227	2,661	2,943	3,161	3,421	3,494	3,655	3,687	3,836	3,999	4,147	4,321
Low	1,632	2,072	2,441	2,708	2,955	3,093	3,164	3,269	3,313	3,393	3,487	3,656	3,813
Medium	1,685	2,150	2,551	2,826	3,058	3,257	3,329	3,462	3,500	3,615	3,743	3,902	4,067

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