

TECHNICAL REPORT

# India HIV Estimates 2006

 NACO

National AIDS Control Organisation



National Institute of Medical Statistics  
(Indian Council of Medical Research)



# TECHNICAL REPORT

# India HIV Estimates-2006



National Institute of Medical Statistics  
(Indian Council of Medical Research)  
New Delhi



National AIDS Control Organisation  
Ministry of Health and Family Welfare  
Government of India



# Abbreviations

AIDS	Acquired Immuno-Deficiency Syndrome
AIIPH&PH	All India Institute of Hygiene and Public Health
AIIMS	All India Institute of Medical Sciences
AIM	AIDS Impact Model
ANC	Ante-natal clinics
ART	Antiretroviral treatment
ARV	Antiretroviral
ASFR	Age Specific Fertility Rate
BMGF	Bill and Melinda Gates Foundation
BSS	Behavioural surveillance survey
CDC	Center for Disease Control
FHI	Family Health International
FSW	Female sex workers
HIV	Human Immuno-Deficiency Virus
HSS	HIV sentinel surveillance
IBBA	Integrated biological and behavioural assessments
ICMR	Indian Council of Medical Research
IDU	Intravenous drug users
IIPS	International Institute for Population Sciences
ISI	Indian Statistical Institute
MSM	Male sex with males
MTCT	Mother to child transmission
NACO	National AIDS Control Organizations
NACP	National AIDS Control Programme
NARI	National AIDS Research Institute
NFHS	National Family Health Survey
NICED	National Institute of Communicable and Enteric Diseases
NIE	National Institute of Epidemiology
NIHFW	National Institute of Health and Family Welfare
NIMS	National Institute of Medical Statistics
PGIMER	Postgraduate Institute of Medical Education and Research
PHR	Populations at higher risk
PLHIV	People living with HIV/AIDS
PLR	Populations at lower risk
RCSHA	Resource Centre for Sexual Health and HIV/AIDS
RMRC	Regional Medical Research Centre
SACS	State AIDS Control Societies
SRS	Sample registration system
STD	Sexually transmitted diseases
TFR	Total fertility rate
UNAIDS	Joint United Nations Program on HIV/AIDS
USAID	United States Agency for International Development
WHO	World Health Organization



# Table of Contents

Abbreviations.....	iii
Foreword.....	vii
Preface .....	ix
1. Introduction .....	1
2. Estimation Process, 2006.....	3
2.1 Process:.....	3
2.2 Overall approach for 2006 estimation.....	4
3. Methodology .....	7
3.1 Defining the epidemic and population groups using the Work Book.....	7
3.2 Estimating adult HIV prevalence using workbook .....	7
3.3 Back-calculating the HIV prevalence for previous years and generating an HIV prevalence epidemic curve using the Workbook .....	9
3.4 Calculation of PLHIV estimates for all age group using Spectrum.....	9
3.5 Uncertainty analyses.....	10
4. Results .....	11
4.1 National HIV estimate .....	11
4.2 Trend in HIV prevalence .....	11
5. Conclusions and Next Steps .....	15
Appendix.....	17





# Foreword

The HIV sentinel surveillance (HSS) in India was initiated to monitor the spread of HIV infections among specific-risk groups, mainly among patients with sexually transmitted diseases (STD) and women attending antenatal clinics (ANC). STD patients were assumed to be a proxy for people with high risk sexual behaviour and the ANC women were considered a proxy for people at low risk sexual behaviour and likely to catch the infection through bridge populations. In the beginning it also included very few sites for Injecting Drug Users (Injecting Drug Users) and Female Sex Workers (FSW) in the areas where networks of these groups were visible. Over time, the HSS network has expanded considerably, to increase the geographical coverage as well as to include high-risk behaviour groups such as Men who have Sex with Men (MSM), IDU, FSW and long-distance truckers.

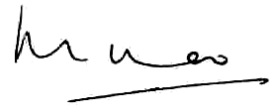
Since 1998, the HSS data was subsequently utilized to estimate the number of people living with HIV (PLHIV). In this endeavour, NACO takes the assistance of a number of institutions of national and international repute. Among them, the National Institute of Health and Family Welfare (NIHFW) takes the lead in coordinating and overseeing the implementation of HIV Sentinel Surveillance, which includes training of the field teams, quality assurance, monitoring of data collection and processing of data analysis. The National Institute of Medical Statistics (NIMS), Indian Council of Medical Research (ICMR) is the nodal agency that carries out the process of HIV estimation. The expert committee on HIV estimation in India formulated in 1998 evolved a methodology involving several assumptions to estimate the number of PLHIV in the country, in consultation with WHO and UNAIDS.

The year 2006 is a landmark in the history of HSS as well as the HIV estimation process. The surveillance network has expanded to 1,122 sentinel sites from 703 that existed the previous year, covering almost all districts of the country. Globally comparable estimates were derived using the WHO/UNAIDS Workbook, specially designed to estimate the HIV burden in low and concentrated epidemics. Further, the availability of multiple data sources this year added valuable inputs towards improving and refining the PLHIV estimates in India and provided ample scope to replace the assumptions with evidence-based values. These data sources are derived from the third round of National Family Health Survey, 2005-06 (NFHS-3), the second round of National Behavioural Surveillance Survey (BSS-2) as well as the Baseline Integrated Biological Behavioural Assessments (IBBA) and NACP-III size estimates for high-risk groups. In addition, consultative meetings with a large group of national and international experts ensured a better understanding of the data and providing reliable estimates.

I would like to acknowledge the efforts put in by National Institute of Medical Statistics, ICMR, New Delhi in bringing out the report. The contributions of Dr. D.C.S. Reddy, WHO India, Dr. Renu Garg, WHO SEARO, Dr. Tobi Saidel, FHI and Dr. Gurusurthy Rangaiyan, UNAIDS are highly appreciated. The contributions of experts from UNAIDS, Geneva and India, CDC Atlanta, Imperial College London, USAID, Macro International, WHO, BMGF, FHI and the World Bank, are gratefully acknowledged. WHO and UNAIDS are specially thanked for their constant support and guidance.

I congratulate Dr. Jotna Sokhey, Additional Project Director, NACO, Dr. Ajay Khera, Joint Director (Basic Services & Surveillance), NACO and Dr. Arvind Pandey, Director, NIMS, for coordinating the HIV estimation process and bringing out of this document.

This technical report is a compendium of the estimation process and the findings. I am confident that this document will be a ready-reckoner for the researchers as well as the programme managers across the country and globe.



**K. Sujatha Rao**  
Additional Secretary & Director General  
National AIDS Control Organisation  
Ministry of Health and Family Welfare  
Government of India

# Preface

HIV Sentinel Surveillance has been established to monitor the trends of HIV infection in the country. HSS data is also being used for estimating the number of People Living with HIV/AIDS (PLHIV) in the country. The first HIV estimation in India was done in 1994 based on data from 52 sites. Since then, the process of estimation of HIV infected persons in the country has evolved to a very great extent. An expert committee on HIV estimation was formulated in 1998 that evolved a methodology for HIV estimation using several assumptions. Although the methodology was adopted in consultation of WHO/UNAIDS, time-to-time validations of assumptions were needed. In 2003, NIMS validated these assumptions with the availability of the results from the expanded HSS sites and a community-based survey on prevalence of sexually transmitted infections in India. In 2006, besides data from a greatly expanded sentinel surveillance system, multiple sets of data sources became available, that helped in replacing the assumptions with evidence-based values.

NIMS, in collaboration with NACO, WHO and four identified and specially capacitated regional Institutes, National Institute of Epidemiology, ICMR Chennai, Regional Medical Research Centre, ICMR Dibrugarh, International Institute for Population Sciences Mumbai and PGIMER Chandigarh, organized a number of workshops for State AIDS Control Society (SACS) officials and other researchers in states so as to understand the data needs, gaps and the sub-epidemics in the country. The outcome of these workshops and information from multiple data sources, such as the third round of National Family Health Survey (NFHS-3), the second round of national behavioural surveillance survey (BSS-2), the baseline integrated biological behavioural assessments (IBBA) and NACP-III estimates for sizes of high risk groups, were used to replace the assumptions with evidence-based values. This report describes in detail the process of estimation of PLHIV in 2006. Following a brief introduction in section 1, the process and the overall approach of the estimation is described in section 2. The methodology in detail is explained in section 3 and the results are given in section 4.

A number of national and international organizations were involved in this venture. The contributions of regional Institutes for estimation and surveillance are greatly appreciated. In addition to the four regional Institutes identified for estimation, National Institute of Communicable and Enteric Diseases, ICMR, Kolkata, All India Institute of Medical Sciences, New Delhi and National AIDS Research Institute, Pune cooperated with NIMS in organizing the capacity building workshops. Their timely help and cooperation is gratefully acknowledged.

The support and guidance provided by the WHO, India and UNAIDS had been the energizer for the team to complete the challenging task. CDC, Atlanta, Imperial College, London, Macro International, USAID, WHO, India, BMGF, FHI, India and the World Bank were other international organizations providing consultation in finalizing the methodology. The contributions of all international organizations are deeply appreciated.



# 1

## Introduction

A systematic and consultative HIV estimation process has been ongoing in India since 1998. A national committee with experts from premier national institutions guides the estimation process with assistance from WHO and UNAIDS. The estimations have relied mainly on data generated by NACO's HIV Sentinel Surveillance (HSS) and some epidemiologic assumptions, using an indigenous Excel Worksheet as a tool. The HIV estimation methods and assumptions have been published previously. During the year 2005–2006 a series of activities were initiated to improve the estimation methodology, and the input data base for estimation has been enriched with the availability of multiple data sources. The HSS expanded to over 1,122 sentinel sites covering almost all the districts of the country. The third round of National Family Health Survey (NFHS-3) tested over 102,000 blood specimens from adult men and women through a population-based

household survey. The second round of national behavioural surveillance survey (BSS-2) and the baseline integrated biological behavioural assessments (IBBA) survey were also conducted during the year. More authentic information was available about the size of population at high risk (PHR) from the NACP-III document. Thus the year 2006 is a benchmark in the history of the estimation of PLHIV in India.

The adult HIV prevalence during last five years remained almost stable at 0.4% varying between 0.45% in 2002 and 0.36% in 2006. PLHIV in all ages in 2006 was 2.47 million. Around 4% of them were children, 8% among the above-49 age groups and the remaining 88% in 15–49 age groups. The order of magnitude of prevalence among different risk groups in descending order was 8.7%, 5.7%, 5.4%, 2.4% and 0.3% among IDUs, MSMs, FSWs, long-distance truckers and general population, respectively.

### The salient features of the HIV estimation process in 2006 are:

- ◆ It compared the current method with global methods
- ◆ Having found that the WHO/UNAIDS workbook method is comparable with the current one under the same assumptions and epidemic specifications, it was decided to use the Workbook.
- ◆ A series of workshops were organized in four regions to understand the epidemic sub populations in the country to restructure the Workbook
- ◆ Multiple sources of data were used to do away with the assumptions involved in the estimation process.
- ◆ A number of consultative meetings were organized with national and international experts to review and modify the estimates.
- ◆ The estimates were re-calculated for the years 2002–2006 to understand the epidemic trend, following the change in methodology.
- ◆ Estimates for PLHIV in all ages were derived from the Spectrum package.



# 2 Estimation Process, 2006

## 2.1 Process:

As in the previous years, HIV estimation for 2006 was consultative and iterative. A number of meetings of the national and international experts were held to review the HIV estimation methods, data sources, assumptions and results. The group of experts included renowned epidemiologists and biostatisticians from national and international organizations viz., National AIDS Control Organization (NACO), National Institute of Medical Statistics (NIMS), ICMR, New Delhi, National Institute of Health and Family Welfare (NIHFW), New Delhi, National Institute of Epidemiology (NIE), ICMR, Chennai, National AIDS Research Institute (NARI), Pune, International Institute for Population Sciences (IIPS), Mumbai, Post Graduate Institute of Medical Education and Research (PGIMER), Chandigarh, Indian Statistical Institute (ISI), Kolkata, WHO, UNAIDS, Geneva and India, CDC, Atlanta, FHI, Imperial College, London, USAID, ORC-MACRO and the World Bank.

Four regional Institutes were identified to understand the micro level epidemiology of HIV/AIDS in India, the global estimation methodologies, and to pinpoint the data needs and data gaps that had to be filled in so as to improve the quality of estimates. They were NIE, ICMR, Chennai in the south,

Regional Medical Research Centre (RMRC), ICMR, Dibrugarh for the east and north-east, PGIMER, Chandigarh for the north and IIPS, Mumbai in the west, under the coordination of NIMS, with support from NACO and WHO, India. In order to understand the data needs and gaps at the micro level, regional workshops were organized in collaboration with the respective regional Institutes, along with All India Institute of Medical Sciences (AIIMS), New Delhi, (NARI), ICMR, Pune, All India Institute of Hygiene and Public Health (AIIHPH), Kolkata and National Institute of Communicable and Enteric Diseases (NICED), ICMR, Kolkata and the State AIDS Control Societies of the respective states.

Proceedings of the workshops and the results of different estimation methodologies were presented and discussed in the expert committee meetings to estimate the HIV burden in India. It also discussed the epidemic structure of the UNAIDS/WHO Workbook with regard to the Indian epidemic and availability of data. Continued consultations with national and international experts were achieved through meetings, workshops, and e-communications. The HIV estimation for 2006 was reviewed and approved by the Technical Resource Group on Surveillance and estimation under the chairpersonship of DG, ICMR and DG, NACO. The key meetings and their outcomes are listed below:

Time	Meeting	Outcome
February–March 2007	Four Regional workshops including regional institutes and State AIDS Control Societies	<ul style="list-style-type: none"> <li>Capacity building on HIV estimation methodologies</li> <li>Identification of data gaps</li> <li>Defining state-level/local sub-epidemics</li> </ul>
17 <sup>th</sup> April 2007	Meeting of the National Expert Committee on HIV Estimation	<ul style="list-style-type: none"> <li>Recommendation on use of WHO/UNAIDS Workbook methods for 2006 estimations</li> </ul>

Time	Meeting	Outcome
28 <sup>th</sup> April 2007	Round up meeting of the regional workshops on model-based HIV Estimation	<ul style="list-style-type: none"> <li>Finalized the structure of the Workbook for HIV estimation in India</li> </ul>
April–May 2007	Weekly meetings of core-technical working group on HIV estimations	<ul style="list-style-type: none"> <li>Refining the workbook structure and decision making on input data for the workbook</li> </ul>
4–6 <sup>th</sup> June 2007	Consultation of stakeholders on HIV estimation	<ul style="list-style-type: none"> <li>Review of data sources</li> <li>Review and approval of methodology of HIV estimates for 2006.</li> </ul>
27 <sup>th</sup> June 2007	Meeting of the experts on HIV estimates	<ul style="list-style-type: none"> <li>Review and approval of methodology and draft estimates</li> </ul>
4 <sup>th</sup> July 2007	Final consensus meeting on HIV estimates	<ul style="list-style-type: none"> <li>HIV estimates approved</li> </ul>
6 <sup>th</sup> July 2007	Release of HIV estimates by Honorable Health Minister	<ul style="list-style-type: none"> <li>Public release of HIV estimates</li> </ul>

## 2.2 Overall Approach for 2006 Estimation

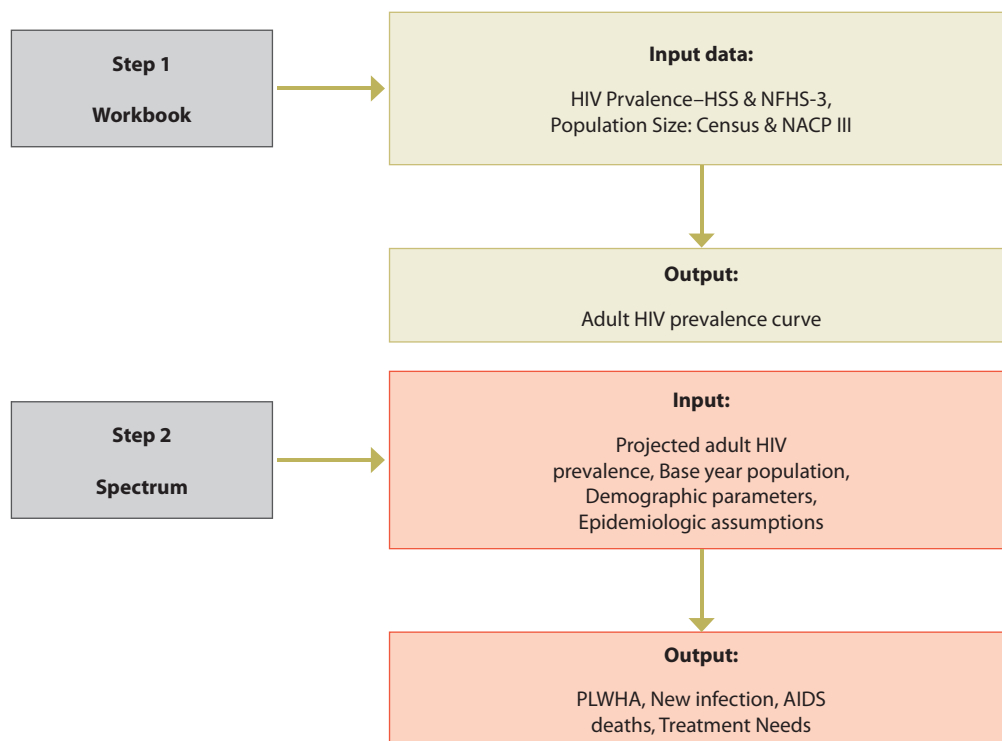
The overall approach to 2006 estimates included five steps as listed below:

1. The sentinel surveillance data was reviewed and used to estimate HIV prevalence for each risk group using the appropriate statistical method, accounting for intra and inter site variation within a specific state. The HIV prevalence among ANC attendees was calibrated with the community-based survey data from NFHS-3.
2. The data on HIV prevalence among each risk group with respective size estimates as given in NACP-III were fed into the UNAIDS/WHO Workbook to estimate the adult HIV prevalence for 2006 for each state.
3. The trend in HIV prevalence in each risk group within a specific state was estimated based on the valid consistent sites using the random effect model. A site was called valid if it had three-fourth coverage of the target and consistent if it had information for five consecutive years, viz. 2002–2006. The HIV prevalence for each risk group for previous years (2002–2005) was then estimated by applying the slope of the trend over the prevalence of 2006.
4. Adult HIV prevalence for these years for each state was estimated by creating separate workbooks. An epidemic curve was fitted for each state using the estimated adult prevalence for five years 2002–2006 to project the HIV prevalence for the epidemic period 1985–2010.
5. The projected HIV prevalence for each state was fed into Spectrum along with programme data on antiretroviral program coverage, percent of mother-baby pairs given NVP etc. and some epidemiologic assumptions, to calculate the number of people living with HIV in all ages.

The diagram below explains the above approach along with the input data sources:



## HIV estimates 2006-Overall approach



### UNAIDS Workbook

The UNAIDS Workbook was developed to estimate and build future scenarios of HIV prevalence in countries with low-level and concentrated epidemics. In concentrated epidemics, HIV has spread rapidly in a defined sub-population, but is not well-established in the general population suggesting active networks of risk within the sub-population. The future course of the epidemic is determined by the frequency and nature of links between highly infected sub-populations and the general population. The UNAIDS Workbook is a series of Excel™ spreadsheets composed of point prevalence worksheets and epidemic curve worksheets. It can be used to make estimates for various regions, generate an epidemic curve and generate estimates of adult prevalence that can be imported into Spectrum.

### Spectrum

Spectrum is a policy modelling system consisting of modules for a number of reproductive health areas. Two Spectrum modules, the demographic projection (DemProj) and the AIDS Impact Model (AIM) are used for making a national HIV estimate. National/regional prevalence projections produced by the Workbook are the input in Spectrum to calculate the impact of the epidemic. The AIM is a computer program for projecting the impact of the AIDS epidemic. It projects the consequences of the HIV/AIDS epidemic, including the number of people living with HIV/AIDS, new infections, AIDS deaths by age and sex, number of adults in need of antiretroviral (ARV) treatment and AIDS orphans, given an assumption about adult HIV prevalence. The DemProj projects the population for an entire country or region by age and sex, based on assumptions about fertility, mortality, and migration.



# 3 Methodology

## Key methodological steps included:

- a. Defining the epidemic and population groups using the Work Book;
- b. Estimating adult HIV prevalence for 2006 for each State using Work Book;
- c. Back-calculating previous years' HIV prevalence (2002–2006) for each state using valid consistent sentinel sites and generating an epidemic curve of HIV prevalence within the Workbook;
- d. Calculating estimates of people living with HIV (PLHIV) for all age groups using Spectrum;
- e. Calculating upper and lower bounds for the point estimate.

## 3.1 Defining the epidemic and population groups using the Work Book

For the purpose of the estimation, the total adult population was divided into populations at higher risk (PHR), i.e., FSW, MSM, IDUS and truckers, and populations at lower risk (PLR):

The general population females included women who are partners of MSM, IDU, truckers, and clients of sex workers. Similarly, the general population male includes husbands of sex workers as well as men who have higher

risk behaviour such as clients of sex workers, ex-clients of sex workers, ex-IDU, ex-MSM etc.

## 3.2 Estimating adult HIV prevalence using workbook

The Workbook requires the following key sets of data to generate the adult HIV prevalence:

- Size of population at higher risk;
- Size of population at lower risk;
- HIV sero-prevalence among populations at higher risk;
- HIV sero-prevalence among populations at lower risk.

### Population Groups

- *Populations at higher risk (PHR)*
  - ◆ Female sex workers (FSWs)
  - ◆ Men who have sex with men (MSM)
  - ◆ Male and female injecting drug users (IDUs)
  - ◆ Truckers (includes drivers and cleaners)
- *Populations at lower risk (PLR) includes all individuals not accounted for in the PHR*
  - ◆ General Population Females – Urban
  - ◆ General Population Females – Rural
  - ◆ General Population Males – Urban
  - ◆ General Population Males – Rural

### 3.2.1 Sizes of Populations at Higher Risk (PHR)

Several sources of data on size estimate were considered including the estimates from the Expert Group on Size Estimation for NACP III planning, coordinated by the Resource Centre for Sexual Health and HIV/AIDS (RCHSA) in 2004 and recent draft estimates from the IBBA. Since IBBA results were available for only selected districts, and that too for more visible subsets of the populations at higher risk (e.g. most visible MSM and FSWs), it was decided to use the estimates provided in NACP III that had state-level estimates.



- **FSW:** State-specific values from the NACP III report were used for high and low size estimates for each state. For states where a range was provided, the lowest and highest values were used for low and high estimates in the workbook. For states where no range was given, the single value was used as the midpoint, and low and high values were calculated as plus or minus 20% of the midpoint. The value of 20% was a consensus of the core technical working group.
- **MSM:** State-specific values from the NACP III report were based on the compilation of information from population-based behavioural survey and review of data from different studies like Avahan data, Avert BSS data, Humsafar trust data etc. Accordingly 65% of adult males were assumed to be sexually active. Among them, 5% are estimated to have homosexual activities and 20% of homosexually active men have had more than 5 partners in the previous month. For the workbook, the estimated number with 5 partners or more was taken as the point estimate and plus or minus 20% of the point estimate was used for low and high values.
- **IDU:** State-specific ranges were available from the NACP III. These ranges were based on a combination of state-wise mapping exercises of IDU, and refined estimates made by the Expert Group after reviewing available evidence and literature. In the few states where there was no refined estimate from the Expert Group, the state mapping figure was used as the midpoint, and low and high values were calculated as plus or minus 20% of the midpoint. Female IDU were estimated to be 10% of all IDU.
- **Truckers:** The NACP III document recorded 5–6 million truckers in the country. Of these 3–3.5 million are long distance truckers. The expert committee recommended the inclusion of 50% of long distance truckers in the workbook for estimation. Assuming that each truck has at least one helper along with the driver, a total of 3 million was included as long distance truckers and helpers. They

were distributed among states following the distribution of the transport related workers in the census report.

### 3.2.2 Sizes of Populations at Lower Risk (PLR)

The total population in the age group 15–49 in the year 2006 for four classes, urban male, urban female, rural male and rural female were derived using the 'Expert Group Population Estimates and Projections' provided by the National Commission of Population, Ministry of Health & Family Welfare, Government of India. The sizes of PLR in these four classes were calculated by subtracting the sizes of PHR, using the following assumptions.

#### Assumptions

##### Urban/Rural

- ◆ FSWs assumed to be 67% urban and 33% rural;
- ◆ MSM assumed to be 60% urban and 40% rural;
- ◆ IDU assumed to be 90% urban and 10% rural in all states except Manipur and Nagaland, where IDU was assumed to be 40% urban and 60% rural;
- ◆ Truckers assumed to be 10% urban and 90% rural;

##### Male/Female

- ◆ IDU assumed to be 10% female and 90% male.

### 3.2.3 Estimation of HIV sero-prevalence rates for Populations at Higher Risk

The HIV prevalence for each of the populations at higher risk (PHR), i.e., FSW, MSM and IDU was estimated using the random effects logistic regression model, accounting for intra and inter site variation within the specific state.

### 3.2.4 HIV sero-prevalence among Populations at Lower Risk (PLR)

The HIV prevalence among ANC attendees was estimated similarly as in the case of PHR, by random effects logistic regression models that

account for intra and inter site variation within the specific state. In case of a limited number of ANC sites in a state, standard logistic regression models were used to estimate prevalence.

The HIV prevalence among ANC attendees was then calibrated to the HIV prevalence among women in NFHS-3. The calibration factor was derived for individual states in high prevalence states (Tamil Nadu, Andhra Pradesh, Karnataka, Maharashtra, Manipur and Tamil Nadu). The calibration factor for Manipur was used for Nagaland since NFHS-3 could not be conducted there and the epidemic was similar. For the remainder of the moderate and low prevalence states, a common calibration factor was derived and used. The urban: rural ratio of HIV prevalence as observed in NFHS-3 was applied in each state to derive HIV prevalence among urban and rural women. Subsequently, the female: male ratio of HIV prevalence of NFHS-3 was applied to get the prevalence among men in urban and rural areas.

### 3.3 Back-calculating the HIV prevalence for previous years and generating an HIV prevalence epidemic curve using the Workbook

#### 3.3.1 Back-calculation of the size of risk groups

Once the workbooks for 2006 were finalized, state-specific year-wise workbooks for 2002 to 2005 were created using the same workbook structure and assumptions that had been used for 2006, with the following modifications:

- *Year-wise population sizes for high-risk groups* were adjusted by calculating the proportion of men and women in each state who were FSWs, IDU and MSM based on the 2004 NACP III data. FSWs were calculated as a proportion of the state-specific female population in 2004, and MSM and IDU as a proportion of the state-specific male population in 2004. These proportions were then applied to gender specific population size estimates projected from the 1991 census for 2001 and 2002, and from the 2001 census, for 2003, 2004 and 2005, to obtain workbook values;

- *Year-wise population sizes for populations at lower risk* were based on year-wise census projections with the appropriate subtractions of populations at higher risk

#### 3.3.2 Back-calculation of the HIV prevalence in risk groups

*Year-wise HIV prevalence for high risk groups* was calculated following the same set of rules. The trend in HIV prevalence in each risk group within a specific state was estimated, based on the consistent sites that were in place during 2002–06, using the random effect model. The HIV prevalence for each risk group for previous years (2002–2005) was then estimated by applying the trend over the prevalence of 2006.

*Year-wise HIV prevalence for populations at lower risk* was calculated by applying the same rule as in the case of populations at higher risk. The trend in HIV prevalence among ANC attendees within a specific state was estimated based on the constant sites that were in place during 2002–06 using the random effect model. The HIV prevalence for previous years (2002–2005) was then estimated by applying the trend over the prevalence of 2006. The calibration factor was assumed to be constant over time, i.e. 2002–06.

#### 3.3.4 Generating prevalence curves using the Workbook

Once the year-wise workbooks were finalized for each state, the prevalence estimates for 2002–2006 were entered on the projection sheet of the 2006 workbook for the respective states to fit the logistic curves and project the adult prevalence for the years 1985–2010.

### 3.4 Calculation of PLHIV estimates for all age groups using Spectrum

The projected prevalence from the Workbook was fed into Spectrum to estimate and project the number of PLHIV in all age groups and other epidemic impact factors for the total epidemic duration i.e., from the initial year 1985 to 2010. The spectrum files were created for each state separately and for the nation.

### Curve Fitting

The single logistic curve was fitted if the epidemic in the state is still growing or starting to stabilize. Three parameters are used to fit the single logistic curve:

- ◆ The year in which the epidemic reached the half of its peak,
- ◆  $\alpha$ , the rate of increase at the start of the epidemic and
- ◆ The peak prevalence value.

The double logistic curve was fitted if the epidemic showed a declining trend. Two additional parameters, the prevalence level at which the epidemic is expected to stabilize and the rate at which the epidemic is declining are used for fitting the double logistic curve.

Spectrum derives these estimates based on the national demographic projections, information on epidemic patterns describing the progression from infection to death, the distribution of infection by age and sex, transmission of HIV from mother-to-child, the effect of HIV infection on fertility, and the effects of anti-retroviral therapy. The information on these parameters, if available for states/the nation was fed into Spectrum along with the workbook projections of HIV prevalence. The default values prepared by the UNAIDS reference group was used wherever specific information was not available. Various input parameters in Spectrum and the source of information is presented in the box below.

### 3.5 Uncertainty Analyses

For each state, the upper uncertainty bound around the adult prevalence rate

was determined by combining the upper confidence intervals of the prevalence estimate in different population groups, pro rata to the population size. Since prevalence among ANC attendees in 2006 was reduced to the level of NFHS-3 by calibration, the NFHS-3 lower confidence interval was used as lower bound for adult prevalence. In order to determine the uncertainty bounds for the previous years (2002–05), separate Workbooks were created for upper bounds in each state using the approach described above. Uncertainty bounds for the national prevalence estimate and the number of people living with HIV were generated by using the Spectrum model. This involved generating up to 1000 logistic curve fits by varying annual estimates. The uncertainty analysis is processed using these curves combined with distributions around key assumptions in Spectrum.

Input parameters in Spectrum and the source of information	
Input parameter	Source of information
<i>Demographic Data</i>	
Base year (1985) population by age and sex	Census of India
Life expectancy by sex	SRS
Migration	Census and expert group population assumption
TFR	Census and expert group population assumption
Sex ratio	Census and expert group population assumption
Model Life Table	Coale-Damney West
ASFR	UN Asia model
<i>Epidemiological assumptions</i>	
HIV age distribution estimates	Default values for concentrated epidemic pattern
MTCT (% MB pair received NVP)	Estimated from MTCT program data
Infant feeding pattern	NFHS-2
Adult/children ART	ART program data
TB Incidence and prevalence	Default

# 4 Results

## 4.1 National HIV estimate

As mentioned earlier, WHO/UNAIDS Workbook method was used for the estimation of adult HIV infections in all 35 states for five years 2002–06. Independent estimates of adult HIV prevalence and number of PLHIV were derived for each state. The national adult HIV prevalence for each year was derived by aggregating the number of adult PLHIV over states and calculating the percentage over the adult population. The national HIV adult prevalence over time (1985–2012) was projected from the national projection sheet of the UNAIDS Workbook by fitting a double logistic curve over five-point estimates. The projected national prevalence curve is shown in Figure-1 below.

The projected national adult prevalence when input to the national spectrum model provided

the estimate of HIV infections for all ages (2.5 million) with an uncertainty bound 2.0–3.1 million (Table-1). State-specific results on adult HIV prevalence and burden are provided in Appendix Tables A1 and A2 respectively. The spectrum curve for number of PLHIV (all ages) is shown in Figure-2.

## 4.2 Trend in HIV Prevalence

Table-2 presents the time trend of HIV prevalence among adults (age 15–49) by sex during 2002–06 in order to facilitate the comparison of HIV estimate over time by the same methodology. The HIV prevalence for adult males and females together has been showing a declining trend during past five years. It was 0.36% in the year 2006 against 0.45% in 2002. The adult HIV prevalence

Figure-1: National Adult Prevalence Projection

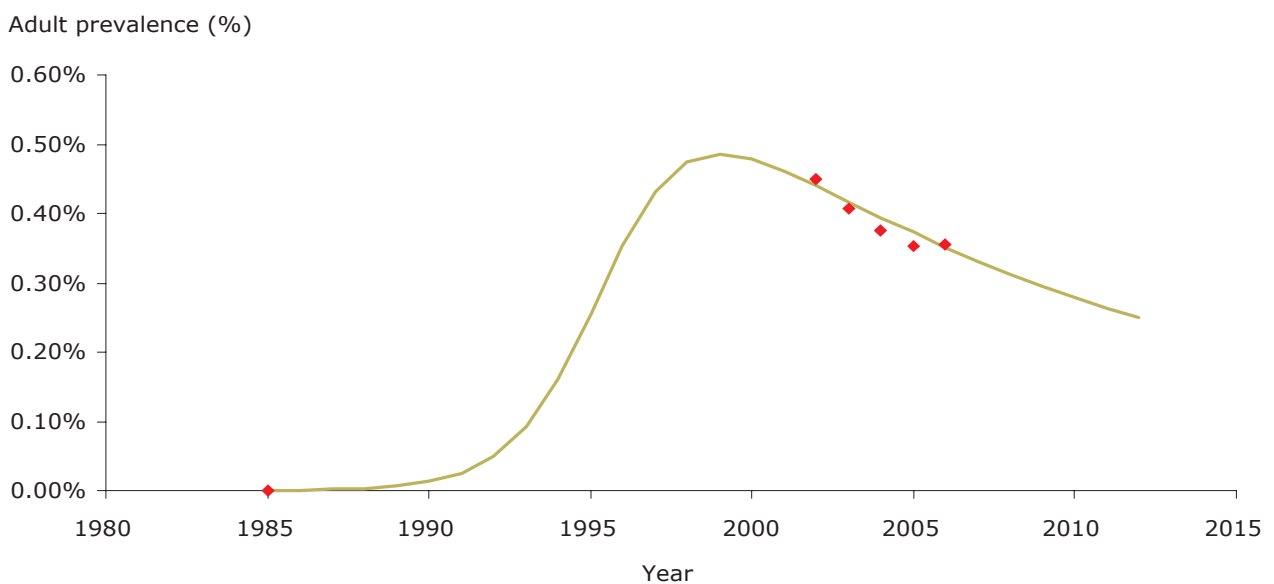
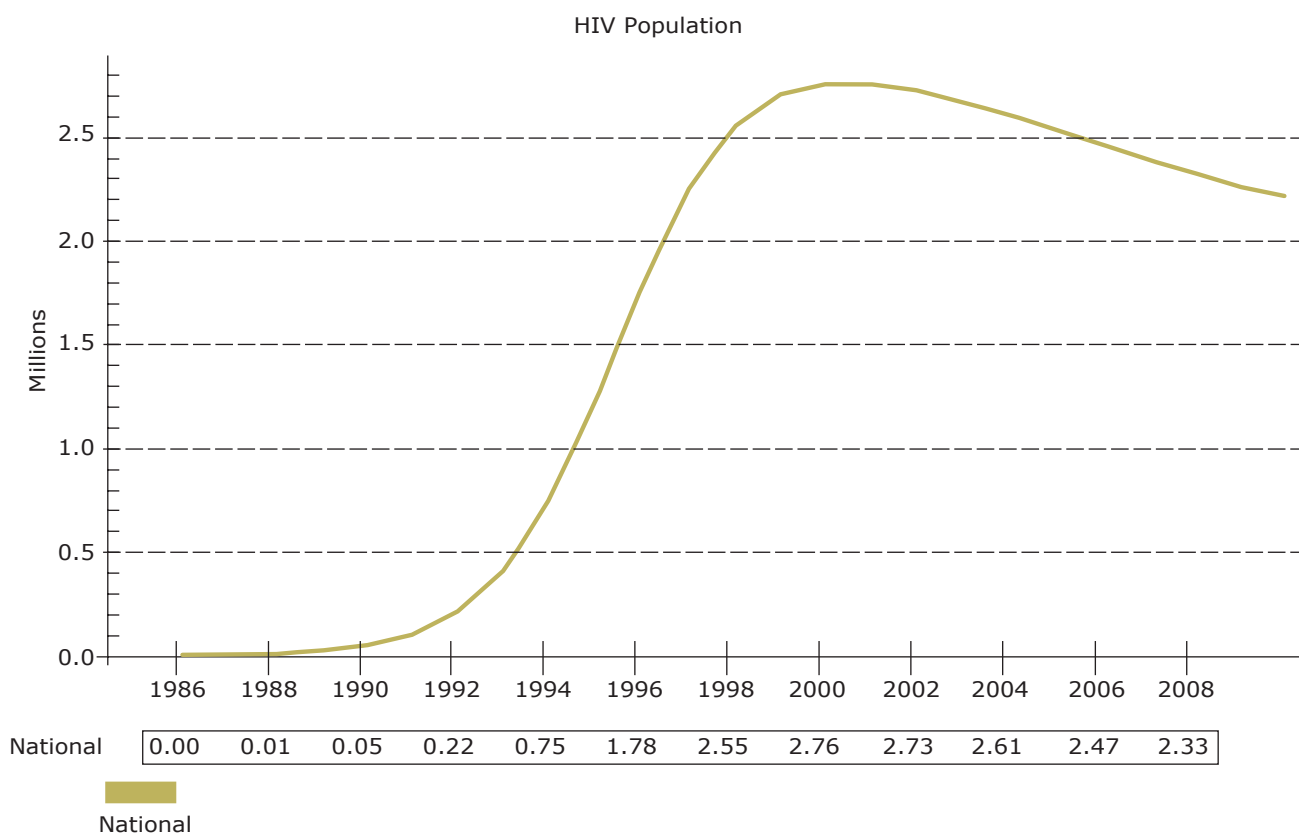


Table-1: Adult HIV prevalence and HIV infections for all age in India

Adult HIV prevalence	0.36 (0.27–0.47)
Number of HIV infections (All ages)	2.5 (2.0–3.1) million

Figure-2: Estimated number of PLHIV (all ages) - 2006



Sex	HIV prevalence				
	2002	2003	2004	2005	2006
Female	0.36%	0.35%	0.33%	0.31%	0.30%
Male	0.53%	0.50%	0.48%	0.46%	0.43%
Total	0.45%	0.43%	0.41%	0.39%	0.36%

among women has declined to 0.30% in 2006 from 0.36% in 2002 while among men it has declined to 0.43% in 2006 from 0.53% in 2002. The percentage of infections among males and females was around 60 and 40 respectively as shown in Table 3.

Table-4 presents the proportion of estimated number of PLHIV by age and time. Accordingly, of the 2.5 million PLHIV in 2006, 88.7% are adults, 7.5% are aged 50 and above, while 3.8% are children. The proportion of infections among children and

Sex	2002	2003	2004	2005	2006
% Female	39.1	39.1	39.1	39.1	39.1
% Male	60.9	60.9	60.9	60.9	60.9%
Total infections (in million)	2.73	2.67	2.61	2.54	2.47



adults above 50 years of age has been slightly increasing during the past five years. It was 3% among children and 5.8% among adults beyond the age of 50 in 2002.

in Table-5. The highest HIV prevalence is among IDU for both high prevalence states and low-moderate states. MSM and FSW are at second and third position respectively. The

Table-4: Percent Distribution of HIV infections by age group and year

Age Group	2002	2003	2004	2005	2006
<15	3.0%	3.2%	3.4%	3.6%	3.8%
15-49	91.2%	90.4%	89.8%	89.2%	88.7%
≥50	5.8%	6.4%	6.9%	7.2%	7.5%
Total infections (in million)	2.73	2.67	2.61	2.54	2.47

Figure-3: Percentage distribution of HIV infection by age and year

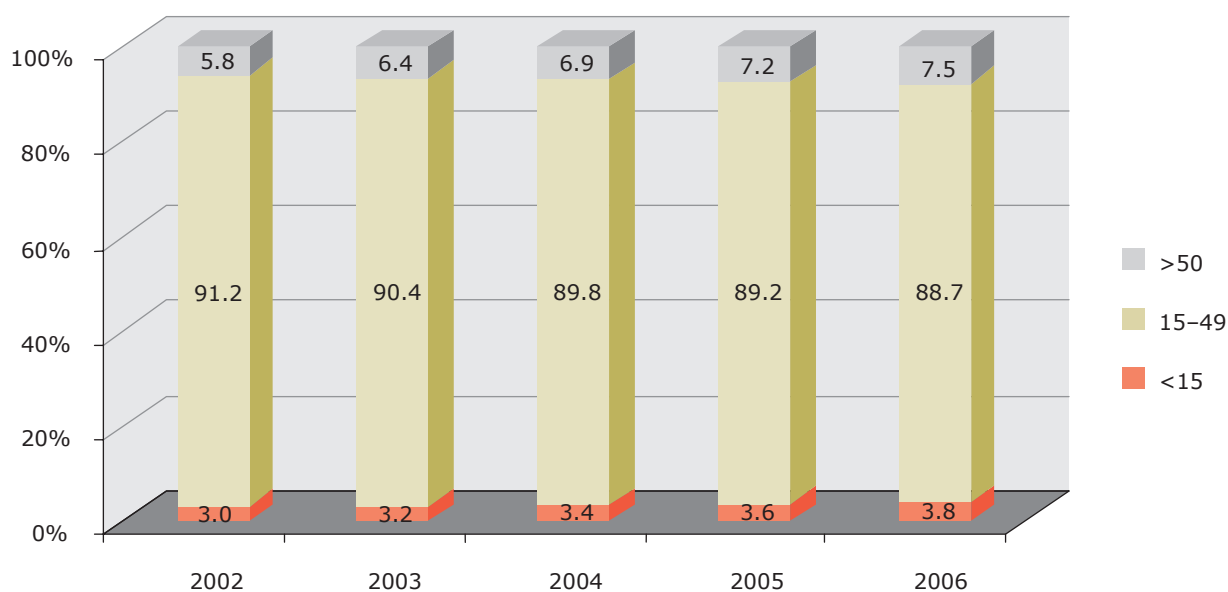


Table-5: HIV Prevalence 2006 in Sub-populations by Epidemic Zone

Epidemic Zone	HIV Prevalence (%) among Risk Groups (2006)				
	IDU	MSM	FSW	GP	Total
High Prevalence States	14.5	12.7	9.1	0.7	0.8
Low-Moderate States	4.8	3.0	2.2	0.2	0.2
India	8.7	5.7	5.4	0.3	0.4

HIV prevalence among different risk groups for the year 2006 by epidemic zone is presented

order of HIV prevalence among risk groups is same at the national level too.

Table-6: Percent share of Adult HIV infections in 2006 among sub-populations by Epidemic Zone

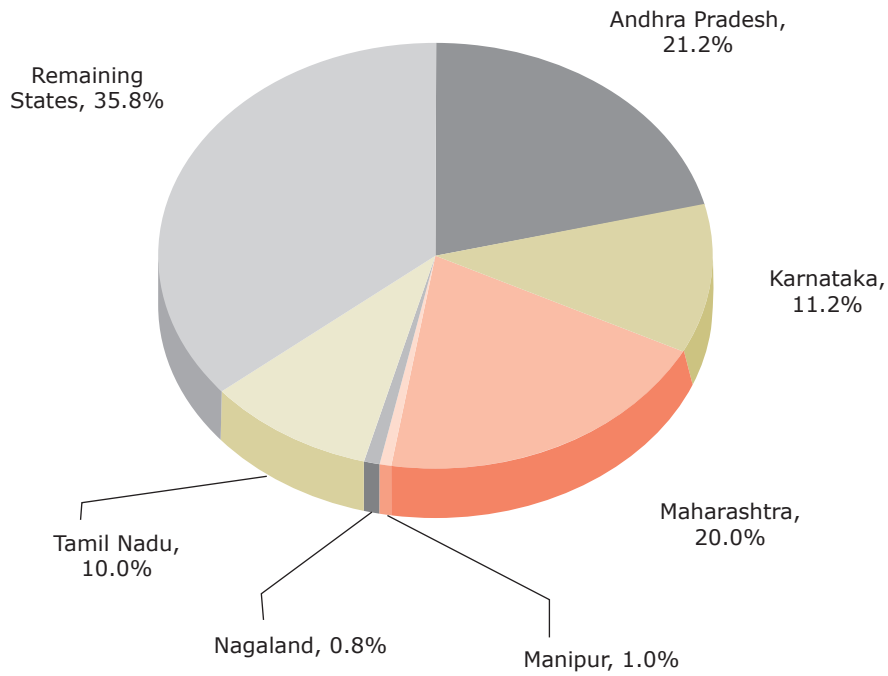
Epidemic Zone	IDU	MSM	FSW	Truckers	GP	Total
High Prevalence States	0.7%	6.5%	3.4%	2.0%	87.4%	100.0%
Low-Moderate States	0.6%	7.2%	1.8%	6.5%	84.0%	100.0%
India	0.7%	6.7%	2.8%	3.6%	86.2%	100.0%



The percentage distribution of adult HIV infections among different risk groups is presented in Table 6. Among the high risk groups MSM has the maximum share and FSW stands at second position.

Major proportion (64%) of the HIV burden in India is in the six high prevalence States. Figure-4 depicts the percentage of total HIV burden in six high prevalence states and in remaining states.

Figure-4 Percentage distribution of HIV burden in States



# 5

## Conclusions and Next Steps

The WHO/UNAIDS Workbook and India's old worksheet approach are based on the same principles and produce the same results for a given set of inputs. Hence, the method of estimation of PLHIV in 2006 is unlikely to produce vastly different results from those generated by the earlier approach. The application of Spectrum to estimate PLHIV for all ages might have used smoothed data. Evolution of the random effects model, on the other hand, ensures that inter and intra-site variations are accounted for, which in turn brings the estimates closer to reality.

The estimates were derived for the past five years, i.e. 2002–2006 and found that the epidemic is stable at the national level, although at the state-level some high prevalence states showed a decline and some in the low prevalence areas showed an increase in the epidemic. The decline was significant only in Tamil Nadu. The lowered estimate does not connote any decline in the epidemic but a correction for some incongruities in data and the previous method of estimation.



# Appendix

Table -A1: State-wise Adult HIV Prevalence

State/Uts	Adult prevalence (15–49)				
	2002	2003	2004	2005	2006
Andhra Pradesh	1.16	1.13	1.10	1.08	1.05
Karnataka	0.85	0.84	0.82	0.81	0.81
Maharashtra	1.08	0.98	0.89	0.80	0.74
Manipur	2.42	2.20	2.01	1.83	1.67
Nagaland	2.00	1.83	1.62	1.45	1.26
Tamil Nadu	0.93	0.73	0.59	0.47	0.39
Goa	1.01	0.92	0.84	0.77	0.73
Gujarat	0.54	0.51	0.48	0.45	0.43
Pondicherry	0.40	0.43	0.47	0.50	0.55
Arunachal Pradesh	0.18	0.13	0.09	0.07	0.05
Assam	0.08	0.06	0.04	0.03	0.03
Bihar	0.10	0.11	0.12	0.13	0.16
Chhatisgarh	0.59	0.43	0.31	0.22	0.17
Delhi	0.35	0.32	0.30	0.27	0.27
Haryana	0.50	0.32	0.21	0.14	0.10
Himachal Pradesh	0.03	0.03	0.03	0.03	0.03
Jammu & Kashmir	0.02	0.02	0.02	0.03	0.04
Jharkhand	0.07	0.07	0.08	0.09	0.11
Kerala	0.59	0.39	0.25	0.17	0.13
Madhya Pradesh	0.17	0.15	0.13	0.12	0.11
Meghalaya	0.19	0.14	0.10	0.07	0.06
Mizoram	1.13	0.99	0.91	0.82	0.74
Orissa	0.06	0.08	0.11	0.15	0.22
Punjab	0.18	0.16	0.14	0.12	0.12
Rajasthan	0.05	0.07	0.09	0.12	0.17
Sikkim	0.24	0.17	0.13	0.09	0.08
Tripura	0.41	0.29	0.21	0.15	0.12
Uttar Pradesh	0.14	0.13	0.12	0.11	0.11
Uttaranchal	0.09	0.08	0.08	0.07	0.08
West Bengal	0.10	0.13	0.16	0.21	0.30
Andaman & Nicobar Islands	0.81	0.66	0.54	0.44	0.37
Chandigarh	0.45	0.42	0.38	0.35	0.34
Dadra & Nagar Haveli	< 100 Cases				
Daman & Diu					
Lakshadweep	No results as there are no valid sites				
<b>India</b>	<b>0.45</b>	<b>0.43</b>	<b>0.41</b>	<b>0.39</b>	<b>0.36</b>



Table -A2: Percent Distribution of HIV Infections in 2006 by Age Group

State/Uts	Percent Distribution			Number in lakh
	<15	15-49	>49	
Andhra Pradesh	2.07	90.58	7.36	5.26
Karnataka	2.25	91.28	6.48	2.76
Maharashtra	3.44	87.27	9.29	4.95
Manipur	3.23	88.23	8.53	0.25
Nagaland	2.99	87.60	9.41	0.19
Tamil Nadu	3.34	86.33	10.33	2.46
Goa	2.75	87.54	9.71	0.07
Gujarat	2.13	89.78	8.10	1.44
Pondicherry	2.47	91.55	5.98	0.04
Arunachal Pradesh	2.63	86.85	10.52	0.02
Assam	2.39	90.15	7.46	0.09
Bihar	1.78	93.23	4.99	0.74
Chhatisgarh	3.60	87.25	9.15	0.38
Delhi	3.73	86.64	9.63	0.30
Haryana	2.83	89.08	8.09	0.39
Himachal Pradesh	2.49	91.05	6.46	0.01
Jammu & Kashmir	1.61	93.10	5.29	0.02
Jharkhand	1.83	93.19	4.98	0.18
Kerala	2.00	87.99	10.01	0.62
Madhya Pradesh	3.29	87.88	8.83	0.46
Meghalaya	2.62	89.11	8.27	0.02
Mizoram	2.65	88.24	9.11	0.05
Orissa	0.89	95.29	3.82	0.48
Punjab	2.29	89.04	8.67	0.20
Rajasthan	1.36	94.78	3.86	0.56
Sikkim	2.79	87.96	9.25	0.01
Tripura	2.30	88.38	9.32	0.05
Uttar Pradesh	3.30	89.51	7.19	1.13
Uttaranchal	3.02	90.92	6.06	0.04
West Bengal	0.84	95.24	3.92	1.49
Andaman & Nicobar Islands	1.87	88.21	9.92	0.02
Chandigarh	5.07	85.05	9.89	0.03
Dadra & Nagar Haveli	< 100 Cases			
Daman & Diu				
Lakshadweep	No results as there are no valid sites			
<b>India</b>	<b>3.8</b>	<b>88.7</b>	<b>7.5</b>	<b>24.7</b>

Table –A3: Projected Population (15–49) 2002–2006

Table –A3-a: Projected Population (15–49) 2002–2003								
State/Uts	Projected population (15–49) as on 1st October, 2002				Projected population (15–49) as on 1st October, 2003			
	Urban		Rural		Urban		Rural	
	Male	Female	Male	Female	Male	Female	Male	Female
Andhra Pradesh	5861724	5636862	15413662	15099007	5981441	5757429	15695340	15389163
Karnataka	5202796	4879792	9716306	9437863	5348333	5026126	9853978	9581494
Maharashtra	12349102	10493784	15642845	14588650	12755815	10847960	15916954	14840106
Manipur	155394	156702	441618	426400	158513	160677	453899	438751
Nagaland	101460	85280	468852	427999	103872	88183	480949	439833
Tamil Nadu	8064952	8061890	9549204	9629870	8330498	8337467	9463982	9544539
Goa	195914	173580	182926	172002	206161	182133	185981	173637
Gujarat	5709431	4964001	9054745	8487815	5886397	5103153	9208386	8628968
Pondicherry	178066	184898	89033	90482	183928	190857	90856	92895
Arunachal Pradesh	154210	60252	739570	221811	160195	65509	757680	224681
Assam	1004437	878927	6365268	6006088	1041220	916292	6497213	6142628
Bihar	2225375	1974210	18454735	17468322	2291611	2029110	18991924	17946032
Chhatisgarh	1147915	1060800	4282723	4257677	1191141	1101763	4368874	4339731
Delhi	4353440	3447910	298771	234291	4538404	3600365	298602	234434
Haryana	1832562	1549856	4297023	3733268	1922047	1622942	4403350	3829635
Himachal Pradesh	182965	147092	1485399	1495709	189962	151385	1514890	1521993
Jammu & Kashmir	759931	609590	2142731	1937199	786102	631771	2187834	1990973
Jharkhand	1638273	1432600	5423351	5210712	1688471	1481032	5567311	5343791
Kerala	2218410	2381952	6348056	6818877	2237781	2399443	6417850	6883430
Madhya Pradesh	4377499	3867708	11872991	10818064	4521998	3995027	12191930	11101490
Meghalaya	125490	124189	515310	497822	128758	128758	528557	510704
Mizoram	124956	118326	124956	115661	128758	122266	127676	117938
Orissa	1581825	1428155	8397375	8315011	1626675	1476253	8538060	8467856
Punjab	2494178	2146676	4596308	4162345	2587356	2219662	4667028	4223881
Rajasthan	3530750	3123566	11270641	10429502	3647196	3223037	11608248	10733011
Sikkim	18156	14924	138840	122057	18935	16230	142283	124971
Tripura	125396	148230	514924	699558	128806	153758	528752	718438
Uttar Pradesh	9068304	7989684	33666670	30652042	9399646	8261439	34632686	31496946
Uttaranchal	610579	529753	1591867	1644166	633517	549722	1630905	1679933
West Bengal	6567126	5815985	16383657	15369480	6700503	5963220	16699077	15696180
A & N Islands	37352	28793	72570	59185	40049	30860	75768	61720
Chandigarh	275475	206621	34362	20268	290961	217740	36444	21660
D & N Haveli	19743	10664	50692	37857	22730	12452	52496	38439
Daman & Diu	16008	17062	39486	22928	16777	17866	43837	24363
Lakshadweep	7470	7465	10138	10131	7577	7580	10824	10828

Source: 'Expert Group Population Estimates and Projections': National Commission of Population, Ministry of Health & Family Welfare, Government of India.

Table –A3-b: Projected Population (15–49) 2004–2005

State/Uts	Projected population (15–49) as on 1st October, 2004				Projected population (15–49) as on 1st October, 2005			
	Urban		Rural		Urban		Rural	
	Male	Female	Male	Female	Male	Female	Male	Female
Andhra Pradesh	6100648	5877515	15976210	15677567	6220418	5997635	16255640	15963572
Karnataka	5495882	5174572	9988758	9722371	5645455	5324592	10122235	9861519
Maharashtra	13171164	11209764	16191216	15089964	13595236	11578197	16463920	15338130
Manipur	161955	165000	466650	452650	165688	169074	478716	465372
Nagaland	105957	91300	495198	452100	108420	94302	507628	464256
Tamil Nadu	8598060	8615100	9372840	9453204	8867644	8894230	9275748	9355835
Goa	218191	192065	189062	176015	230935	203040	193276	179280
Gujarat	6065338	5243476	9359784	8768396	6246811	5385517	9508342	8905509
Pondicherry	192585	198528	93795	95316	202384	206790	97856	97745
Arunachal Pradesh	166286	70349	776003	228084	172484	75861	794539	230929
Assam	1079022	954207	6628355	6278544	1117858	993208	6759176	6414848
Bihar	2358287	2084650	19527892	18423486	2424429	2139858	20063797	18900054
Chhatisgarh	1235396	1143162	4454806	4421472	1280692	1185504	4539979	4502371
Delhi	4728990	3757288	298380	234506	4926478	3919330	298103	235090
Haryana	2014652	1697898	4509364	3926155	2110429	1775288	4613934	4022247
Himachal Pradesh	196516	155724	1545208	1548498	203157	160108	1575280	1574672
Jammu & Kashmir	812638	654320	2233404	2046013	839537	677235	2279443	2101262
Jharkhand	1739356	1529640	5710054	5476464	1790418	1579427	5854033	5608162
Kerala	2256644	2416947	6487782	6946920	2275542	2433353	6556210	7009343
Madhya Pradesh	4667836	4123442	12512062	11385146	4816541	4254454	12833323	11669462
Meghalaya	132309	133650	542961	525250	136220	138384	555444	538470
Mizoram	133407	127050	130113	120450	137332	131130	132884	123318
Orissa	1672554	1525522	8676707	8618875	1718937	1575433	8813244	8769605
Punjab	2682806	2294673	4737201	4284200	2780554	2370622	4805707	4343818
Rajasthan	3765272	3324346	11948874	11038963	3884476	3427008	12291972	11346317
Sikkim	19764	17050	146034	128150	20572	17856	149008	131688
Tripura	132261	159934	542763	737014	136318	166224	555844	755819
Uttar Pradesh	9739174	8539621	35614627	32355288	10086502	8824306	36608695	33224714
Uttaranchal	657826	569437	1670413	1716587	682004	589930	1710391	1752576
West Bengal	6832395	6109995	17009135	16017550	6963850	6257350	17316418	16335550
A & N Islands	42806	33526	78478	64303	45625	36257	81234	66936
Chandigarh	309057	231778	38558	22542	328631	246285	41303	23985
D & N Haveli	26891	14839	53782	39571	30602	18407	55084	40719
Daman & Diu	17562	18686	48294	25831	18361	19523	52858	27332
Lakshadweep	7683	7694	11525	11542	7790	7809	12241	12272

Source: 'Expert Group Population Estimates and Projections': National Commission of Population, Ministry of Health & Family Welfare, Government of India.



Table –A3-c: Projected Population (15–49) 2006

State/Uts	Projected Population (15–49) as on 1st October, 2006			
	Urban		Rural	
	Male	Female	Male	Female
Andhra Pradesh	6339619	6117210	16534102	16249290
Karnataka	5796504	5477295	10253808	9997770
Maharashtra	14025888	11952768	16732746	15582880
Manipur	169200	173196	492372	478270
Nagaland	111108	97352	521136	476006
Tamil Nadu	9137028	9174294	9174904	9254100
Goa	243846	213792	196974	181696
Gujarat	6429724	5528183	9655112	9040808
Pondicherry	213331	215080	101374	100748
Arunachal Pradesh	178788	82070	813288	233192
Assam	1157740	1033310	6890717	6551510
Bihar	2490960	2195200	20598435	19376070
Chhatisgarh	1327040	1228800	4624880	4582912
Delhi	5132188	4088352	297168	235024
Haryana	2208885	1855150	4718065	4117300
Himachal Pradesh	210432	164538	1604544	1600506
Jammu & Kashmir	867350	701064	2324300	2155608
Jharkhand	1842155	1629894	5998720	5741894
Kerala	2293380	2449770	6624224	7070145
Madhya Pradesh	4966584	4387071	13156682	11954883
Meghalaya	139872	143198	570204	551850
Mizoram	142128	135840	135360	125652
Orissa	1765824	1627080	8949763	8918364
Punjab	2880168	2448072	4872097	4401584
Rajasthan	4004793	3530016	12635961	11655000
Sikkim	21432	19244	152844	134142
Tripura	139872	172630	570204	774288
Uttar Pradesh	10441716	9114091	37611432	34102289
Uttaranchal	707070	610686	1749804	1788926
West Bengal	7094828	6405255	17623593	16654995
A & N Islands	48504	39054	84036	69618
Chandigarh	349716	261072	43488	25456
D & N Haveli	34968	21508	55836	42450
Daman & Diu	18612	19810	58092	29432
Lakshadweep	7896	7924	12408	12452

Source: Interpolated using 'Expert Group Population Estimates and Projections': National Commission of Population, Ministry of Health & Family Welfare, Government of India.

Table-A4: Size Estimates for High Risk Groups, 2004

Table-A4-a: Size Estimates for IDU, 2004	
State/UTs	IDU Range
Andhra Pradesh	298-2640
Karnataka	4819-5056
Maharashtra	220-9900
Manipur	26800-24002
Nagaland	16827-15500
Tamil Nadu	7539-12620
Goa	1050
Gujarat	24-11300
Pondicherry	15-1040
Arunachal Pradesh	757
Assam	100-1500
Bihar	338-5890
Chhattisgarh	Not Applicable
Delhi	6070-9605
Haryana	13510
Himachal Pradesh	210-1000
Jammu & Kashmir	48-380
Jharkhand	Not Applicable
Kerala	1722-12000
Madhya Pradesh	219-3530
Meghalaya	72-1450
Mizoram	10380-8850
Orissa	696-15504
Punjab	864-8500
Rajasthan	387-3780
Sikkim	271
Tripura	528-7000
Uttar Pradesh	1466-17200
Uttaranchal	125-240
West Bengal	5080-13418
A & N Islands	Not Applicable
Chandigarh	1671-3000
Daman and Diu	Not Applicable
D & N Haveli	Not Applicable
Lakshwadeep	Not Applicable
<b>Total</b>	<b>100173-189729</b>

Source: Extracted from Report of the Expert Group on Size Estimation of Population with High Risk Behaviour for NACP-III Planning

Table-A4-b: Size Estimates for MSM, 2004	
State/UTs	MSM
Andhra Pradesh	170,291
Karnataka	118,893
Maharashtra	222,771
Manipur	4,843
Nagaland	4,628
Tamil Nadu	138,792
Goa	3,038
Gujarat	116,624
Pondicherry	2,152
Arunachal Pradesh	2,563
Assam	60,895
Bihar	191,138
Chhattisgarh	46,296
Delhi	33,624
Haryana	50,229
Himachal Pradesh	13,649
Jammu & Kashmir	23,695
Jharkhand	61,372
Kerala	68,371
Madhya Pradesh	138,981
Meghalaya	5,198
Mizoram	2,029
Orissa	82,480
Punjab	57,394
Rajasthan	130,036
Sikkim	1,275
Tripura	7,259
Uttar Pradesh	387,039
Uttaranchal	19,121
West Bengal	183,280
A & N Islands	853
Chandigarh	2,241
Daman & Diu	409
D & N Haveli	538
Lakshadweep	138
<b>Total</b>	<b>2,352,133</b>

Source: Extracted from Report of the Expert Group on Size Estimation of Population with High Risk Behaviour for NACP-III Planning

Table-A4-c: Size Estimates for FSW, 2004

State/UTs	Corrections after district-wise and rural correction and for estimate based on HIV prevalence	Corrections after district-wise and rural corrections and for estimate based on Best regional data
Andhra Pradesh	109,385	109,385
Karnataka	77,504	77,504
Maharashtra	170,377	172,910
Manipur	9,044	9,044
Nagaland	4,956	4,956
Tamil Nadu	108,153	108,153
Goa	2129.33	2,129
Gujarat	26166.42	26,166
Pondicherry	1935.15	1,935
Arunachal Pradesh	695.59	1,270
Assam	4,168	29,464
Bihar	31,845	82,796
Chhatisgarh	4,576	21,556
Delhi	46632.46	46,632
Haryana	12243.98	24,997
Himachal Pradesh	7296.38	7,296
Jammu & Kashmir	3,076	11,977
Jharkhand	6,466	28,186
Kerala	7800.45	7,800
Madhya Pradesh	16,914	64,949
Meghalaya	598.50	2,434
Mizoram	1562.75	1,563
Orissa	6,294	39,838
Punjab	12882.38	28,616
Rajasthan	23461.20	59,576
Tripura	1396.50	3,618
Sikkim	175.56	686
Uttar Pradesh	35,746	170,179
Uttaranchal	2,470	8,773
West Bengal	92,009	92,009
A & N Islands	210.14	210
Chandigarh	3,394	3,394
Daman & Diu	113.05	113
<b>Total</b>	<b>831,677</b>	<b>1,250,114</b>

Source: Extracted from Report of the Expert Group on Size Estimation of Population with High Risk Behaviour for NACP-III Planning



Table-A5: HIV Prevalence 2002–2006

TableA5-a: Adjusted* HIV Prevalence among ANC Women 2002–2006					
State/UTs	2002	2003	2004	2005	2006
Andhra Pradesh	1.46	1.43	1.40	1.38	1.35
Karnataka	1.05	1.04	1.04	1.03	1.02
Maharashtra	1.20	1.09	0.98	0.89	0.80
Manipur	1.71	1.57	1.43	1.30	1.19
Nagaland	1.62	1.45	1.29	1.15	1.03
Tamil Nadu	1.07	0.86	0.69	0.56	0.45
Goa	1.37	1.23	1.12	1.01	0.91
Gujarat	0.78	0.72	0.67	0.63	0.58
Pondicherry	0.46	0.50	0.55	0.59	0.63
Arunachal Pradesh					0.08
Assam	0.31	0.22	0.16	0.11	0.04
Bihar	0.16	0.11	0.08	0.06	0.35
Chhatisgarh	0.22	0.24	0.28	0.31	0.30
Delhi	1.18	0.84	0.60	0.42	0.18
Haryana	0.27	0.24	0.22	0.20	0.14
Himachal Pradesh	0.86	0.54	0.35	0.22	0.05
Jammu & Kashmir	0.06	0.06	0.06	0.05	0.04
Jharkhand	0.01	0.02	0.02	0.03	0.18
Kerala	0.11	0.12	0.14	0.16	0.21
Madhya Pradesh	1.12	0.74	0.48	0.32	0.17
Meghalaya	0.29	0.26	0.22	0.19	0.09
Mizoram	0.37	0.26	0.18	0.13	0.96
Orissa	1.51	1.35	1.20	1.08	0.43
Punjab	0.10	0.14	0.21	0.30	0.12
Rajasthan	0.26	0.21	0.18	0.15	0.30
Sikkim	0.09	0.12	0.16	0.22	0.13
Tripura	0.53	0.37	0.26	0.18	0.21
Uttar Pradesh	0.85	0.60	0.42	0.30	0.19
Uttaranchal	0.25	0.24	0.22	0.21	0.11
West Bengal	0.14	0.13	0.12	0.12	0.44
Andaman & Nicobar Islands	0.10	0.15	0.21	0.31	0.56
Chandigarh	1.33	1.07	0.86	0.70	0.23
Dadra & Nagar Haveli	0.34	0.31	0.28	0.25	0.00
Daman & Diu	0.00	0.00	0.00	0.00	0.00
Lakshadweep	0.00	0.00	0.00	0.00	0.00

\*for inter and intra site variations and trends.

Table-A5-b: NFHS-3 Results of HIV Prevalence

State	Women (%)	Men (%)	Total (%) with C I	Male: Female
Andhra Pradesh	0.76	1.22	0.97 (0.70–1.25)	1.6 : 1
Karnataka	0.54	0.86	0.69 (0.44–0.93)	1.6 : 1
Maharashtra	0.48	0.78	0.62 (0.43–0.81)	1.6 : 1
Manipur	0.76	1.59	1.13 (0.82–1.44)	2.1 : 1
Tamil Nadu	0.40	0.27	0.34 (0.18–0.50)	0.7 : 1
Uttar Pradesh	0.05	0.10	0.07 (0.03–0.11)	2.1 : 1
<b>Non High Prevalence State</b>	0.08	0.16	0.12 (0.07–0.19)	2.1 : 1
<b>India</b>	0.22	0.36	0.28 (0.23–0.33)	1.6 : 1
<b>Urban</b>	0.29	0.41	0.35	
<b>Rural</b>	0.18	0.32	0.25	

Table –A5-c: Adjusted\* HIV Prevalence among IDU Users, 2002–2006

State/UTs	2002	2003	2004	2005	2006
Andhra Pradesh	23.70	22.32	20.93	19.55	18.16
Karnataka	9.17	7.78	6.39	4.99	3.60
Maharashtra	25.94	24.55	23.17	21.78	20.40
Manipur	28.79	26.59	24.39	22.20	20.00
Nagaland	2.43	2.13	1.84	1.54	1.25
Tamil Nadu	29.73	28.35	26.97	25.58	24.20
Goa	4.45	4.14	3.82	3.51	3.20
Gujarat	4.45	4.14	3.82	3.51	3.20
Pondicherry	4.45	4.14	3.82	3.51	3.20
Arunachal Pradesh	4.45	4.14	3.82	3.51	3.20
Assam	5.25	4.94	4.62	4.31	4.00
Bihar	1.45	1.14	0.83	0.51	0.20
Chattisgarh	4.45	4.14	3.82	3.51	3.20
Delhi	11.24	10.93	10.62	10.31	10.00
Haryana	1.26	0.94	0.63	0.31	0.00
Himachal Pradesh	4.45	4.14	3.82	3.51	3.20
Jammu & Kashmir	4.45	4.14	3.82	3.51	3.20
Jharkhand	1.65	1.34	1.03	0.71	0.40
Kerala	4.27	3.96	3.64	3.33	3.02
Madhya Pradesh	4.45	4.14	3.82	3.51	3.20
Meghalaya	4.45	4.14	3.82	3.51	3.20
Mizoram	3.07	2.70	2.34	1.97	1.60
Orissa	11.63	11.33	11.02	10.71	10.40
Punjab	15.03	14.72	14.41	14.11	13.80
Rajasthan	4.45	4.14	3.82	3.51	3.20
Sikkim	1.45	1.14	0.83	0.51	0.20
Tripura	4.45	4.14	3.82	3.51	3.20
Uttar Pradesh	5.88	5.56	5.25	4.94	4.63
Uttaranchal	4.45	4.14	3.82	3.51	3.20
West Bengal	5.25	4.94	4.62	4.31	4.00
Andaman & Nicobar Islands	4.45	4.14	3.82	3.51	3.20
Chandigarh	18.82	18.52	18.21	17.91	17.60
Dadra & Nagar Haveli	4.45	4.14	3.82	3.51	3.20
Daman & Diu	4.45	4.14	3.82	3.51	3.20

\*for inter and intra site variations and trends.

Table –A5-d: Adjusted\* HIV Prevalence among MSM 2002–2006

State/UTs	2002	2003	2004	2005	2006
Andhra Pradesh	13.12	12.40	11.68	10.96	10.25
Karnataka	22.05	21.34	20.63	19.91	19.20
Maharashtra	18.46	17.75	17.03	16.32	15.60
Manipur	13.27	12.55	11.84	11.12	10.40
Nagaland	13.12	12.40	11.69	10.97	10.25
Tamil Nadu	8.48	7.76	7.04	6.32	5.60
Goa	5.27	5.15	5.03	4.92	4.80
Gujarat	12.61	12.26	11.90	11.55	11.20
Pondicherry	2.87	2.75	2.64	2.52	2.40
Arunachal Pradesh	2.47	2.35	2.24	2.12	2.00
Assam	1.26	1.14	1.02	0.90	0.78
Bihar	0.88	0.76	0.64	0.52	0.40
Chhattisgarh	2.47	2.35	2.24	2.12	2.00
Delhi	12.72	12.61	12.49	12.38	12.27
Haryana	2.47	2.35	2.24	2.12	2.00
Himachal Pradesh	0.92	0.80	0.68	0.56	0.44
Jammu & Kashmir	2.47	2.35	2.24	2.12	2.00
Jharkhand	2.47	2.35	2.24	2.12	2.00
Kerala	0.88	0.76	0.64	0.52	0.40
Madhya Pradesh	2.47	2.35	2.24	2.12	2.00
Meghalaya	2.47	2.35	2.24	2.12	2.00
Mizoram	2.47	2.35	2.24	2.12	2.00
Orissa	2.47	2.35	2.24	2.12	2.00
Punjab	5.27	5.15	5.03	4.92	4.80
Rajasthan	0.48	0.36	0.24	0.12	0.00
Sikkim	2.47	2.35	2.24	2.12	2.00
Tripura	2.47	2.35	2.24	2.12	2.00
Uttar Pradesh	2.47	2.35	2.24	2.12	2.00
Uttaranchal	2.47	2.35	2.24	2.12	2.00
West Bengal	7.06	6.95	6.83	6.72	6.60
Andaman & Nicobar Islands	2.47	2.35	2.24	2.12	2.00
Chandigarh	5.27	5.15	5.03	4.92	4.80
Dadra & Nagar Haveli	2.47	2.35	2.24	2.12	2.00
Daman & Diu	2.47	2.35	2.24	2.12	2.00

\*for inter and intra site variations and trends.

Table –A5-e: Adjusted\* HIV Prevalence among FSW, 2002–2006

State/UTs	2002	2003	2004	2005	2006
Andhra Pradesh	15.60	13.91	12.22	10.53	8.84
Karnataka	14.88	13.19	11.50	9.81	8.12
Maharashtra	19.55	17.86	16.18	14.49	12.80
Manipur	17.85	16.29	14.73	13.16	11.60
Nagaland	22.64	21.08	19.52	17.96	16.40
Tamil Nadu	10.37	8.68	6.99	5.29	3.60
Goa	1.95	1.70	1.45	1.20	0.95
Gujarat	7.39	7.14	6.90	6.65	6.40
Pondicherry	2.44	2.19	1.94	1.69	1.44
Arunachal Pradesh	1.00	0.75	0.50	0.25	0.00
Assam	1.40	1.15	0.90	0.65	0.40
Bihar	1.61	1.35	1.10	0.85	0.60
Chattisgarh	3.09	2.84	2.59	2.34	2.09
Delhi	2.00	1.75	1.50	1.25	1.00
Haryana	1.41	1.16	0.91	0.66	0.41
Himachal Pradesh	1.67	1.42	1.17	0.92	0.67
Jammu & Kashmir	1.95	1.70	1.45	1.20	0.95
Jharkhand	1.87	1.62	1.37	1.12	0.87
Kerala	1.00	0.75	0.50	0.25	0.00
Madhya Pradesh	2.07	1.82	1.57	1.32	1.07
Meghalaya	1.95	1.70	1.45	1.20	0.95
Mizoram	11.38	11.14	10.89	10.65	10.40
Orissa	2.00	1.75	1.50	1.25	1.00
Punjab	2.60	2.35	2.10	1.85	1.60
Rajasthan	2.40	2.15	1.90	1.65	1.40
Sikkim	1.95	1.70	1.45	1.20	0.95
Tripura	1.95	1.70	1.45	1.20	0.95
Uttar Pradesh	1.41	1.15	0.90	0.65	0.40
Uttaranchal	1.95	1.70	1.45	1.20	0.95
West Bengal	8.57	8.32	8.08	7.83	7.58
Andaman & Nicobar Islands	1.95	1.70	1.45	1.20	0.95
Chandigarh	1.67	1.42	1.17	0.92	0.67
Dadra & Nagar Haveli	1.95	1.70	1.45	1.20	0.95
Daman & Diu	1.95	1.70	1.45	1.20	0.95

\*for inter and intra site variations and trends.



Table-A6-a: Members of the Technical Resource Group Surveillance and Estimation – NACP III

1.	Dr. N.K. Ganguly, Chairperson	DG, ICMR
2.	Ms. K. Sujatha Rao, Co-Chairperson	AS & DG, NACO
3.	Dr. L.M. Nath, Member	Ex-AIIMS
4.	Dr. Arvind Pandey, Member	NIMS
5.	Dr. M. Bhattacharya, Member	NIHFW
6.	Dr. M.D. Gupte, Member	NIE
7.	Dr. J.P. Narain, Member	WHO-SEARO
8.	Dr. D.C.S. Reddy, Member	NPO, WR-India
9.	Dr. A. Indrayan, Member	UCMS
10.	Dr. Meera Sharma, Member	PGIMER
11.	Dr. Shashi Kant, Member	AIIMS
12.	Dr. Rajesh Kumar, Member	PGIMER
13.	Dr. J.P. Muliya, Member	CMC, Vellore
14.	Dr. Prabhat Jha, Member	CGHR, Toronto
15.	Dr. Paul De Ley, Member	UNAIDS
16.	Dr. Peter Ghys, Member	UNAIDS
17.	Dr. Tobi Saidel, Member	FHI
18.	Dr. Gina Dalabetta, Member	BMGF
19.	Dr. Ajay Khera, Member	JD, NACO

Table-A6-b: Members of Core Group on HIV Estimation India, 2007

1.	Dr. D.C.S. Reddy	WHO, India
2.	Prof. Arvind Pandey	NIMS (ICMR), New Delhi
3.	Dr. Ajay Khera	NACO
4.	Dr. Shashi Kant	AIIMS
5.	Prof. M. Bhattacharya	NIHFW, New Delhi
6.	Dr. G. Rangaiyan	UNAIDS, India
7.	Dr. Tobi Saidel	FHI
8.	Dr. Renu Garg	WHO, SEARO
9.	Dr. Mariamma Thomas	NIMS/ICMR
10.	Dr. Damodar Sahu	NIMS/ICMR
<b>Working Group</b>		
11.	Dr. Sudhir Bunga	CDC, India
12.	Mr. Abhishek Singh	IIPS
13.	Mr. A. Elangovan	NIE/ICMR
14.	Dr. Girish K. Makhija	NACO
15.	Dr. Sutapa Agrawal	NIMS (ICMR)
16.	Mr. Deepak Bharadwaj	NIMS (ICMR)

Table-A6-c: Members of Consensus and Consultative Meeting on HIV Estimation India 2007

1.	Prof. N.K. Ganguly	ICMR
2.	Ms. K. Sujatha Rao	NACO
3.	Dr. Jotna Sokhey	NACO
4.	Dr. S.K. Sinha	MOHFW
5.	Dr. Salim Habayeb	WHO
6.	Dr. Jai Narain	WHO
7.	Dr. Dennis Broun	UNAIDS
8.	Dr. Vidhya Ganesh	UNICEF
9.	Dr. Dora Warren	CDC
10.	Dr. Lalit Kant	ICMR
11.	Prof. Arvind Pandey	NIMS/ICMR
12.	Dr. Deoki Nandan	NIHFW
13.	Prof. Shashi Kant	AIIMS
14.	Prof. L.M. Nath	Ex-AIIMS
15.	Prof. M. Bhattacharya	NIHFW
16.	Prof. P.N. Mari Bhat	IIPS/NFHS
17.	Dr. M.D. Gupte	NIE/ICMR
18.	Dr. Tobi Saidel	FHI
19.	Prof. Rajesh Kumar	PGIMER, Chandigarh
20.	Dr. D.C.S. Reddy	WHO, India
21.	Prof. Kamala Gupta	IIPS/NFHS
22.	Prof. S. Parasuraman	IIPS/NFHS
23.	Dr. Mariamma Thomas	NIMS/ICMR
24.	Dr. Damodar Sahu	NIMS/ICMR
25.	Dr. K.D. Maiti	MOHFW
26.	Dr. S. Paranjape	NARI/ICMR
27.	Dr. Renu Garg	WHO, SEARO
28.	Dr. G. Rangaiyan	UNAIDS, India
29.	Dr. Rajat Adhikari	FHI
30.	Dr. Jyoti Tewari	NFHS Team
31.	Dr. Ajay Khera	NACO
32.	Dr. Gina Dallabetta	BMGF
33.	Dr. B.N. Bhattacharya	ISI, Kolkatta
34.	Dr. S. Mehendale	NARI/ICMR
35.	Dr. D. Bachani	NACO
36.	Dr. M. Saukat	NACO
37.	Dr. Yves Soutyerand	WHO, Geneva
38.	Dr. Fred Arnold	Macro International, USA
39.	Dr. Peter Ghys	UNAIDS, Geneva
40.	Dr. Geoffe Garnett	Imperial College, London
41.	Dr. Meade Morgan	CDC, GAP
42.	Dr. David Wilson	World Bank
43.	Dr. Prabhat Jha	CGHR, Canada
44.	Dr. Swarup Sarkar	UNAIDS, Bangkok



