India HIV Estimations 2017

TECHNICAL REPORT

National AIDS Control Organization & ICMR-National Institute of Medical Statistics
Ministry of Health & Family Welfare
Government of India

सत्यमेव जयते

India HIV
Estimations 2017

Technical Report

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स्वास्थ्य एवं परिवार कल्याण मंत्री
भारत सरकार
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MESSAGE

It is my pleasure to note that National AIDS Control Organization is releasing publications from its biennial HIV estimations exercise. The publications (Technical Report and Fact-Sheets) provide a detailed update on the status of HIV/AIDS epidemic as well as progress made on the commitment of 'Ending AIDS' under Sustainable Development Goals in India.

Evidence driven National AIDS Control Programme has steered a very strong response to HIV/AIDS epidemic in India. In recent past, the response has been further augmented through game changer policies of 'Test and Treat', 'HIV/AIDS Prevention and Control Act' and 'Viral Load Testing'. Reports from HIV Estimations 2017 have quantified the successes as well as challenges of AIDS response in the country.

I take this opportunity to commend all organizations involved, especially the team of National AIDS Control Organization and Indian Council of Medical Research-National Institute of Medical Statistics for timely publication of this 14th edition of HIV Estimations. I am sure that the publications would be extremely useful for all stakeholders engaged under NACP in taking stock of status of AIDS epidemic, progress made till now and further augmenting the national AIDS response as we work together towards achieving 'End of AIDS'.

(Jagat Prakash Nadda)

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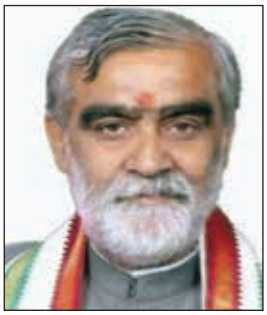

MESSAGE

Indian's response to AIDS epidemic has been almost three decades old. The response, which is designed for scale and backed by strong institutional arrangements, financial commitments and political willpower, has yielded rich dividends. The success story has been duly quantified through extremely scientific and periodic exercises of HIV Estimations and it gives me immense pleasure to see that reports from HIV Estimations 2017 are being released by National AIDS Control Organisation.

Evidence driven response has been one of the fundamental cornerstones of National AIDS Control Programme (NACP) since its inception in 1992. Programme monitoring, epidemic surveillance and research are key components of spectrum of strategic information under national AIDS Control Programme. HIV Estimations 2017 is an outcome of extremely strong and complementary strategic information activities under NACP.

I commend the efforts of all stakeholders involved in HIV Estimations process for bringing out the reports. I am confident that the reports shall be of immense support to all concerned for further enhancing of strong and efficient AIDS response in India.

(Ashwini Kumar Choubey)

New Delhi
August, 2018

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I/3178610/2018
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MESSAGE

India is committed to achieve 'End of AIDS' by 2030. Enabling the realization of this vision, strategic information management continues to be the mainstay of national AIDS response across the prevention-detection-treatment continuum. Biennial HIV Estimations is a critical piece of strategic information under National AIDS Control Programme.

It is indeed heartening that National AIDS Control Organization (NACO) is releasing the report and fact-sheets of 14th round of HIV estimations. The report and fact-sheets from 2017 round provide detailed information on status of HIV/AIDS epidemic in country on various indicators. NACO has put in tremendous efforts to institutionalize HIV estimations exercise which uses varieties of data that provide a very reliable and updated evidence on HIV epidemic.

I congratulate National AIDS Control Organization and Indian Council of Medical Research-National Institute of Medical Statistics for their enormous efforts in carrying out this important exercise. I hope the HIV Estimations 2017 report and fact-sheets will be used by all stakeholders in policy planning and decision making and contribute towards achieving 'End of AIDS'.

(Anupriya Patel)

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Government of India
Department of Health and Family Welfare
Ministry of Health & Family Welfare

Dated : 23rd August, 2018

MESSAGE

I am pleased to present the reports from HIV Estimations 2017 providing latest information on the Status of AIDS epidemic in country. The reports detail magnitude and direction of all key major HIV/AIDS epidemic indicators in a comprehensive way. All the indicators are presented State/UT wise providing important insights for policy makers and programme implementers for strengthening the AIDS response.

Strong epidemic monitoring has been integral to National AIDS Control Programme (NACP) since beginning. NACP has one of the world's largest HIV sentinel surveillance covering almost all districts in India. Every round of HIV sentinel surveillance is followed by HIV estimations providing detailed and updated information on the Status of AIDS epidemic. The epidemic monitoring is implemented through strong institutional arrangement comprising AIIMS (New Delhi), ICMR-NIMS (New Delhi), ICMR-NARI (Pune), ICMR-NICED (Kolkata), ICMR-NIE (Chennai), PGIMER (Chandigarh) and RIMS (Imphal). This ensure high quality data generation, analysis and quick dissemination of epidemiological evidences for action.

I applaud all institutes and stakeholders involved, for their contribution in robust epidemic monitoring and bringing out the publications from HIV Estimations 2017. I am confident that the publication would be found relevant and action oriented to policy makers, implementers, administrators, civil societies, researchers and academicians involved with national AIDS response.

(Preeti Sudan)

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Dated the 16th July, 2018

FOREWORD

'Know your epidemic, know your response' has been fundamental to the national AIDS response in India. The approach has resulted in location and population specific responses and has yielded rich dividends. HIV Estimation and Projection activities have been one of the core components of a comprehensive strategic information system under the National AIDS control Programme.

The HIV Estimations 2017 provide a comprehensive update on the status of the AIDS epidemic from 1981 to 2017 in 35 States and UTs in India. The exercise has been done through use of UNAIDS recommended and globally accepted modelling tool (Spectrum 5.63) with a consistent set of definitions, approaches to data and methods. This is the most robust round of HIV Estimations to date as the latest National Family Health Survey and HIV Sentinel Surveillance data has been used in the modelling. Both had a significant impact and have contributed to improvements of India's and States/UTs HIV Estimations.

Equipped with most recent evidences and tools, the exercise has produced not only an estimate of the magnitude of the HIV epidemic, but also of the impact of prevention and treatment interventions. The estimation results confirm that India's AIDS response with its widest possible spectrum of interventions, particularly the scale-up of ART; continue to be an extraordinary success story that can teach lessons to other public health programmes. Today, the National AIDS Control Programme offers free ART to People Living with HIV (PLHIV) as soon as they are detected HIV positive, a policy that has resulted in 1.2 million PLHIV who are already on ART.

While the treatment programme is on track, HIV Estimations 2017 has once again highlighted important challenges on the prevention front. It has indicated that annual new HIV infections have almost stabilized in recent years. The HIV incidence rate among key population continues to be very high. In addition, there are States where the new infections have either increased or not decreased as desired under the programme. Therefore, there is a need for a much more intensified and strategic prevention approach.

HIV Estimations 2017 provides a unique opportunity to see the national AIDS response in wider context. Despite tremendous progress, the message is clear the epidemic is not yet over. We all must unite efforts to achieve the end of the AIDS by 2030. I am confident that policy makers, programme managers and all other stakeholders will study this report to make themselves aware of the larger perspective of the magnitude and directions of national and State/UTs epidemics and take prompt action to further reinforce efforts for leading a comprehensive, effective and efficient AIDS response in India.

(Sanjeeva Kumar)

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PREFACE

The HIV estimates exercise has been carried out in the country for the last 20 years, since 1998. It is a technically rigorous scientific process led by the National Institute of Medical Statistics (ICMR-NIMS) with the National AIDS Control Organisation (NACO, MoHFW).

The 2017 HIV estimates have been generated in a true partnership approach involving demographers, epidemiologists, clinicians, scientists and programme personnel from ICMR Regional Institutes, State AIDS Control Society and independent experts participating in this exercise. As members of the 'National Working Group on HIV Estimates,' they work collectively as an independent body with the mandate to generate estimates under the oversight of the 'Technical Resource Group on HIV Surveillance and Estimations.' The Technical Resource Group validate the process, methodology and results before they are finalised.

Since 2006, India has been generating HIV estimates using globally recommended tools and methods proposed by the 'UNAIDS Reference Group on HIV Estimates, Modelling and Projections' which is the Spectrum software having an inbuilt EPP component. Spectrum supports advanced demographic, mathematical and epidemiological modelling functions; and, over the years, the software has increasingly been nationalised with India-specific-data used to inform specific parameters and assumptions for modelling as they have become available. There is close technical collaboration with the UNAIDS Reference Group, and well as the UNAIDS country office in India and regional and global offices in Bangkok and Geneva respectively, WHO India throughout the process. Experts from these organisations are also members of the 'National Working Group on HIV Estimates.'

Like the 2012 round, the 2017 round has had a strong focus on human resource capacity development. Through a national level training executed with international trainers and followed-up by series of national workshops—where hands-on supportive supervision and mentoring was provided as the estimates were generated—a pool of national human resources adept in the estimations exercise have been created. Such a participatory approach and focus on skill building will be ensued in subsequent rounds as well.

I congratulate all members of the National Working Group on HIV Estimates for this key strategic work on 2017 HIV estimates. The 2017 HIV estimates provides the latest and most critical information on the HIV epidemic at the national level and across 35 states / Union Territories. I encourage all AIDS programme stakeholders to refer to this technical report.

Dr. M Vishnu Vardhana Rao
Director, ICMR-NIMS

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MESSAGE

The use of epidemiological evidences to gauze the magnitude and directions of HIV/AIDS epidemic have been the cornerstone of the National AIDS Control Programme (NACP) since its inception. Initiated in 1985 as the first activity under the national AIDS response, action-oriented HIV epidemic monitoring in country has evolved as one of the most robust and functional disease surveillance system. Currently, with more than 1300 surveillance sites, almost the entire country is covered under HIV Surveillance system.

One of the key characteristics of India's HIV Surveillance is its evolving morphology in line with the programme needs and technological advances. HIV Sentinel Surveillance has been complemented with periodic bio-behavioural surveillance survey that also included world's largest national integrated bio-behavioural surveillance (IBBS) implemented among high risk population in 2014-15. National Family Health Survey-4 provided critical insights into HIV related risk behaviour and HIV prevalence in the general population. This evolved system with HIV sentinel surveillance, integrated biological and behavioural Surveillance, national family health survey and programme monitoring data piece together a comprehensive system providing the insights into the level, trends and drivers of the HIV epidemic. The HIV Estimations 2017 is an excellent outcome of these complementary systems that allow us to understand the current status of HIV epidemic across locations and populations.

Consistent with the emerging needs and country commitments towards achieving the end of AIDS as a public health threat by 2030, epidemic monitoring systems are being augmented to further enhance the insights into the level, trend and drivers of the HIV. District level HIV burden estimations, HSS plus for enabling the more frequent behavioural surveillance, dovetailing syphilis and Hepatitis as a biomarker into the existing surveillance, update the size-estimation of high risk population and development of patient centric IT enabled integrated M&E system for case-based surveillance are being worked out to strengthen the epidemic monitoring at the front-end of national AIDS response.

Within this vast landscape of the epidemic monitoring, HIV Estimation 2017 is a critical piece of evidence. Every stakeholders of national AIDS response or organization working in this field need to use this report to finetune their policy, implementation design and impact monitoring as we move ahead, collectively, to achieve the end of AIDS as public health threat.

(Alok Saxena)

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Dr. D.K. Shukla
Ex-Director-in-Charge

MESSAGE

This report marks the culmination of a technically rigorous and iterative work done over nearly twelve months with members of the National Technical Working Group on HIV Estimates that include: experts from all ICMR Regional Institutes, UNAIDS, WHO, CDC, State AIDS Control Societies—in addition to ICMR-NIMS who provide technical leadership to the national HIV estimations process with NACO.

The 2017 HIV estimates have been generated using the latest tool and method recommended by the UNAIDS Reference Group on Estimations, Projections and Modelling version Spectrum 5.63. This tool has the Population Projection in DemProj module and several other parameters in the AIDS Impact Model (AIM) module of Spectrum customised to India using national data. There has been close partnership with international experts John Stover (Avenir Health) and UNAIDS (Bangkok and Geneva) offices during this process.

A key data used in the estimations exercise is HIV Sentinel Surveillance (HSS). The National AIDS Control Organization (NACO) conducts HSS across a network of sites in the country to understand HIV level in various population groups. HSS is conducted by NACO with the help of National Institute of Health and Family Welfare (NIHFW), and National Institute of Medical Statistics (NIMS-ICMR). The data generated through HSS is input for the estimates modelling tool to understand the disease burden in the population. As the data from HIV Sentinel Surveillance is not representative of the general population, certain assumptions—which have been gradually refined with the help of available data sources—are used to generate estimates on key indicators.

Another key data used in this estimations round is HIV prevalence data from NFHS 4. For the first time both NFHS 3 and NFHS 4 prevalence data have been used as two survey points in the respective state models. For the first time also, separate projections for Andhra Pradesh and Telangana have been created—post the states bifurcation—and individual state estimates on HIV prevalence, people living with HIV, annual new HIV infections and AIDS-related deaths made available.

The 2017 HIV estimates have been validated by the Technical Resource Group on HIV Surveillance and Estimations. The 2017 report on HIV estimates provides critical knowledge on the status of the HIV epidemic in India: at national and sub-national level. The method and process used in India, and as described in this report, will add to the existing global scientific knowledge on HIV estimations. The results and key findings will also be incredibly useful to national and state M&E officers, programme managers, implementers, community representatives, and other stakeholders to refer to, as national efforts to reduce new infections and AIDS related deaths are Fast-Tracked.

Dr. DK Shukla
Scientist G & Chairman, HIV Estimation 2017

MESSAGE

The way HIV estimations are produced in India is praiseworthy given the rich expertise and significant time that are invested in this important task round after round. The process is led by the National AIDS Control Organization (NACO) in close collaboration with the Indian Council of Medical Research (ICMR), the National Institute for Medial Statistics (NIMS) with the support of UNAIDS and partners. It has improved over time by resulting in better estimation results. In the current estimation round, beyond the broader participation of statisticians, public health specialists, epidemiologists, demographers, behavioural and social scientists, monitoring and evaluation and strategic information staff working at different levels and from different parts of the country, capacity has been built to improve understanding and use of estimation results.

UNAIDS has led the development of HIV estimations globally through provision of technical tools and assistance and coordination support. Regular update of estimations of HIV prevalence, incidence and other key numbers such as the people living with HIV (PLHIV) and new HIV Infections among adults and children, women and men, AIDS-related deaths to track the impact of the epidemic and monitor and evaluate responses. As new data becomes available and modelling tools are refined, estimations results are upgraded.

India faces more challenges than most other countries in producing HIV modelled estimations, because of the country's large size and heterogenous epidemic levels, trends and patterns.The strategy of developing Spectrum models for individual States or Union Territories and then combining them in a national model to generate overall indicator measurements is sound. Experts must work over months to produce estimation results, which are rigorously reviewed by the India's National Working Group on Estimations before being vetted by the Technical Resource Group in Estimations.

While the estimation results in this round confirm the overall decline in new HIV infections and AIDS-related deaths in India, they show that there is no room for complacency as in some States HIV infections are on the rise, these trends need to be carefully monitored and drivers of the local epidemic addressed with greatest urgency. This is needed so that India will deliver on its high-level commitments by 2020 and it will put the country on track to end AIDS by 2030. Hence, the need to scale-up effective interventions in an efficient approach to accelerate progress towards these targets.

Many new initiatives have been introduced by the Government of India in recent times, which is laudable. Some are already showing results e.g. the Test and Treat Policy and Mission 'Sampark' which are helping to fill the gap to reach 90-90-90. However, more efforts are needed to reduce new HIV infections. This is and must remain a top priority to break the epidemic cycle and ensure India will be AIDS-free.

Dr Bilali Camara
UNAIDS Country Director for India

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ACKNOWLEDGEMENT

HIV Estimations is a biennial exercise undertaken by National AIDS Control Organization (NACO) since 1998 to provide the latest status of AIDS epidemic and programmatic needs in terms of prevalence, PLHIV size, incidence, AIDS related deaths and PMTCT needs. In continuation of this institutionalized activity, HIV Estimations 2017 was undertaken under the guidance of 'Technical Resource Group (TRG) for HIV Surveillance and Estimation'.

NACO gratefully acknowledges the contributions made by various stakeholders that helped the completion of the 2017 round of HIV Estimations in India.

The TRG for HIV Surveillance and Estimation is chaired by Shri Sanjeeva Kumar, Addl. Secretary & DG (NACO & RNTCP) and co-chaired by Dr Sanjay Mehendale (Addl. DG, ICMR). We place on record our sincere thanks to them for providing vision, insights and support for the HIV Estimations 2017.

We gratefully acknowledge the leadership and guidance of Dr S Venkatesh (the then Addl. DG, NACO and now DGHS, Officer In-Charge, MoHFW, Govt. of India) for his leadership and guidance to this exercise.

National Working Group (NWG), constituted by NACO, was instrumental in planning, organization and execution of the HIV Estimations 2017. Excellent leadership to the working group was provided by Dr D K Shukla (ICMR-NIMS, New Delhi).

Dr Damodar Sahu acted as the focal person for the HIV estimation 2017 at NIMS-ICMR, New Delhi. Dr Anil Kumar, Dr Jitenkumar Singh, Dr Sarita Nair and Mr Srikant Reddy actively contributed in the timely completion of the process under the guidance of the Dr. M. Vishnu Vardhan Rao (Director, ICMR-NIMS).

Dr DCS Reddy (Independent Technical Expert), Prof. Arvind Pandey (Advisor, NIMS-ICMR, New Delhi), Dr John Stover (Vice President, Avenir Health and member UNAIDS HIV Estimation Reference Group), Dr Shashi Kant (Professor and Head, Centre for community Medicine, AIIMS, New Delhi), Dr Laishram Ladu Singh (Officiating Director, IIPS, Mumbai), Dr S.K. Singh (Professor, IIPS, Mumbai) and Dr Yujwal Raj (Former NPO, NACO) augmented the HIV Estimations 2017 process with their expertise and provided critical technical guidance at all stages. Shri Biswajit Das (Director, Evaluation, MoHFW) provided critical data from NFHS-IV that enabled implementation of HIV Estimations 2017 with most updated and comprehensive set of epidemiological data.

Dr Pushpanjali Swain (NIHFW, New Delhi) represented nodal institute for HIV Surveillance. Dr Sheela Godbole (NARI, Pune), Dr A. Elangovan (NIE, Chennai), Dr M.K. Saha (NICED, Kolkata), Dr Sanjay Rai (AIIMS, New Delhi), Dr P.V.M. Lakshmi (PGIMER, Chandigarh) and Dr T Gambhir (RIMS, Imphal) enriched NWG with their insights into the epidemic in their respective regions. Dr Amitav Das (Odisha SACS), Ms Poonam Bakshi, (Chandigarh SACS), Mr Sabyasachi Chakraborty (Delhi SACS) and Mr Amol Palkar (Mumbai DACS) provided crucial programmatic data during estimation exercise.

Mr Taoufik Bakkali (UNAIDS RST for Asia and the Pacific, Bangkok), Dr Savina Ammassari (UNAIDS India), Ms Nalini Chandra (UNAIDS India), Dr Nicole Seguy (WHO India), Dr BB Rewari (WHO SEARO), Dr Henita Kuntawala (PEPFAR India), Ms Deepika Joshi (CDC India) and Mr Jiban J Baishya (USAID, India) brought international perspectives to ensure that India's HIV Estimation process is at par with global benchmarks.

UNAIDS India, under the leadership of Dr Bilali Camara (Country Director, UNAIDS India) provided holistic support to this exercise from the inception till publication.

Dr Naresh Goel (DDG, NACO), Dr R.S. Gupta (DDG, NACO) and Dr Shobini Rajan (ADG, NACO) provided programmatic insights during the exercise. Dr Asha Hegde (NACO), Dr Manish Bamrotiya (NACO), Dr Suman (NACO), Ms Mariyam (NACO) and Ms H. ManngaihKim (NACO) shared critical programme data and provided technical support during the various stages of the exercise. Dr Pradeep Kumar coordinated the operational and technical aspects of this exercise from conceptualisation till dissemination.

Surveillance is information for action. In the spirit, we present findings from "HIV Estimations 2017" to the nation with great pride and belief that insights provided in this report will be used by all stakeholders including the policy makers, programme managers researchers and academicians to fast-track the AIDS response to have an AIDS free India.

(Dr Kuldeep Singh Sachdeva)

TABLE OF CONTENTS

ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
AIIMS	All India Institute of Medical Sciences
AIM	AIDS Impact Module
ANC	Antenatal care
ARD	AIDS-related death
ART	Antiretroviral therapy
CDC	Centers for Disease Control and Prevention
EPP	Estimation and Projection Package
FSW	Female Sex Workers
H/TG	Hijra/Transgender people
HIV	Human Immunodeficiency Virus
HRG	High Risk Group
IBBS	Integrated Biological and Behavioural Surveillance
ICMR	Indian Council of Medical Research
IDU	Injecting Drug Users
IIPS	International Institute for Population Sciences
NIHFW	National Institute of Health & Family Welfare
NACO	National AIDS Control Organisation
NACP	National AIDS Control Programme
NFHS	National Family Health Survey
NIMS	National Institute of Medical Statistics
MoHFW	Ministry of Health and Family Welfare
MSM	Men having Sex with Men
PEPFAR	The United States President's Emergency Plan for AIDS Relief
PLHIV	People Living with HIV
PMTCT	Prevention of Mother to Child Transmission of HIV
TRG	Technical Resource Group
UT	Union Territory
UNAIDS	Joint United Nations Programme on HIV/AIDS
WHO	World Health Organisation

EXECUTIVE SUMMARY

1. National AIDS Control Organization (NACO), Ministry of Health and Family Welfare (MoHFW), Government of India carries out biennial HIV estimations in collaboration with the Indian Council of Medical Research (ICMR) - National Institute of Medical Statistics (NIMS). HIV Estimations 2017, the latest round, provide updated information on the status of HIV epidemic in India at national and State/Union Territory (UT) levels, on key indicators: adult HIV prevalence, annual new infections (HIV incidence), AIDS-related mortality and prevention of mother-to-child transmission (PMTCT) needs.

2. HIV Estimations 2017 used latest Spectrum 5.63 as recommended by UNAIDS. The State/UT models in this round are improved over previous rounds in terms of data inputs, approach to handling the survey data as well as assumptions of various epidemiological parameters. The improvements included updating of sex/age pattern of incidence using data from the 3rd and 4th rounds of National Family Health Survey. In view of these improvements, results from HIV estimations 2017 are more robust, cannot be compared with previous rounds of estimations and replace all previous estimations on the level and trends of the HIV epidemic as well as programme needs.

3. By the end of 2017, there were an estimated 21.40 [15.90 - 28.39] lakh people living with HIV (PLHIV) in India. There was an adult (15-49 years) HIV prevalence of 0.22%. Slightly more than two fifths (42%) of the total estimated PLHIV were females. Around 87.58 [36.45 – 172.90] thousand new HIV infections and 69.11 [29.94 -140.84] thousand AIDS-related deaths occurred in 2017. Meanwhile, an estimated 22,677 [10,927-40,605] pregnant women needed ART to prevent mother-to-child transmission of HIV.

4. At 2.04% [1.57-2.56], Mizoram had the highest adult HIV prevalence in the country, followed by Manipur at 1.43% [1.17-1.75] and Nagaland at 1.15% [0.92-1.41]. Telangana [0.70%, 0.50-0.95], Andhra Pradesh [0.63%, 0.47-0.85], Karnataka [0.47%, 0.37-0.63], Goa [0.42%, 0.21-0.79], Maharashtra [0.33%,0.25-0.45] and Delhi [0.30%, 0.18-0.47] were other States/UT with adult HIV prevalence higher than the national average. Tamil Nadu [0.22%, 0.14-0.31] had a point prevalence like the national prevalence. All other States/UT had adult HIV prevalence similar to or lower than the national average. Lowest adult HIV prevalence was in the State of Jammu & Kashmir [0.03%, 0.01-0.07].

5. With 3.30 lakh [2.531-4.353] PLHIV, Maharashtra had the highest number of PLHIV contributing 15% of total PLHIV in the country. Andhra Pradesh [2.70 lakh, 2.005-3.581], Karnataka [2.47 lakh, 1.914-3.235] and Telangana [2.04 lakh, 1.495-2.773] were the other States with PLHIV estimate number in the range of 2 to 3 lakh. West Bengal [1.44 lakh, 1.038-1.914], Tamil Nadu [1.42 lakh, 0.932-1.975], Uttar Pradesh [1.34 lakh, 1.018-1.776] and Bihar [1.15 lakh, 0.838-1.587] had PLHIV

between one and two lakhs.Together, these eight States contribute almost three fourth of the total number of PLHIV in country.

6. HIV incidence per 1000 uninfected population in 2017 was highest in Mizoram (1.32) followed by Nagaland (0.59) and Manipur (0.58). Telangana, Chandigarh, Delhi, Andaman & Nicobar Islands, Dadra & Nagar Haveli, Andhra Pradesh, Goa, Daman & Diu and Puducherry had HIV incidence per 1000 uninfected population in the range of 0.11-0.26. Haryana, West Bengal, Bihar, Karnataka, Gujarat, Jharkhand, Punjab, Uttarakhand, Chhattisgarh, Meghalaya, Odisha, Arunachal Pradesh, Maharashtra, Tamil Nadu and Tripura had HIV incidence per 1000 uninfected population in the range of 0.05-0.09. All the other States/UTs had HIV incidence per 1000 uninfected population less than 0.05.

7. While HIV incidence among general population is low across States except for a few, it is much higher among HRGs. Within the HRG group, the incidence rate is much higher among IDU than FSW or MSM.

8. With an estimated 9,324 [4,860-14,768] new HIV infections in 2017, Telangana had the highest number of new annual HIV infections contributing to 11% of total in the country. Bihar was next, contributing 10% of total, followed by West Bengal (10%), Uttar Pradesh (8%), Andhra Pradesh (7%), Maharashtra (7%), Karnataka (6%) and Gujarat (5%). Together, these eight States contributed almost two thirds of all annual new HIV infections in India.

9. New HIV infections have peaked in 1995 and then started to decline. An estimated 87.58 thousand [36.45 – 172.90] new HIV infections occurred in 2017, meaning there has been an 85% decline in annual new HIV infections since the peak of the epidemic. However, the pace of decline in new HIV infections has levelled off in recent years. Between 2010 and 2017, new HIV infections have declined by only 27%. The target is to achieve 75% reduction in new infections by 2020, from the baseline value of 2010.

10. While the new infections are declining nationally, there are inter-State variations. In five States, viz. Arunachal Pradesh (65%), Assam (37%), Mizoram (18%), Meghalaya (10%) and Uttarakhand (4%), new infections increased in 2017 in comparison to 2010. In the remaining States/UT, new infections are declining. However, there were variations in the level of decline. In the States/UT of Chhattisgarh, Delhi, Jammu & Kashmir, Manipur, and Nagaland, the decline has been 10% or less.

11. Nationally, around 69.11 thousand [29.94-140.84] PLHIV died of AIDS related causes in 2017. Annual AIDS-related deaths among PLHIV kept on increasing until 2005 and then started to decline. Since the peak, the number of annual AIDS-related deaths have declined by almost 71%. Similar to the national trend, AIDS-related deaths have dropped in all of India's States/UTs after attaining a peak in the period from 2005 to 2010, with the exception of Assam, Bihar, Jharkhand, Haryana, Delhi and Uttarakhand.

12. India is estimated to have had around 22,677 [10,927-40,605] HIV-positive women who gave birth in 2017 and needed prophylaxis for prevention of mother-to-child transmission (PMTCT) of HIV. State-wise, the PMTCT need was highest in Maharashtra followed by Uttar Pradesh, Bihar, Andhra Pradesh, Karnataka, Telangana, West Bengal, Gujarat, Tamil Nadu and Rajasthan. Together, these 10 States contribute almost three fourth of the total PMTCT need in the country.

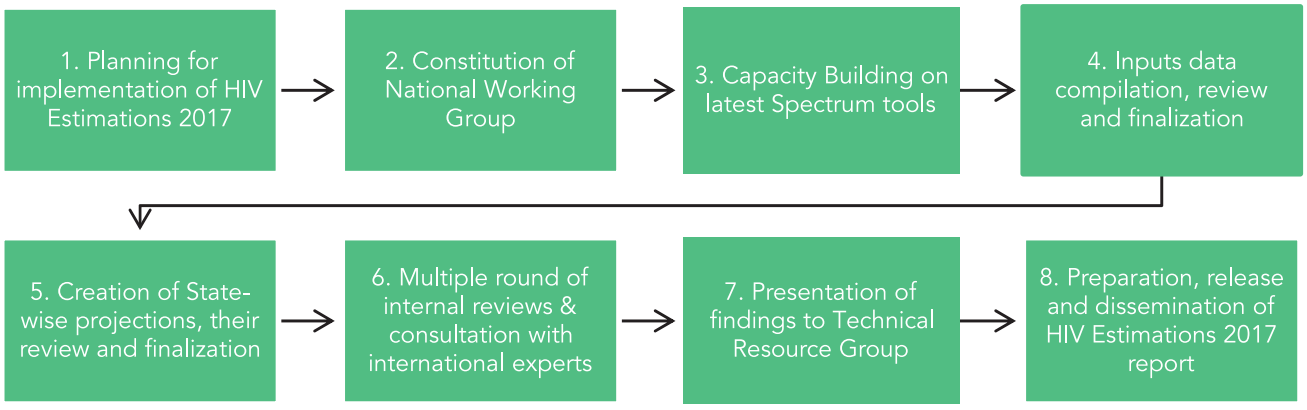
13. HIV Estimations 2017 corroborate the previous rounds in terms of characteristic of the HIV epidemic in India. While the national HIV prevalence and incidence remains low, the epidemic is strong in some geographical regions and population groups. The impact of the programme has been significant but there is no place for complacency.

1. INTRODUCTION

The National AIDS Control Organization (NACO), Ministry of Health and Family Welfare (MoHFW), Government of India undertakes HIV estimations biennially in collaboration with the Indian Council of Medical Research (ICMR) - National Institute of Medical Statistics (NIMS). The first round of HIV estimation in India was done in 1998, while the last round was done in 2015. The objective of HIV estimations is to provide updated information on the status of HIV epidemic in India at national and State/UT level to the National AIDS Control Programme (NACP). Estimations of adult HIV prevalence, annual new infections (HIV incidence), AIDS-related mortality and prevention of mother-to-child transmission (PMTCT) needs are produced as outcomes of HIV Estimations. The modelled estimates are needed because there is no direct reliable way of measuring these core indicators which are used to track the epidemic and monitor and evaluate the response in countries around the world. HIV Estimations 2017 is the latest round in a series of HIV Estimations under NACP.

Figure 1 depicts an overview of HIV Estimations 2017 process. Like in previous rounds, estimations were carried out by an independent National Working Group (NWG) under the guidance of ICMR-NIMS using UNAIDS recommended Spectrum Model. The members of NWG comprised independent experts, representatives from NACO, from institutes identified for HIV Surveillance and Estimation activities in India and from United Nations (UN) organizations (i.e., Joint UN Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO)). Representatives of the United States President's Emergency Plan for AIDS Relief (PEPFAR) were also members of NWG. In addition, experts from the International Institute for Population Sciences (IIPS), nodal organization for implementing National Family Health Survey (NFHS), were represented in the NWG for HIV Estimations 2017.

FIGURE 1: HIV Estimation Process at a Glance, HIV Estimations 2017



Implementation of HIV Estimations 2017 was launched through first meeting of the NWG on 19 June 2017 in New Delhi. Members of the NWG reviewed modelling parameters that were updated in the latest version of Spectrum model as well as various data requirements. They also worked out the estimation implementation plan. Decisions made during the first NWG meeting included: (i) Doing separate estimations for the newly split states of Andhra Pradesh and Telangana; (ii) Considering Hijra/Transgender (H/TG) people as a sub-group along with other High Risk Groups (HRG) including Female Sex Workers (FSW), Men who have Sex with Men (MSM), and Injecting Drug Users (IDU) wherever data permits; (iii) Redistributing the non-resident people receiving ART from in-migration UTs of Chandigarh and Delhi to their original place of residence, and (iv) Doing the projection up to 2026 in line with the duration of India's National Strategic Plan for HIV/AIDS and STI (2017-2024). The NWG also recommended to make appropriate use of HIV prevalence data from the National Family Health Survey Round 4 (NFHS-4) for the estimations.

After the first meeting, members of NWG as well as representatives from State AIDS Control Society (SACS) were trained on use of the latest version of the Spectrum model. Training was provided during the 'Expert Consultation cum Capacity-Building Workshop' held in New Delhi on 16 - 19 August 2017. Leading national and international experts, specialized in modelling, demography, epidemiology, statistics etc., participated in the workshop. These included experts from UNAIDS Regional Support Team for Asia-Pacific region, UNAIDS Geneva, East-West Center (University of Hawaii) and Avenir Health.

After the training, demographic, programmatic and epidemiological data updates were done, as required, in the Spectrum models for each State/UT and curve fitting was implemented. The outcome of each State/UT model was critically reviewed by the NWG in a series of consultation meetings with experts from UNAIDS India and Avenir Health. Appropriate modifications in State/UT models were made as per suggestions received. The results were finally vetted and approved by India's Technical Resource Group (TRG) on HIV Surveillance and Estimations comprising national and international experts. The composition of the TRG on HIV Surveillance & Estimation and NWG for HIV Estimations 2017 is in Annexures 1 and 2.

2. METHODOLOGY AND TOOL

2.1 Overview

Figure 2 shows the conceptual framework used for the development of HIV Estimations 2017. Spectrum version 5.63 was employed in line with recommendations of the UNAIDS Secretariat. Spectrum version 5.30, together with Spectrum 4.53 beta 19, was used for generating the preceding HIV Estimations 2015. Since then, many new versions of the Spectrum have been released due to improvements in the model. Major improvements made in current version 5.63, compared to version 5.30, are on modelling assumptions pertaining to (i) mortality probabilities among adults when on ART, (ii) preventive impact of ART, (iii) fertility pattern among HIV-positive pregnant women, and (iv) mother-to-child transmission rate. The details of updates made in various versions of Spectrum over time are available somewhere else.[1]

Specifically, the Demographic Projection (DemProj) and the AIDS Impact Module (AIM) of Spectrum are used in HIV Estimations. Estimation and Projection Package (EPP), a separate package until 2011, is now an integral part of the AIM module.

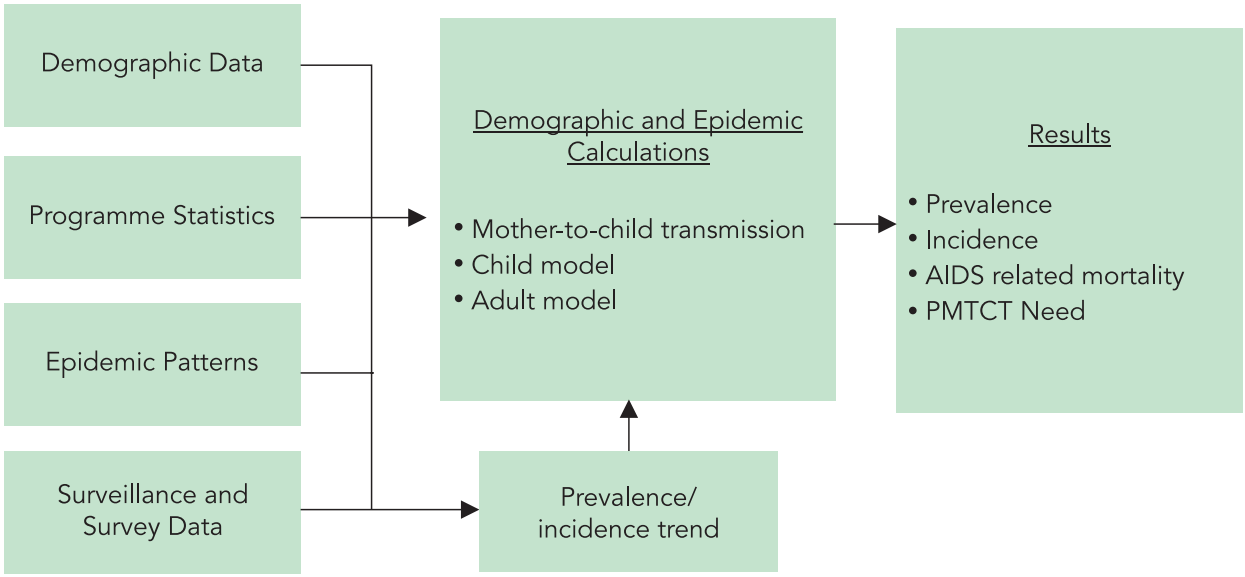
The three main sets of data that need to be inputted in the model are: demographic data, programme statistics such as ART coverage data, data depicting epidemic patterns and levels such as HIV prevalence obtained from sentinel surveillance and community-based surveys as well as population size estimates. The geographical focus of the current modelling exercise was on 35 States/UTs in India and at the national level.[2]

EPP uses inputted HIV prevalence data to generate prevalence curve since the beginning of epidemic up to the final year of projection, and then calculates the associated HIV incidence. In the next step, Spectrum takes the resulting incidence fits from EPP, applies a demographic model and age/gender specific data on HIV incidence to generate epidemiological and programme-related estimations of key indicators.

Validity and reliability of the curve fits and results from Spectrum for each of the State/UT models were assessed based on a range of evidence from different sources and knowledge of the local epidemic. For this purpose, several factors such as start of the epidemic, year of peak in the epidemic, epidemic levels and trends as well as ART and PMTCT coverage were considered. Whenever necessary, adjustments were made in model parameters to ensure consistency and validity of result.

1 http://avenirhealth.org/Download/Spectrum/Spectrum%20Update%20List.pdf
2 Lakshadweep is not included in HIV Estimations because of lack of surveillance data from this UT

FIGURE 2. Conceptual Framework of Spectrum 'AIDS Impact Model'



2.2 Data Inputs into Spectrum

There are several data elements required in Spectrum for production of HIV estimations. As a first step, demographic data were inputted into the DemProj module to project the population for each State/UT by age and sex based on assumptions about fertility, mortality, and migration. In the HIV Estimations 2017, State/UT wise demographic projections were made for each year by age and sex for the period from 1981 up to 2026.

Secondly, data pertaining to treatment programmes, such as ART and PMTCT coverage under the National AIDS Control Programme (NACP), were inputted into the models. This allows to account for the impact of programmes, in terms of survival and mortality as well as HIV transmission of different kinds i.e., between individual persons and from mother to child.

Thirdly, the epidemic structure for each State/UT was updated based on HIV prevalence data obtained through ongoing HIV Sentinel Surveillance (HSS), Integrated Biological and Behavioural Surveys (IBBS) and population-based surveys such as NFHS in India. This allows to define epidemic trends over the years.

2.2.1 Demographic Data

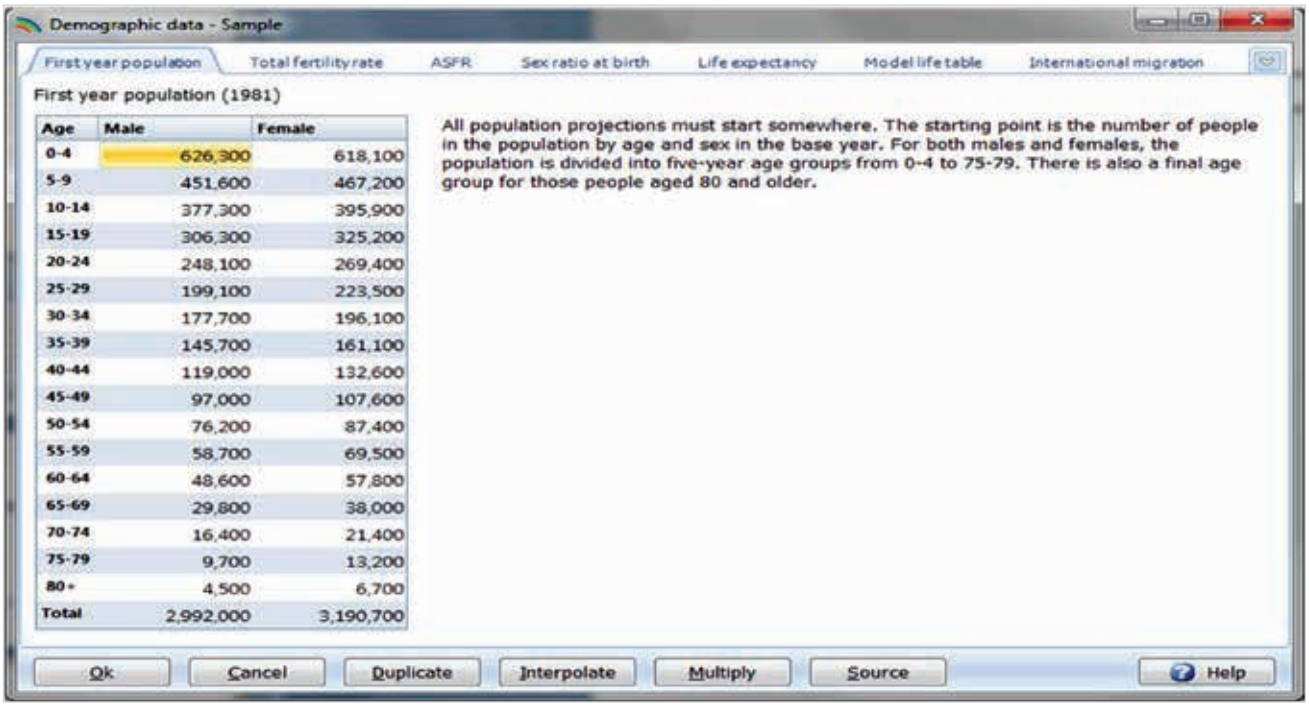
In the DemProj Module the start year for the demographic projection was set at 1981, whereas the end year was fixed at 2026. The last HIV estimations round, done in 2015, had set the end year for demographic projections at 2021. Another difference in the current estimation round, compared to the previous one, was the production of separate demographic trends and projections for the states of Andhra Pradesh and Telangana as these were administratively bifurcated in 2014.

To update and extend demographic projections till 2026 using DemProj module, census data were used together with data from India's Sample Registration System (SRS) and NFHS. For each year the size of the total population by sex and age, level and age-specific pattern of fertility, sex-ratio at birth, sex and age specific level and pattern of mortality, and volume and age-sex distribution of net-migration were defined in each State/UT specific model (Figure 3).

2.2.1.1 Total Population Size by Age and Sex for Base Year 1981

The total population size by sex and age for the base year of the projection was drawn from India's 1981 Census. These figures, however, could not be incorporated directly into the models as raw census data has limitation of age under-reporting and mis-reporting, and undefined ages recorded.[3,4,5] Hence, the 1981 Census data was adjusted (separately for males and females) by distributing the number of people included in the undefined age category in equal proportion into all of the other age groups.[4] The age distribution was then adjusted using a smoothing technique as suggested by the India's Expert Group for Population Projections.[6]

FIGURE 3. DemProj module of Spectrum showing the ribbon with different menu, HIV Estimations 2017



Age	Male	Female
0-4	626,300	618,100
5-9	451,600	467,200
10-14	377,300	395,900
15-19	306,300	325,200
20-24	248,100	269,400
25-29	199,100	223,500
30-34	177,700	196,100
35-39	145,700	161,100
40-44	119,000	132,600
45-49	97,000	107,600
50-54	76,200	87,400
55-59	58,700	69,500
60-64	48,600	57,800
65-69	29,800	38,000
70-74	16,400	21,400
75-79	9,700	13,200
80+	4,500	6,700
Total	2,992,000	3,190,700

2.2.1.2 Fertility Patterns (1981-2026)

Fertility patterns were derived using total fertility rate (TFR) and age-specific fertility rates (ASFR) for each State/UT. The ASFR were available for the period 1981 to 2015 from the Sample Registration System (SRS) for bigger States. However, for smaller States, ASFR was available only for 1990-2008. TFR and ASFR were projected further, as required, using the Gompertz Model conforming to the suggestions by India's Expert Group for Population Projection.[6,7,8]

3 Jain SP. Census Single Year Age Returns and Informant Bias. Demography India 1980; 9(1): 286– 296.
4 Saxena PC, Verma KR, Sharma KA. Errors in Age Reporting in India, A Socio-cultural and Psychological Explanation. Indian Journal of Social Work 1986; 47(2): 127–135.
5 Chandra NK. Adjustment of age data for India's census population. Demography India 1980; 9(1): 274–285.
6 Registrar General of India. Population Projection for India and States 2001–2026: Report of the Technical Group on Population Projections. National Commission on Population, Office of the Registrar General and Census Commissioner, India, New Delhi, 2006.
7 Uddin MM. Fertility estimation for Bangladesh using Gompertz model. Rural Demogr 1983; 10(1– 2): 19–22.
8 Wang Z, Zuidhof MJ. Estimation of growth parameters using a nonlinear mixed Gompertz model. Poult Sci 2004; 83(6): 847–52.

2.2.1.3 Sex Ratio at Birth (1981-2026)

Sex ratio at birth for bigger States/UTs was drawn from SRS for 1981-2015 and for smaller States/UTs for 1990-2008. For smaller States/UTs, sex ratios for earlier years (1981-1989) were calculated by applying the Reverse Survival Method using 1991 Census data.[9] The method was applied separately for males and females, and the sex ratio at birth computed based on male/female birth ratio. This allowed estimation of the number of male and female births in the 5 and 10-year periods prior to 1991 by using the number of children aged 0-4 and 5-9 years registered in the 1991 Census as, theoretically, these children are survivors of births which respectively took place in 1987-1991 and 1981-1986. The sex ratios at birth were kept constant for these two time periods.

2.2.1.4 Mortality Pattern (1981-2026)

Levels and age-sex pattern of mortality were inputted for each State/UT by using life expectancy at birth and age-sex specific mortality rates. For bigger States/UTs, life expectancy at birth were inputted as available from SRS for these five-year periods: 1981-85, 1986-90, 1991-95, 1996-2000, 2001-06, 2007-11, 2008-12, 2009-13, 2010-14 and 2011-15. For smaller States/UTs, for which SRS life tables are not available, Infant Mortality Rates (IMR) were estimated for the years 1981, 1991, 2001, and 2011 using Census data deducting the number of surviving children from the number of children ever born.[10,11] To establish the age-sex pattern of mortality, the Coale-Demeny West Model life tables were applied to all States/UTs, except for Delhi and Meghalaya where the United Nations (UN) South-Asia Model life tables were used because Coale-Demeny West Model did not match the mortality patterns registered in these two locations.[12, 13] Yearly mortality rates beyond 2015 were projected by using the methodology suggested by India's Expert Group for Population Projection.

2.2.1.5 Migration Pattern (1981-2026)

Inputs into the model regarding migration included the volume of net-migrants and age distribution of migrants by sex. These were derived by applying different direct and indirect calculation methods using Census data from 1981, 1991 and 2001 as well as crude birth rate (CBR) and crude death rate (CDR) from the SRS.[10, 11] The volume of net-migration was calculated by sex through deducting out-migrants from in-migrants as Census recorded information on place and duration of residence, and place of remuneration.

As the 2011 Census data on migration was not available, the Indirect Residual Method was used to estimate the volume of net-migrants. This method is based on the idea that the population change between any two consecutive census rounds is the result of natural growth (births minus deaths) and the net-migratory movement. It was assumed that the contribution of international migration is negligible compared to the population change in between successive censuses. Estimates of net-migration for the years after 2011 were projected following the guidelines from India's Expert Group on Population Projection.[6] The age-distribution of both male and female migrants was obtained from Census data for the periods of 1981-91 and 1991-2001. The age-sex distribution of migrants after these dates was assumed to be constant.

9 The Reverse Survival Method assumes that reporting of age, especially of children, is accurate, and that the children population is not affected by migration. It also assumed that fertility of migrants and non-migrants do not differ and that the level and age pattern of mortality during early childhood are known. Furthermore, an assumption is made that the population count of children in Census is of reasonably good quality.

10 United Nations. Manual X – Indirect Techniques for Demographic Estimation. Population Studies No 81, Department of International Economic and Social Affairs, United Nations, New York., 1983.

11 Shryock HS, Siegel JS, Larmon EA. The Methods and Materials of Demography: Volume 1. Department of Commerce, Bureau of the Census, United States, 1980.

12 Coale AJ, Demeny P. Regional Model Life Tables and Stable Populations: Second Edition. New York, NY: Academic Press, 1983.

13 United Nations. Model Life Tables for Developing Countries. United Nations Publication, 1982

2.2.2 Programme Data

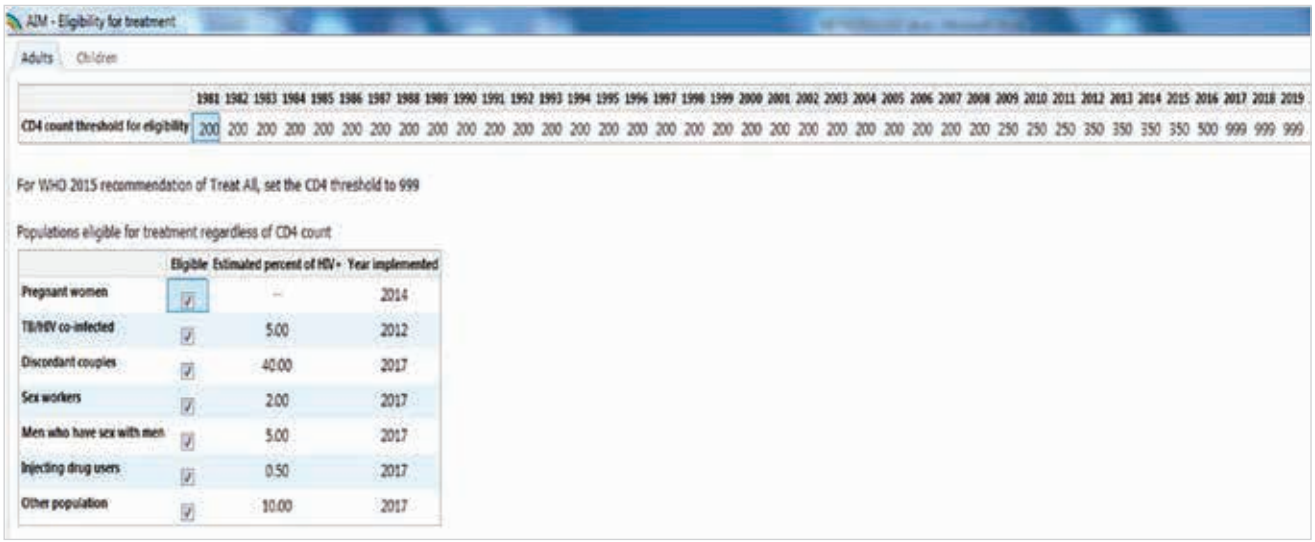
The next set of data which was inputted in AIM module of Spectrum pertained to treatment eligibility and programme coverage of ART and PMTCT. These data inputs are required in the model as they affect HIV transmission as well as the survival and mortality of PLHIV, and hence influence the disease burden.

2.2.2.1 Eligibility for Receiving ART

Treatment eligibility criteria for adults and children used in India were defined in Spectrum based on national policy. This has changed over time with subsequent revisions rising the CD4 count level to allow diagnosed PLHIV to enrol in ART earlier for better treatment outcomes (Figure 4). CD4 count thresholds defining the eligibility of adults to receive ART in India changed over the years as follows: 200 cells/µl until 2008; 250 cells/µl for 2009-2011, 350 cells/µl for 2012-2015 and 500 cells/µl in 2016. In 2017 the Treat All Policy was introduced (reflected as 999 cells/µl in Spectrum from 2017 onwards).

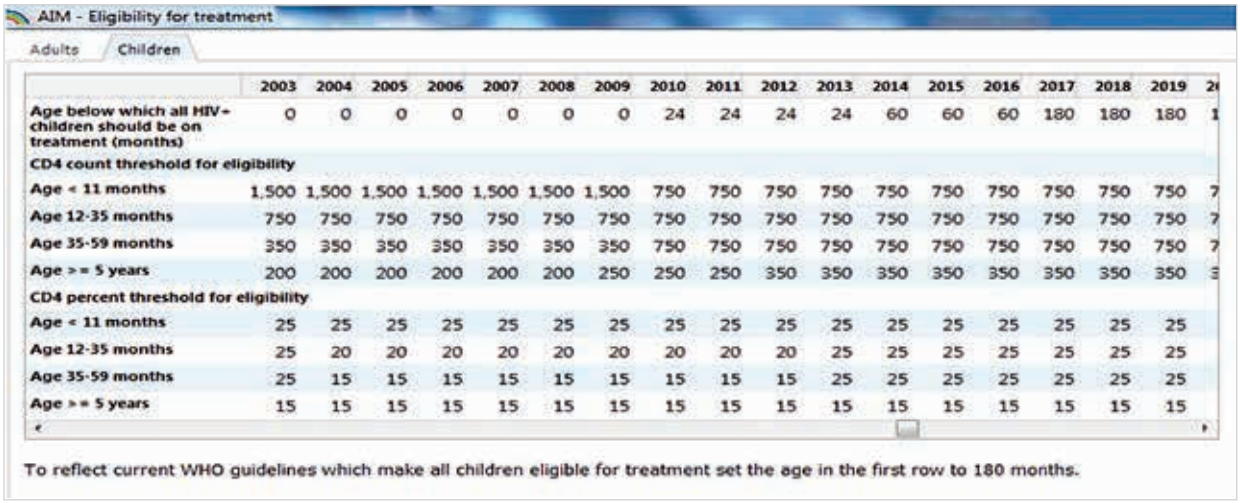
As depicted in Figure 4, population groups living with HIV who are eligible for treatment regardless of CD4 count and the year when they become eligible were also specified in line with national policy guidelines. Estimated percent of PLHIV for each group were specified in the models as a proportion of all adult PLHIV.

FIGURE 4: CD4 Count Thresholds for ART Eligibility among Adults by Year, HIV Estimations 2017



For children, the model has three components to define eligibility: age, CD4 count and CD4 percent (Figure 5). ART eligibility criteria for age was updated based on the national guidelines while value for CD4 count and CD4 percent-based eligibility criteria was kept as default as in previous rounds. In the model, a child is considered as eligible if he/she meets any of the three criteria.

FIGURE 5. ART eligibility by age and CD4 Count/Percent Thresholds (Children), HIV Estimations 2017



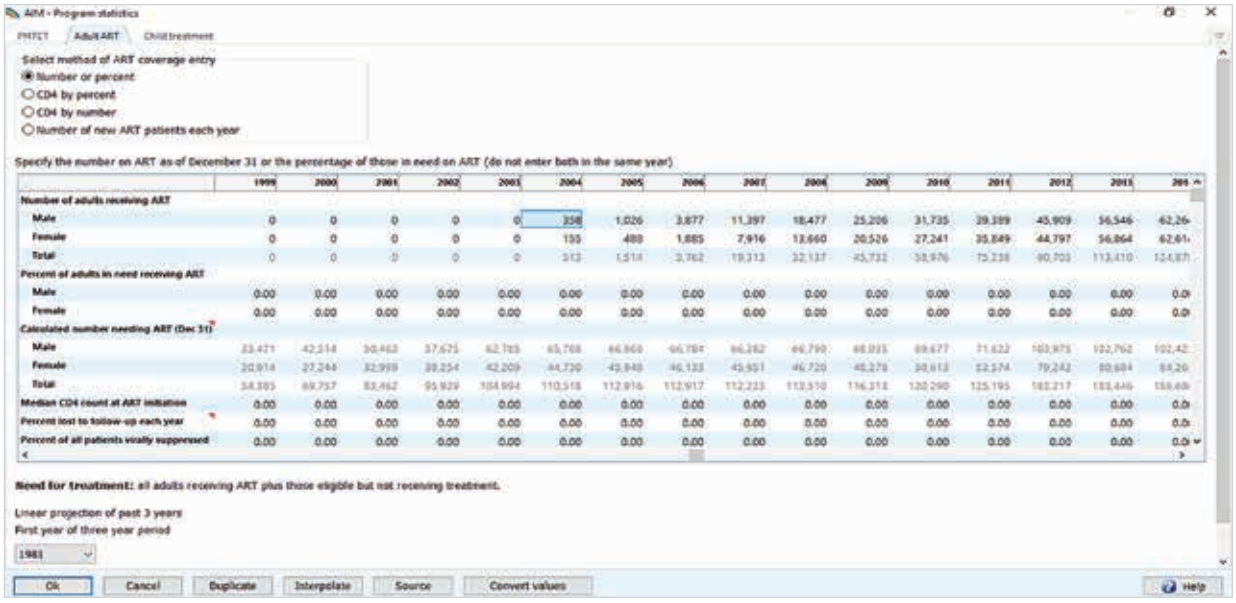
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Age below which all HIV+ children should be on treatment (months)	0	0	0	0	0	0	0	24	24	24	24	60	60	60	180	180	180
CD4 count threshold for eligibility																	
Age < 11 months	1,500	1,500	1,500	1,500	1,500	1,500	1,500	750	750	750	750	750	750	750	750	750	750
Age 12-35 months	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750
Age 35-59 months	350	350	350	350	350	350	350	750	750	750	750	750	750	750	750	750	750
Age >= 5 years	200	200	200	200	200	200	250	250	250	350	350	350	350	350	350	350	350
CD4 percent threshold for eligibility																	
Age < 11 months	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
Age 12-35 months	25	20	20	20	20	20	20	20	20	20	25	25	25	25	25	25	25
Age 35-59 months	25	15	15	15	15	15	15	15	15	15	25	25	25	25	25	25	25
Age >= 5 years	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15

To reflect current WHO guidelines which make all children eligible for treatment set the age in the first row to 180 months.

2.2.2.2 ART Coverage of Adults and Children

Programme data on ART coverage among adults and children were available from 2004 to 2016 and data inputted into the Spectrum models accordingly. For the year 2017-2026, percent ART coverage against the projected ART need, were worked out based on analysis of past performance and coverage that was expected to be achieved by the programme (Figure 6).

FIGURE 6. ART Treatment Coverage by Year, HIV Estimations 2017



2.2.2.3 Coverage of Prevention of mother-to-child transmission (PMTCT) of HIV

Coverage of the PMTCT services is another key input from programme data in Spectrum. Data was updated for 2015 and 2016 as new monitoring data has become available from these two years. Data for 2003-2014 was already available in each State model. As of now, Option B+ is the recommended regimen for all HIV-positive pregnant women across all States/UTs. Data for PMTCT coverage were therefore updated accordingly for the three sub-components of Option B+ from the year of applicability which varied by States/UTs. The three sub-components of Option B+ are: (i) those

pregnant women already on ART at the time of the first antenatal visit, (ii) those women starting on ART during the current pregnancy more than 4 weeks before delivery, and (iii) those starting on ART less than 4 weeks before delivery. Data inputs were also available for single-dose Nevirapine as this was the recommended model in many of States from 2003 to 2014. For the period from 2017 to 2026, PMTCT coverage was projected in terms of percent coverage with 5% increase every year from the percent coverage value of the preceding year.

Furthermore, for estimation of the probability of HIV transmission from mother to child during breastfeeding, parameters on the duration of breastfeeding were updated in the models. These were specifically derived from various rounds of NFHS including that of NFHS 4 for each of the States/UTs and applied to the time trend as appropriate. Data were updated under this section under the assumption that there is no difference of breastfeeding behaviour whether or not the mother is positive, or whether or not she is on ART.

2.2.3 Defining Assumptions on Adult and Child parameters

In the next step, the model requires definition of assumptions pertaining to adult and child parameters. Assumptions on three parameter groups (i.e., adult transition parameters, paediatric transition parameters, and MTCT transmission probabilities), as done in the earlier round of estimations, were selected from various default options available in Spectrum. These default parameters are based on findings of special studies and surveys from many sites around the world. The details of the studies used to inform these parameters can be found in the Spectrum Manual.[14]

Under 'Adult' and 'Paediatric' Transition, assumptions are made on progression rates, HIV mortality (with or without ART), ART initiation by age (paediatric), TFR reduction and effectiveness of cotrimoxazole (paediatric). The default options provided by Spectrum version 5.63 were kept. Wherever regional options were available, the 'Asia' pattern was selected.

In Spectrum there are assumptions pertaining to MTCT transmission probabilities that define HIV transmission probability from mother to children based on the mother's CD4 level and different ARV regimens. Table 1 provides the default probabilities used in this estimation round in Spectrum version 5.63.

TABLE 1. Default Peripartum and Breastfeeding Assumption Rates, HIV Estimations 2017

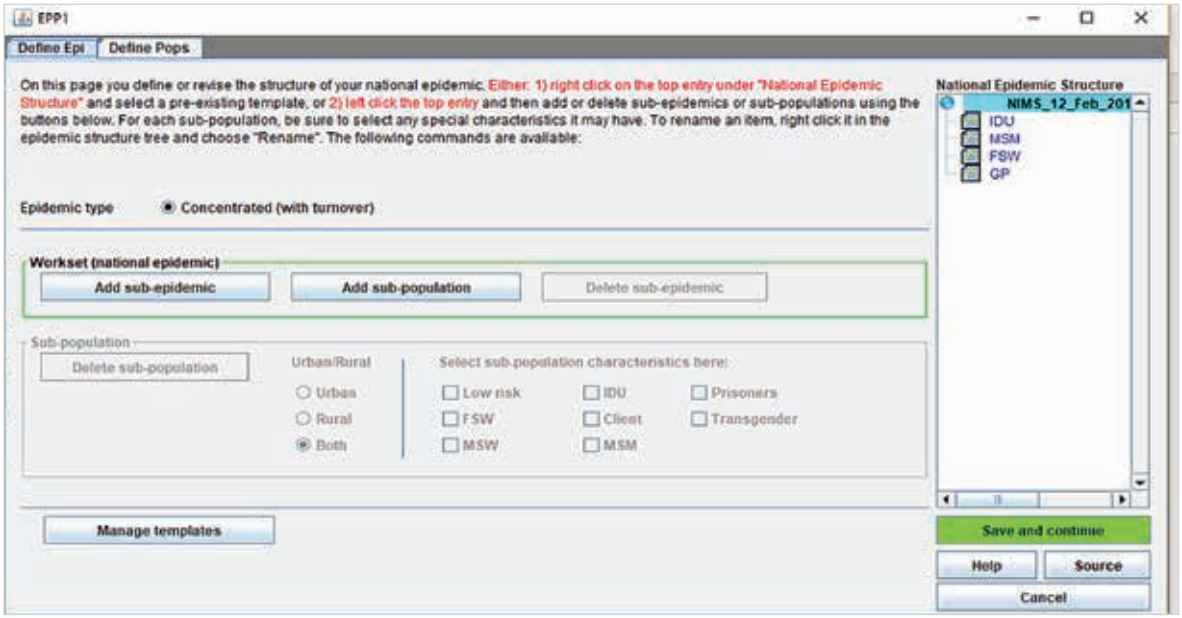
Regimen	Perinatal	Breastfeeding (per month)	
		CD4 <350	CD4>=350
No prophylaxis			
Existing infections			
CD4 < 200	37	0.81	
CD4 200-350	27	0.81	
CD4 > 350	15		0.51
Incident infections	18.20	26.90	26.90
Single dose nevirapine	8.90	0.78	0.51
WHO 2006 dual ARV regimen	4.10	0.78	0.51
Option A	4.10		0.20
Option B	1.90		0.13
ART			
Started before pregnancy	0.21	0.01	
Started during pregnancy > 4 weeks	1.90	0.13	
Started during pregnancy < 4 weeks	7.60	0.20	

14 http://www.avenirhealth.org/Download/Spectrum/Manuals/AIMManualEnglish.pdf

2.2.4 Defining Epidemic Configuration

Updating the epidemic configuration was the next step in HIV estimation process (Figure 7). The update involved review of the epidemic structure and adjustments from the previous round. Epidemic structure or sub-population characteristics were updated only when new data necessitating these changes were available. For example, Hijra/Transgender (H/TG) population was added as a separate sub-population in select States (Maharashtra and Tamil Nadu) as minimum required prevalence data points were available (i.e., either at least one site with a minimum of three points of HIV prevalence or at least two sites with minimum of two data points). The data were drawn from ongoing HSS and the 2014-15 IBBS and populations size estimates. Table 2 summarizes the epidemic configuration in terms of epidemic type and sub-population groups by State/UT.

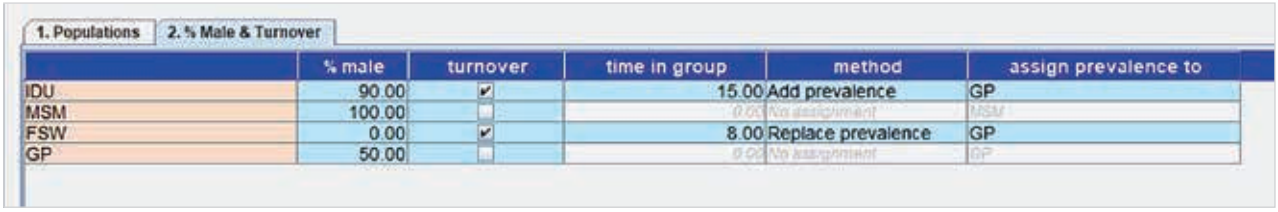
FIGURE 7. Structure of Epidemic Patterns, HIV Estimations 2017



For the States of Andhra Pradesh and Telangana, seperate state models were created for the first time. The epidemic configuration was freshly defined as population size estimates and HIV prevalence estimates for each sub-population group were re-distributed across these two States.

In concentrated epidemic settings, additional information is required in Spectrum on the proportion of sub-populations that is male and the average duration individuals stay in the sub-population (Figure 8). These parameters are used to calculate female/male ratios and the rate of turnover in each sub-population. The input value on these parameters was kept the same as in the preceding HIV Estimations 2015.

FIGURE 8. Percent Male & Turnover Rate Under Epidemic Configuration, HIV Estimations 2017



	% male	turnover	time in group	method	assign prevalence to
IDU	90.00	✔	15.00	Add prevalence	GP
MSM	100.00		0.00	No assignment	MSM
FSW	0.00	✔	8.00	Replace prevalence	GP
GP	50.00		0.00	No assignment	GP

Table 2: Population Sub-Groups Represented in States/UTs, HIV Estimations 2017

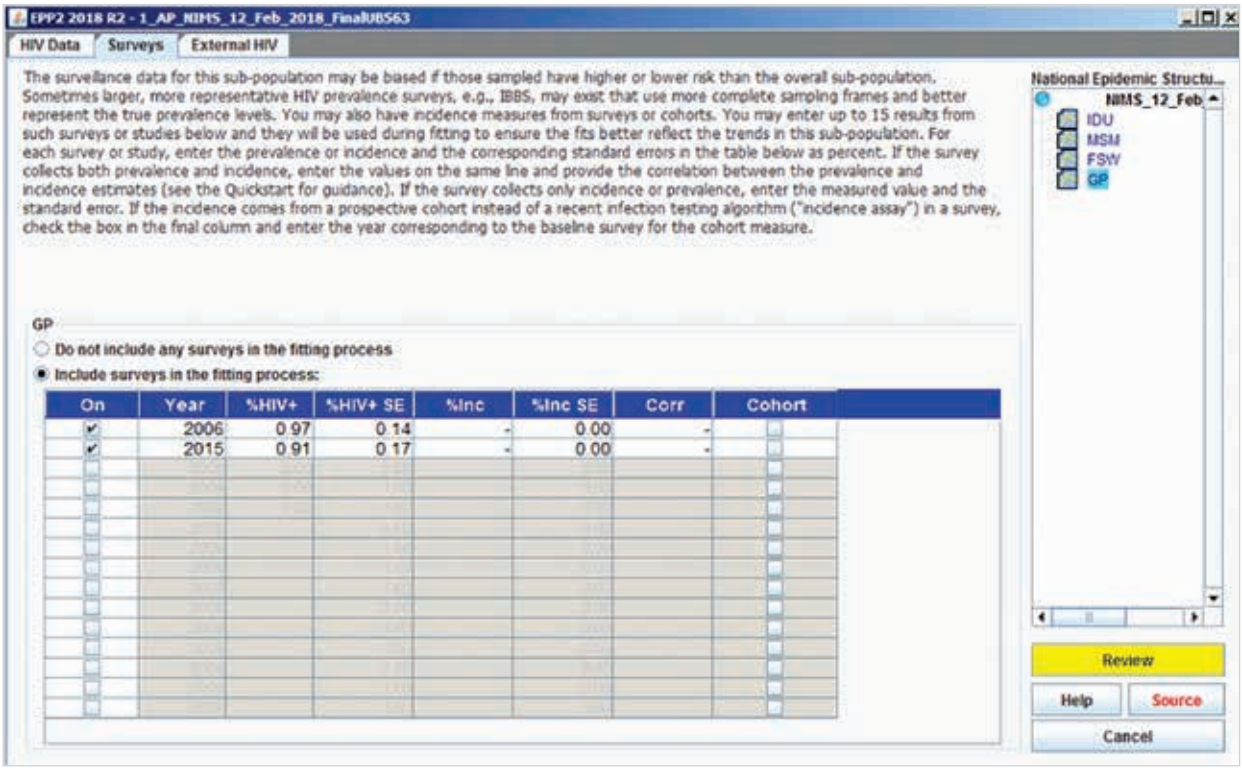
State/UT	FSW	MSM	H/TG	IDU	GP
Andhra Pradesh	✓	✓	–	✓	✓
Arunachal Pradesh	✓	–	–	✓	✓
Assam	✓	–	–	✓	✓
Bihar	✓	✓	–	✓	✓
Chhattisgarh	–	–	–	–	✓
Delhi	✓	✓	–	✓	✓
Goa	–	✓	–	–	✓
Gujarat	✓	✓	–	✓	✓
Haryana	✓	✓	–	✓	✓
Himachal Pradesh	✓	✓	–		✓
Jammu & Kashmir	–	–	–	–	✓
Jharkhand	✓	✓	–	✓	✓
Karnataka	✓	✓	–	✓	✓
Kerala	✓	✓	–	✓	✓
Madhya Pradesh	✓	–	–	–	✓
Maharashtra	✓	✓	✓	✓	✓
Manipur	✓	✓	–	✓	✓
Meghalaya	–	–	–	–	✓
Mizoram	–	✓	–	✓	✓
Nagaland	✓	–	–	✓	✓
Odisha	✓	✓	–	✓	✓
Punjab	✓	✓	–	✓	✓
Rajasthan	✓	–	–	–	✓
Sikkim	✓	–	–	✓	✓
Tamil Nadu	✓	✓	✓	✓	✓
Telangana	✓	✓	–	✓	✓
Tripura	–	–	–	✓	✓
Uttar Pradesh	✓	✓	–	✓	✓
Uttarakhand	–	–	–	–	✓
West Bengal	✓	✓	–	✓	✓
Andaman & Nicobar	–	–	–	–	✓
Chandigarh	✓	✓	–	✓	✓
Dadra Nagar Haveli	–	–	–	–	✓
Daman & Diu	–	–	–	–	✓
Puducherry	✓	✓	–	–	✓

2.2.5 Surveillance and Survey Data

After reviewing and updating the epidemic structure and population, HIV prevalence data was updated in next step. Broadly, for each State/UT, HSS data were updated by adding data points from the most recent 2016-17 HSS. Data from Ante-natal Clinic (ANC) attendees as well as High Risk Groups (HRGs) were used to update the prevalence values in the surveillance page of Spectrum. As in previous rounds, surveillance data were carefully scrutinised to identify and eliminate outlier values (i.e., data points much higher or lower than the overall trend) in consultation with experts and stakeholders. Data from India's national IBBS (2014-15) was also used as surveillance data points in this round in some of the States/UTs where this helped inform HIV prevalence trends in HRG sub-groups (e.g., for H/TG).

HIV Estimations 2017 is the most robust round of estimation so far because it used representative HIV prevalence data from two rounds of large-scale population-based surveys (NFHS-3 and NFHS-4).[15,16] HIV prevalence data from the NFHS were employed as survey data for defining epidemic trends in the general population for State/UT models as per NFHS data availability (Figure 9). The prevalence data from NFHS, together with their confidence intervals, better represent prevalence levels in the general population and were therefore used in the HIV prevalence and incidence curve fitting processes.

FIGURE 9. NHFS Prevalence Data Inputted into Model, HIV Estimations 2017



2.3 Epidemic Modelling

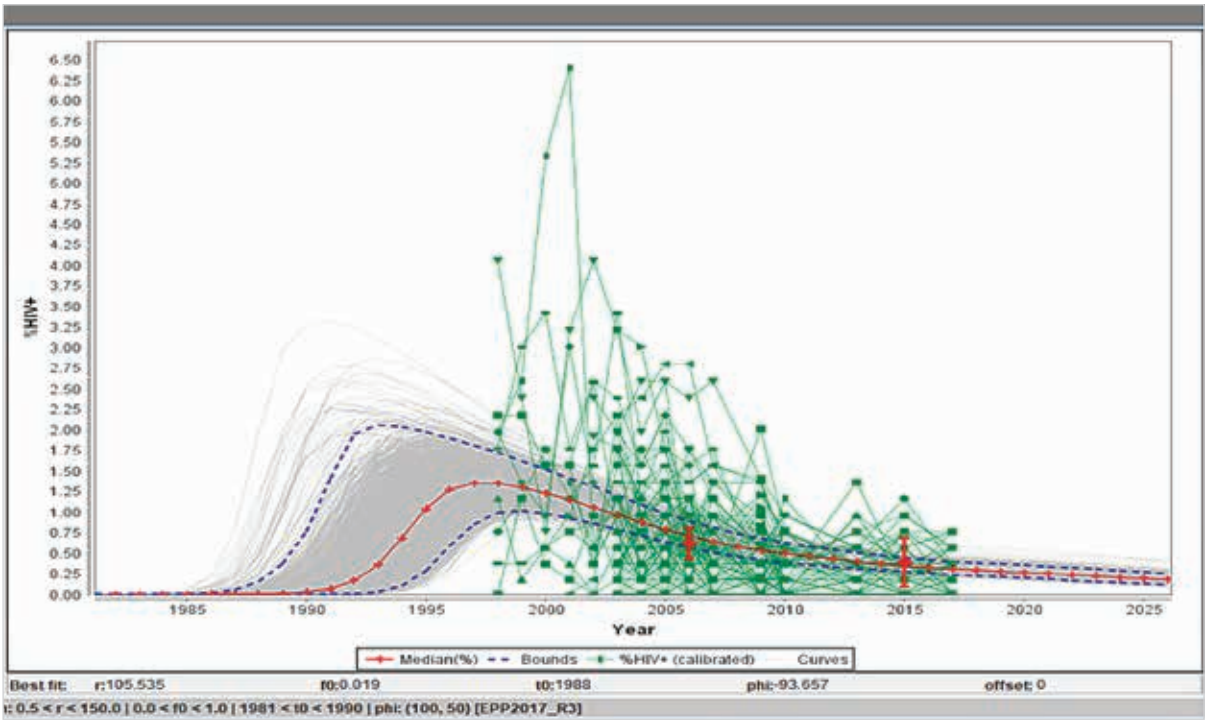
The epidemic modelling process consists of three key steps: (i) Curve fitting, (ii) Calibration of fitted curves based on additional data sources, and (iii) Fitting of results. These steps, which were followed in the HIV Estimation 2017 process, are described in the next sections.

15 http://rchiips.org/NFHS/NFHS-3%20Data/VOL-1/India_volume_I_corrected_17oct08.pdf
16 http://rchiips.org/NFHS/NFHS-4Reports/India.pdf

2.3.1 Curve fitting

Once HIV prevalence data from sentinel surveillance and population-based surveys has been inputted, curve fitting is undertaken in the epidemic modelling (Figure 10). In this estimation round, as in the past, the EPP Classic model was used for the curve fitting. The way this model functions has been documented in detail elsewhere.[17] In essence, the population aged 15-49 years is divided into categories including individuals (i) not at risk of HIV; (ii) at risk of HIV, but not yet infected; and (iii) at risk and already living with HIV. Modelling of HIV transmission is governed by four parameters: (i) r, the rate of infection, assumed constant, (ii) t_0, the start year of the epidemic, (iii) f_0, the initial fraction of the adult population at risk of infection, and (iv) ϕ, which specifies the behavioural response of the population to the epidemic modulating the split between at-risk and not-at-risk populations.

FIGURE 10. Surveillance and Survey Data and Curve Fitting, HIV Estimations 2017



Due to updates in demographic, programme coverage and HIV prevalence data in all States/UTs, curve fitting was done for each State/UT model. In instances where the models produced unrealistic curves given available knowledge about the epidemic, conditions were applied under modelling parameters tab in Spectrum to align HIV prevalence to trends observed in different data sources. Four guiding principles were used in applying conditions to modelling parameters: (i) Make as little use as possible of conditions, (ii) Avoid placing conditions on higher and lower prevalence values in same year, (iii) Refrain from setting conditions close to years in which data are available, and (iv) Avoid putting conditions on HIV prevalence values for projections after 2017. These principles were followed to ensure that the modelling had enough flexibility to reflect the true uncertainty in the data and was not restricted artificially. The details of informing the curve fitting through conditions on HIV prevalence is available in UNAIDS Quick Start Guide for Spectrum.[18]

17 Ghys, P. D., Brown, T., Grassly, N. C., Garnett, G., Stanecki, K. A., Stover, J., & Walker, N. (2004). The UNAIDS Estimation and Projection Package: a software package to estimate and project national HIV epidemics. Sexually transmitted infections, 80(suppl 1), i5-i9.

18 http://www.unaids.org/sites/default/files/media_asset/QuickStartGuide_Spectrum_en.pdf

2.3.2 Calibration

The epidemic modelling process offers the flexibility of making final adjustments for each sub-population after curve fitting has been done. Six options are available in Spectrum version 5.63 on the Calibration page: (i) Use the modelling results as they are, (ii) Adjust the results by considering all surveys, (iii) Adjust the results to agree with the most recent surveys, (iv) Adjust HIV prevalence to a user-specified value for a user-specified year, (v) Scale the results up and down by a factor, and (vi) Remove all calibrations.

In HIV estimations 2017, for HRG sub-populations, prevalence curves were adjusted to fit 2015 values to HIV prevalence recorded in the IBBS. This approach was same as that used in the HIV Estimations 2015. However, HIV Estimations 2017 differed significantly from previous rounds in its approach towards calibration of general population prevalence curves. As data from two rounds of large-scale population-based surveys (i.e., NFHS) were inputted in the Survey page for the general population and used during the curve fitting, the 'best curve fit' was already informed by a good balance of survey and surveillance data. In view of this, the modelling results for the general population were used without further calibration for all States except in the case of Bihar, Chhattisgarh, Gujarat, Himachal Pradesh and Kerala. For these State, excluding Kerala, the 'best curve fit' for the general population was adjusted to results of last survey (i.e., NFHS-4). This was done as the NWG felt that the 'best curve fit' in the models of these States were either overestimating or underestimating the epidemic considering evidence from different sources and available knowledge. The calibration applied in the models of these States has ensured that the EPP curve goes directly through the value derived from NHFS-4 and adjusts the modelled prevalence curve accordingly.

For Kerala, the general population HIV prevalence curve was calibrated to HIV prevalence value of 0.07% in 2015. This was done because the State group prevalence from NFHS-4 for the States of Tamil Nadu, Kerala and Puducherry appeared to overestimate prevalence when applied solely to Kerala. But when prevalence data from the States group was disaggregated and taken only for Kerala, no positive case was observed among sampled respondents in the NHFS. Both scenarios seemed unrealistic for this State. Hence, a decision was made to adjust Kerala's HIV prevalence for 2015 to match trends registered in Tamil Nadu under assumption that they both had similar prevalence trajectories.

2.3.3 Review of fitted results

In the next step, HIV prevalence and incidence trends by population type as well as for general population, which resulted from curve fitting and calibration, were reviewed. The process also included comparison of trends with State/UT and national models used in the previous HIV Estimations 2015. Upon comparative review, modifications were made wherever required, based on the HIV prevalence and incidence curves for each population type as well as of the combined population trend.

2.4 Setting the pattern of incidence by sex and age

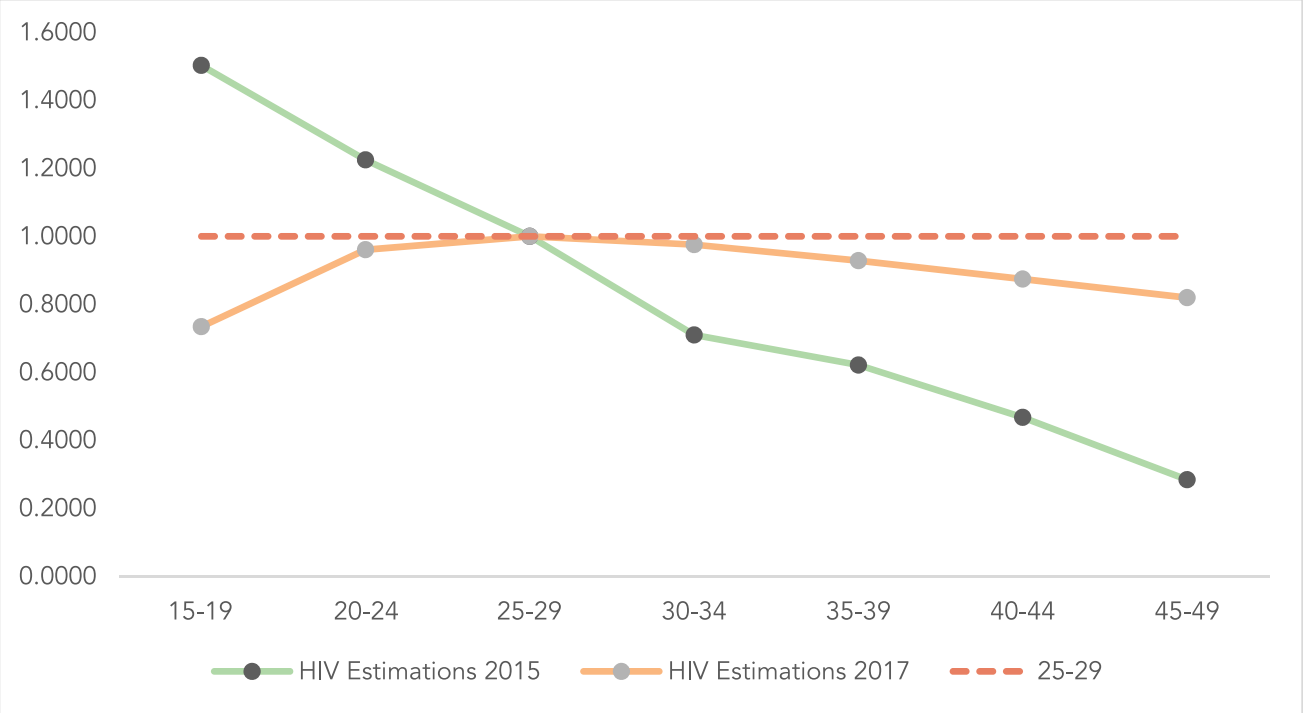
Adult HIV incidence trends derived from running EPP Classic consist of new infections among adults aged 15-49 years. As Spectrum has an age structure, while EPP does not have this, new infections coming from EPP Classic are distributed by age and sex in a next step. As at the time of HIV Estimations 2017 HIV prevalence data by age and sex was available from two rounds of NFHS, this data was used

to estimate HIV incidence by age and sex. However, given that prevalence levels by age from NFHS for each State/State group do not show consistent patterns and have very large confidence bounds (largely because of small sample sizes with few PLHIV captured in general population included in survey), the incidence rate ratios were fitted for the national level, and then used in each state model.

As the sex ratio of prevalence varied by State/State group, ratio of female to male incidence was worked out in each State/State group model. This was done by preserving the national pattern but adjusting the asymptote to the group value.

Use of incidence rate ratios from the NFHS surveys was a major improvement in HIV Estimations 2017 from previous estimation rounds and has had a major impact on estimation results. The impact is noteworthy especially in the estimate of HIV incidence among females with better accuracy in the estimated number of HIV-positive pregnant women needing PMTCT (Figure 11).

FIGURE 11. Incidence Rate Ratio (IRR) among Females, Comparison of HIV Estimations 2017 and HIV Estimations 2015



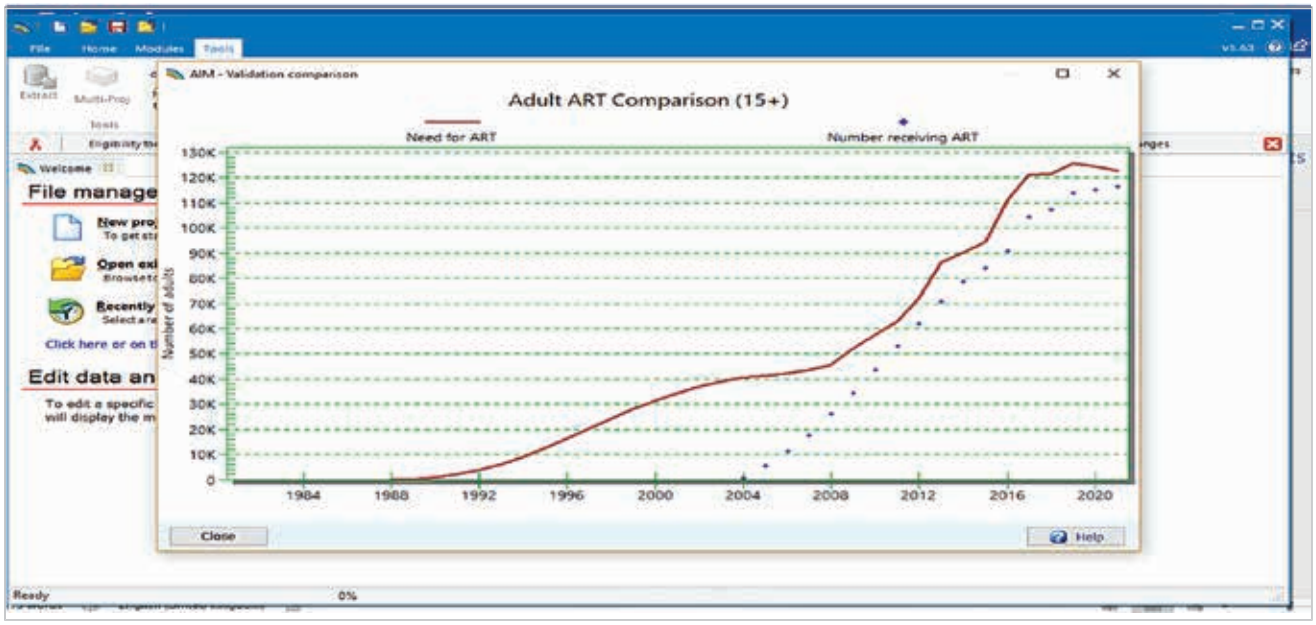
2.5 Results Generation, Validation and Uncertainty Analysis

In the final steps, results were generated on six key indicators comprising adult prevalence (15-49 years), number of PLHIV, HIV incidence rate, new HIV infections, AIDS-related deaths and need for PMTCT. The results were disaggregated by sex (male and female) and age (all ages, adults aged 15-49 years and adults aged 15+) as applicable (Figure 12).

FIGURE 12. HIV Estimation Outputs, HIV Estimations 2017

The results generated in the current estimation round were validated in respect to available knowledge. For example, the need for ART was compared to the number of PLHIV who are already receiving ART. Where ART coverage, derived from programme data, was more than the estimated ART need, appropriate action was taken to adjust the modelling as required (Figure 13).

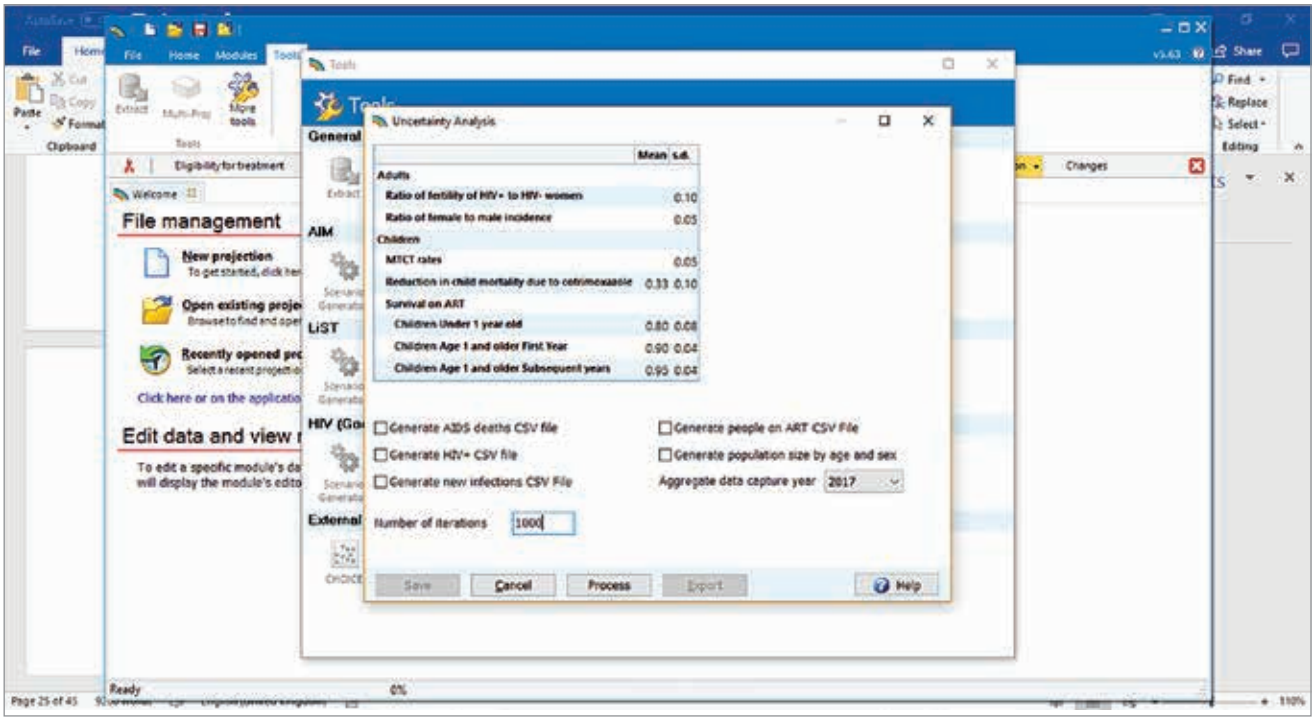
FIGURE 13. HIV Estimations Validations, HIV Estimations 2017



Once final estimation results were generated for each of the key indicators, the range of plausible values was calculated to define 'uncertainty bounds' (Figure 14). The width of the bounds largely depends on the quantity of available data for input into model. States/UTs with a large number of surveillance sites have a smaller uncertainty bound than States/UTs with a lesser number of surveillance sites. As HIV Estimations 2017 used NHFS data for the curve fitting, the uncertainly

bound of estimations is also determined by the NHFS sample size and standard error in NFHS HIV prevalence. Besides the quantity of surveillance/survey data, the width of the uncertainty bound also depends on the number of assumptions used to develop the estimate. The more assumptions, the wider the uncertainty bound since each assumption introduces additional uncertainty. The details on the methodology applied to uncertainty analysis under Spectrum can be found elsewhere.[19,20]

FIGURE 14. Uncertainty Analysis, HIV Estimations 2017



19 Stover, J., Johnson, P., Zaba, B., Zwahlen, M., Dabis, F., & Ekpini, R. E. (2008). The Spectrum projection package: improvements in estimating mortality, ART needs, PMTCT impact and uncertainty bounds. Sexually Transmitted Infections, 84(Suppl 1), i24-i30.

20 http://avenirhealth.org/Download/Spectrum/Manuals/SpectrumManualE.pdf

3. RESULTS

The Sustainable Development Goals (SDGs) aim to achieve End of AIDS as a public health threat by 2030. As a signatory, India stands committed to achieve this goal through its National AIDS Control Programme. National Health Policy (NHP 2017) and National Strategic Plan for HIV/AIDS and STI 2017-2024 reiterate to achieve End of AIDS through a well-defined roadmap and has articulated medium term targets for 2020.

The 2020 targets are (i) to attain reduction in new HIV infections by 75% from the baseline value of 2010, (ii) to attain treatment target of 90-90-90, (iii) to eliminate mother-to-child transmission of HIV and syphilis by 2020, and (iv) to eliminate HIV/AIDS related stigma & discrimination by 2020. These targets are consistent with global fast track targets accelerating action to end the AIDS epidemic by 2030.

This 2017 HIV Estimations report is being published at a crucial juncture, just three years before progress against the Fast Track target of 2020 will be evaluated. It provides an opportunity to reassess the level and trend of the epidemic and understand what must be done to ensure that States/UTs, and the country as a whole, are on course to achieve HIV-related commitments.

This report covering 29 States and 6 Union Territories (UTs) provides up-to-date evidence on the status of HIV epidemic in India in terms of HIV prevalence, number of people living with HIV (PLHIV), HIV incidence, number of new HIV infections, AIDS-related deaths and number of pregnant women requiring PMTCT. State/UT wise estimates for each of these indicators are presented in Annexure 3. The estimates are displayed with uncertainty bounds, as applicable, defining the range within which the true value (if it could be measured) lies.

In some cases, the estimations are presented in this report also by groups of States (6). The grouping has been kept same as that used in NFHS for consistency.[21] The groups are (i) North: Chandigarh (CH), Delhi (DL), Haryana (HR), Himachal Pradesh (HP), Jammu & Kashmir (JK), Punjab (PJ), Rajasthan (RJ) and Uttarakhand (UK), (ii) Central: Chhattisgarh (CG), Madhya Pradesh (MP) and Uttar Pradesh (UP), (iii) East: Bihar (BH), Jharkhand (JH), Odisha (OD), West Bengal (WB), (iv) Northeast: Arunachal Pradesh (AR), Assam (AS), Manipur (MN), Meghalaya (MG), Mizoram (MZ), Nagaland (NG), Sikkim (SK) and Tripura (TR), (v) West: Dadra & Nagar Haveli (DNH), Daman & Diu (DD), Goa (GO) , Gujarat (GJ), Maharashtra (MH), and (v) South: Andaman & Nicobar Islands (AN), Andhra Pradesh (AP), Karnataka (KA), Kerala (KE), Puducherry (PO), Tamil Nadu (TN) and Telangana (TL).

21 http://rchiips.org/NFHS/NFHS-4Reports/India.pdf

3.1 Overview of HIV/AIDS Epidemic

In 2017, there was an estimated adult (15-49 years) prevalence of 0.22% [0.16-0.30] in India. Around 21.40 lakh PLHIV were living in the country (Figure 15 and Table 3). Almost 97% of the total PLHIV belonged to the 15+ years age group. Females constituted 42% of estimated PLHIV (15+ years). 87.58 thousand people were newly infected with HIV in 2017, while 69.11 thousand PLHIV died from AIDS-related causes in the same year. Adults (15+ years) constituted around 96% of new HIV infections and AIDS-related deaths. Females constituted 40% of new HIV infections (15+ years) and 31% of AIDS-related deaths among them (15+ years).

FIGURE 15. Overview of HIV/AIDS in India, HIV Estimations 2017

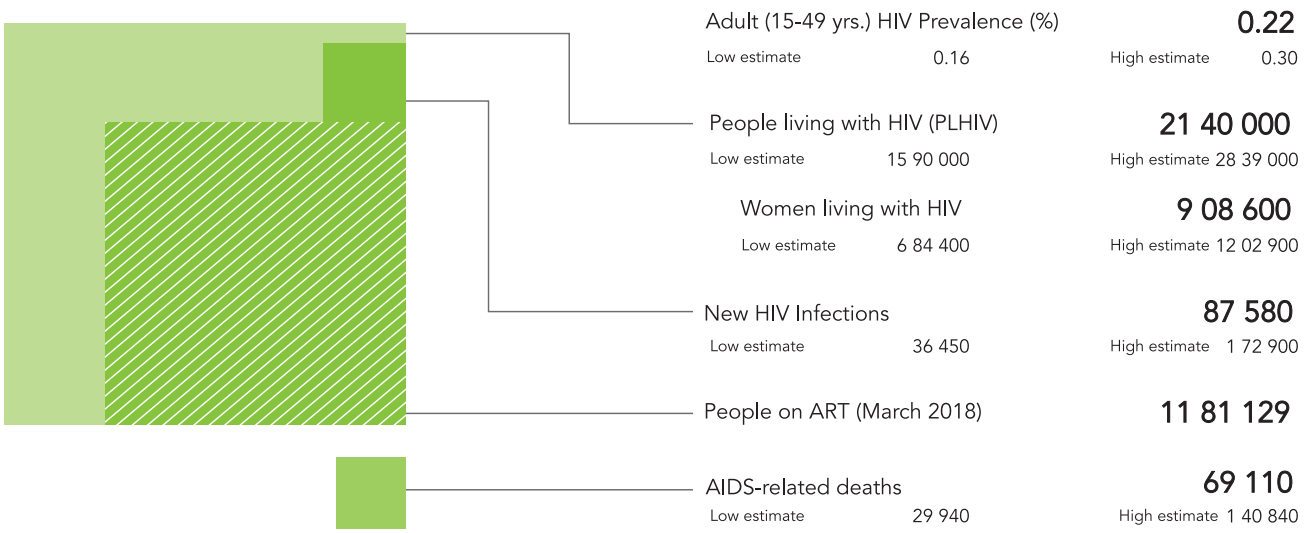


Table 3. National Summary of the HIV/AIDS Epidemic in 2017, HIV Estimations 2017

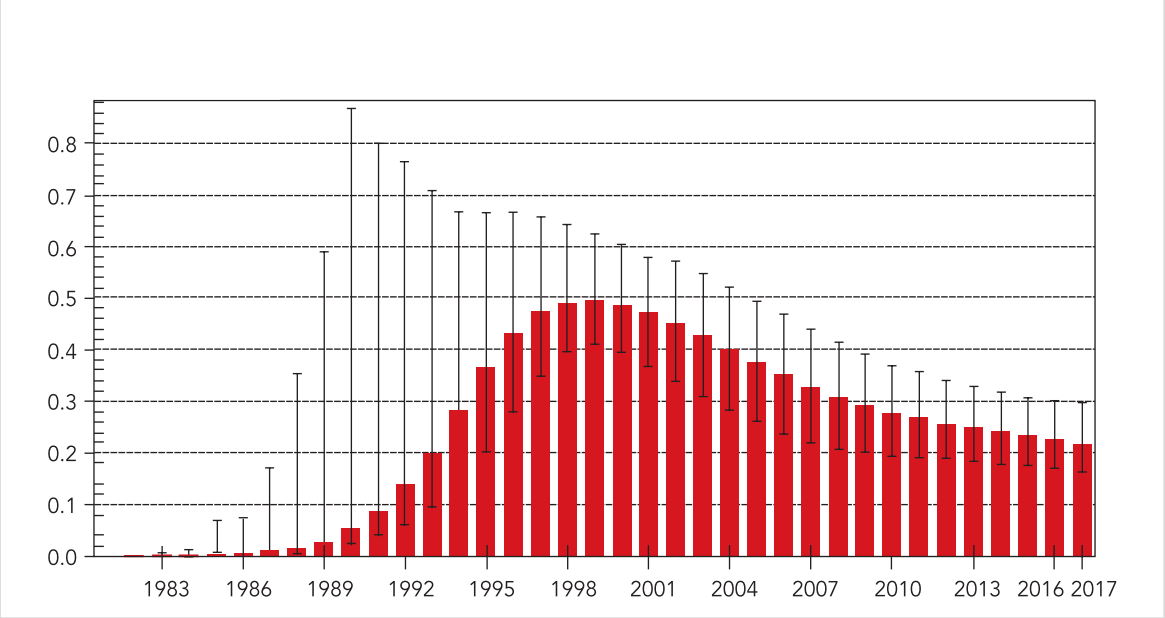
Adult (15-49 Yrs) Prevalence	Total	0.22 % [0.16-0.30]
	Male	0.25 % [0.18 - 0.34]
	Female	0.19 % [0.14 - 0.25]
Number of people living with HIV	Total	21.40 [15.90 - 28.39] lakh*
	Adults (15+ years)	20.79 [15.45 - 27.59] lakh
	Women (15+ years)	8.79 [6.61 - 11.62] lakh
	Children (<15 years)	0.61 [0.43 - 0.85] lakh
New HIV Infections	Total	87.58 [36.45 – 172.90] thousand
	Adults (15+ years)	83.84 [34.18 -166.63] thousand
	Women (15+ years)	33.57 [13.59 -65.79] thousand
AIDS-related deaths	Total	69.11 [29.94 -140.84] thousand
	Adults (15+ years)	66.54 [28.31 -135.94] thousand
	Women (15+ years)	20.48 [7.69 -53.27] thousand
PMTCT need	Total	22,677 [10,927-40,605]

* Lakh = 100,000

3.2 Adult HIV Prevalence (15-49 Years)

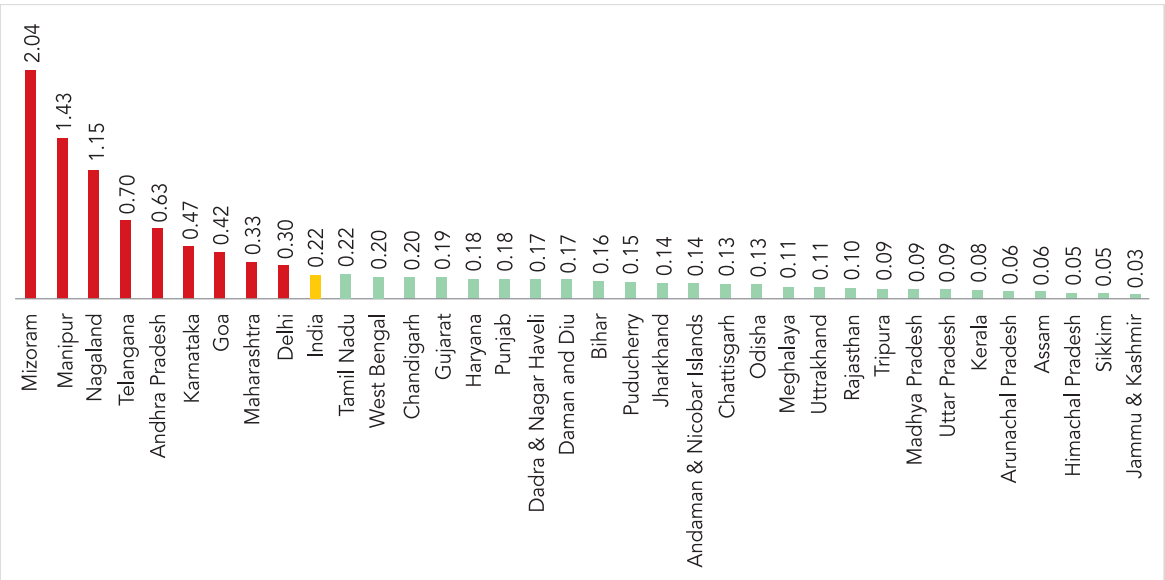
Adult HIV prevalence among 15-49-year old people has been declining in India. It was estimated at 0.22% [0.16-0.30] in 2017 (Figure 16).

FIGURE 16. Adult HIV Prevalence in India in 1981-2017, HIV Estimations 2017



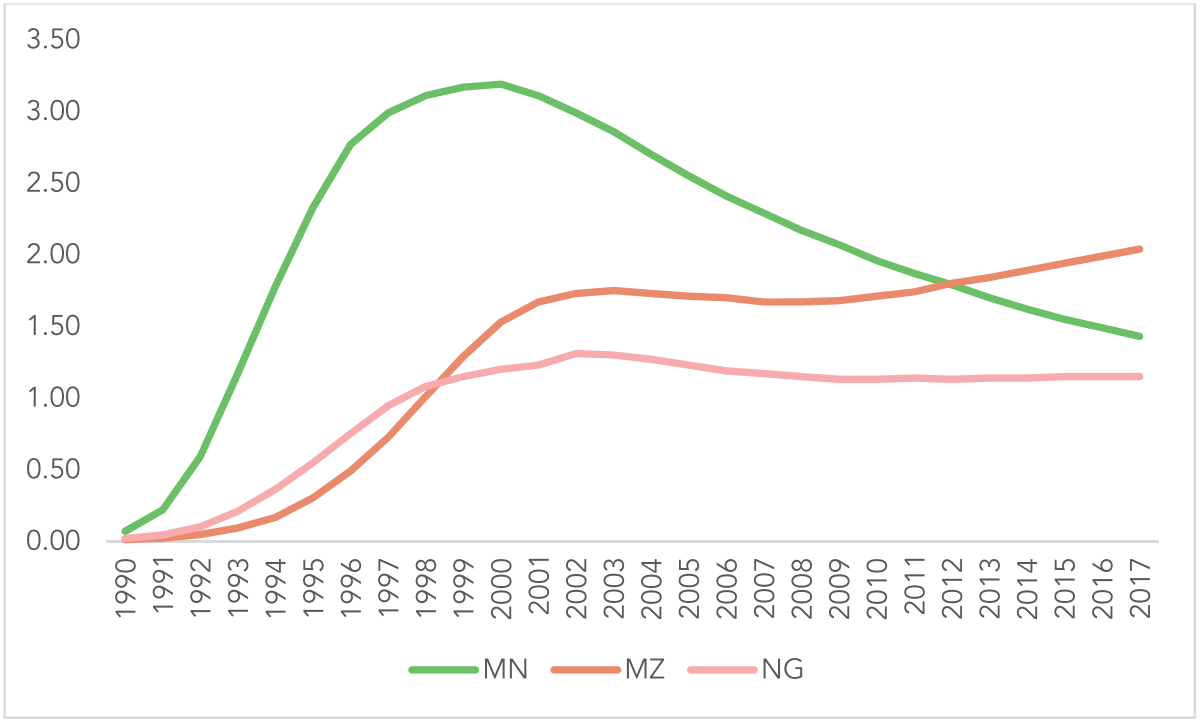
At 2.04% [1.57-2.56], Mizoram had the highest adult HIV prevalence in 2017, followed by Manipur at 1.43% [1.17-1.75] and Nagaland at 1.15% [0.92-1.41]. Telangana [0.70%, 0.50-0.95], Andhra Pradesh [0.63%, 0.47-0.85], Karnataka [0.47%, 0.37-0.63], Goa [0.42%, 0.21-0.79], Maharashtra [0.33%,0.25-0.45] and Delhi [0.30%, 0.18-0.47] were other States with an adult HIV prevalence higher than the national average. Tamil Nadu [0.22%, 0.14-0.31] had a point prevalence similar to the national prevalence (Figure 17). All other States had an adult HIV prevalence like the national average or lower, with lowest adult prevalence being in the State of Jammu & Kashmir [0.03%, 0.01-0.07].

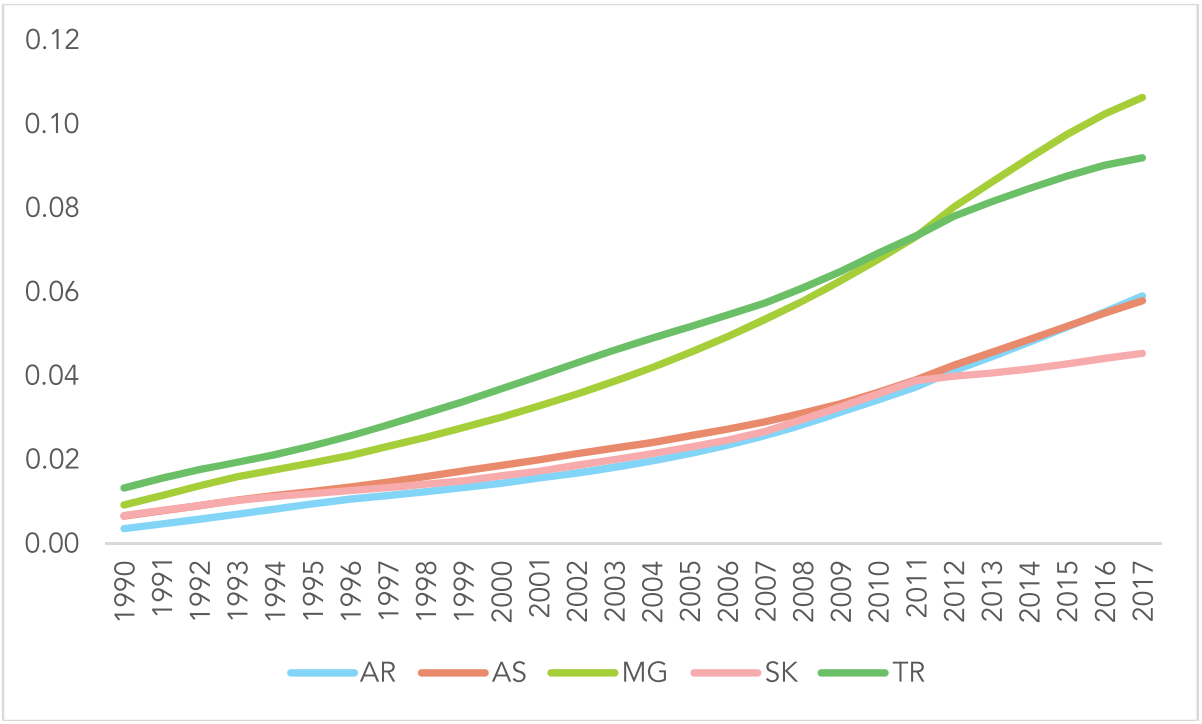
FIGURE 17. State wise Adult HIV Prevalence in 2017, HIV Estimations 2017



While the national adult HIV prevalence has been declining, there are significant inter-State variations. Even within a group of States, heterogeneity exists in the prevalence trend. In Northeast, the states of Manipur, Mizoram and Nagaland have a prevalence of over 1% but the epidemic trend in them varies considerably. In Manipur the prevalence declined after reaching a peak of around 3% in 1999 where as in Nagaland it is stable around 1% and in Mizoram it continues to rise after a period of stable trend. In the remaining states in the region the prevalence levels are low (in the range of 0.05 to 0.11) but rising (Figure 18).

FIGURE 18. Adult HIV Prevalence in North-eastern States during 1990 to 2017, HIV Estimations 2017[22]





22 Arunachal Pradesh (AR), Assam (AS), Manipur (MN), Meghalaya (MG), Mizoram (MZ), Nagaland (NG), Sikkim (SK) and Tripura (TR)

Variations in the trend of adult HIV prevalence are also visible in the Eastern States (Figure 19). In West Bengal, the prevalence has peaked and then declined. However, in the rest of States in this region (Bihar, Jharkhand and Odisha) the adult HIV prevalence is rising and still needs to attain the peak. Similarly, in the Central region, prevalence has declined after attaining a peak in Chhattisgarh, while in Madhya Pradesh and Uttar Pradesh, it plateaued after attaining the peak (Figure 20). All of these States have an adult HIV prevalence rate lower than the national average.

FIGURE 19. Adult HIV Prevalence in Eastern States during 1990 to 2017, HIV Estimations 2017[23]

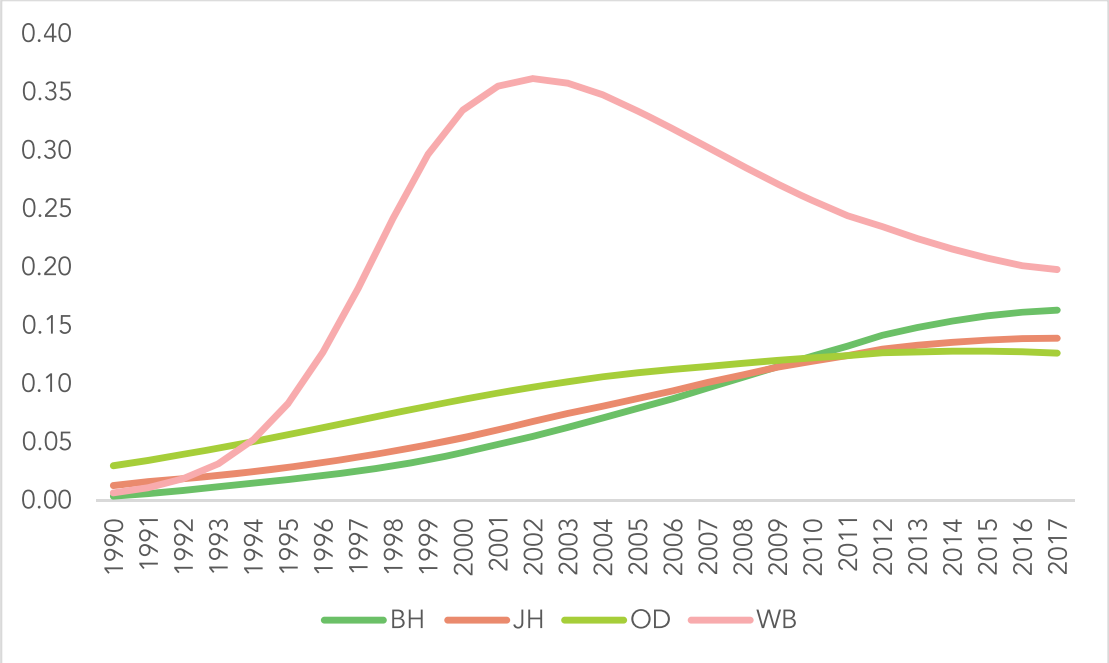
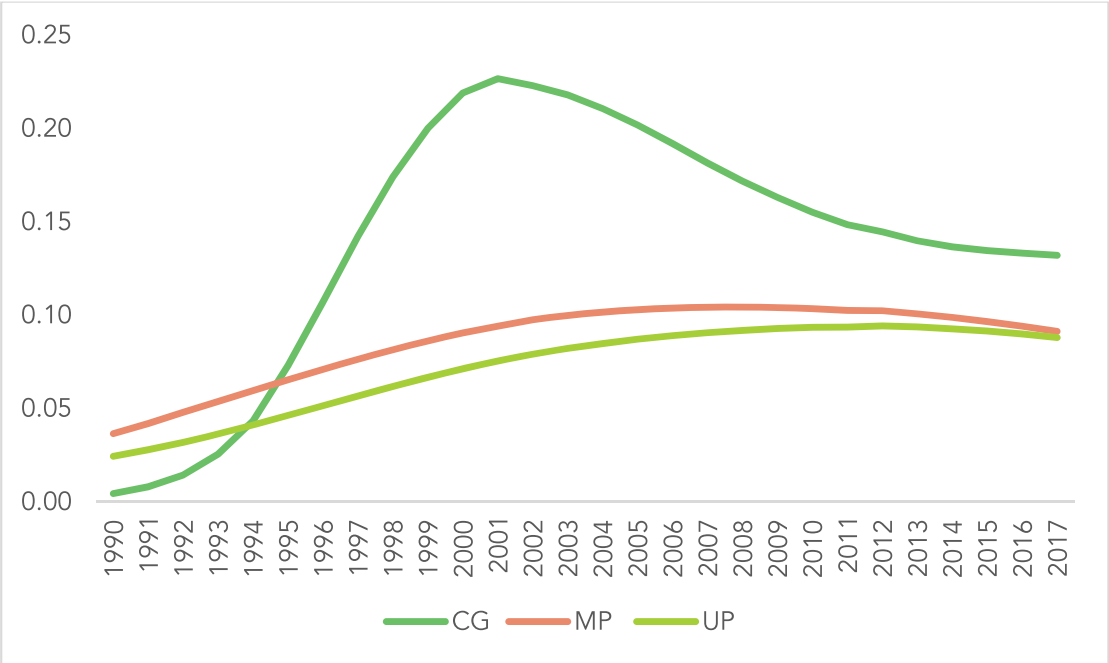


FIGURE 20. Adult HIV Prevalence in Central States during 1990 to 2017, HIV Estimations 2017[24]



23 Bihar (BH), Jharkhand (JH), Odisha (OD), West Bengal (WB)
24 Chhattisgarh (CG), Madhya Pradesh (MP) and Uttar Pradesh (UP)

All the States/UTs in the Northern region have shown a stable to rising trend in adult HIV prevalence (Figure 21). In the Western region, there are instead two types of prevalence curves. The States of Maharashtra and Goa have similar prevalence curves which peaked in 1997-98 and then declined significantly (Figure 22). The rest of the States/UTs in this region are experiencing rising prevalence trends. In the Southern region, all the major States (Andhra Pradesh, Karnataka, Kerala, Tamil Nadu and Telangana) have shown a declining prevalence trend (Figure 23).

FIGURE 21. Adult HIV Prevalence in Northern States/UTs during 1990 to 2017, HIV Estimations 2017[25]

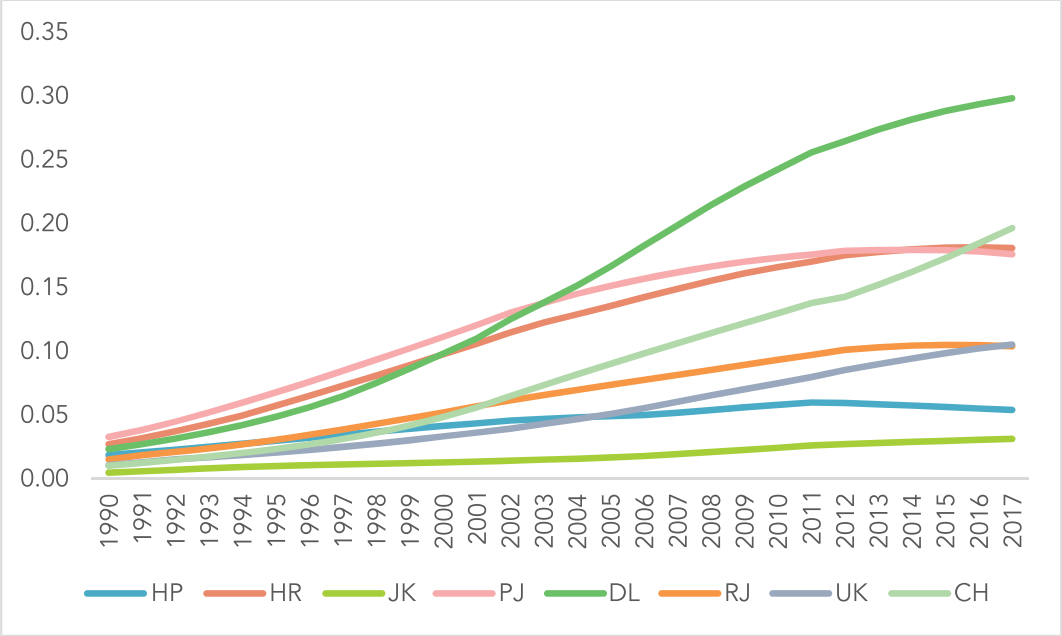
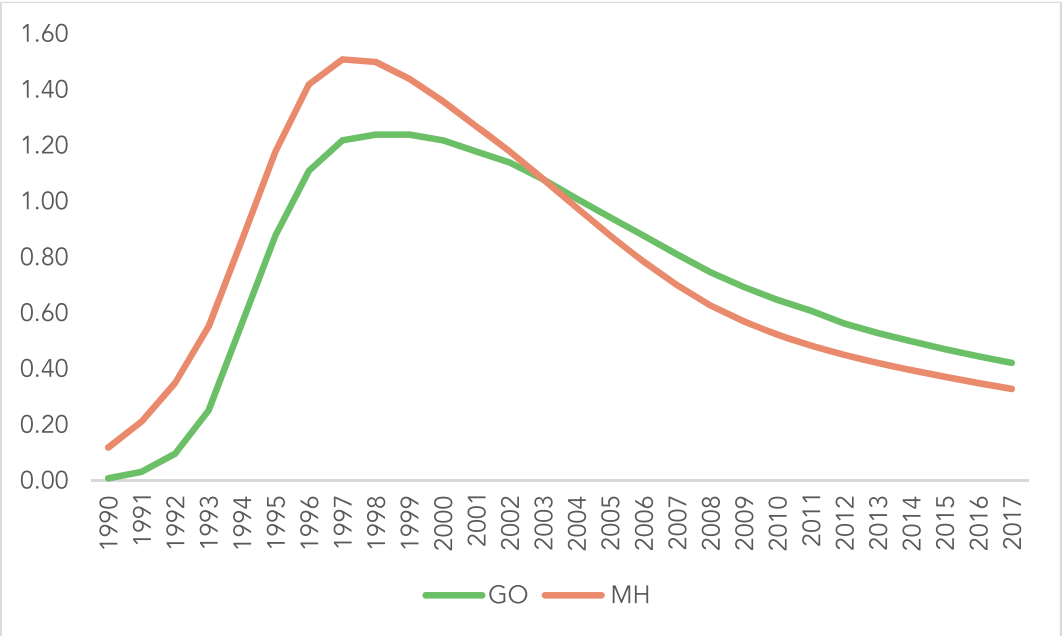


FIGURE 22. Adult HIV Prevalence in western States/UTs during 1990 to 2017, HIV Estimations 2017[26]



25 Chandigarh (CH), Delhi (DL), Haryana (HR), Himachal Pradesh (HP), Jammu & Kashmir (JK), Punjab (PJ), Rajasthan (RJ) and Uttarakhand (UK)

26 Dadra & Nagar Haveli (DNH), Daman & Diu (DD), Goa (GO), Gujarat (GJ), Maharashtra (MH)

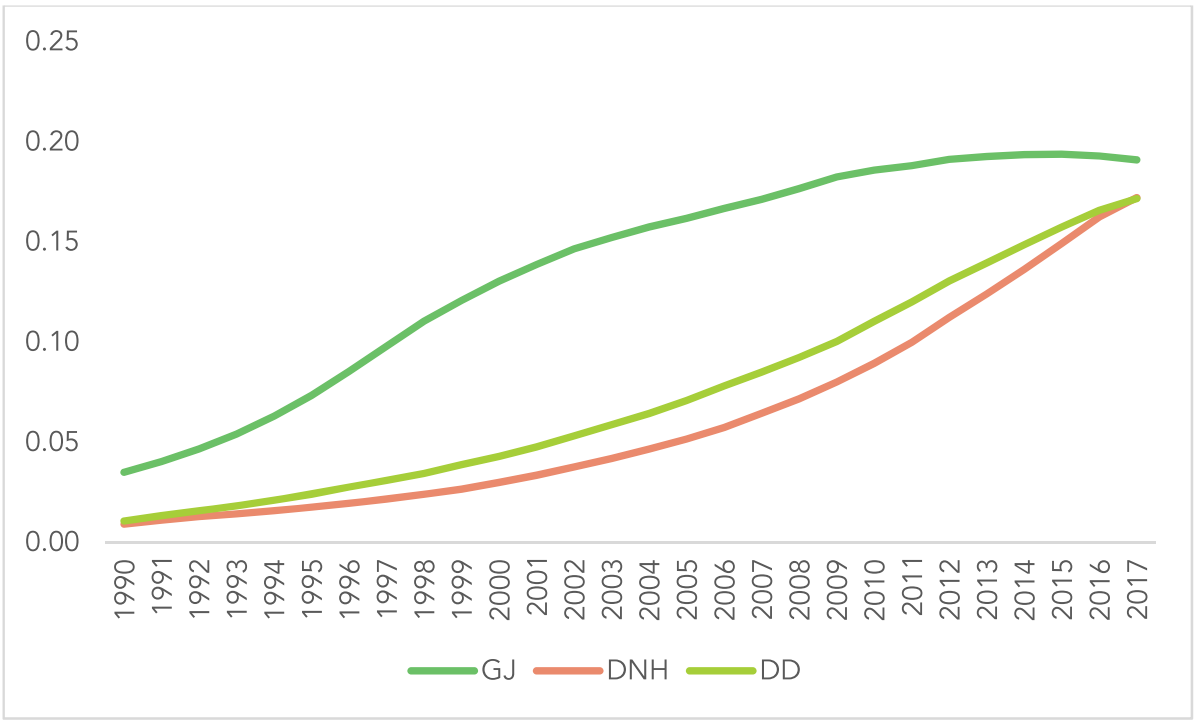
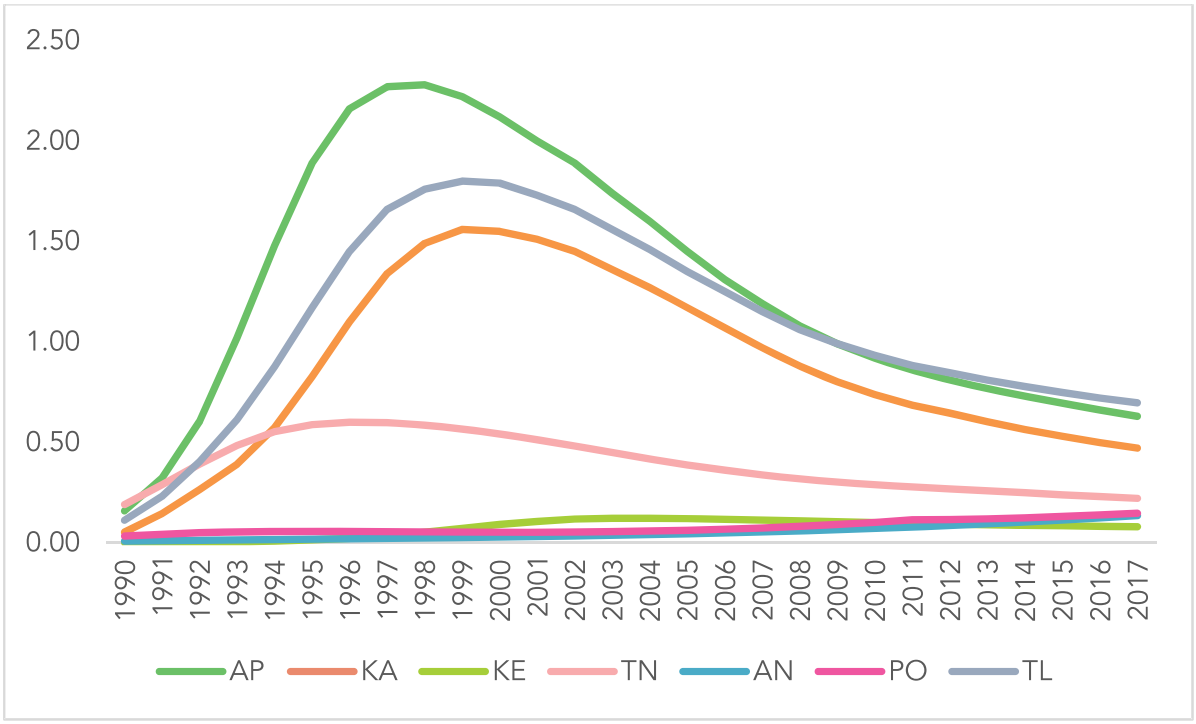


Figure 23. Adult HIV Prevalence in southern States/UTs during 1990 to 2017, HIV Estimations 2017[27]



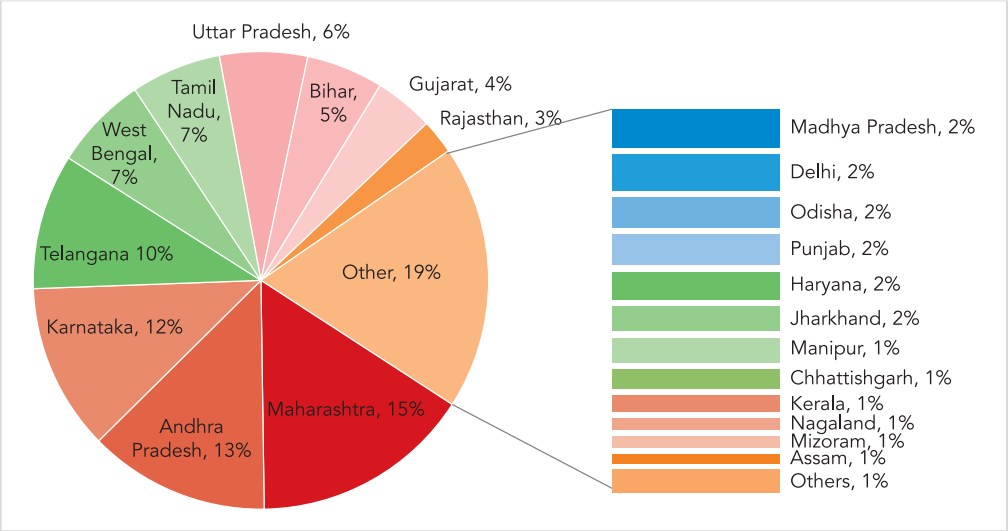
26 Dadra & Nagar Haveli (DNH), Daman & Diu (DD), Goa (GO), Gujarat (GJ), Maharashtra (MH)

27 Andaman & Nicobar Islands (AN), Andhra Pradesh (AP), Karnataka (KA), Kerala (KE), Puducherry (PO), Tamil Nadu (TN) and Telangana (TL)

3.3 PLHIV Number

The estimation show that India had around 21.40 lakh people living with HIV/AIDS in 2017. With 3.30 lakh [2.531-4.353] PLHIV, Maharashtra had the highest number of PLHIV contributing 15% to the total PLHIV size in the country. Andhra Pradesh [2.70 lakh, 2.005-3.581], Karnataka [2.47 lakh, 1.914-3.235] and Telangana [2.04 lakh, 1.495-2.773] are other States with PLHIV number in the range of 2 to 3 lakh. West Bengal had 1.44 lakh [1.038-1.914], Tamil Nadu 1.42 lakh [0.932-1.975], Uttar Pradesh 1.34 lakh [1.018-1.776] and Bihar 1.15 lakh [0.838-1.587] PLHIV in 2017. Together these 8 States contribute almost three fourths of total PLHIV in the country (Figure 24).

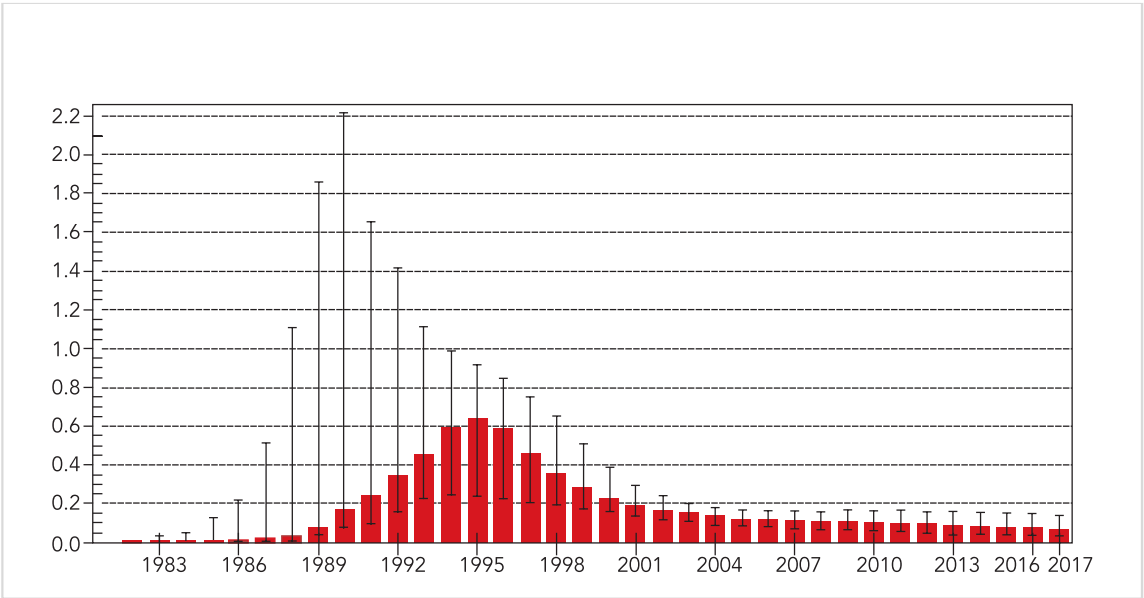
FIGURE 24. States/UTs wise percent distribution of total PLHIV in 2017, HIV Estimations 2017



3.4 HIV Incidence

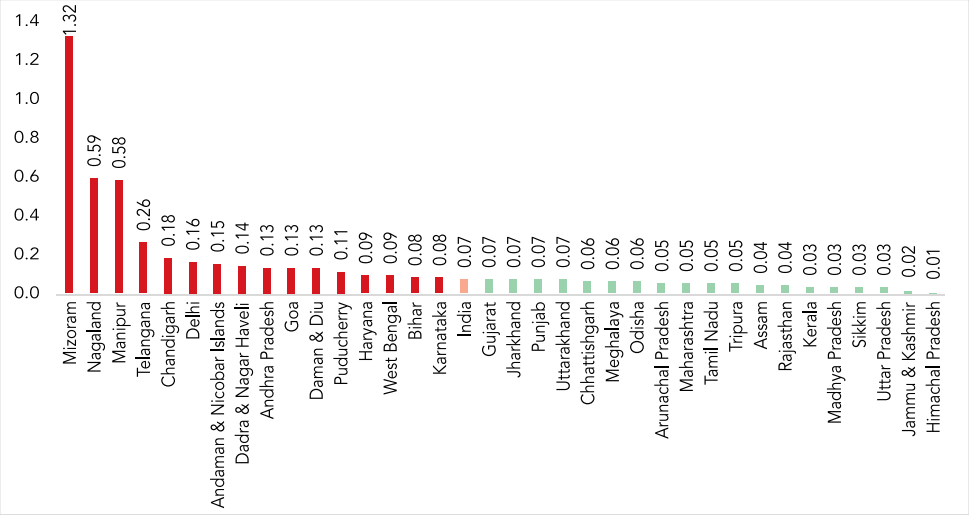
Prevention of new HIV infections continues to be the mainstay of India's national AIDS response and has resulted in significant reductions in HIV incidence. HIV incidence per 1000 uninfected population is estimated to have declined from 0.64 in 1995 to 0.07 in 2017. However, the pace of decline in HIV incidence has been slow of late, dropping from 0.10 in 2010 to 0.07 in 2017 (Figure 25).

FIGURE 25. HIV Incidence per 1000 uninfected population during 1981-2017, HIV Estimations 2017



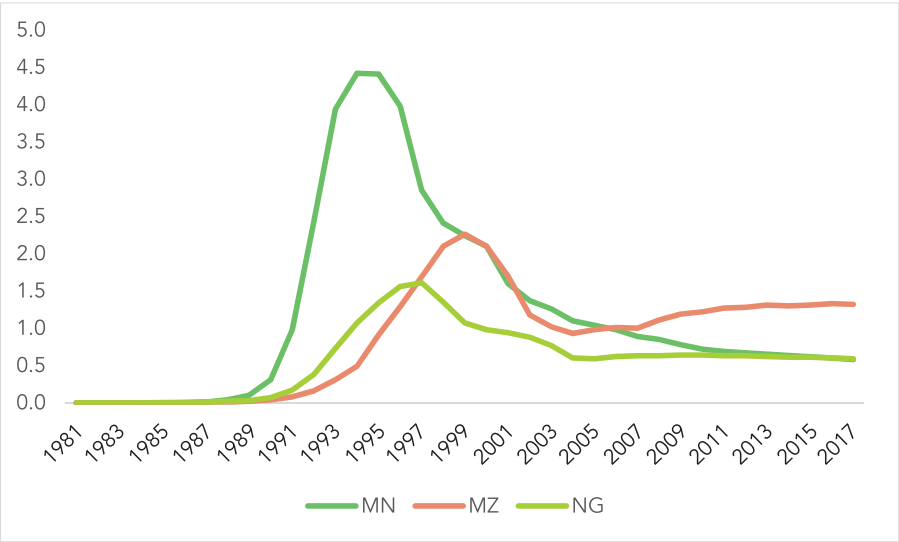
HIV incidence per 1000 uninfected population in 2017 was highest in Mizoram (1.32) followed by Nagaland (0.59) and Manipur (0.58). Telangana, Chandigarh, Delhi, Andaman & Nicobar Islands, Dadra & Nagar Haveli, Andhra Pradesh, Goa, Daman & Diu and Puducherry had HIV incidence per 1000 uninfected population in the range of 0.11 to 0.26. Haryana, West Bengal, Bihar, Karnataka, Gujarat, Jharkhand, Punjab, Uttarakhand, Chhattisgarh, Meghalaya, Odisha, Arunachal Pradesh, Maharashtra, Tamil Nadu and Tripura had HIV incidence per 1000 uninfected population in the range of 0.05-0.09. All other States/UTs had HIV incidence per 1000 uninfected population of less than 0.05 (Figure 26).

FIGURE 26. State/UT wise HIV Incidence per 1000 uninfected population in 2017, HIV Estimations 2017



As noted with prevalence, HIV incidence has been declining at national level. But there are significant inter-State variations. Even within a group of States, heterogeneity exits in the incidence trend. In the Northeast, there is the State of Manipur where incidence peaked to a very high level, and then declined but still it is almost eight times higher than the national level. Then, there are States of Nagaland and Mizoram, where incidence has been either stable to rising in recent past (Figure 27). In the States of Arunachal Pradesh, Assam, Meghalaya, Sikkim and Tripura, HIV incidence has been increasing, but remains at a relatively lower level.

Figure 27. HIV Incidence per 1000 uninfected population in North-eastern States in 1981-2017, HIV Estimations 2017[28]

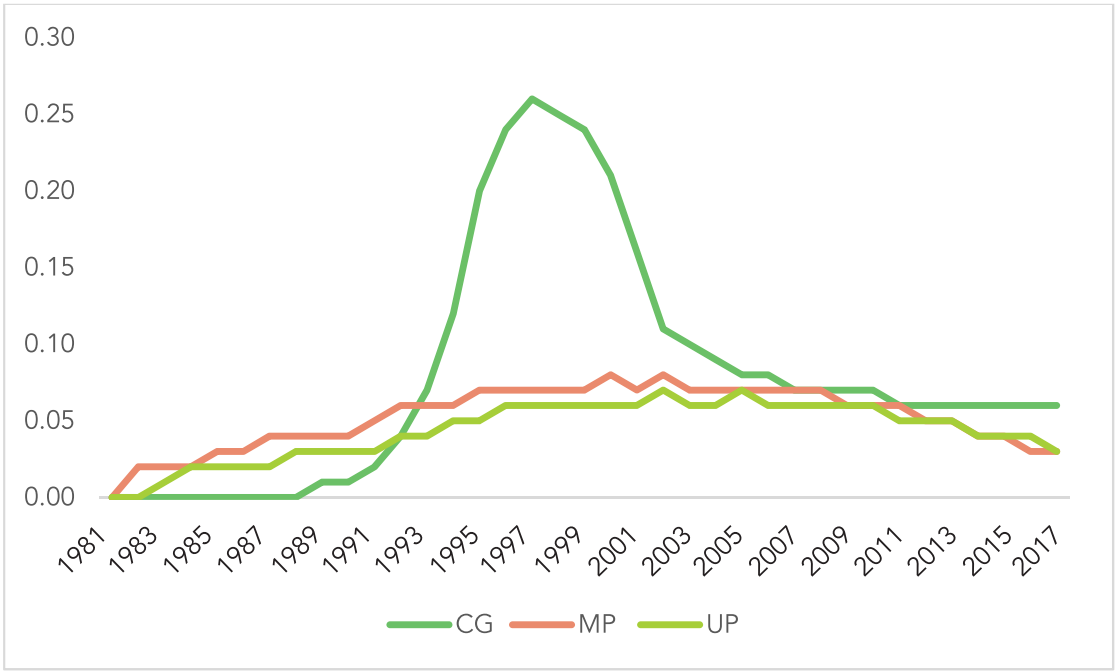


28 Manipur (MN), Mizoram (MZ), and Nagaland (NG)

Meanwhile, HIV incidence is declining in all Eastern States. However, there is variation in the level and timing of peak incidence. In West Bengal, incidence peaked in the late 1990s at 0.45% while in the remaining Eastern States, a peak was attained sometime in the 2006-2008 period at around 0.10% (Figure 28). Similarly, in the Central region, HIV incidence has been declining and was at much lower levels (Figure 29).

FIGURE 28. HIV Incidence per 1000 Uninfected Population in Eastern States in 1981-2017, HIV Estimations 2017[29]

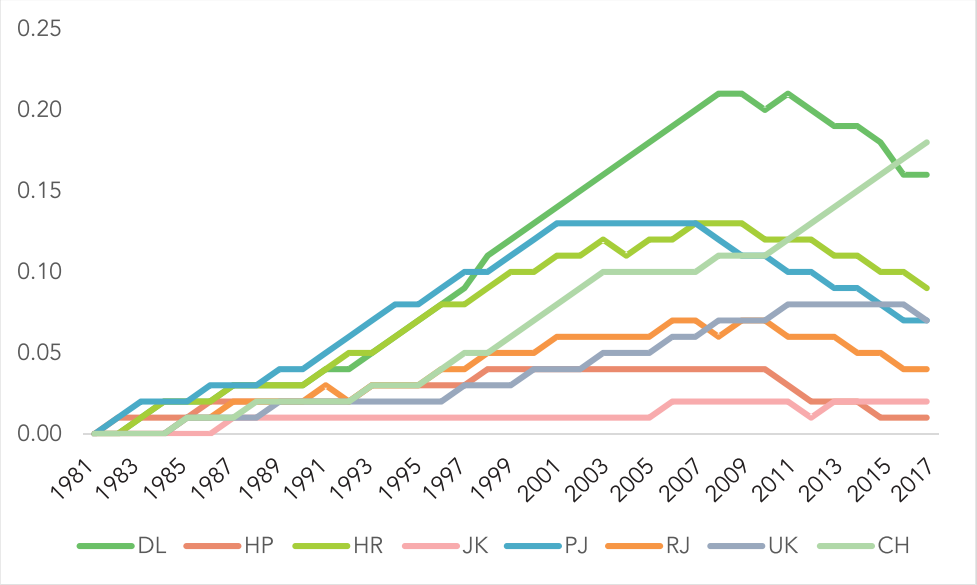
Figure 29. HIV Incidence per 1000 Uninfected Population in Central States in 1981-2017, HIV Estimations 2017[30]



29 Bihar (BH), Jharkhand (JH), Odisha (OD), West Bengal (WB)
30 Chhattisgarh (CG), Madhya Pradesh (MP) and Uttar Pradesh (UP)

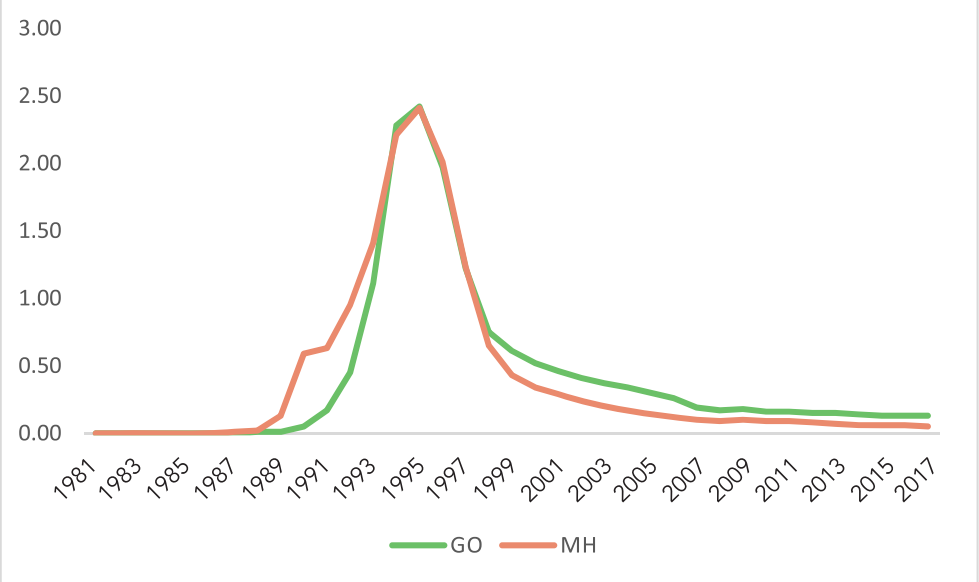
HIV incidence in Northern States/UTs is heterogenic, both in terms of level as well as in trend. In Delhi, Haryana, Himachal Pradesh, Punjab and Rajasthan, incidence has peaked (though at different points in time) and then started to decline. However, Delhi has had a much higher incidence level in comparison to the rest of States (Figure 30).

FIGURE 30. HIV Incidence per 1000 Uninfected Population in Northern States in 1981-2017, HIV Estimations 2017[31]

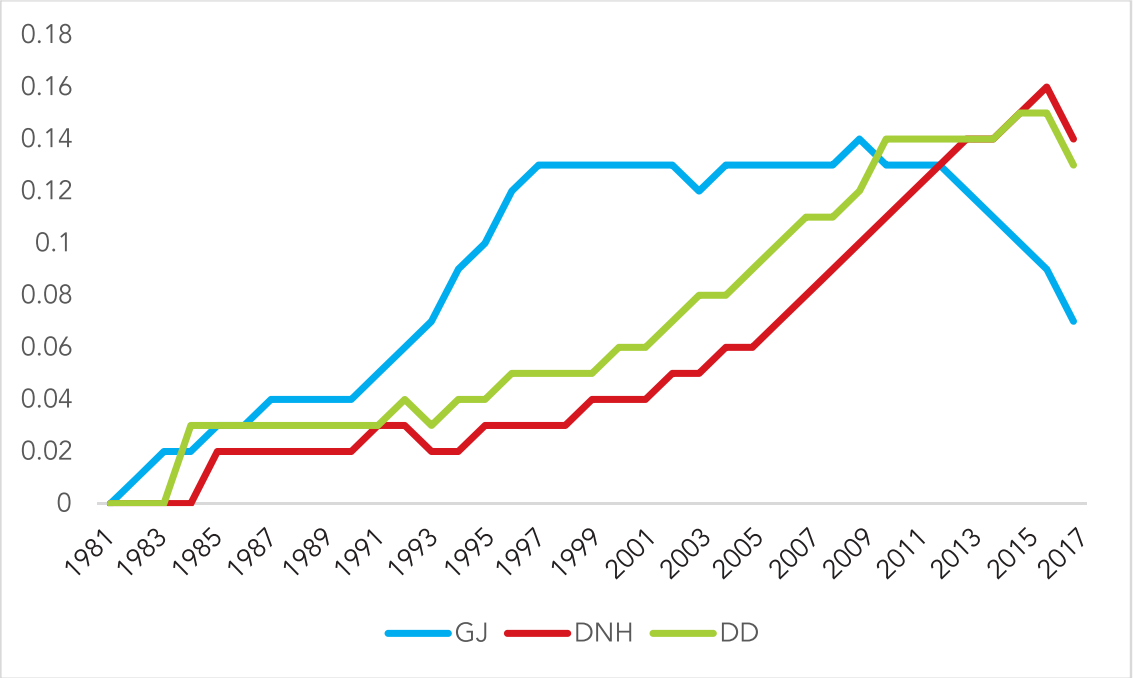


In the Western region, there are two main types of incidence trends. In the States of Maharashtra and Goa, incidence peaked in the mid-1990s and then declined significantly. In Gujarat it reached a peak in late 1990s, then stabilized until 2010 and thereafter started to decline sharply (Figure 31).

Figure 31. HIV Incidence per 1000 Uninfected Population in Western States in 1981-2017, HIV Estimations 2017[32]

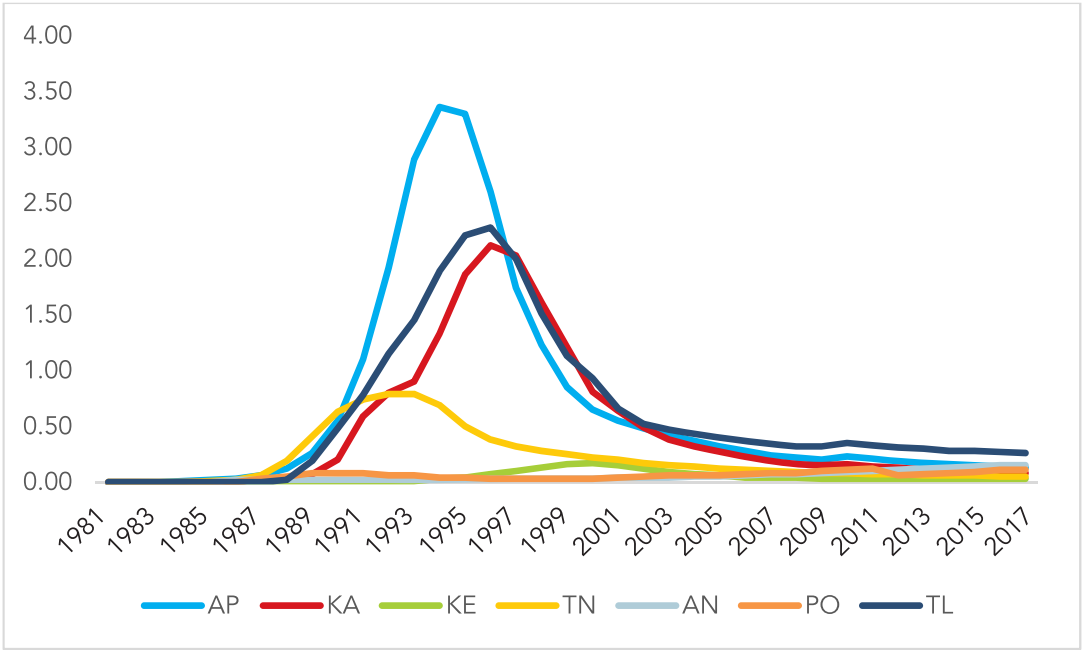


31 Chandigarh (CH), Delhi (DL), Haryana (HR), Himachal Pradesh (HP), Jammu & Kashmir (JK), Punjab (PJ), Rajasthan (RJ) and Uttarakhand (UK)
32 Dadra & Nagar Haveli (DNH), Daman & Diu (DD), Goa (GO) , Gujarat (GJ), Maharashtra (MH)



In the Southern region, all the major States (Andhra Pradesh, Karnataka, Tamil Nadu and Telangana) have shown a declining incidence trend except from Kerala which has had a stable trend at a very low level (Figure 32).

FIGURE 32. HIV Incidence per 1000 Uninfected Population in Southern States in 1981-2017, HIV Estimations 2017[33]



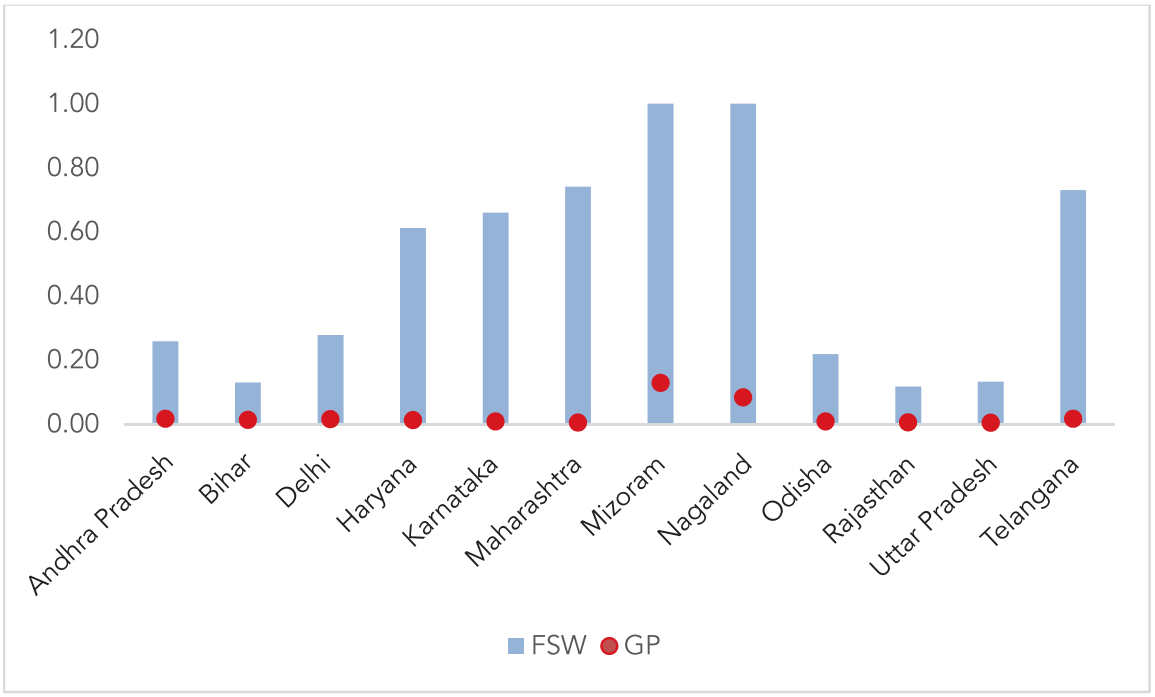
32 Dadra & Nagar Haveli (DNH), Daman & Diu (DD), Goa (GO) , Gujarat (GJ), Maharashtra (MH)

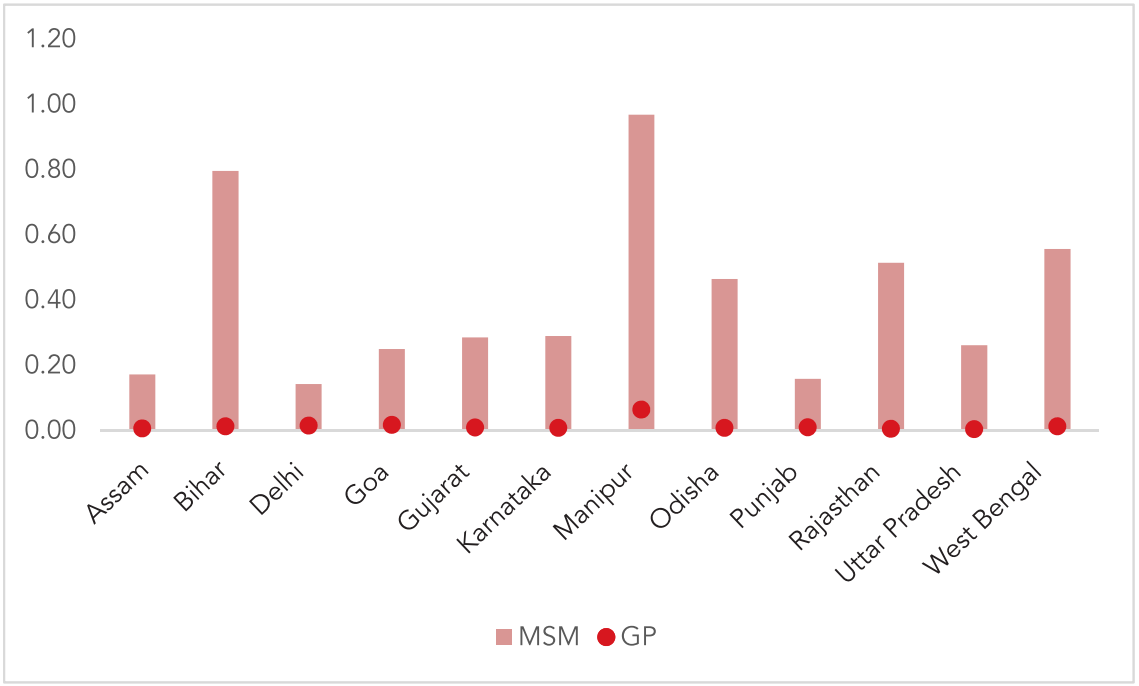
33 Andaman & Nicobar Islands (AN), Andhra Pradesh (AP), Karnataka (KA), Kerala (KE), Puducherry (PO), Tamil Nadu (TN) and Telangana (TL)

3.5 HIV Incidence among high risk group

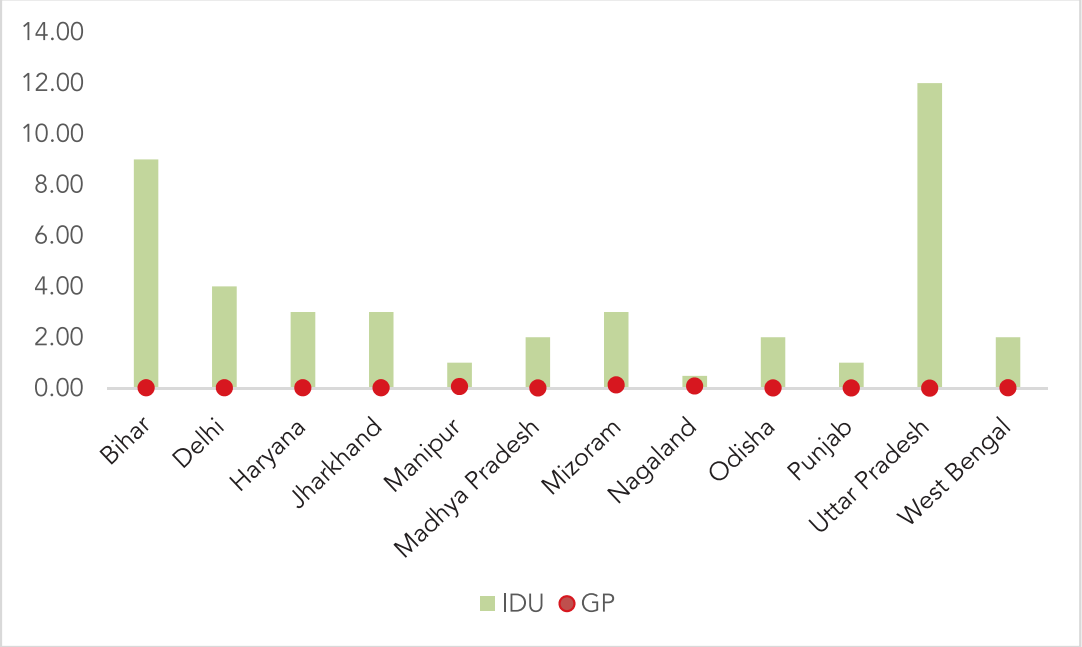
India has a concentrated epidemic with substantially higher HIV prevalence in high-risk groups (HRG) than in the general population (GP).[34] Figure 33 presents the percentage of uninfected HRG population who became infected in 2017 (HIV incidence rate) in comparison to that in the general population (aged 15-49 years).

Figure 33. HIV Incidence Among High-Risk Groups and General Population in 2017, Select States, HIV Estimations 2017





34 National AIDS Control Organization (2017). HIV Sentinel Surveillance: Technical Brief, India 2016-17. New Delhi: NACO, Ministry of Health and Family Welfare, Government of India

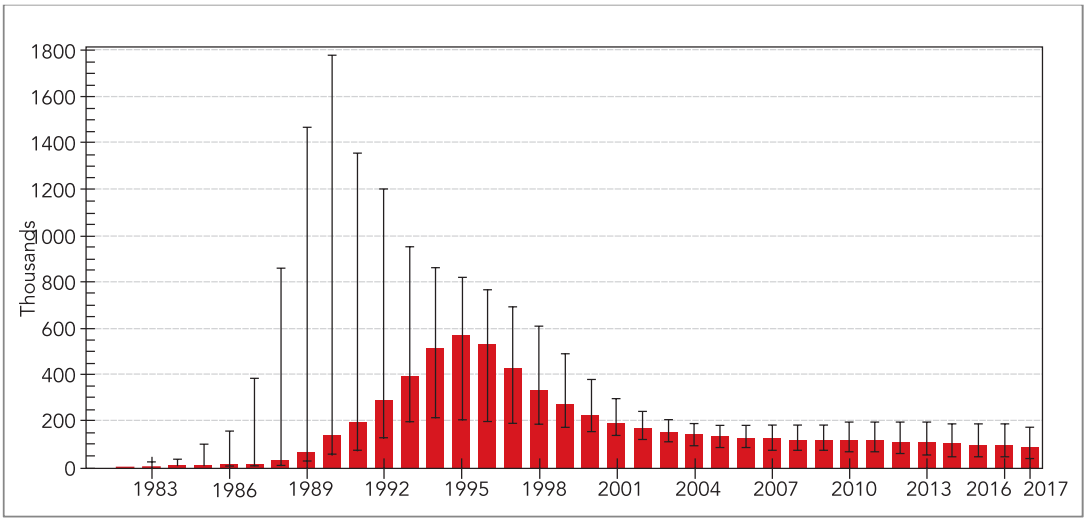


While the HIV incidence in the general population is low across all States/UTs except for a few, HIV incidence among HRGs is overall much higher. Within the HRG, the incidence rate is much higher among the IDU than the FSW or MSM. Among FSW, the highest incidence is estimated in the States of Mizoram and Nagaland. Even in the erstwhile high prevalence States of Maharashtra, Karnataka and Telangana, incidence is much higher among FSW than the general population. Similar pattern is noticed among MSM and IDU also. Among MSM, Manipur followed by Bihar, West Bengal, Rajasthan and Odisha have highest incidence while among IDUs, UP and Bihar recorded the highest incidence.

3.6 New HIV Infections

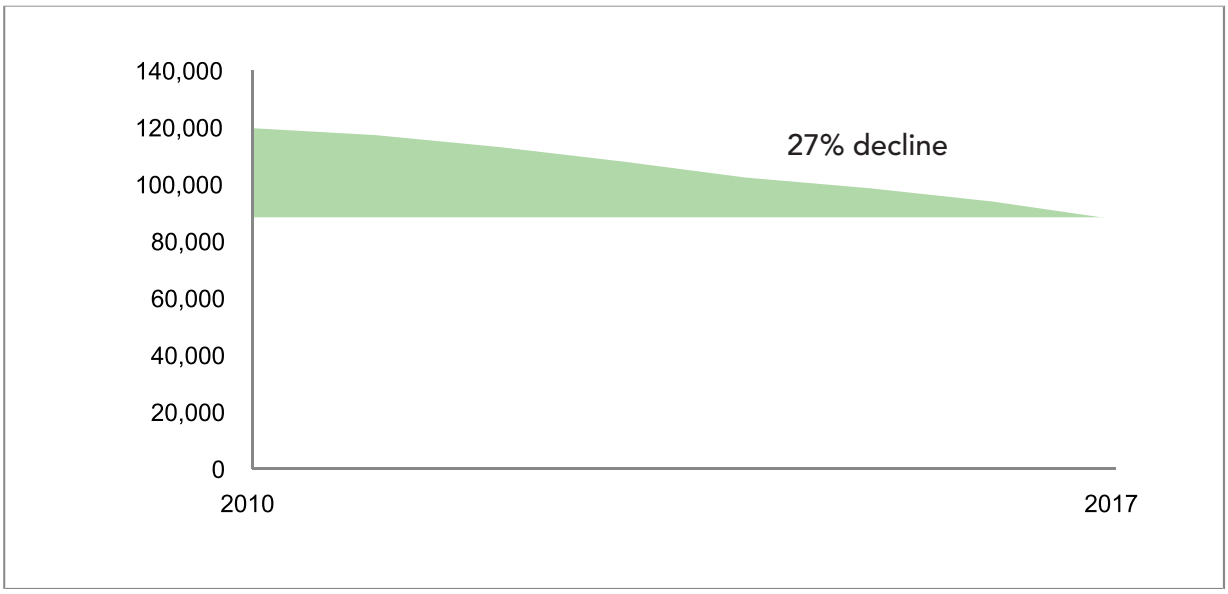
Reducing the new HIV infections by 75% from the baseline value of 2010 is an integral component of the 2020 Fast track targets. The new infections are estimated to have peaked in 1995 and then started to decline. Around 87.58 thousand [36.45 – 172.90] new HIV infections occurred in 2017 indicating about 85% decline in annual new HIV infections since the peak of 1995 (Figure 34).

FIGURE 34. New HIV Infections over the Years, HIV Estimations 2017



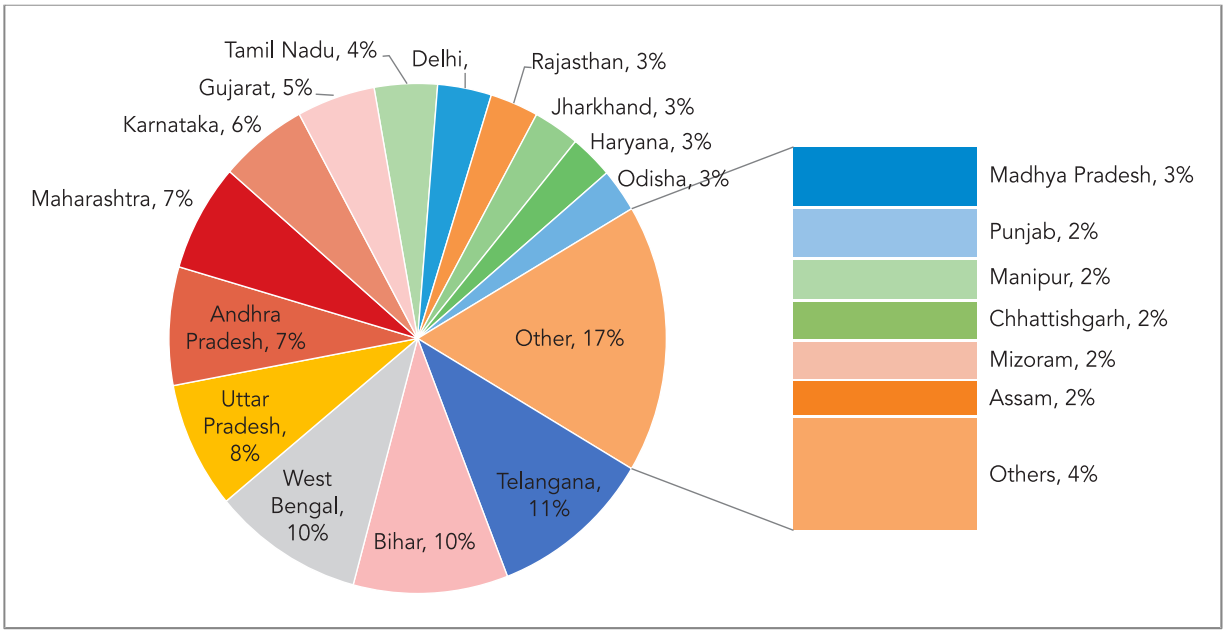
The pace of decline in new HIV infections has reduced since 2010. From 2010 to 2017 new infections have declined by only 27%. Clearly, the progress on prevention goals has been slow (Figure 35).

FIGURE 35. New HIV Infections in 2010-2017, HIV Estimations 2017



With 9,324 [4,860-14,768] new HIV infections in 2017, Telangana contributes maximum (11%) to total new infections in the country. Bihar was the next contributing 10% of total new HIV infections followed by West Bengal (10%), Uttar Pradesh (8%), Andhra Pradesh (7%), Maharashtra (7%), Karnataka (6%) and Gujarat (5%). Together, these 8 States contribute almost two thirds of country annual new HIV infections (Figure 36).

FIGURE 36. States/UTs Wise Percent Distribution of Annual New HIV Infections in 2017, HIV Estimations 2017



While the new infections are declining nationally, there are inter-State variations (Figure 37 & 38). In Arunachal Pradesh (65%), Assam (37%), Mizoram (18%), Meghalaya (10%) and Uttarakhand (4%), annual new infections increased in 2017 in comparison to 2010. In the remaining States, the trend was declining. However, there were variations in the level of decline. In the States of Chhattisgarh, Delhi, Jammu & Kashmir, Manipur and Nagaland, the decline has been less than 10%. In the States of Bihar, Goa, Haryana, Jharkhand, Kerala, Sikkim, Tripura, West Bengal and Telangana, the decline was in range of 10%-25%. In the erstwhile high prevalence States of Andhra Pradesh (39%), Karnataka (46%), Maharashtra (41%) and Tamil Nadu (32%), decline in new infections was much higher.

FIGURE 37. State/UT wise change in Annual New Infections (%) from 2010-2017, HIV Estimations 2017

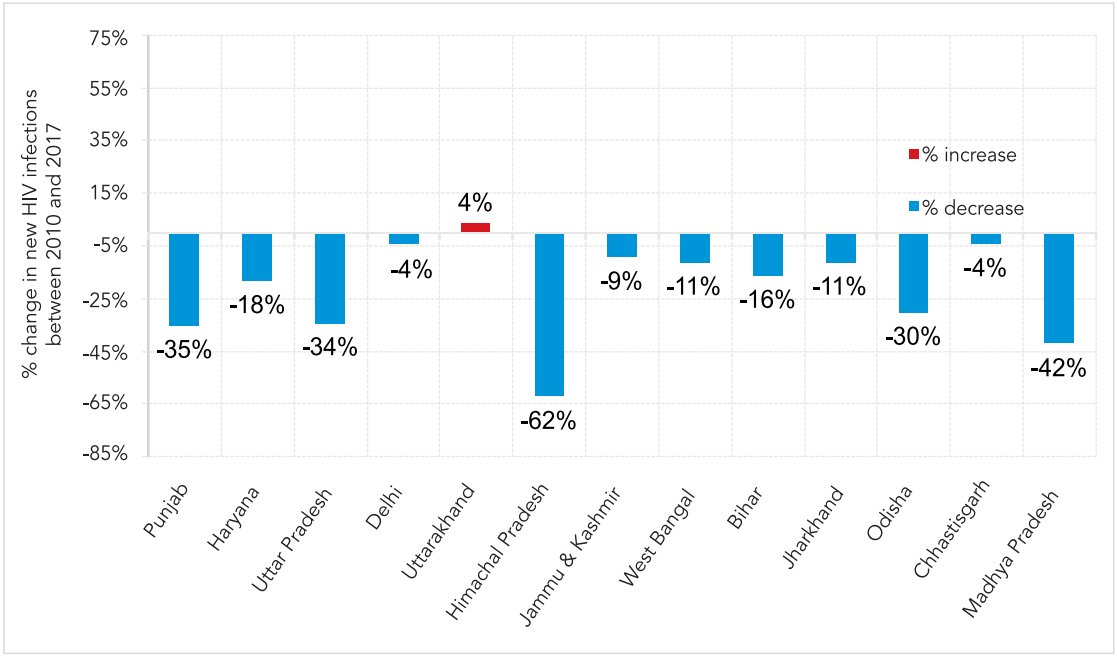
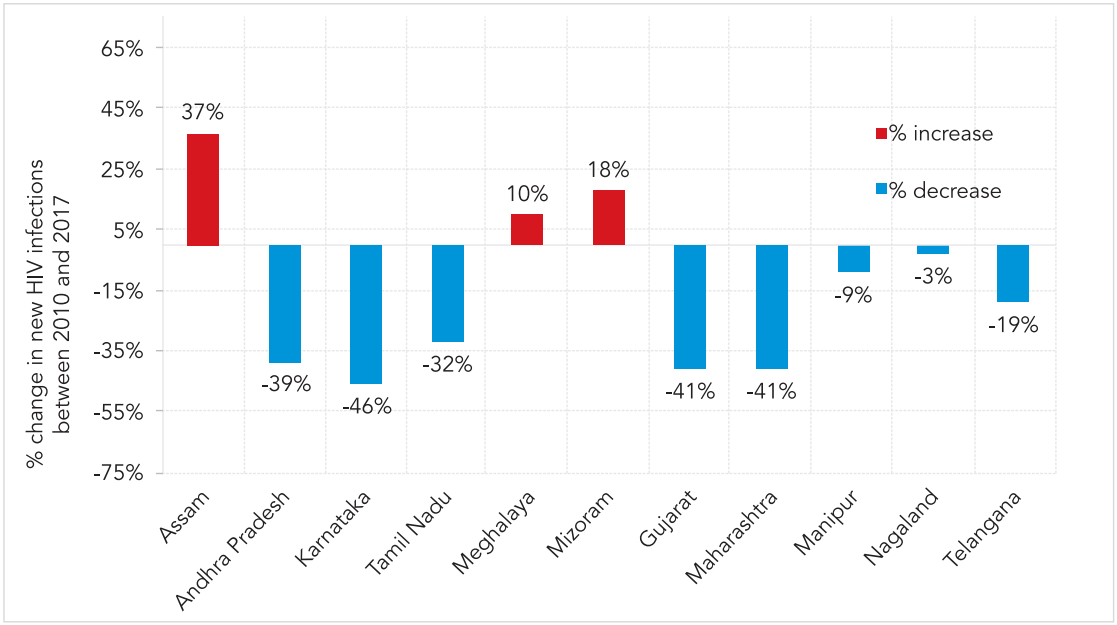


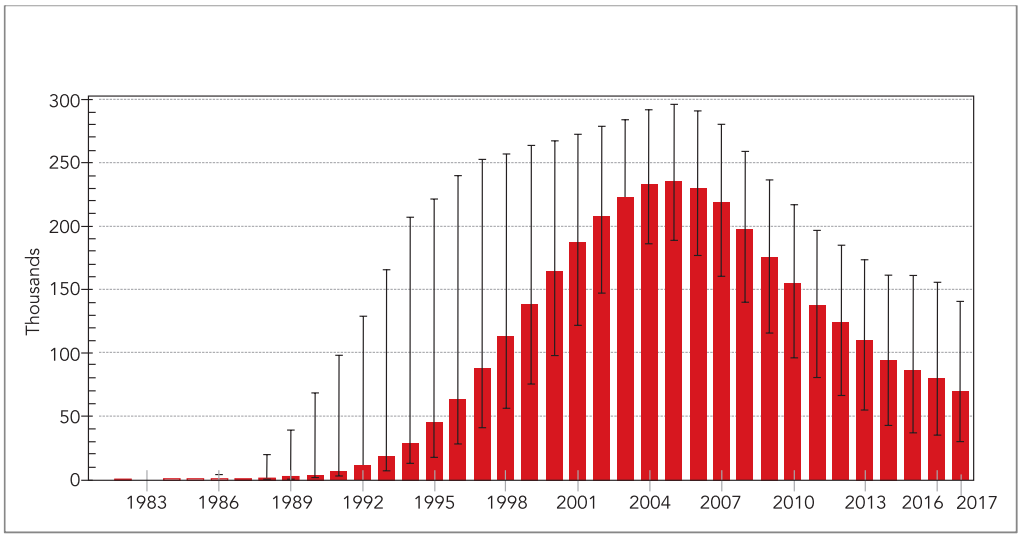
FIGURE 38. State/UT wise change in Annual New Infections (%) from 2010-2017, HIV Estimations 2017



3.7 AIDS Related Deaths

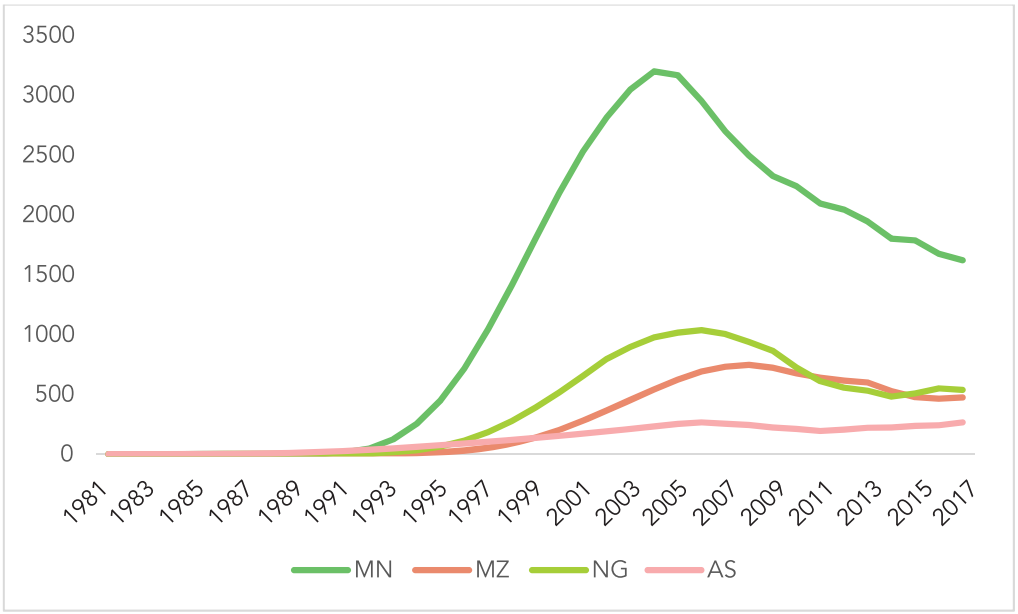
Changes in AIDS related deaths imply the impact of ART programme. Nationally, around 69.11 thousand [29.94 -140.84] PLHIV died of AIDS related causes in 2017. Annual AIDS related deaths among PLHIV kept on increasing till 2005 and then started to decline. Since the peak, the annual AIDS related deaths have declined by almost 71% (Figure 39).

FIGURE 39. AIDS-Related Deaths over the years, HIV Estimations 2017



In line with the national trend, the number of AIDS-related deaths has dropped in most of India's States/UTs after attaining the peak between 2005-2010 (Figure 40-45). Exceptions are Assam, where AIDS-related deaths remained stable, in Bihar, Jharkhand and Haryana they have been rising, and Delhi and Uttarakhand they rose until the recent past. Decline in deaths from AIDS-related illnesses were sharpest in earlier high-prevalence States including Andhra Pradesh, Karnataka, Maharashtra, Tamil Nadu and Telangana in the Southern and Western regions of the country.

Figure 40. AIDS-Related Deaths over the years in Select North-eastern States, HIV Estimations 2017[35]



35 Assam (AS), Manipur (MN), Mizoram (MZ), Nagaland (NG)

FIGURE 41. AIDS-Related Deaths over the years in Eastern States, HIV Estimations 2017[36]

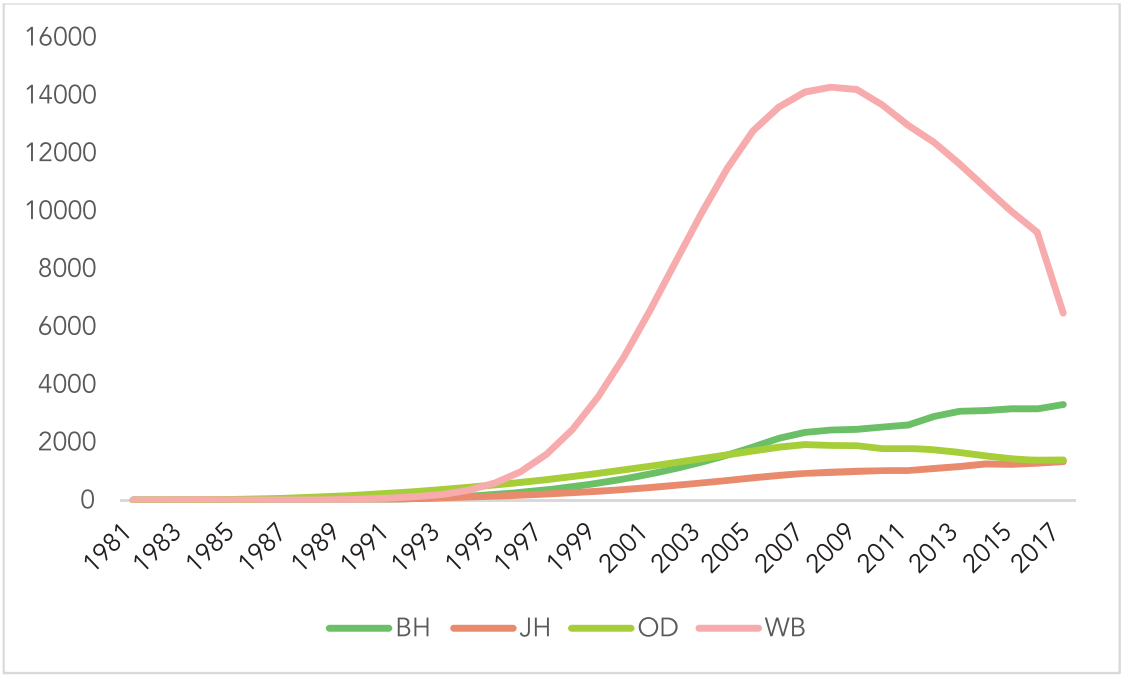
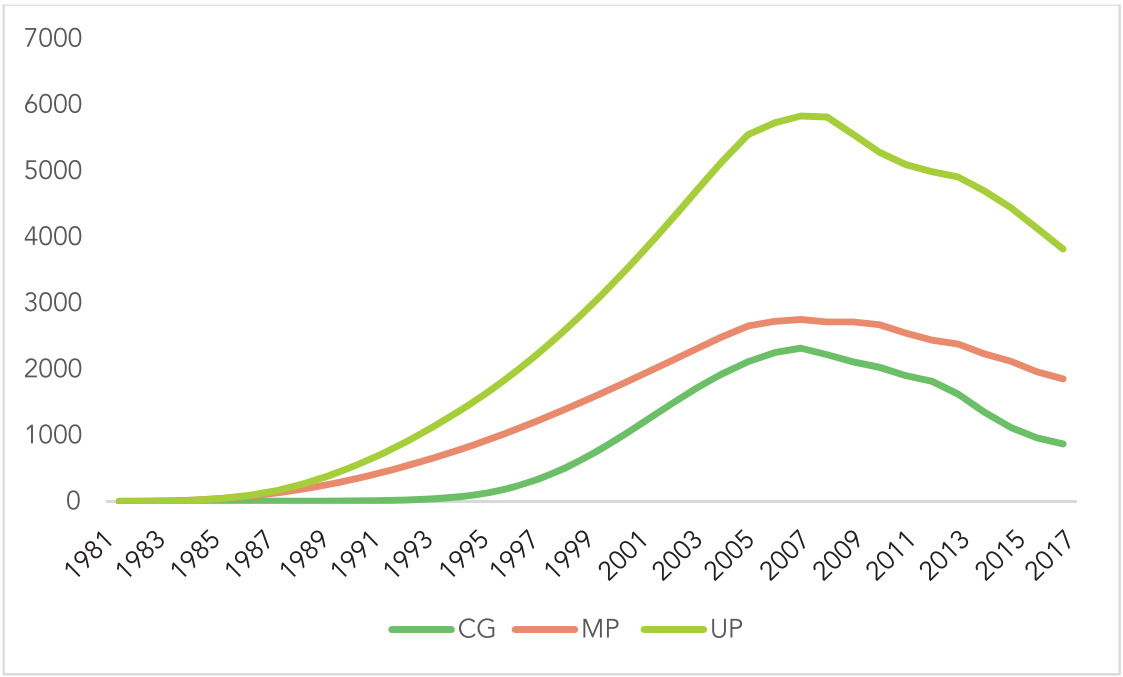


FIGURE 42. AIDS-Related Deaths over the years in Central States, HIV Estimations 2017[37]



36 Bihar (BH), Jharkhand (JH), Odisha (OD), West Bengal (WB)
37 Chhattisgarh (CG), Madhya Pradesh (MP), Uttar Pradesh (UP)

FIGURE 43. AIDS-Related Deaths over the years in Northern States, HIV Estimations 2017[38]

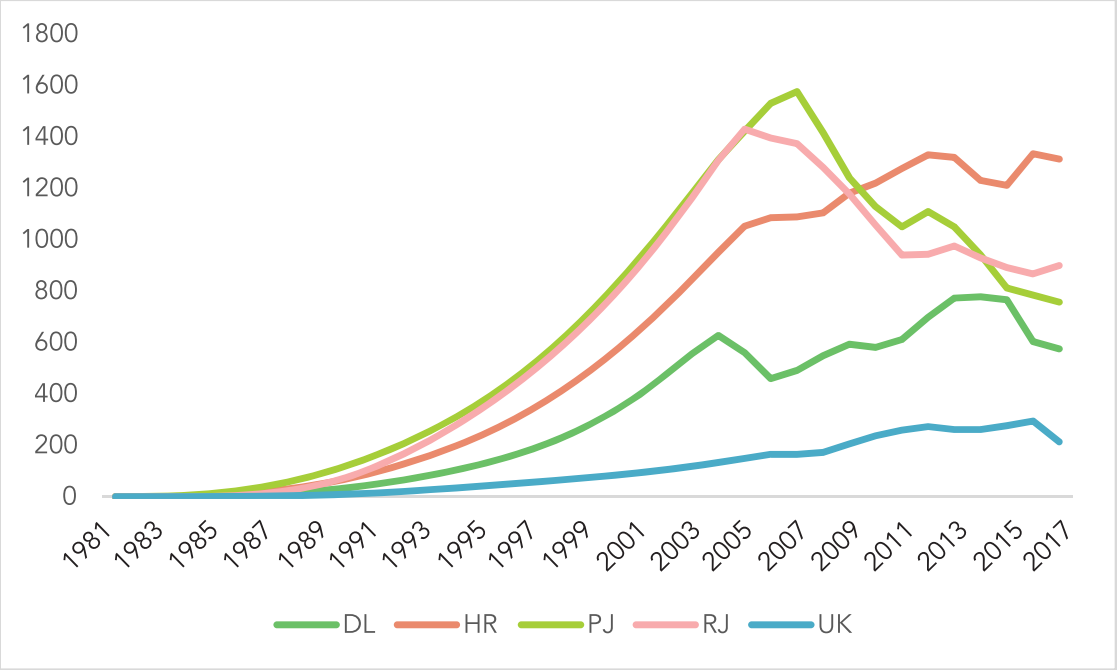
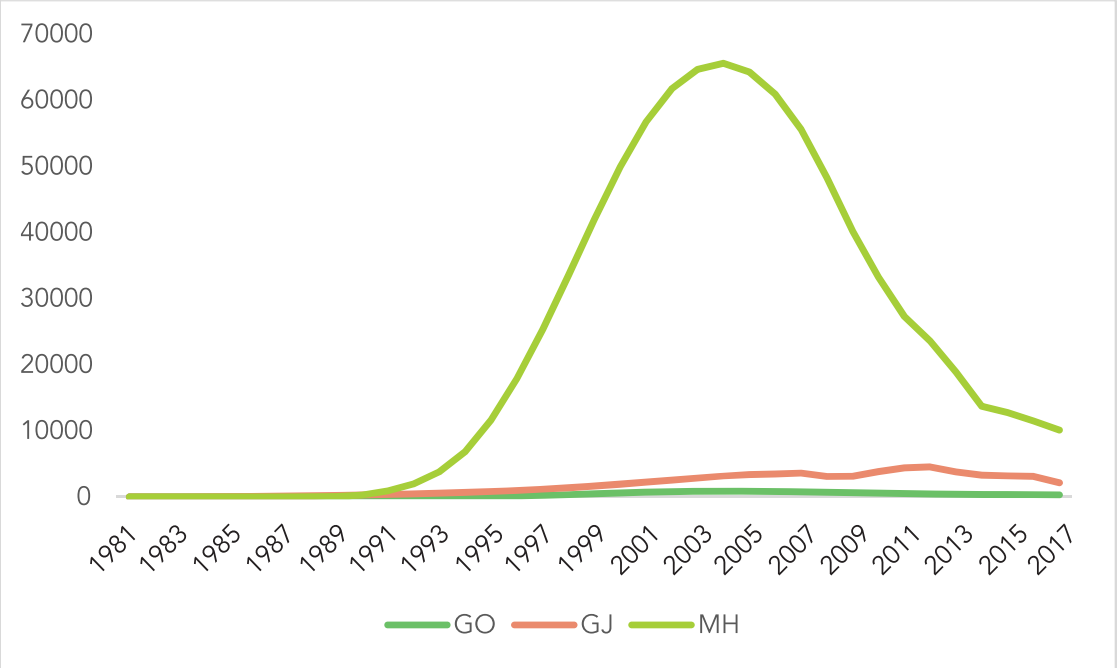
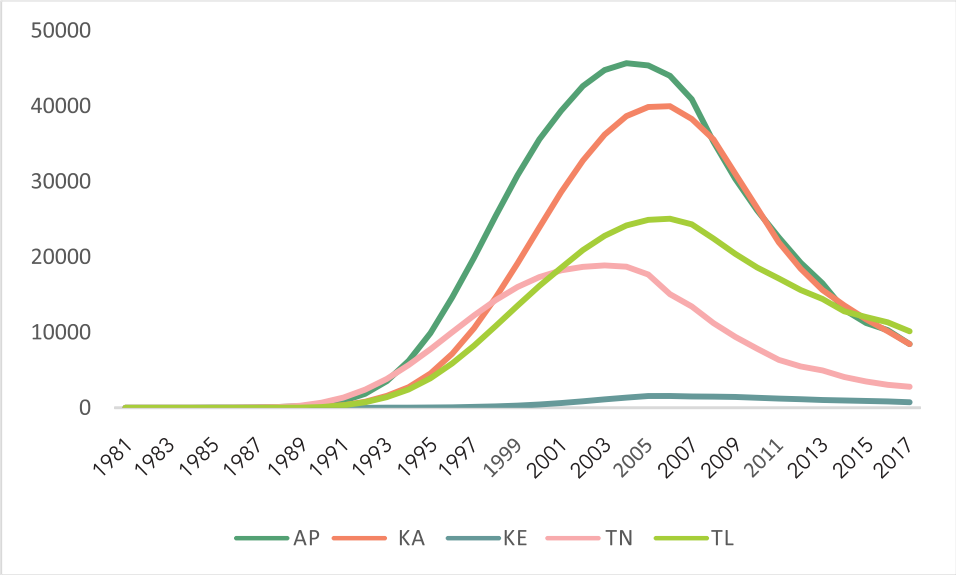


FIGURE 44. AIDS-Related Deaths over the years in Western States, HIV Estimations 2017[39]



38 Delhi (DL), Haryana (HR), Punjab (PJ), Rajasthan (RJ), Uttarakhand (UK)
39 Goa (GO), Gujarat (GJ), Maharashtra (MH)

FIGURE 45. AIDS-Related Deaths over the years in Southern States, HIV Estimations 2017[40]

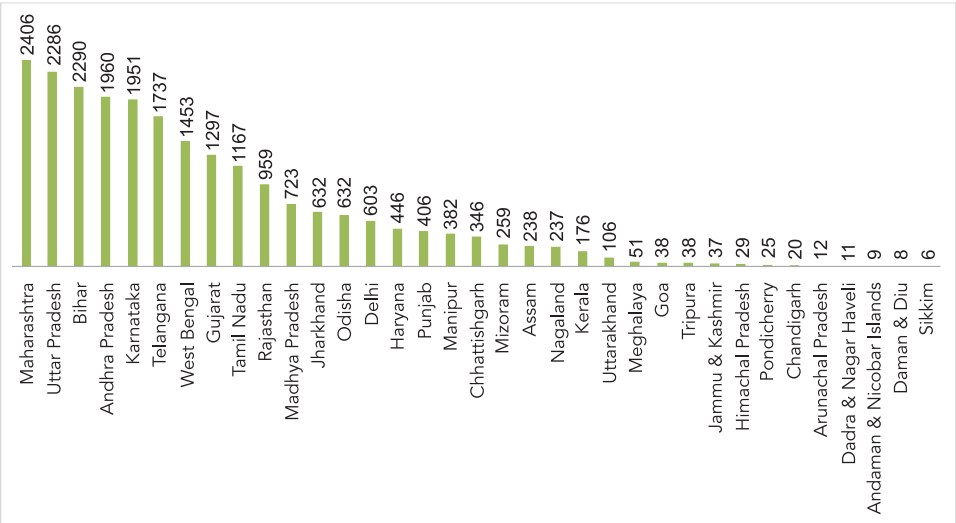


3.8 Prevention of Mother to Child Transmission need

Prevention of mother-to-child transmission (PMTCT) need is defined as the number of HIV-positive women giving birth in a year requiring prophylaxis to prevent HIV transmission to their baby. This indicator is used by the National AIDS Control Programme (NACP) for the planning and budgeting of PMTCT interventions. Besides, the estimates derived from Spectrum are also used as a denominator for assessing PMTCT ART coverage as an important process indicator to monitor progress made on MTCT elimination targets with the aim of achieving ≥95% ART coverage of HIV-positive pregnant women giving birth.[41]

India is estimated to have had around 22,677 [10,927-40,605] HIV-positive women who gave birth in 2017 and needed ART prophylaxis to prevent HIV transmission to their baby. State/UT wise, PMTCT needs were highest in the State of Maharashtra followed by Uttar Pradesh, Bihar, Andhra Pradesh, Karnataka, Telangana, West Bengal, Gujarat, Tamil Nadu and Rajasthan (Figure 46). Together, these ten States contributed almost three fourth of the overall PMTCT need in the country.

FIGURE 46. State/UT Wise PMTCT need in 2017, HIV Estimations 2017



40 Andhra Pradesh (AP), Karnataka (KA), Kerala (KE), Tamil Nadu (TN), Telangana (TL)
41 Consolidated strategic information guidelines for HIV in the health sector; World Health Organization 2015

4. SUMMARY AND CONCLUSIONS

HIV Estimations 2017 is the latest round in a series of estimation exercises that have been conducted in India since 1998. The modelling tool used for the development of this estimation round is the UNAIDS recommended Spectrum version 5.63. India has consistently used Spectrum in this kind of exercise for a long time but, as new improved Spectrum versions became available globally, it has adopted the latest recommended versions, as in previous rounds, to ensure its results are regionally and internationally comparable.

In the current round of estimations, a total of 35 models were developed for each State/UT separately and then aggregated into a model for production of national level HIV estimates. This is not an easy task, especially because in India estimations are developed in a very participatory manner with involvement of experts from NACO, ICMR-NIMS, Regional Institutes, SACS and independent specialists. The estimates development and vetting process takes in general nearly one year, with many workshop sessions which also involve capacity building of epidemiologists, statisticians, demographers and programme managers who will be able to take this kind of activities forward in the future while building on the past.

As in earlier rounds of estimation, it is important to reiterate that comparisons over time should always be done using the time series data from same round of estimations. The reason is that data inputs change over time and so do some of the assumptions in the Spectrum model. This means that it is not possible to compare results of earlier published estimates with the results of current round. Until the publication of the next updated estimations in India, the results presented in the current report are those that need to be referred to for any need. These are based on the very latest surveillance and survey data which was inputted in the models and have added to the precision of the HIV estimations.

The Spectrum version 5.63, used in this round, has also been updated by the UNAIDS Reference Group on Estimates, Models and Projections based on evidence gathered around the world to fine-tune assumptions underpinning the Spectrum modelling tool. In other words, results from various rounds of HIV estimations are not comparable one with another because of improvements in methodological issues and data inputs and changes in modelling parameters with each successive round. Each round provides the best estimates based on knowledge and evidence available at that point of time.

HIV Estimations 2017 is different from earlier rounds in many respects. They used a time frame from 1981 to 2026 with demographic projections elaborated accordingly by using data from a range of sources including India's Census. Programme coverage data for ART and PMTCT was updated for two more years compared to the previous round. Also, "Test and Treat" Policy introduced in country in April 2017 is accounted for in the current estimates and projections. While most Spectrum default options were used from adult and child transmission parameters, some key India and State/UT specific parameters for age-sex distribution of HIV incidence were introduced in the current modelling. HIV

Surveillance data were updated from the 2016-17 rounds of surveillance and, most importantly, survey data from NFHS-4 was used extensively.

HIV Estimations 2017 is unique and more robust than all the previous rounds as this was the first time when data from National Family Health Survey (NFHS) rounds 3 and 4 were incorporated. NFHS-4 provided HIV prevalence for 11 groups of States/UTs. For many of the States/UTs, HIV prevalence from a community based representative survey (NFHS-IV) was available for the first time and use of this data has resulted in significant corrections in prevalence as well as incidence estimates of many States/UTs. Also, HIV prevalence data was used upfront in the curve fitting that further improved the Bayesian statistics approach used in EPP modelling as curve fitting was informed by a representative survey.

The results of the 2017 round of HIV Estimates confirm the national declining trend in new HIV infections and AIDS-related deaths corroborating India's success story in curbing the epidemic. However, they also inform the programme that there truly is no place for complacency as new HIV infections are stable to rising in some locations across the country. Sustained commitment and much more vigorous action are needed to reach the ambitious prevention and treatment targets set for 2020 in view of ending AIDS by 2030.

Annual new HIV infections have declined by more than 60% since 2000. However, the rate of their decline has been much slower in recent years and far behind the pace needed to reach the 2020 target. Between 2010 and 2017, new infections have declined only by 27%. While this is better than the global average of 16%,[42] a new impetus is clearly needed to fast track HIV prevention efforts to achieve the 75% reductions in new infections by 2020 against the 2010 baseline. New models and modus operandi are urgently needed to deliver on commitments made by India in the medium and long run to end AIDS.

The heterogeneity across India in epidemic levels, trends and patterns and progress made through HIV prevention calls for an intensified and better customized approach with differential prevention and care services informed by solid use of strategic information. New infections have increased particularly in States like Assam, Mizoram, Meghalaya and Uttarakhand. Also, several other Indian States/UTs have registered declines in new infections which is less than the national average. This is the case especially of States like Bihar, West Bengal, Telangana, Delhi, Jharkhand and Haryana and a source of major concern.

Strategic focus on the States of Mizoram, Manipur, Nagaland and Telangana is also important for the prevention programme as their HIV incidence rate is almost four times higher than the national average. While the high HIV incidence rate in North-eastern States does not have a major impact on India's total new infections, it does have a significant bearing on prevalence rates in this region of the country. However, Telangana's high incidence rate does add much to the total volume of new infections in India given the size of the State's population. Strengthening prevention programmes in this State should therefore be a top priority.

As HIV incidence continues to be much higher in female sex workers, men who have sex with men, injecting drug users and hijra/transgender people, these high-risk groups must continue to be the primary target of HIV prevention efforts. An increased focus on those at highest risk in these key populations as well as partners of HRGs, including bridge populations (i.e., migrants and truckers), is necessary to achieve the 2020 target of 75% reductions in new HIV infections.

42 UNAIDS DATA 2017, Joint United Nations Programme on HIV/AIDS (UNAIDS), 2017

Scale-up of the ART programme is a flagship initiative under the national AIDS response in India. The result has been phenomenal with continued declines in AIDS-related deaths. While globally, scale-up of ART has resulted in 48% decline in deaths from AIDS-related causes since its peak, AIDS-related deaths have declined by almost 71% in India.[43] Clearly, the AIDS treatment programme in the country has not only been extremely successful, but also has set global benchmark in terms of level of impact.

However, inter-State variations in the trend of death due to AIDS-related illness persist. Estimated AIDS-related deaths are still rising in Bihar, Jharkhand, Haryana, Delhi and Uttarakhand, while they have stabilised in Assam. These are States where the implementation of the ART programme needs to be more closely monitored and strengthened.

More needs to be done to accelerate progress on the 90-90-90 targets, especially to enhance HIV testing for detection of new HIV cases, putting them on ART and improving their retention, because the overall coverage of the ART programme in India is still only around 56% against the global target of putting 82% PLHIV on ART by 2020. The recent launch of Mission 'Sampark' (i.e. Contact), which aims to facilitate identification and contacting of ART patients who have been lost to follow-up to bring them back into the ART programme and foster treatment adherence for lasting viral load suppression, is a promising step in this regard.

Another critical target is the elimination of mother-to-child transmission of HIV which, the current estimations show, is within striking distance in many States/UTs with national PMTCT coverage of 60% in 2016-17. However, major challenges remain and must be urgently addressed, especially in States like Bihar, Jharkhand, Uttar Pradesh and Telangana where the PMTCT coverage is still significantly lower than the national average.

In the light of these challenges, it is important to highlight that a lot of new initiatives have been undertaken under the National AIDS Control programme which are expected to accelerate progress on HIV prevention, case detection as well as on treatment and viral load suppression and create a better enabling environment for outreach and service delivery. Prevention remains at the top of the agenda and various complementary, integrated and coordinated initiatives are ongoing under the new 'Prevention Coalition Framework'. Improvement of size estimations of high risk populations is a critical component in India's Prevention Road Map and will be undertaken following recommendations of a White Paper on Population Size Estimations that has been undertaken by NACO to put in place a cost-effective, feasible and sustainable size estimation strategy in the Indian context.

The HIV prevention approach is being re-modelled and expanded to target and cover wider group of people at risk of HIV. Community-based screening is being scaled up, a strategy which is showing promising results to reach the unreached vulnerable populations and link them to a comprehensive package of prevention, detection and treatment services. Prevention and treatment services have newly been introduced in prisons and other closed settings. Testing for HIV and Syphilis among pregnant women has been intensified to reach dual elimination of mother-to-child transmission of HIV and Syphilis.

Implementation of the 'Test and Treat' strategy is critical but has been also complemented by a vigorous execution of Mission 'Sampark' as well as intensification and expansion of HIV prevention efforts. Investments will need to be balanced and cost-effectiveness enhanced. Viral load testing is

43 UNAIDS DATA 2017, Joint United Nations Programme on HIV/AIDS (UNAIDS), 2017

also being scaled up to monitor the effectiveness of ART on the health of patients taking lifelong treatment as well as progress on the third 90 target (i.e., viral load suppression).

Another major step that has recently been taken by the Government of India, which is expected to positively impact on results, is the integration of the HIV programme with the TB programme. This, together with the strengthened dialogue and coordination with bodies of health professionals and the private health care sector, will give renewed impetus to the national response to AIDS and TB. Package of services for Hepatitis C is also being added into national AIDS response appropriately.

The use of strategic information, like the HIV estimations presented in this report and data from other sources, will be the key to success in reaching ambitious targets. The ultimate goals which country aims to achieve remain the same – End of AIDS as a public health threat by 2030. This critical vision can only be achieved through sustained commitment and active mobilization of all stakeholders.

ANNEXURES

Annexure 1. Composition of Technical Resource Group on HIV Surveillance and Estimation

Chair: Shri Sanjeeva Kumar, Additional Secretary and Director General, NACO

Co-chair: Dr Sanjay Mehendale, Additional Director General, ICMR

Member Secretary: Dr S Venkatesh, DDG (MES), NACO

Members:

1. Shri Alok Saxena, Joint Secretary, NACO
2. Dr Henk Bekedam, Country Representative, WHO India
3. Dr Bilali Camara, Country Director, UNAIDS India
4. Dr N.S. Dharmshaktu, Principal Advisor to Ministry on Public Health, MoHFW, GOI
5. Dr Peter Ghys, Director, Strategic Information and Evaluation, UNAIDS, Geneva
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10. Dr Manoj Vasant Murhekar, Director, National Institute of Epidemiology, Chennai
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19. Dr Jagdish Chandra, Former Director, Kalawati Saran Children's Hospital, New Delhi
20. Dr Timothy Holtz, Director, DGHT, CDC India
21. Dr John Stover, Vice President, Avenir Health and member UNAIDS HIV Estimation Reference Group
22. Mr Ashok R Kavi, Chairman, The Humsafar Trust
23. Ms Abhina Aher, Associate Director, India HIV/AIDS Alliance
24. Dr Naresh Goel, Deputy Director General, IEC and Lab Services, NACO
25. Dr R.S. Gupta, Deputy Director General, Care Support & Treatment, NACO
26. Dr K.S. Sachdeva, Deputy Director General, Basic Services Division, NACO
27. Dr Shobini Rajan, Assistant Director General, Blood Transfusion Services, NACO

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   Scientist E & HIV Estimation Focal Person, ICMR-NIMS
2. Dr Pradeep Kumar,
   Programme Officer, Surveillance, NACO

Annexure 2. Composition of National Working Group on HIV Estimations 2017

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Annexure 3. State and UT-wise summary of HIV Epidemic in 2017, HIV Estimations 2017

State/UT	Adult Prevalence (in percent)	PLHIV (in lakh)	New HIV Infections (in thousand)	AIDS related death (in thousand)	PMTCT need
Andhra Pradesh	0.63 [0.47-0.85]	2.700 [2.005-3.581]	6.55 [2.72-12.92]	8.46 [3.67-17.24]	1,960 [1,323-2,825]
Arunachal Pradesh	0.06 [0.03-0.10]	0.006 [0.003-0.010]	0.08 [0.03-0.15]	0.02 [0.01-0.04]	12 [8-19]
Assam	0.06 [0.03-0.10]	0.135 [0.078-0.236]	1.39 [0.58-2.95]	0.27 [0.08-0.67]	238 [144-422]
Bihar	0.16 [0.12-0.23]	1.154 [0.838-1.587]	8.85 [5.27-14.01]	3.30 [1.50-5.68]	2,090 [1,550-2,851]
Chhattisgarh	0.13 [0.10-0.21]	0.262 [0.194-0.415]	1.55 [0.88-2.83]	0.87 [0.47-1.74]	346 [242-583]
Delhi	0.30 [0.18-0.47]	0.457 [0.286-0.711]	3.10 [1.53-5.79]	0.58 [0.17-1.68]	533 [356-807]
Goa	0.42 [0.21-0.79]	0.059 [0.032-0.110]	0.21 [0.03-0.63]	0.31 [0.06-0.77]	38 [18-73]
Gujarat	0.19 [0.10-0.33]	0.918 [0.507-1.553]	4.52 [1.74-8.95]	2.12 [0.60-7.21]	1,297 [702-2,144]
Himachal Pradesh	0.05 [0.03-0.09]	0.031 [0.018-0.054]	0.09 [0.04-0.19]	0.03 [0.01-0.06]	29 [15-54]
Haryana	0.18 [0.12-0.26]	0.363 [0.253-0.511]	2.48 [1.42-3.98]	1.31 [0.61-2.29]	446 [308-654]
Jharkhand	0.14 [0.04-0.31]	0.334 [0.097-0.726]	2.60 [0.54-6.30]	1.33 [0.08-3.57]	632 [208-1372]
Jammu & Kashmir	0.03 [0.01-0.07]	0.030 [0.013-0.061]	0.21 [0.05-0.68]	0.03 [0.01-0.14]	37 [16-64]
Karnataka	0.47 [0.37-0.63]	2.474 [1.914-3.235]	5.01 [1.83-10.18]	8.45 [3.58-15.92]	1,951 [1,300-3,037]
Kerala	0.08 [0.06-0.10]	0.228 [0.186-0.286]	0.88 [0.51-1.40]	0.75 [0.42-1.21]	176 [133-238]
Meghalaya	0.11 [0.06-0.16]	0.021 [0.013-0.032]	0.19 [0.04-0.38]	0.02 [0.01-0.05]	51 [32-71]
Maharashtra	0.33 [0.25-0.45]	3.297 [2.531-4.353]	5.95 [2.5-12.10]	10.1 [4.92-21.52]	2,406 [1,632-3,376]
Manipur	1.43 [1.17-1.75]	0.315 [0.261-0.389]	1.61 [1.04-2.39]	1.62 [1.18-2.20]	382 [299-489]
Madhya Pradesh	0.09 [0.06-0.13]	0.512 [0.366-0.731]	2.39 [1.41-3.94]	1.85 [0.86-3.31]	723 [525-1052]
Mizoram	2.04 [1.57-2.56]	0.168 [0.129-0.211]	1.50 [1.02-2.04]	0.47 [0.27-0.71]	259 [207-323]
Nagaland	1.15 [0.92-1.41]	0.170 [0.137-0.209]	1.23 [0.90-1.59]	0.54 [0.35-0.77]	237 [191-293]
Odisha	0.13 [0.08-0.21]	0.414 [0.252-0.669]	2.42 [1.08-4.57]	1.39 [0.44-3.07]	603 [368-1,018]
Punjab	0.18 [0.12-0.25]	0.406 [0.275-0.570]	1.90 [0.92-3.27]	0.76 [0.25-1.66]	406 [292-551]
Rajasthan	0.10 [0.07-0.15]	0.547 [0.366-0.808]	2.75 [1.34-4.74]	0.9 [0.36-1.73]	959 [681-1360]
Sikkim	0.05 [0.03-0.09]	0.002 [0.001-0.005]	0.02 [0.01-0.05]	0.002 [0.00-0.01]	6 [4-9]
Tamil Nadu	0.22 [0.14-0.31]	1.419 [0.932-1.975]	3.63 [1.33-7.43]	2.80 [1.31-6.88]	1,167 [709-1,684]
Telangana	0.70 [0.50-0.95]	2.037 [1.495-2.773]	9.32 [4.86-14.77]	10.16 [5.86-15.42]	1,737 [1,177-2,526]
Tripura	0.09 [0.06-0.18]	0.027 [0.018-0.051]	0.21 [0.11-0.66]	0.07 [0.03-0.13]	38 [27-70]
Uttarakhand	0.11 [0.07-0.16]	0.080 [0.053-0.120]	0.73 [0.36-1.48]	0.21 [0.11-0.39]	106 [72-156]
Uttar Pradesh	0.09 [0.07-0.12]	1.340 [1.018-1.776]	7.06 [4.68-10.44]	3.82 [1.92-6.58]	2,286 [1,801-2,997]
West Bengal	0.20 [0.14-0.27]	1.439 [1.038-1.914]	8.61 [4.86-13.42]	6.47 [4.52-8.99]	1,453 [1,024-2,056]
Andaman & Nicobar Islands	0.14 [0.09-0.20]	0.004 [0.003-0.007]	0.06 [0.03-0.11]	0.02 [0.01-0.02]	9 [6-12]
Chandigarh	0.20 [0.14-0.25]	0.021 [0.015-0.027]	0.24 [0.14-0.35]	0.05 [0.03-0.08]	20 [15-26]
Dadra & Nagar Haveli	0.17 [0.08-0.37]	0.005 [0.003-0.011]	0.06 [0.02-0.14]	0.01 [0.00-0.03]	11 [7-20]
Daman & Diu	0.17 [0.08-0.36]	0.004 [0.002-0.009]	0.04 [0.02-0.09]	0.01 [0.00-0.03]	8 [5-13]
Puducherry	0.15 [0.08-0.23]	0.018 [0.011-0.028]	0.17 [0.06-0.34]	0.02 [0.01-0.05]	25 [15-36]
India	0.22 [0.16-0.30]	21.400 [15.90-28.39]	87.58 [36.45-172.90]	69.11 [29.94-140.84]	22,677 [10,927-40,605]

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National AIDS Control Organization (Ministry of Health and Family Welfare, Government of India) biennially undertakes HIV estimations through Indian Council of Medical Research-National Institute of Medical Statistics. HIV Estimations 2017, the latest round, provides updated information on the status of HIV epidemic in India at national and State level on key indicators of HIV prevalence, annual new infections (HIV incidence), AIDS-related mortality and prevention of mother-to-child transmission.

HIV Estimation 2017 (Technical Report & Fact Sheets) is a critical piece of evidence for HIV epidemic monitoring. The findings is useful for all stakeholders under National AIDS Control Programme to fine-tune their policy, implementation design and impact monitoring as country move ahead, collectively, to achieve the end of AIDS as a public health threat.

NACO
National AIDS Control Organisation
India's voice against AIDS
Ministry of Health & Family Welfare, Government of India