A Review of HIV estimation technique on HIV prevalence rates at National & State Level in India

A dissertation submitted in partial fulfillment of the requirements for the award of

Post-Graduate Diploma in Health and Hospital Management

by

Gunjika Vishwanath Misra



International Institute of Health Management Research

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under the guidance of

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Abstract

Impact of Change in HIV estimation technique on HIV prevalence rates at National & State Level in India

by

Gunjika Vishwanath Misra

The acquired immunodeficiency syndrome (AIDS) is a bane of global proportions for mankind. The number of people infected with HIV in India is estimated to be one of the highest in the world. It has been 20 years since the first AIDS case was diagnosed in the southern city of Chennai, India is still juggling different public health priorities, while maintaining and increasing its spending on HIV/AIDS programs. In this scenario, an estimation of the Annual Prevalence Rate at the national & state level assumes a significant amount of importance. Prevalence rate is the number of cases of a specific disease present in a given population at a given time. It is an important indicator for long lasting diseases like HIV/AIDS. HIV surveillance first began in 1985 under the aegis of the Indian Council of Medical Research, among blood donors. With the formulation of NACO in 1992, sentinel sites were set up in select metros. In the year 1998, Annual Sentinel Surveillance a.k.a HIV sentinel surveillance (HSS), involving sentinel sites, was initiated. Prior to the year 2006, HSS was the chief source of HIV data including the Annual Prevalence Rate for the states and the country. The HSS alongwith several assumptions viz. Ante Natal Clinic attendees serving as proxy for general population; STD patients serving as proxy for HRG and Bridge groups; No High Risk Group (HRG) sites were there in the beginning. Between 2002 – 2006, several changes viz. establishment of HRG sites, expansion of ANC sites to peri-urban/rural settings, major expansion of all sites, as well as, incorporation of change in the methodology of the HIV sentinel surveillance were undertaken. The UNAIDS Workbook approach & Spectrum, a policy modeling system, were the new additions in the methodology. Between 2002 – 2005, the annual prevalence rate of HIV in India was 0.42. In 2006, it dipped to 0.36. In 2007 it decreased further still to 0.29. Provisional HSS estimates for the year 2008 are slightly higher at 0.32, but lower than the earlier estimates. This led to the understanding that prior to the incorporation of the above mentioned approaches, the HIV estimates in India was grossly overestimated.

The aim of the study is to critically evaluate & undertake a trend analysis of the impact of the change in methodology on the dip in the national & state level Annual prevalence rates.

This study uses the national & state – level annual prevalence data of HIV collected in the HIV Sentinel Surveillance[9] from 2002 – 08. The HSS is an annual cross-sectional survey which adopts a facility/clinic based approach. Since it depends on unlinked anonymous testing of samples collected within the shortest possible period, the process minimizes selection as well as participation bias.

Adult prevalence showed a decrease from 0.45 per cent in 2002 to 0.29 per cent in 2007. The year 2006 incorporated an upheaval of existing infrastructure and a deviation in assessment methodology by including the WHO/UNAIDS estimation model. This facilitated the addition of the UNAIDS Workbook and the Spectrum Software.

This study attempts to indicate how a change in the epidemiological data estimation techniques can result in correction of data identification. The changes incorporated in the year 2006, brought about an improvement in national as well as state level HIV statistics of in India.

PART – I

Internship Report

1.1 Introduction to National AIDS Control Organization (NACO) and its Profile

1.1.1: *NACO – History*

National AIDS Control Organisation is a division of the Ministry of Health and Family Welfare that provides leadership to HIV/AIDS control programme in India.

In 1986, following the detection of the first AIDS case in the country, the National AIDS Committee was constituted in the Ministry of Health and Family Welfare. As the epidemic spread, need was felt for a nationwide programme and an organisation to steer the programme. In 1992 India's first National AIDS Control Programme (1992-1999) was launched, and National AIDS Control Organisation (NACO) was constituted to implement the programme.

The objective of NACP-I (1992-1999) was to control the spread of HIV infection. During this period a major expansion of infrastructure of blood banks was undertaken with the establishment of 685 blood banks and 40 blood component separation. Infrastructure for treatment of sexually transmitted diseases in district hospitals and medical colleges was created with the establishment of 504 STD clinics. HIV sentinel surveillance system was also initiated. NGOs were involved in the prevention interventions with the focus on awareness generation. The programme led to capacity development at the state level with the creation of State AIDS Cells in the Directorate of Health Services in states and union territories.

During NACP-II (1999-2006) a number of new initiatives were undertaken and the programme expanded in new areas. Targeted Interventions were started through NGOs, with a focus on High Risk Groups (HRGs) viz. commercial sex workers (CSWs), men who have sex with men (MSM), injecting drug users (IDUs), and bridge populations (truckers and migrants). The package of services in these interventions includes Behaviour Change Communication, management of STDs and condom promotion. The School AIDS Education Programme was conceptualised to build up life skills of adolescents and address issues relating to growing up. All

channels of communication were engaged to spread awareness about HIV/AIDS, promote safe behaviours and increase condom usage. Voluntary counselling and testing facilities were established in healthcare facilities to promote access to HIV counselling and testing. The interventions for prevention of parent to child transmission were also started. Free antiretroviral therapy was initiated in selected hospitals in the country. Development of indigenous vaccine and research on microbicides are some initiatives in HIV research. Apart from this, some policy initiatives during NACP-II included National AIDS Prevention and Control Policy, National Blood Policy, a strategy for Greater Involvement of People with HIV/AIDS and National Rural Health Mission.

A National Council on AIDS chaired by the Prime Minister and consisting of 31 ministries, seven chief ministers, civil society representatives, positive people's network and private sector organisations was constituted with the following objectives:

- To mainstream HIV/AIDS issue in all ministries and departments by treating it as a development challenge and not merely a public health problem.
- To provide leadership to mount multi-sectoral response to combat HIV/AIDS in the country with special reference to youth, women and the workforce.

1.1.2: *Vision & Values*

NACO envisions an India where every person living with HIV has access to quality care and is treated with dignity. Effective prevention, care and support for HIV/AIDS is possible in an environment where human rights are respected and where those infected or affected by HIV/AIDS live a life without stigma and discrimination.

NACO has taken measures to ensure that people living with HIV have equal access to quality health services. By fostering close collaboration with NGOs, women's self-help groups, faith-based organisations, positive people's networks and communities, NACO hopes to improve access and accountability of the services. It stands committed to building an enabling environment wherein those infected and affected

by HIV play a central role in all responses to the epidemic – at state, district and grassroot level.

NACO is thus committed to contain the spread of HIV in India by building an all-encompassing response reaching out to diverse populations. We endeavour to provide people with accurate, complete and consistent information about HIV, promote use of condoms for protection, and emphasise treatment of sexually transmitted diseases. NACO works to motivate men and women for a responsible sexual behaviour.

NACO believes that people need to be aware, motivated, equipped and empowered with knowledge so that they can protect themselves from the impact of HIV. We confront a stark realty – HIV can happen to any of us. Our hope is that anyone can be saved from the infection with appropriate information on prevention. NACO is built on a foundation of care and support, and is committed to consistently fabricate strategic responses for combating HIV/AIDS situation in India.

NACO envisions:

- Building an integrated response by reaching out to diverse populations.
- A National AIDS Control Programme that is firmly rooted in evidence-based planning.
- Achievement of development objective
- Regular dissemination of transparent estimates on the spread and prevalence of HIV/AIDS
- Building an India where every person is safe from HIV/AIDS
- Building partnerships
- An India where every person has accurate knowledge about HIV and contributes towards eradicating stigma and discrimination
- An India where every pregnant woman living with HIV has the choice to bring an HIV free baby into the world
- An India where every person has access to Integrated Counselling & Testing Centres (ICTCs)

- An India where every person living with HIV is treated with dignity and has access to quality care
- An India where every person will eventually live a healthy and safe life, supported by technological advances
- An India where every person who is highly vulnerable to HIV is heard and reached out to**.**

1.1.3: *Location*

The NACO office is located at the 6th & the 9th floors of the Chandralok Building, at Connaught Place's strategically located Janpath area. In addition to NACO, the Chandralok Building also houses offices of other government based organizations as well, like the Shipping Corporation of India (SCI), Central Electricity Regulation Commission (CERC), State Bank of Patiala, All India Council for Technical Education(AICTE), among others. While the 9th floor office caters to the administrative backbone of the Organization, the 6th floor houses the majority of its working staff. Chandralok building is flanked on both sides by Kidwai Bhawan on the left and the MTNL Building on the right. The Imperial hotel is located in front of the Chandralok building premises.

The official address of NACO is:

National AIDS Control Organization
Ministry of Health & Family Welfare
6th & 9th Floor, Chandralok Building,
36, Janpath,
Connaught Place.
New Delhi - 110001

1.1.4: *Policies & Guidelines*

The spread of HIV/AIDS from the high risk groups to general population and from initial hot spots to new areas in India underlines the need for a comprehensive National AIDS Control Policy to effectively control the epidemic in the country.

The HIV/AIDS policies and guidelines in India view the epidemic as a developmental problem rather than a mere public health issue. It is therefore necessary that NACP-III is integrated with various development programmes like the National Rural Health Mission (NRHM), Reproductive and Child Health (RCH) programme and the Revised National Tuberculosis Control Programme (RNTCP). The focus of all these programmes is prevention of HIV transmission.

Among the preventive services are awareness generation, condom promotion, prevention of parent to child transmission, increasing ICTC services, promotion of voluntary blood donation and access to safe blood. The policies also have guidelines on targeted Interventions (TIs) for high risk groups like injecting drug users (IDUs), men having sex with men (MSM), female sex workers (FSWs) etc.

Apart from this, policies have extensive guidelines on the management of common opportunistic infections, malignancies among adult/adolescent PLHA and operational guidelines for ART centres to standardise ART services across the country. The National Policy on Blood Banks ensures adequate supply of safe blood and blood components.

1.1.5: *Divisions*

1. Administration
2. Basic Services
3. Blood Safety
4. Care, Support and Treatment
5. Finance
6. IEC & Mainstreaming
7. Lab Services
8. Monitoring, Evaluation, Research & Surveillance
9. Procurement
10. STI/RTI Services
11. Targeted Interventions (TI)

1.1.5.1 *Care, Support and Treatment Division*

The care, support and treatment needs of HIV positive people vary with the stage of the infection. The HIV infected person remains asymptomatic for the initial few years; it manifests by six to eight years. As immunity falls over time the person becomes susceptible to various opportunistic infections (OIs). At this stage, medical treatment and psycho-social support is needed. Access to prompt diagnosis and treatment of OIs ensures that PLHAs live longer and have a better quality of life.

Under NACP–II, focus was given on low-cost care, support and treatment of common OIs. Apart from further improving the availability, accessibility and affordability of ART treatment to the poor, NACP-III plans to strengthen family and community care through psycho-social support to the individuals, more particularly to the marginalised women and children affected by the epidemic, improve compliance of the prescribed ART regimen, and address stigma and discrimination associated with the epidemic.

To achieve this objective, 350 Community Care Centres are planned to be set up during the programme period (2007- 2012) in partnership with PLHA in high prevalence and moderate prevalence districts. These centres will be established based on the epidemiological profile and PLHA load of the districts, and linked to the nearest ART centre. The centres will provide counselling for drug adherence, nutritional needs, treatment support, referral and outreach for follow up, social support and legal services. State AIDS Prevention and Control Societies will ensure access of high risk groups to community care centres through linkages between TIs and the centres.

By strengthening local responses, NACP–III seeks high levels of drug adherence (>95 percent) and compliance of the prescribed ART regimen. This approach to care, support and treatment also creates awareness about the prevention of HIV infection and, thus, is a very significant part of NACP–III in achieving NACO's mission of containing and reversing HIV/AIDS incidence in India.

Care and Support for Children

Approximately 50,000 children below 15 years are infected by HIV every year. So far, care and support response to these children was at a very minimal level. NACP–III plans to improve this through early diagnosis and treatment of HIV exposed children; comprehensive guidelines on paediatric HIV care for each level of the health system; special training to counsellors for counselling HIV positive children; linkages with social sector programmes for accessing social support for infected children; outreach and transportation subsidy to facilitate ART and follow up, nutritional, educational, recreational and skill development support, and by establishing and enforcing minimum standards of care and protection in institutional, foster care and community-based care systems.

1.1.5.2: *Monitoring, Evaluation, Research and Surveillance Division*

India's response to HIV epidemic is influenced by the available surveillance data, implementation capacities and political commitment at state and national level. Apart from the sentinel surveillance, nationwide Computerised Management Information System (CMIS) provides strategic information on programme monitoring and evaluation.

Monitoring

However, in the planning of NACP-III it was felt that data from sentinel surveillance and CMIS are not sensitive enough to detect the emerging hot spots of the epidemic. To overcome this, NACO, in its third HIV/AIDS programme introduced Strategic Information Management System (SIMS) at national and state levels to focus on strategic planning, monitoring, evaluation, surveillance and research. It is aimed to provide effective tracking and response to HIV epidemic. The system assigns clear responsibilities to all programme officers and facilitates data flow and feedback at various levels.

Evaluation

Although a number of new initiatives were taken in the previous programme, their evaluation was not given adequate attention. This hindered the assessment of their efficacy. In NACP-III tools are proposed to be developed in consultation with the technical partners for the evaluation of each of the proposed intervention.

Research

Beginning NACP-III, NACO has positioned itself as the promoter and coordinator of research on HIV/AIDS not only in India, but the entire South Asia region through partnership and networking with national academic and other institutions in the region. This initiative will enhance NACO's knowledge and evidence base of the various aspects of the epidemic.

1.2: Work Engagements

1.2.1: *Terms of Reference of TECHNICAL OFFICER (R&D)*

1. Assist in assessment of Community Care Centers & ART Centers.
2. Compile and prepare status reports and executive summaries for dissemination/ action/ feedback for the CST & BSD Divisions.
3. Conduct desk research for the CST & BSD Divisions.
4. Assist in all research activities of CST & BSD Division.
5. Assist in examination of proposals received for research grants of CST & BSD Divisions.
6. Coordination with SACS, Development Partners, training institutions, NGOs and Private Sector for research related activities of CST & BSD Divisions.
7. Field visits to monitor research activities of the CST & BSD Divisions.
8. Any other work assigned by Secretary & DG, NACO/ DDG/Programme Officer.

1.2.2: *Nature of management activities undertaken - Routine or General*

Both. Responsible for routine management activities (initiating, processing and tracking office files; overseeing research project grant payments, analyzing and evaluating research proposals, etc.) as well as general management tasks (field visits to assess the progress of research projects, community care centres, academic centres, providing assistance in formulation and preparation of policy guidelines, undertaking research activities for policy formulations, etc.).

1.3: Managerial Tasks Undertaken

A. Completion of report of '**HIV Case Reporting**' Project by April 2010.
B. Completion of report on '**Assessment of CCC**' by May 2010.
C. Project assistance on '**Examining the barriers to Accessing HIV Testing and Counselling Services among High Risk Populations in India**' by June 2010.
D. Report on Workshop on "**Priority of Research in Pediatrics & PPTCT**" by June 2010.

1.3.1: *Workshops/Conferences/Training Sessions attended*

A. April 2010: Underwent training on '**MS Office 2007**'
B. April 2010: Underwent training on '**Office Procedure Guidelines**'
C. May 2010: Attended a series of presentations on '**Assessment of Link ART Centres**', '**Assessment of Community Care Centres**' and '**Recommendations of the PPTCT & Pediatric Conference**' organized by NACO.

1.3.2: *Field Visits Undertaken*

A. April - May 2010: Field visit to Rajkot, Gujarat to assess the progress in the Gujarat chapter of the project titled 'Examining the barriers to Accessing HIV Testing and Counselling Services among High Risk Populations in India'.

PART – II

Dissertation Report

Introduction

The first HIV estimation in India was done in 1994 based on 52 sites data. National Institute of Medical Sciences-Indian Council of Medical Research (NIMS-ICMR) is the nodal agency for HIV estimation in India. Estimates of PLHAs & Adult HIV prevalence, besides ART needs, new infection and HIV-related deaths are generated. A revision of the HIV estimation process was done in the year 2006. Salient features of this revision are as follows:

i) Availability of data from multiple sources

ii) Replacement of assumptions with evidence (in the form of NHFS-III).

The chief tools to HIV data estimation in India is the NACO organized HIV Sentinel Surveillance (HSS) and the National Behavioral Surveillance Survey (BSS). Conducting HIV sentinel surveillance (HSS) in a country as enormous and diverse as India is a massive undertaking. In 1994, HSS was conducted in 55 sites and expanded to 180 sites in 1998. In 2003, 455 sites were conducting surveillance. India's HSS system uses anonymous, unlinked blood sample screening for HIV antibodies to estimate the prevalence of HIV population groups in various States. Surveys are now conducted annually, and survey sites include STI clinics and ANC, as well as sites that work with IDUs, CSWs and MSM. The most recent round of HSS was completed in 670 sites in 2004. These sites included 166 STI clinics, 271 ANCs, 124 rural ANC sites, 13 sites where IDUs were surveyed, 3 sites for MSM and 2 sites for CSWs (NACO 2004). The national working group on HIV estimations and projections commended NACO for adding sites that target IDUs, CSWs and MSM in addition to ANC and STI sites, to better monitor the trend of the HIV epidemic. The quality of HIV surveillance in India was described by an expert team of UNAIDS and WHO in 2001 as having the basic components of a high-quality surveillance system but lacking adequate representation, which has since been improved by adding rural sites and sites for core risk groups, and increasing the total number of sites.

Till date, two rounds of the National Behavioral Surveillance Surveys (BSS) have been conducted in 2001 & 2006. Ten rounds of BSS & four rounds of BSS have been conducted in the high HIV prevalence Indian states of Tamil Nadu and Maharashtra respectively. Two rounds of Integrated Biological & Behavioral Assessment (IBBA) have been conducted

under the Avahan Programme in 23 districts. Integrated Biological & Behavioral Surveillance (IBBS) have been conducted in all the priority districts of the country in a phased manner.

The first case of HIV infection in India was reported in a commercial sex worker in 1986 at Madras Medical College in Chennai. Nationally, the HIV prevalence among adults (aged 15–49 years) is less than 1%, but with a population of more than 100 crore, India has the world's second-largest number of PLWHA. In six States—Andhra Pradesh, Karnataka, Maharashtra, Manipur, Nagaland and Tamil Nadu—the HIV epidemic is classified as a generalized one, with more than 1% of women attending antenatal clinics (ANCs) being infected and an HIV prevalence among STI clinic patients of more than 5%. The prevalence of HIV remains the highest among CSWs and their clients, men who have sex with men (MSM), IDUs, truck drivers and patients with STIs, whose behaviour puts them at high risk for contracting HIV. Mumbai has the country's largest brothel-based sex industry, with over 15,000 sex workers. Up to 70% of sex workers in Mumbai are HIV positive. Data on MSM and transgendered persons in Mumbai found that 17% of men and 68% of transgendered people were HIV positive. Twenty-two per cent of MSM were married, and 44% had visited female CSWs. The IDU epidemic is perceived as a problem mainly in the north-eastern States with a reported HIV prevalence of more than 70% in sentinel surveillance sites during the past years. However, selected surveys point out the increasing evidence of IDU in other parts of India, including border areas. Major metropolitan cities such as Mumbai, Kolkata, Chennai and Delhi have seen a diffusion of injecting drug use within the past decade.

A recent study showed that among 4648 drug users interviewed in 14 cities across the country, 43% had injected drugs. By 2001, an estimated 15%–35% of truck drivers nationwide were HIV positive. HIV infection rates among STI patients were 19.6% in Andhra Pradesh and 13% in Manipur (NACO 2005c). In India, infection may be due to both HIV-1 and the less pathogenic HIV-2. HIV-1 subtype C is predominant, while HIV-1 A/C recombinants have been described in Maharashtra. In the north-eastern States, other subtypes are present, including subtype B' (similar to the subtype found in Thai IDUs), E, C and B'/C recombinants.

In 1987, HIV sentinel surveillance and AIDS case identification began in 62 public health centers and nine reference centers. Over the next six years, AIDS cases were reported in all states. Initially, HIV spread among female sex workers and their male clients, STI clinic patients, and professional blood donors (individuals who accept a monetary compensation in return for donating blood). It subsequently began to spread among populations including women attending antenatal clinics. By 1990, HIV prevalence among sex workers and STI clinic attendees in Maharashtra and among IDUs in Manipur had surpassed 5 percent. By 1994 in Maharashtra, HIV was no longer restricted to these subpopulations, but had spread to the general population. HIV was also spreading in Gujarat and Tamil Nadu, where prevalence among high-risk groups was over 5 percent.

By 1998, HIV had spread rapidly in the four large southern states, not only within high-risk groups but also in the general population, where it was over 1 percent. Infection rates among women attending ANCs were 3.3 percent in Namakkal in Tamil Nadu and 5.3 percent in Churachandpur in Manipur. Among IDUs in Churachandpur, HIV prevalence was 76 percent and in Mumbai, 64.4 percent.

In 1999, HIV prevalence in the ANC survey in Namakkal had risen to 6.5 percent. In some Mumbai sites, about 60 percent of sex workers were infected with HIV. HIV infection among STI patients was 30 percent in Andhra Pradesh and 14 to 60 percent in Maharashtra.

By 2001, an estimated 15 to 35 percent of truck drivers nationwide were HIV-positive. HIV prevalence in the general population had surpassed 1 percent in six states (Maharashtra, Manipur, Andhra Pradesh, Tamil Nadu, Karnataka and Nagaland). These states accounted for 75 percent of the country's estimated HIV cases.

India had an estimated 1.8 – 2.9 million HIV positive persons in 2007, with an estimated adult HIV prevalence of 0.34% (0.25%–0.43%). As the HIV Prevalence among the high risk groups (HRG) is very high compared to that among the general population, India continues to be in the category of concentrated epidemic. The sexual mode continues to be the major mode of transmission, though transmission through injecting drug use and Men having Sex with Men are on the rise in many new pockets.

A systematic and consultative HIV estimation process has been ongoing in India since 1998. A national committee with experts from premier national institutions guides the estimation process with assistance from WHO and UNAIDS.

The estimations have relied mainly on data generated by NACO's HSS and some epidemiologic assumptions, using an indigenous Excel Worksheet as a tool. During the year 2005–2006 a series of activities were initiated to improve the estimation methodology, and the input data base for estimation has been enriched with the availability of multiple data sources. The HSS expanded to over 1,122 sentinel sites covering almost all the districts of the country. The third round of National Family Health Survey (NFHS-3) tested over 102,000 blood specimens from adult men and women through a population-based household survey. The second round of national behavioural surveillance survey (BSS-2) and the baseline integrated biological behavioural assessments (IBBA) survey were also conducted during the year. More authentic information was available about the size of population at high risk (PHR) from the NACP-III document. Thus, the year 2006 is a benchmark in the history of the estimation of PLHIV in India.

Research Problem

India has often been criticized for overestimating its human immunodeficiency virus (HIV) burden. Until 2005, the adult HIV prevalence in India was estimated at around 0.9 per cent with an estimated 5.2 million people living with HIV/AIDS (PLHA). These estimates were based on sentinel surveillance results. A formal sentinel surveillance system was established in India in 1998. In this system, most surveillance sites were established in antenatal clinics (ANC) and Sexually transmitted disease (STD) clinics (99 and 77 sites, respectively), while a few (9) were established among injecting drug users (IDUs). Owing to the concentrated nature of the HIV epidemic in large parts of the country and the paucity of population based information in the areas with higher prevalence, HIV estimates in past years were derived using sentinel surveillance data in a locally developed estimation method that involved several assumptions. Prevalence among ANC attendees was used as a proxy for the prevalence in the general population and that among STD patients as a proxy for the prevalence among populations with high risk behaviour. The absence or inadequacy of HIV surveillance among female sex workers (FSW) and men having sex with men (MSM) was a weakness of India's surveillance system and consequently also for the estimation of the HIV burden. With the gradual expansion of surveillance over time since 1998 resulting in greater availability of data, FSW and MSM were included in the estimation process but the STD group was not discarded, which led to the possibility of double counting. Moreover, the representativeness of the ANC surveillance sites for the general population had not been verified. A Guntur study in Andhra Pradesh has demonstrated that:

(i) application of the HIV rate obtained among people visiting STI clinics in public sector hospitals to the 6 per cent of the adult population assumed to be at high risk;

(ii) referral of HIV-positive pregnant women from the private sector to large public hospitals; and

(iii) Over-representation of pregnant women from lower socio-economic strata who had higher HIV prevalence among those utilizing antenatal services of public hospitals led to over-estimation.

In 2006, improved data were available from multiple sources. Sentinel surveillance among ANC women was expanded covering nearly every district in the country allowing better geographical representation with adequate data for each State to undertake State-specific estimations. Additional sites for high risk groups were included in more States. The on-site monitoring and quality assurance of testing was strengthened. In addition, a nation-wide household HIV sero-survey of the general population was conducted as a part of the third round of the National Family Health Survey8 (NFHS-3). This provided an opportunity to validate the surveillance data and assumptions used in the estimation process. Further, in order to improve international comparability, the WHO/UNAIDS-recommended Workbook9 and Spectrum were adopted for the 2006 HIV burden estimation.

This study reviews the data and methods used for the 2006 HIV burden estimation. We describe here the data and methods used for the 2006 HIV burden estimates for India and compare the resulting estimates with those of earlier years and later years (2007-2008).
The study objective is to critically evaluate & undertake a trend analysis of the impact of the change in HIV estimation methodology on possible deviations in the national & state level annual HIV prevalence rates in India.

Methodology:

HIV prevalence results from 2006 sentinel surveillance and from NFHS-3 became available in March and May 2007 respectively. Three expert meetings were convened between March and July 2007 to advise on the data and methods to be adopted for the 2006 HIV burden estimation. The participants of the meetings were experts from various national and international academic/research organizations. The discussions at these meetings resulted in the adoption of a consensus approach described below.

Estimates were derived in the following steps:

(1) For each State the HIV prevalence among ANC was estimated for 2006;

(2) For the year 2006 for each State the prevalence among the general population was calibrated to the NFHS-3 result for the State or for the group of remaining States;

(3) For each State for the previous years 2002-2005 and later years 2007-2008, HIV prevalence among ANC was estimated applying a random effects model to results from consistent sites and adjusted with the calibration factor for NFHS-3;

(4) for each State for the years 2002-2006 the number of people with high risk behaviour living with HIV was estimated and added to the above estimate of people living with HIV in the general population;

(5) For each State a point estimate of adult prevalence was calculated in Workbook for each year between 2002 and 2006 and adult prevalence curve since the start of the epidemic was generated using the Workbook's projection feature. This curve was used in Spectrum to generate the number of people living with HIV by year, age and sex for each year since the start of the epidemic;

(6) State-specific and national uncertainty ranges around the number of people living with HIV and the adult prevalence were generated.

State-wise HIV prevalence estimates among ANC:

The primary data source for deriving State-specific prevalence levels among the general population was ANC sentinel surveillance. ANC surveillance was expanded from 200 sites in 2002 to 456 in 2006, thus providing improved representation of data at State level to undertake State-specific estimations. Subjects in these sites were selected by consecutive sampling and tested for HIV by unlinked anonymous testing. Sites with a minimum 75 per cent coverage of the assigned sample of 400 were considered as valid for estimations resulting in 419 valid sites for 2006.

The HIV prevalence among ANC attendees for 2006 was estimated adjusting for inter- and intra-state variations using mixed-effects logistic regression models, separately for each State. Analyses were performed by SAS version 9.1.3 using data from valid sites only. Model estimation was performed using PROC GLIMMIX and for each model the outcome was specified as an aggregate sample proportion using events/trials syntax. In case of non-

convergence or limited ANC sites within a State, standard logistic regression models were used.

Calibration of adjusted rates to NFHS-3 results:

NFHS-3 was designed to provide an HIV prevalence estimate among adults; it was designed to cover women age 15-49 yr and men age 15-54 yr for the six high prevalence States (Andhra Pradesh, Karnataka, Maharashtra, Manipur, Nagaland and Tamil Nadu), for Uttar Pradesh which is a low prevalence State, for the 26 remaining States, and for the country as a whole. However, the survey could not be conducted in Nagaland, owing to non co-operation. Over 1,02,000 adult males and females of the households sampled for the survey were tested for HIV status, resulting in an HIV test response rate8 of 85 per cent among women and 78 per cent among men. The weighted HIV prevalence estimates in the adult population age 15-49 yr for both sexes and the female-male (F:M) and urban-rural (U:R) ratios of HIV infection were taken from the survey data for each of the five high prevalence States surveyed separately and for the remaining States together. In the high prevalence States, HIV prevalence among ANC attendees was estimated for urban and rural combined as sentinel sites were present in these areas. These were calibrated to the HIV prevalence among women in NFHS-3. A calibration factor 'k' was derived as the ratio of the two estimates. We then applied the U: R ratio of HIV prevalence observed in NFHS-3 in each State to derive the HIV prevalence among urban and rural women. Subsequently the F: M ratio of HIV prevalence, observed in NFHS-3, was applied to urban and rural female prevalence to obtain HIV prevalence among urban and rural males. It resulted in four separate prevalence estimates for urban and rural females and males. As there were no NFHS-3 data for Nagaland, the calibration factor observed in Manipur for this State also was used, in view of their geographical contiguity and similarity of the epidemic.

The sample sizes covered under NFHS-3 in low and moderate prevalence States were small to provide State level estimates. Therefore, an aggregate HIV prevalence of all the low and moderate prevalence States was computed. Similarly, HIV prevalence among ANC attendees was computed taking all these States together. As ANC sentinel sites in low and moderate prevalence States were located in urban areas, a common 'k' for these States was computed as the ratio of HIV prevalence among ANC attendees and HIV prevalence in urban sample of NFHS-3. This factor was used to calibrate HIV prevalence among ANC women. The

prevalence estimates for rural women and urban males and females were obtained by applying U: R and F: M ratios of these States, observed in NFHS-3.

Trends of HIV prevalence for the general population:

The prevalence estimates for each year from 2002 to 2005 were by using trends based on consistent sites. Mixed-effects logistic regression models (accounting for the clustering within the sites with specification of random effects on the intercept) were used to estimate linear trends in HIV prevalence among ANC attendees. Variables included in this model were year, State and State × year. The interaction term was added into the model to allow for the estimation of trends separately by State. Model parameters from the mixed-effects logistic regression along with calibrated 2006 State-specific prevalence estimates were used in the calculation of prevalence for the years 2002 to 2005. States with a limited number of consistent sites were combined to increase the sample size and to afford the estimation of State-specific trends in HIV prevalence. States were combined on the basis of geographic and/or cultural similarity and were assumed to share similar trends in HIV prevalence. Between 2002 and 2006, the U:R ratio of HIV prevalence among women in moderate and low HIV prevalence States was taken as constant at 3.1:1 (observed in NFHS-3). In the case of high prevalence States, the State-specific U:R ratios in HIV prevalence observed in NFHS-3, *i.e.* 0.86:1 in Andhra Pradesh, 0.68:1 in Karnataka, 0.85:1 in Maharashtra, 1.22:1 in Manipur and 0.54:1 in Tamil Nadu, were considered as constant for the calculations for years 2002-2006. Based on these assumptions, the prevalence among urban and rural women and men were derived for the years 2002-2005.

HIV among groups with high risk behaviour (HRG):

Surveillance for HRG was expanded from 18 sites in 2002 to 234 in 2006. In 2006 surveillance data were available from 137, 51, 31 and 15 sentinel sites for FSW, IDU, MSM and long distance truckers respectively. Subjects in these sites were selected by consecutive sampling from established health facilities (*e.g.,* drop-in centers, detoxification centers *etc.*) or by camp approach where such health facilities were not available. Subjects were tested for HIV by unlinked anonymous testing11. Sites with a minimum of 75 per cent coverage of the assigned sample size 250 were considered as valid for estimations. In 2006, mixed-effects

logistic regression models were used to derive prevalence estimates among FSW, MSM, and IDU. To account for the clustering of patients within HRG sites, random effects were specified on the intercept. Estimates were calculated for each HRG using the following State groupings. HIV prevalence amongst long distance truckers was available only for 15 sites from four States, Kerala, Orissa, Punjab and West Bengal for 2006. The median HIV prevalence for these sites was used in all States assuming the prevalence among this group would be similar across the States. In the Workbook, besides the general population, the following groups were included: IDU, MSM, FSW and half of the estimated number of long distance truckers and helpers. State-wise data on the size of IDU, FSW, and MSM groups were drawn from the National AIDS Control Programme-III (NACP-III) document, prepared by an expert committee on size estimation through a consultative process by reviewing the mapping and size estimation of HRG undertaken in each State. This document also had recorded the national estimate for the number of long distance truckers as 3 to 3.5 million. A review of various studies on the number of truckers in this document also said that each trucker has at least one helper. Hence the national estimate for the size of truckers and helpers was considered to be six million. Following the suggestion of the expert committee 50 per cent, *i.e.*, 3 million was included in the Workbook. They were distributed among the States following the distribution of transport related workers in the 2001 Census and were used as the size of long distance truckers in the States.

Generation of point estimates of adult prevalence by State: Population sizes as well as adjusted and calibrated prevalence estimates, for each risk group mentioned above, were entered into the Workbook.

The remaining population was classified into four groups, namely, urban females (UF), rural females (RF), urban males (UM) and rural males (RM). The sizes of these groups were determined by subtracting the sizes of the aforementioned HRG from the population estimates provided by the report of the Technical Group on Population Projections. Workbooks were created for each State and for each year in the 2002-2006 separately, resulting in an annual State-specific estimate of adult prevalence. A prevalence curve was then generated for each State from 1985 to 2010, by entering the annual prevalence estimates from 2002-2006 in the curve fitter provided in the Workbook. In States which had shown a

declining trend, a double logistic curve was fitted and for the remaining States a single logistic curve was fitted. Numeric values of the curve were read into the Spectrum17 model. The Spectrum model is designed for estimation and projection of impact indicators based on estimated adult prevalence over time combined with a set of assumptions. We used the time series data on the total fertility rate (TFR), the life expectancy for both the sexes separately from the Sample Registration System, antiretroviral treatment (ART) and prevention of mother to child transmission (PMTCT) data from service statistics of NACO, and the age and sex distribution of population from the 2001 Census of India report. The age patterns of HIV prevalence set for concentrated epidemics were retained, but the male: female ratios (as estimated from NFHS-3 in (2005-06) were kept constant over time.

Uncertainty bounds: Uncertainty bounds for the national prevalence rate estimate and the number of people living with HIV were generated by using Spectrum10 model. This involved generating up to 1000 logistic curve fits by varying annual estimates. The uncertainty analysis was processed using these curves combined with distributions around key assumptions in Spectrum.

Table 1 shows national & statewise adult prevalence rates of HIV/AIDS for the year 2002 – 2008.

Trend Analysis: WHO-UNAID estimated prevalence rates for the year 2007 and provisional prevalence rates for the year 2008 were then mapped on time trend graphs to show the differences in prevalence trends down the years.

Table 1: National and state wise Adult HIV Prevalence Rates (2002 – 2008*)

	2002	2003	2004	2005	2006	2007	2008
Andhra Pradesh	1.16	1.13	1.1	1.08	1.05	0.974	1.071
Karnataka	0.85	0.84	0.82	0.81	0.81	0.676	0.815
Maharashtra	1.08	0.98	0.89	0.8	0.74	1.325	1.127
Manipur	2.42	2.2	2.01	1.83	1.67	1.044	1.203
Nagaland	2	1.83	1.62	1.45	1.26	0.371	0.542
Tamil Nadu	0.93	0.73	0.59	0.47	0.39	0.727	0.532
Goa	1.01	0.92	0.84	0.77	0.73	0.457	0.448
Gujarat	0.54	0.51	0.48	0.45	0.43	0.440	0.413
Pondicherry	0.4	0.43	0.47	0.5	0.55	0.166	0.171
Arunachal Pradesh	0.18	0.13	0.09	0.07	0.05	0.000	0.117
Assam	0.08	0.06	0.04	0.03	0.03	0.117	0.121
Bihar	0.1	0.11	0.12	0.13	0.16	0.093	0.234
Chhatisgarh	0.59	0.43	0.31	0.22	0.17	0.167	0.054
Delhi	0.35	0.32	0.3	0.27	0.27	0.609	0.643
Haryana	0.5	0.32	0.21	0.14	0.1	0.145	0.155
Himachal Pradesh	0.03	0.03	0.03	0.03	0.03	0.022	0.044
Jammu & Kashmir	0.02	0.02	0.02	0.03	0.04	0.010	0.005
Jharkhand	0.07	0.07	0.08	0.09	0.11	0.050	0.119
Kerala	0.59	0.39	0.25	0.17	0.13	0.233	0.126
Madhya Pradesh	0.17	0.15	0.13	0.12	0.11	0.080	0.095
Meghalaya	0.19	0.14	0.1	0.07	0.06	0.213	0.002
Mizoram	1.13	0.99	0.91	0.82	0.74	0.565	0.540
Orissa	0.06	0.08	0.11	0.15	0.22	0.342	0.321
Punjab	0.18	0.16	0.14	0.12	0.12	0.345	0.634
Rajasthan	0.05	0.07	0.09	0.12	0.17	0.210	0.199
Sikkim	0.24	0.17	0.13	0.09	0.08	0.014	0.119
Tripura	0.41	0.29	0.21	0.15	0.12	0.022	0.050
Uttar Pradesh	0.14	0.13	0.12	0.11	0.11	0.059	0.171
Uttaranchal	0.09	0.8	0.8	0.07	0.08	0.000	0.032
West Bengal	0.1	0.13	0.16	0.21	0.3	0.402	0.386
Andaman & Nicobar Islands	0.81	0.66	0.54	0.44	0.37	0.079	0.184
Chandigarh	0.45	0.42	0.38	0.35	0.34	0.266	0.407
Dadra & Nagar Haveli	< 100 Cases					0.050	0.000
Daman & Diu						0.013	0.038
Lakshadweep	No results as there are no valid sites					0.000	
India	**0.45**	**0.43**	**0.41**	**0.39**	**0.36**	**0.294**	**0.327**

Findings & Results

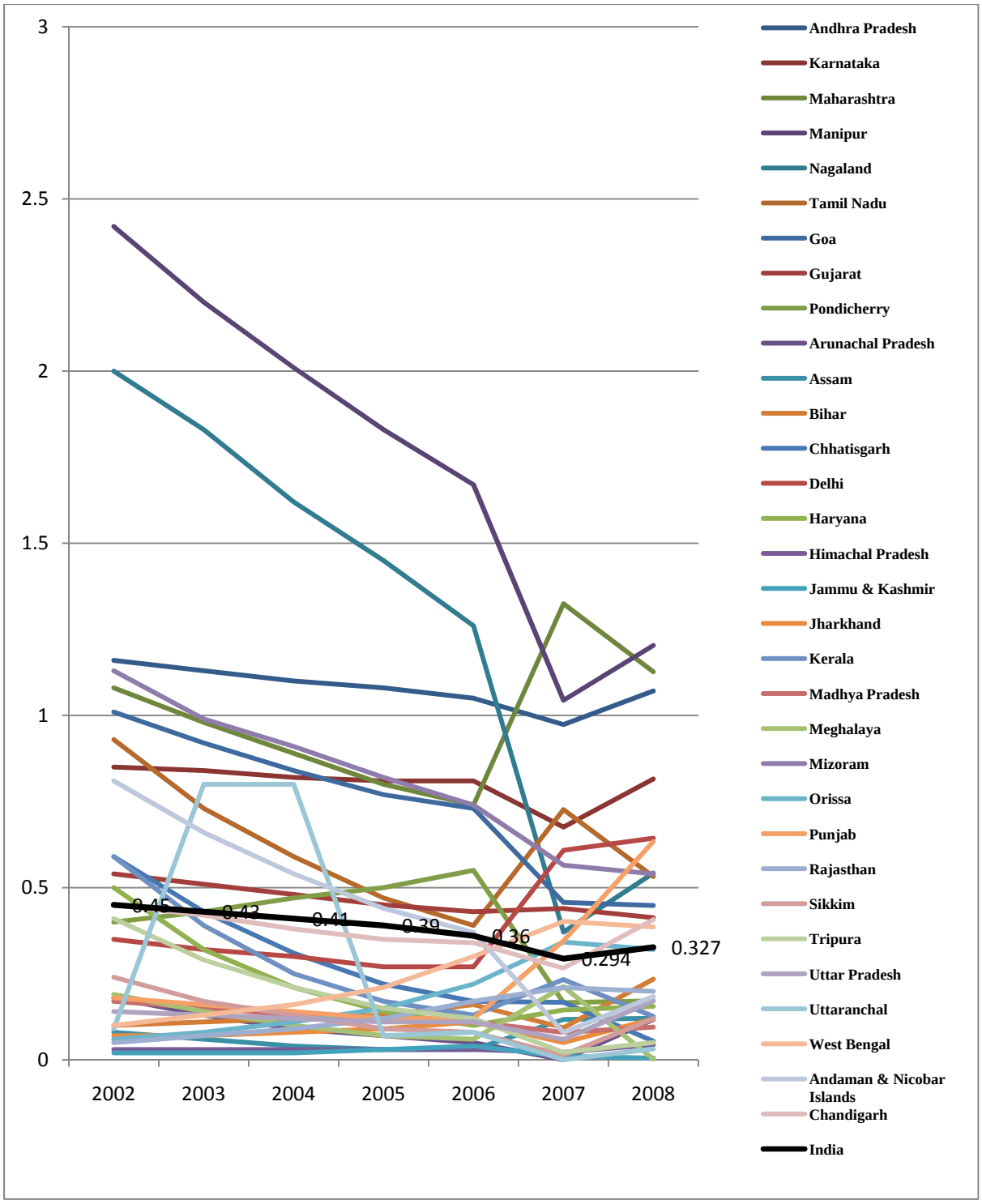


Fig. 1: Time Trend Analysis of National Vs. State level Annual HIV Prevalence Rates

OBSERVATIONS:

The HIV prevalence rates show a general decline at both the national and the state levels. While some states exhibit a sharp decline in the prevalence rates, others show subtle variations. The national estimates show a decline from an average of 0.42 prevalence rate from 2002 – 2005, to 0.36 in 2006. Furthermore, it can be observed that some states actually show an increase in the prevalence rates. These are the vulnerable states. On the whole it can be safely concurred that the changes adopted in the HIV estimation technique in the year 2006 have brought a decline in the HIV prevalence rates.

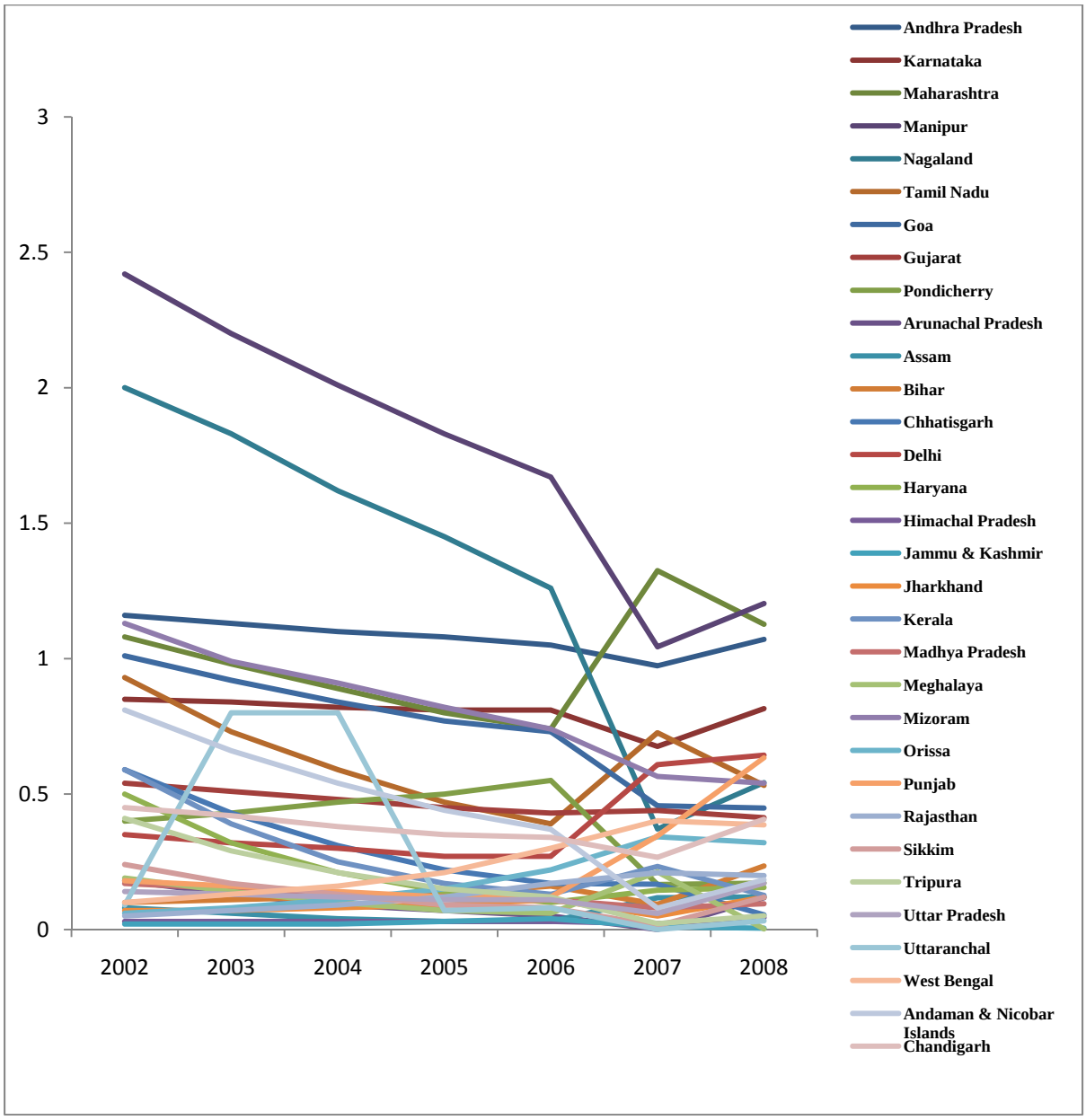


Fig. 2: Time Trend Analysis of HIV prevalence rate in Indian states

OBSERVATIONS:

The state wise data shows a downward trend adopted by the HIV estimates. This downward trend is sharp for most states and not much apparent for the others. Some states although exhibiting low prevalence estimates are showing an upward trend since these are the focus, vulnerable states. The figure above shows an overall decline in HIV estimates.

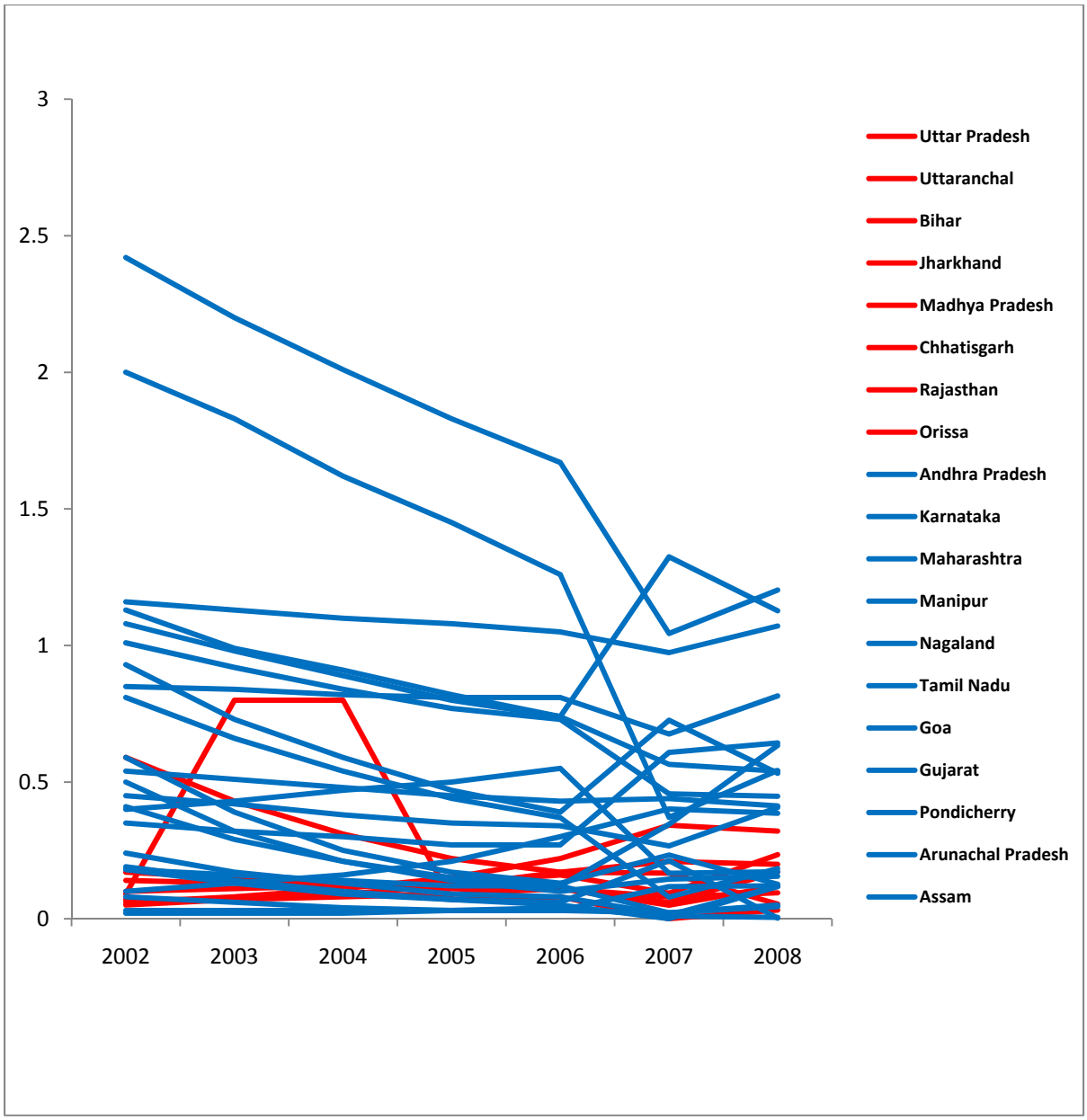


Fig. 3: Time Trend Analysis of HIV prevalence rate in Empowered Action Group (EAG; in red color) Vs. Non-EAG states (in blue color)

OBSERVATIONS:

The EAG states exhibit low HIV prevalence rates. Uttaranchal, exhibits dramatic ups and downs in HIV estimates between 2002 - 2005. At low prevalence rates, the HIV estimates are also showing a decline. The Non-EAG states are also showing a downward trend. So, on comparing the trends of the EAG & Non-EAG states, we are able to see a gradual decline in HIV estimates which is comparatively lesser in EAG states than in Non-EAG states.

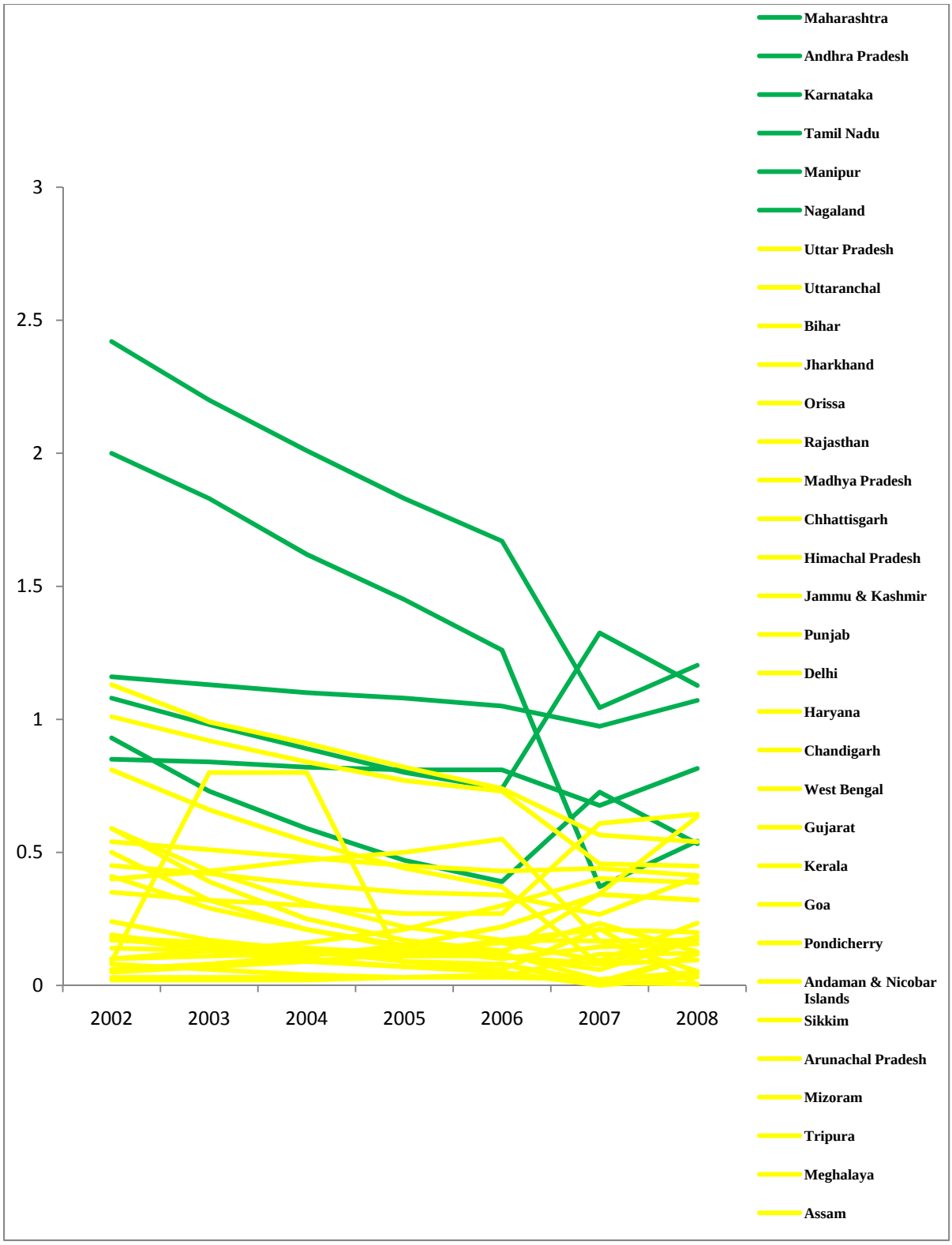


Fig. 4: Time Trend Analysis of HIV prevalence rate in High Prevalence (in green color) Vs. Low Prevalence states (in yellow)

OBSERVATIONS:

As expected, the High prevalence states are showing sharp declines in the HIV estimates as compared to the low prevalence states. Among the high prevalence states, Tamil Nadu is showing consistently low prevalence rates which may signify a reduction in the HIV epidemic in the state.

Table 2: Adult HIV Prevalence Rates for North Indian States (2002 – 2008*)

States	2002	2003	2004	2005	2006	2007	2008
Jammu & Kashmir	0.02	0.02	0.02	0.03	0.04	0.010	0.005
Himachal Pradesh	0.03	0.03	0.03	0.03	0.03	0.022	0.044
Punjab	0.18	0.16	0.14	0.12	0.12	0.345	0.634
Uttaranchal	0.09	0.8	0.8	0.07	0.08	0.000	0.032
Delhi	0.35	0.32	0.3	0.27	0.27	0.609	0.643
Haryana	0.5	0.32	0.21	0.14	0.1	0.145	0.155
Uttar Pradesh	0.14	0.13	0.12	0.11	0.11	0.059	0.171
Chandigarh	0.45	0.42	0.38	0.35	0.34	0.266	0.407

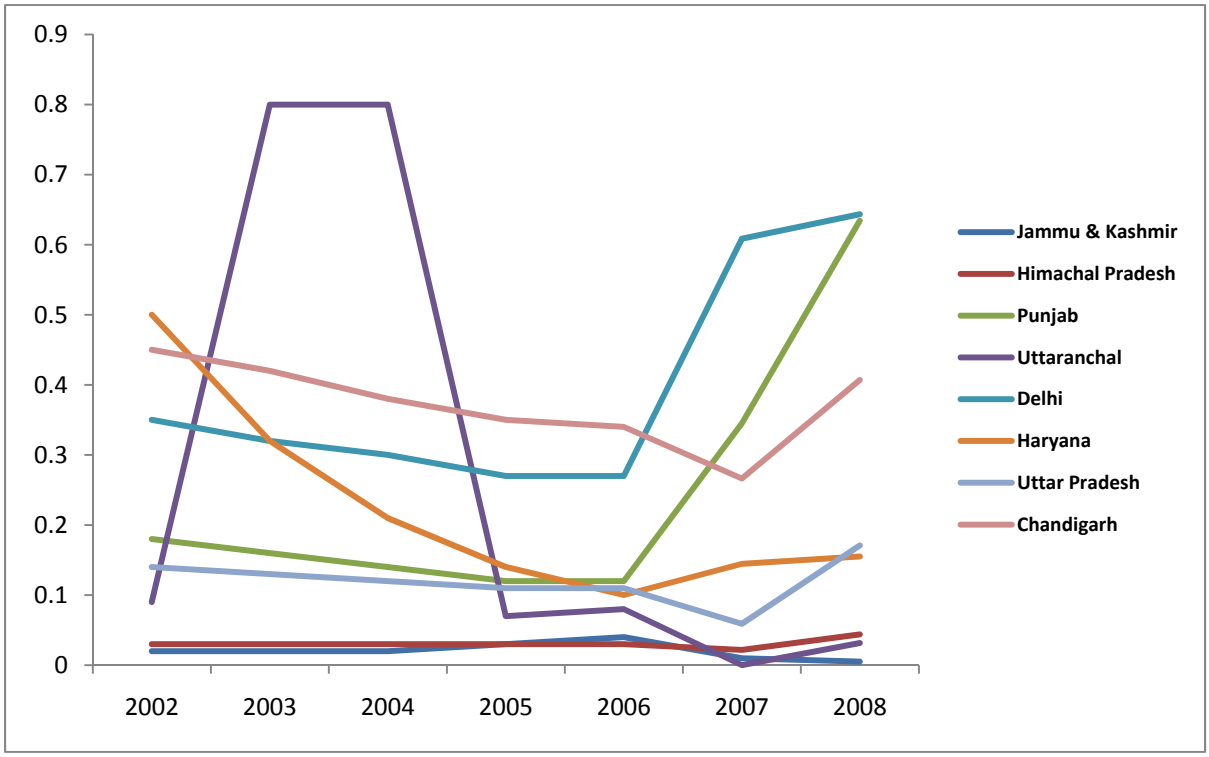


Fig. 5: Time Trend Analysis of HIV prevalence rates in North Indian states

OBSERVATIONS:

The north Indian state of Uttaranchal is showing highly dramatic prevalence rates. On the whole, HIV prevalence rates in the North Indian states are showing a downward trend, the only exception being Delhi, Haryana & Chandigarh which are low prevalence but high vulnerability states/Union Territories.

Table 3: Adult HIV Prevalence Rates for East Indian States (2002 – 2008*)

States	2002	2003	2004	2005	2006	2007	2008
West Bengal	0.1	0.13	0.16	0.21	0.3	0.402	0.386
Bihar	0.1	0.11	0.12	0.13	0.16	0.093	0.234
Jharkhand	0.06	0.08	0.11	0.15	0.22	0.342	0.321
Orissa	0.06	0.08	0.11	0.15	0.22	0.342	0.321

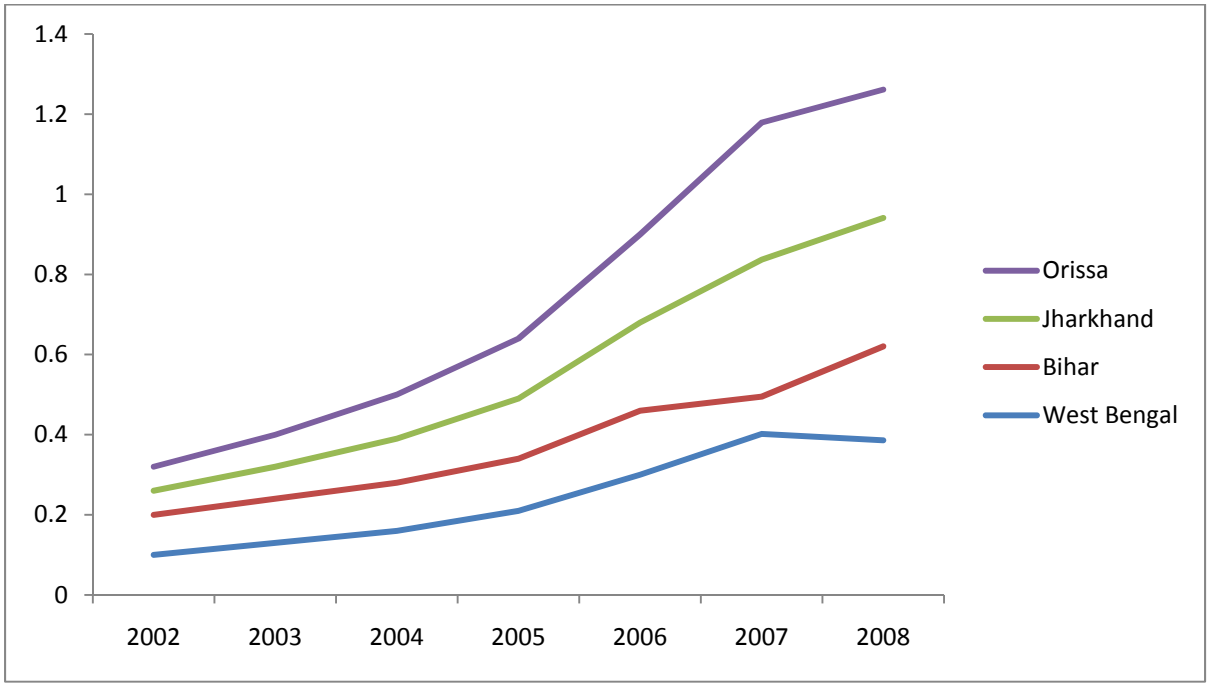


Fig. 6: Time Trend Analysis of HIV prevalence rates in East Indian states

OBSERVATIONS

Contrary to the national & other states HIV estimates, the estimates of East Indian states are actually showing an upward trend. This is attributable to the fact that these states are the low prevalence but high vulnerability states for HIV/AIDS.

Table 4: Adult HIV Prevalence Rates for West Indian States (2002 – 2008*)

States	2002	2003	2004	2005	2006	2007	2008
Rajasthan	0.05	0.07	0.09	0.12	0.17	0.210	0.199
Gujarat	0.54	0.51	0.48	0.45	0.43	0.440	0.413
Maharashtra	**1.08**	**0.98**	**0.89**	**0.8**	**0.74**	**1.325**	**1.127**

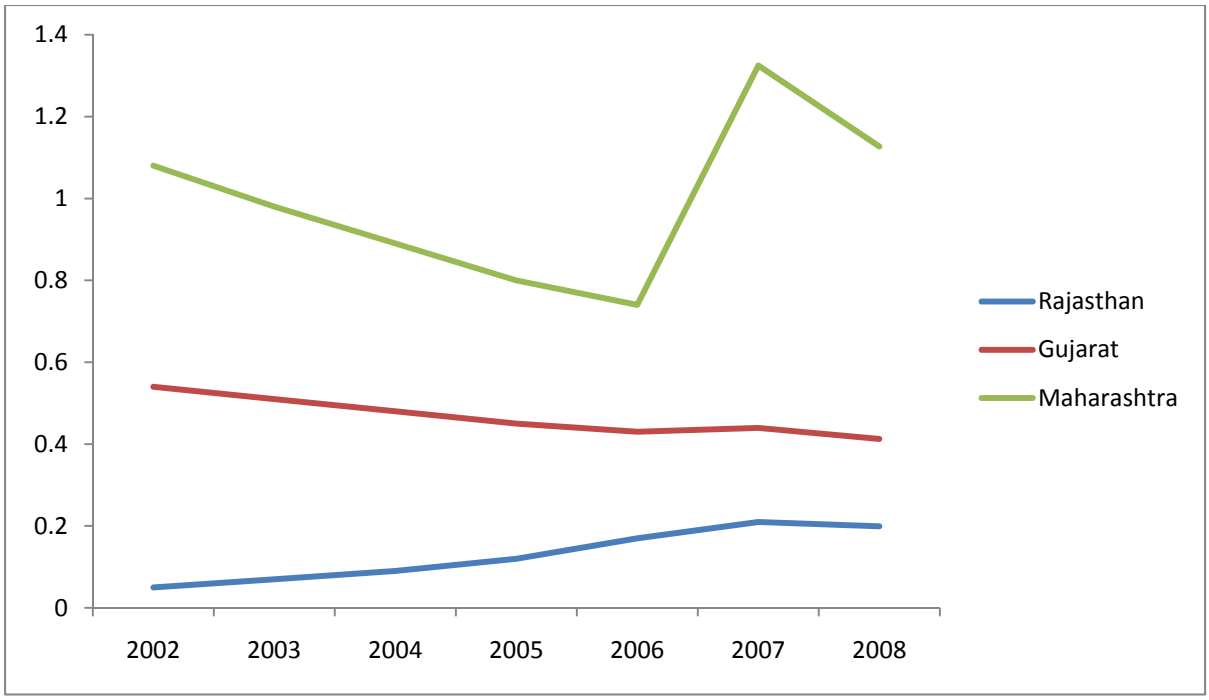


Fig. 7: Time Trend Analysis of HIV prevalence rates in West Indian states

OBSERVATIONS:

Maharashtra, being a high prevalence state is exhibiting a high HIV estimate and a steep drop in estimates around 2006-2007. However, it is also showing an upward trend around 2007-2008 confirming its status as a high prevalence state. This is primarily attributable to its capital, Mumbai, the center of one of the biggest sex trade business in India. HIV estimates are stable in Gujarat, showing a slight dip around 2007. Rajasthan, on the contrary is showing a gradual increase in HIV estimates right from 2002 till 2006 and then becomes stable, although at a high estimate, between 2007-2008, thus reaffirming its status as a low prevalence but highly vulnerable state.

Table 5: Adult HIV Prevalence Rates for South Indian States (2002 – 2008*)

States	2002	2003	2004	2005	2006	2007	2008
Andhra Pradesh	**1.16**	**1.13**	**1.1**	**1.08**	**1.05**	**0.974**	**1.071**
Karnataka	**0.85**	**0.84**	**0.82**	**0.81**	**0.81**	**0.676**	**0.815**
Kerala	0.59	0.39	0.25	0.17	0.13	0.233	0.126
Tamil Nadu	**0.93**	**0.73**	**0.59**	**0.47**	**0.39**	**0.727**	**0.532**
Goa	1.01	0.92	0.84	0.77	0.73	0.457	0.448
Lakshadweep	No results as there are no valid sites					0.000	
Pondicherry	0.4	0.43	0.47	0.5	0.55	0.166	0.171
Andaman & Nicobar Islands	0.81	0.66	0.54	0.44	0.37	0.079	0.184

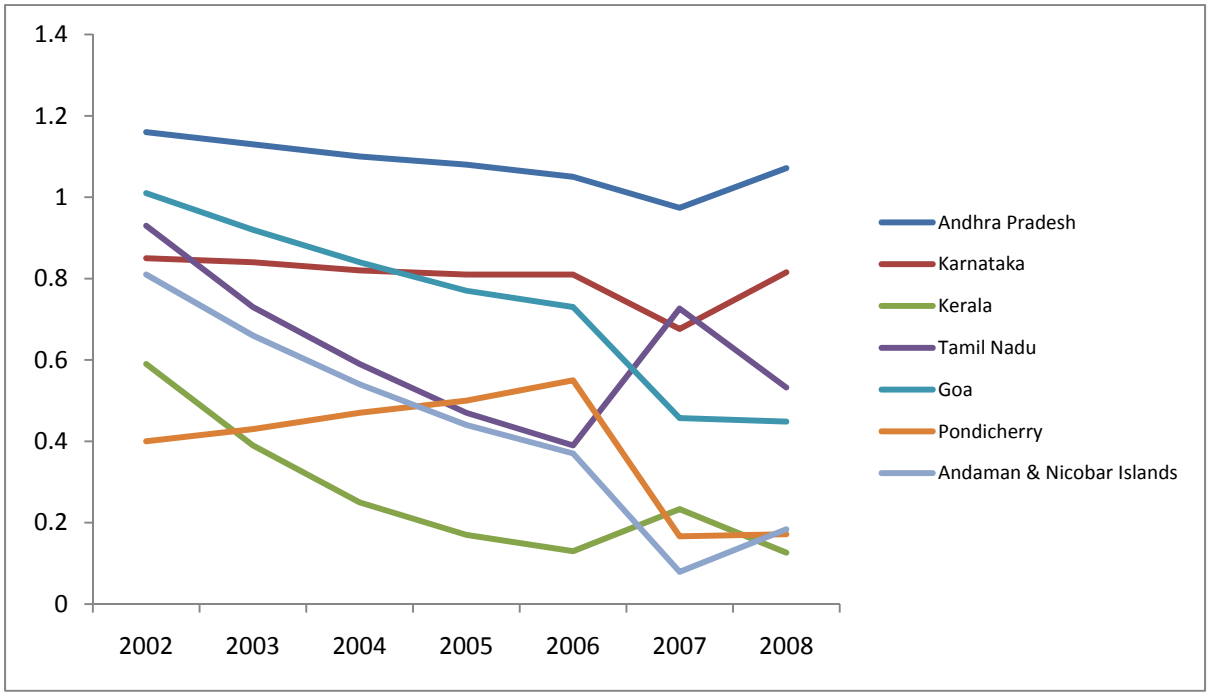


Fig. 8: Time Trend Analysis of HIV prevalence rates in South Indian states

OBSERVATIONS:

Three of the seven south Indian states (namely, A.P., Karnataka and Tamil Nadu) are high prevalence states. They are showing sharp declines. Among others, notable is the case of Kerala which shows an upward trend post-2006. The remaining south Indian states are showing a downward trend in HIV estimates

Table 6: Adult HIV Prevalence Rates for North East Indian States (2002 – 2008*)

States	2002	2003	2004	2005	2006	2007	2008
Sikkim	0.24	0.17	0.13	0.09	0.08	0.014	0.119
Arunachal Pradesh	0.18	0.13	0.09	0.07	0.05	0.000	0.117
Manipur	**2.42**	**2.2**	**2.01**	**1.83**	**1.67**	**1.044**	**1.203**
Nagaland	**2**	**1.83**	**1.62**	**1.45**	**1.26**	**0.371**	**0.542**
Mizoram	1.13	0.99	0.91	0.82	0.74	0.565	0.540
Tripura	0.41	0.29	0.21	0.15	0.12	0.022	0.050
Meghalaya	0.19	0.14	0.1	0.07	0.06	0.213	0.002
Assam	0.08	0.06	0.04	0.03	0.03	0.117	0.121

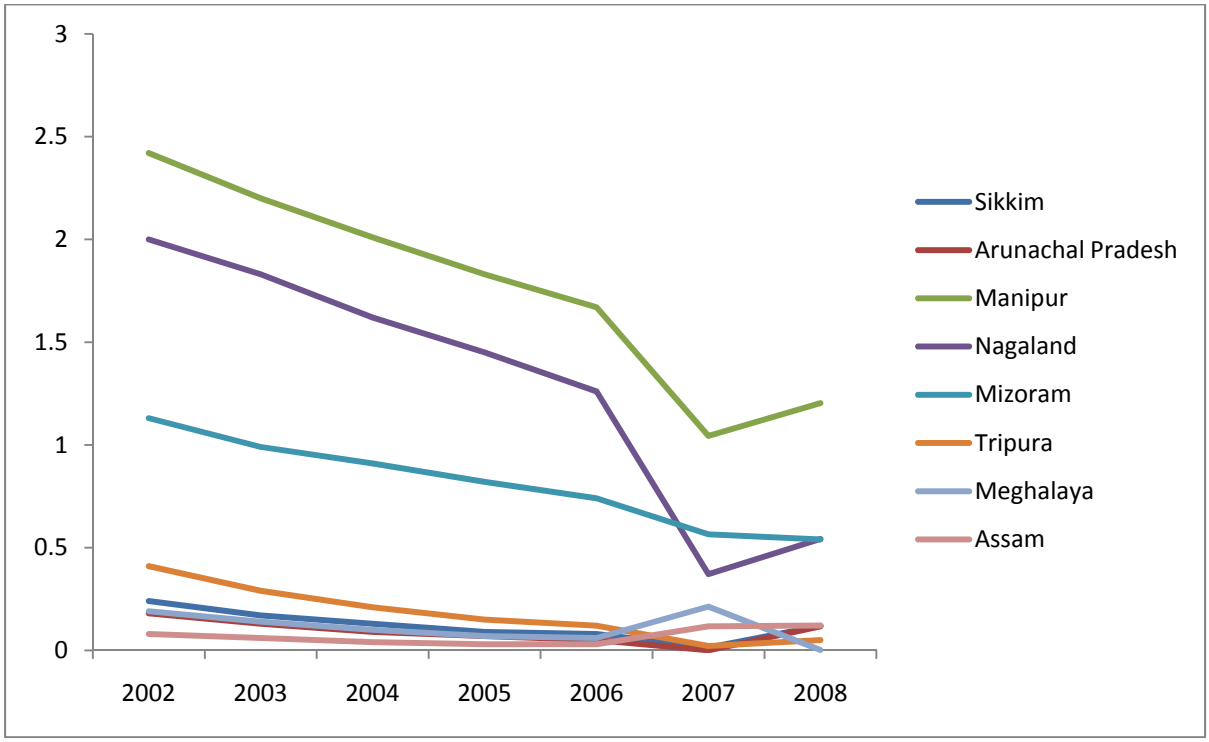


Fig. 9: Time Trend Analysis of HIV prevalence rates in North Eastern Indian states

OBSERVATIONS:

Manipur & Nagaland being high prevalence states are showing sharp declines in HIV estimates around 2006. With the sole exception of Mizoram, which is actually showing an increase around 2007, all other North Eastern states are showing a downward trend in HIV estimates post-2006.

Table 7: Adult HIV Prevalence Rates for Central Indian States (2002 – 2008*)

States	2002	2003	2004	2005	2006	2007	2008
Madhya Pradesh	0.17	0.15	0.13	0.12	0.11	0.080	0.095
Chhattisgarh	0.59	0.43	0.31	0.22	0.17	0.167	0.054

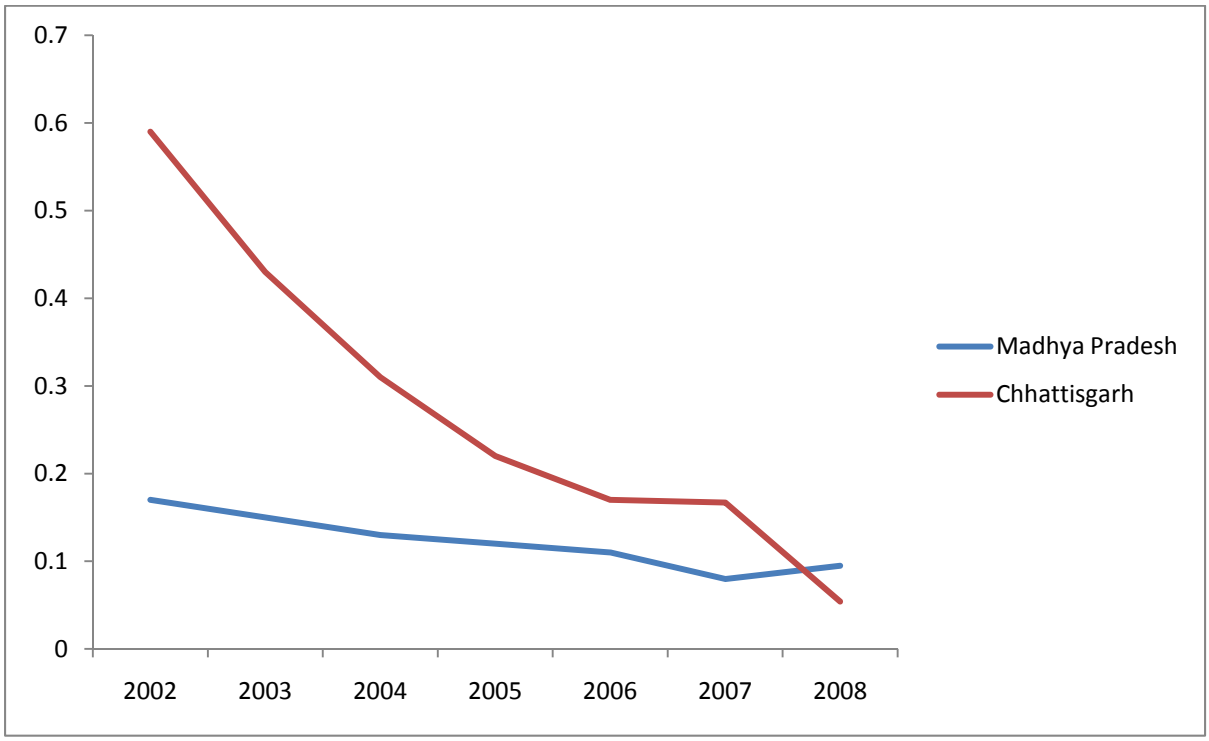


Fig. 10: Time Trend Analysis of HIV prevalence rates in Central Indian states

OBSERVATIONS:

The central Indian States of Madhya Pradesh & Chhattisgarh are showing declines in HIV estimates in and after 2006. However, Madhya Pradesh is showing an increase around 2008

Conclusion & Recommendations

The new estimates for 2006 of adult HIV prevalence and the number of PLHA of all ages [2.5 million (range 2.0-3.1 million)] represented a major downward revision from the 0.91 per cent and 5.7 million, respectively, reported by the UNAIDS19 for 2005. This 2005 estimate was essentially based on the adult prevalence reported by National AIDS Control Organization using the previous methodology.

There were two major changes in the current method of estimation. First, HIV prevalence among antenatal clinic attendees was adjusted and calibrated to NFHS-3 estimates as opposed to the use of unadjusted median prevalence used in the past. Secondly, in the 2006 estimation STD patients were not included as a separate estimation group representing people with high risk behavior. It is important to consider the justification and impact of these changes. In India, utilization of antenatal services of the public sector is poor (28.7%), 50 per cent of women marry before the age of 18 yr and complete the family by the age of 26 yr. Thus, antenatal clinic attendees are young, sexually more active and have had unprotected sex to be pregnant. Thus, they are not representative of all adult women, and HIV prevalence observed among them is likely to be higher than that in the general population. Public antenatal care facilities were preferred by women of lower socio-economic strata among whom HIV prevalence was higher and those antenatal mothers detected positive for HIV in the private sector were selectively referred to public facilities, leading to exaggeration of HIV prevalence in ANC sites.

Despite these limitations, the HIV prevalence among ANC attendees had been used for past estimation exercises because of the absence of any other credible nationwide data.

Secondly, in past estimation exercises people with an STD (estimated at about 6% of the adult population in urban and rural areas of high prevalence States and 6% of the adult population in urban area and 5% of the adult population in rural area in moderate and low prevalence states in previous rounds) were retained as a separate group for estimation in both States with high and low prevalence, even after the inclusion of FSW and MSM.

The new analysis for 2006 suggested that the use of non representative ANC sentinel surveillance data without adjustments, and the inclusion of a large section of the population to represent a population at higher risk of HIV, had led to overestimation in the past exercises. HIV prevalence among high risk behavior population, IDU, MSM, FSW and half

of trucker population were included in the current estimation, based on two considerations. Firstly, the HIV epidemic in most parts of India is concentrated and in concentrated epidemics household surveys are expected to underestimate the true HIV prevalence as some groups with high risk behaviour may reside in institutions and not in households. Secondly, a proportion of the population that is generally mobile is likely to have been missed in the population-based survey. Indeed, 13.5 per cent of men and 6.4 per cent of women who were eligible to be interviewed did not complete interviews for a variety of reasons (most of them because of absence at the time of the survey) and those individuals were not tested for HIV. An additional 2.1 per cent of men and 1.1 per cent of women who were interviewed were not tested for HIV because they were absent at the time of blood collection. A further 6.3 per cent of men and 7.5 per cent of women were also missed for HIV testing in the survey for other reasons including refusal to provide blood for HIV testing. However, a non response analysis, conducted for NFHS-3, showed that non participation in the blood collection for HIV makes almost no difference to the HIV prevalence estimates for the household-based population.

However, the use of pooled estimate of HIV prevalence of NFHS-3 for low and medium prevalence States to derive calibration factors and need to use the same in subsequent years until the next nationwide household survey are the limitations of the current methodology. The current estimate is a revision based on improved data and methodological changes. The difference between the current estimate and previously published estimates does not represent a true decline at the population level. However, even at this level, India continues to be the third largest contributor to the global HIV burden after South Africa and Nigeria. The prevalence trend at national level appears to be stable after 2002 under both the approaches. Tamil Nadu is the only high prevalence State that has shown significant decline in HIV prevalence. HIV prevalence remained stable at high level in Andhra Pradesh and Karnataka. Increasing epidemic trend in seven low prevalence States, namely, Pondicherry, Jammu & Kashmir, Jharkhand, Bihar, Orissa, Rajasthan and West Bengal draws attention to the policy and programme managers. Given the large size of the country, providing ART to those requiring would be an important challenge for the coming years. In addition, the size of the population at risk of HIV infection remains huge, requiring the concerted preventive efforts.

It can thus be safely concluded that Differences in the estimates in pre- & post- 2006 years does not indicate a decline in the HIV/AIDS epidemic. It simply denotes correction of the incongruities & defects in earlier estimation methods. There is a need to develop fool-proof estimation calibrator standards so that the assessment process gets rid of the need of NFHS-III or other survey-based results for adjustment.

Since the study is a trend analysis of HIV prevalence before and after changes in HIV estimation technique, it is not possible to conclusively determine whether the changes in prevalence are only due to the changes in the HIV estimation technique. The trend analysis cannot tease out the effect of the AIDS control programs running in different states & nationally in relation to the impact on HIV prevalence.

It is only possible to infer that since the trends have shown a greater decline after the introduction of the new technique it is possible that at least some fraction of the decline is attributable to the change in the estimation technique alone.

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Abbreviations

AIDS	Acquired Immuno Deficiency Syndrome
ANC	Ante Natal Clinic
ART	Anti Retroviral Therapy
BSS	Behavioral Surveillance Survey
CMIS	Computerized Management Information System
CSW	Commercial Sex Worker
FSW	Female Sex Worker
HIV	Human Immunodeficiency Virus
HRG	High Risk Group
HSS	HIV Sentinel Surveillance
IBBA	Integrated Biological & Behavioral Analysis
IDU	Intravenous Drug User
MSM	Men having Sex with Men
NACO	National AIDS Control Society
NACP	National AIDS Control Program
NFHS	National Family Health Survey
NGO	Non-Government Organization
OI	Opportunistic Infections
PLHA / PLHWA	People Living with HIV/AIDS
TI	Targeted Interventions
STD/STI	Sexually Transmitted Disease/Infection
WHO	World Health Organization

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