

# INTEGRATED AND ENHANCED SURVEILLANCE AND EPIDEMIOLOGY OF HIV, STI AND RELATED CO-MORBIDITIES UNDER THE NATIONAL AIDS & STD CONTROL PROGRAMME

**Strategic Framework**

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# INTEGRATED AND ENHANCED SURVEILLANCE AND EPIDEMIOLOGY OF HIV, STI AND RELATED CO-MORBIDITIES UNDER THE NATIONAL AIDS & STD CONTROL PROGRAMME

## Strategic Framework





सत्यमेव जयते

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## FOREWORD

Surveillance is essential to an effective public health response. Recognising the importance, setting-up of HIV surveillance has been focused globally since the detection of the first case in 1981. The World Health Organization and The Joint United Nations Programme on HIV/AIDS issue periodic guidelines to tailor surveillance systems to the needs of specific epidemic states.

In India, HIV surveillance is the first activity under the national AIDS response. Initiated as early as 1985 in the form of sero-surveillance by the Indian Council of Medical Research, the system discovered the first HIV case in India in April 1986. Since then, the HIV surveillance system under the National AIDS and STD Control Programme (NACP) has evolved significantly as one of the world's largest, fully sustainable HIV surveillance systems covering four bio-markers and eight population groups.

The Government of India has approved the continuation of the National AIDS and STD Control Programme (Phase-V) as a fully funded Central Sector Scheme for a period of five years (2021-22 to 2025-26). The NACP Phase-V aims to reduce annual new HIV infections and AIDS-related death by 80% since the baseline value of 2010 through strategies focusing on the prevention and control of HIV/AIDS and STI/RTI.

Given the ambitious agenda of the NACP Phase-V focussing on the incidence and AIDS-related mortality, National AIDS Control Organization has formulated a strategic framework for integrated and enhanced surveillance and epidemiology (IESE) of HIV, STI and related co-morbidities. The IESE framework aims to measure the level, trends, and determinants of HIV, STI and related co-morbidities prevalence, incidence and mortality using systems of the highest possible scientific rigour. The framework is fully funded by the Government of India through NACP Phase-V.

The country has initiated a very important journey towards ending of HIV/AIDS epidemic as a public health threat by 2030. The integrated and enhanced surveillance and epidemiology will be the central navigator in this journey. I am confident that we all would be fully implementing the IESE and all new components of NACP Phase-V as we fast-track our efforts to reach the 2030 sustainable development goals.

**Alok Saxena**

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**अपनी एचआईवी अवस्था जानें, निकटतम सरकारी अस्पताल में मुफ्त सलाह व जाँच पाएँ**

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सत्यमेव जयते

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## PREFACE

Surveillance and Epidemiology (S&E) plays a fundamental role in public health. HIV surveillance systems monitor the magnitude and trends in the prevalence of infection and risk behaviour. Data from HIV surveillance systems are used for evidence-based program planning. This course will provide a background of the HIV epidemic, an overview of HIV surveillance systems and a basic understanding of HIV surveillance components. Epidemiological indicators of prevalence, incidence and mortality by location and population remain fundamental to monitor the progress made towards the 2030 Endgame.

The surveillance system is continuously evolving under the National AIDS and STD Control Program (NACP) since its inception in 1992. Given the contour of Sustainable Development Goal (SDG), National AIDS Control Organisation (NACO) has formulated Integrated and Enhanced Surveillance and Epidemiology (IESE) of HIV, STIs and related comorbidities to anchor the national AIDS response till 2030. The IESE framework has been recommended by NACO's Technical Working Group (TWG) and Technical Resource Group (TRG) on Surveillance & Epidemiology and approved by the competent authority. This document provides the strategic framework of IESE under the NACP in India.

The strategic framework reviews the status of surveillance & epidemiology under NACP vis-avis global recommendations and SDG context and provides the roadmap for granular, collaborative and outcome driven IESE under NACP till 2030. The strategic framework outlines the population groups, the bio-behavioural domain and the data collection approaches under IESE keeping individual and community in centre while adhering to highest possible ethical standards of the public health surveillance & epidemiology.

The strategic framework of IESE is a natural extension of the strategy document of the National AIDS & STD Control Programme Phase-V (2021-2026) which identify Strategic Information as the third guiding principle. I am confident that all the stakeholders will use this document extensively for augmenting evidence-driven national AIDS response under NACP.

**Nidhi Kesarwani**







## MESSAGE

On behalf of UNAIDS, I am pleased to congratulate the National AIDS Control Organisation, Ministry of Health and Family Welfare (NACO, MoHFW) for developing one of the world largest and strongest HIV Surveillance and Epidemiology (S&E) systems to guide the National AIDS Control Programme (NACP). This system has periodically been upgraded considering the evolving epidemic, latest programme data needed for impact planning, noting the latest global methods available to generate those data, and building on and innovating towards locally relevant and context specific methods which are feasible for implementation at the national/State/district levels. Implementation is via a well functional domestically resourced national structure comprising of central and regional institutes and State AIDS Control Societies.

As part of this thoughtful approach to carefully evolve and design this system, in the year 2021, NACO has once again undertaken such an analysis and stock-taking of the existing S&E system to make it even more responsive and agile to respond to the programme data needs — which varies by region/State/district. Through a very thorough consultative process with national and international experts, the 2021 'Integrated and Enhanced Surveillance and Epidemiology Framework under the National AIDS Control Programme' (IESE) has been formulated, keeping the 2030 Sustainable Development Goal milestone of 'ending AIDS as a public health threat.' This is strongly appreciated.

The IESE framework is indeed a timely and strategic NACO initiative. I am sure that the data generated in the coming years through this framework, will provide critical evidence for impact planning towards the 2030 'End-Line' of ending AIDS. The IESE framework covers the gambit of S&E activities ranging from HIV, STI, and Hepatitis Sentinel Surveillance by population groups and geographies; Behavioural Surveillance; Mortality Surveillance; Incidence Surveillance using programme cohort data; key population mapping and size estimation; estimating the spread and magnitude of HIV and STI by population and geographies; conducting operations research on key S&E topics critical for the programme, and bringing all these evidences together and making them timely available for planning at the national/State/district level. UNAIDS is pleased to have supported NACO in developing this critical framework, along with ICMR Regional Institutes, WHO, PEPFAR and other partners.

The IESE framework report is a very rich framework guide. I recommend other countries to also refer to it and take benefit from it as needed. Indeed, it will be difficult for the world and the region to end SDG 3.3 without India's leadership.

Congratulations once again to NACO. UNAIDS reaffirms its full and continued support to their leadership in surveillance and epidemiology, and support in implementing the various national initiatives planned towards achieving the End of AIDS.



**David Bridger**

UNAIDS Country Director for India



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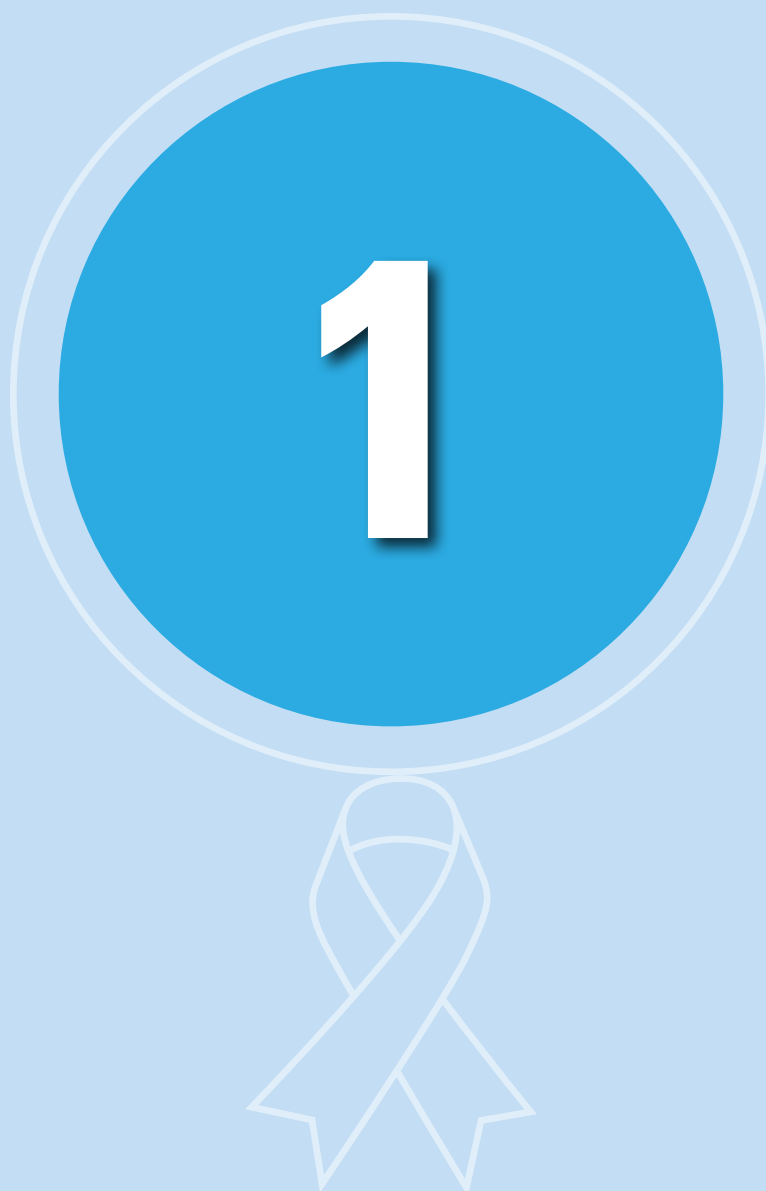
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# LIST OF ABBREVIATIONS

AGYW	Adolescent Girls and Young Women
AIIMS	All India Institute of Medical Science
AIDS	Acquired Immunodeficiency Syndrome
AMR	Antimicrobial Resistance
ART	Antiretroviral Therapy
ARV	Antiretroviral
BBSS	Bio-Behavioural Surveillance Survey
BSS	Behavioural Surveillance Survey
CBS	Case-based Surveillance
CST	Care, Support and Treatment
CT	Chlamydia Trachomatis
DBS	Dried Blood Spot
DAPCU	District AIDS Prevention and Control Unit
EDTA	Ethylenediaminetetraacetic acid
EID	Early Infant Diagnosis
IESE	Integrated and Enhanced Surveillance and Epidemiology
FSW	Female Sex Worker
HBV	Hepatitis B Virus
HCV	Hepatitis C Virus
HIV	Human Immunodeficiency Virus
HRG	High-risk Group
HSS	HIV Sentinel Surveillance
IBBS	Integrated Bio-behavioural Surveillance
ICMR	Indian Council of Medical Research
ICMR-NIMS	Indian Council of Medical Research-National Institute of Medical Statistics
IDU	Injecting Drug Users
KIF	Key Indicators Framework
LDT	Long-distance Truckers
MPSE	Mapping and Population Size Estimation
MSM	Men having Sex with Men
MTCT	Mother-To-Child Transmission
NACO	National AIDS Control Organization

NACP	National AIDS and STD Control Programme
NFHS	National Family Health Survey
OST	Opioid Substitution Therapy
PCBS	Programmatic Case-based Surveillance
PLHIV	People Living with HIV
p-MPSE	Programmatic Mapping and Population Size Estimation
PMTCT	Prevention of Mother-to-Child Transmission
PrEP	Pre-exposure Prophylaxis
RDS	Respondent-driven Sampling
RITA	Recent Infection Testing Algorithm
RSTRRL	Regional STI Training, Research and Reference Laboratories
S&E	Surveillance and Epidemiology
SACS	State AIDS Control Society
SDG	Sustainable Development Goals
SGS	Second-Generation Surveillance
SMM	Single Male Migrant
SOCH	Strengthening Overall Care for HIV Beneficiaries
SRH	Sexual and Reproductive Health
STI	Sexually Transmitted Infections
STD	Sexually Transmitted Diseases
TPT	TB Preventive Therapy
TRG	Technical Resource Group
TSU	Technical Support Unit
TWG	Technical Working Group
UAT	Unlinked Anonymous Testing
UN	United Nations
UNAIDS	The Joint United Nations Programme on HIV and AIDS
VL	Viral Load
WHO	World Health Organization



# INTRODUCTION

Public health Surveillance is an essential public health function to inform disease prevention and control measures<sup>[1,2]</sup>. Defined as “ongoing systematic collection, analysis, interpretation and dissemination of health data for the planning, implementation and evaluation of public health action”, public health Surveillance not only guides public health policy and strategies but also documents the impact of an intervention or progress made towards specified public health targets/goals by providing in-depth insights into the epidemic<sup>[3]</sup>.

Global AIDS response has recognized Surveillance as critical to understanding the epidemic level and the emerging trends towards making sound decisions on response measures<sup>[4]</sup>. Recognizing the vital role, the World Health Organization (WHO) and the Joint United Nations (UN) Programme on HIV and AIDS (UNAIDS) have provided guidelines periodically on HIV Surveillance systems<sup>[5,6,7,8,9,10,11,12,13,14,15]</sup>. The objectives have been to develop standardised and comprehensive Surveillance systems for measuring the level and trend of prevalence, incidence, related mortality, and their determinants, including estimating the size of the populations that are most at risk to HIV<sup>[16,17]</sup>.

In India, HIV Surveillance is one of the first interventions under the national AIDS response. Recognizing the HIV epidemic threat, the Indian Council of Medical Research (ICMR) initiated sero-Surveillance in search of the virus in 1985, thus detecting the first case of HIV in India in April 1986<sup>[18,19]</sup>. This sero-Surveillance evolved into the HIV Sentinel Surveillance (HSS), which was first piloted in 1994 and then formalized into the annual Surveillance system in 1998 under the National AIDS and STD Control Programme (NACP)<sup>[20]</sup>.

The yearly HIV Surveillance system under NACP gradually evolved into biennial HSS plus. The 17<sup>th</sup> round, implemented in 2021, covered eight population groups [pregnant women, single male migrants (SMM), Long-distance Truckers (LDT), inmates at central prison sites, Female Sex Workers (FSW), Men who have Sex with Men (MSM), Hijra/ Transgender (H/TG) people, and Injecting Drug Users (IDU)] targeting bio-behavioural data collection from almost 5.06 lakh samples<sup>[21]</sup>. The blood specimens were tested for four bio-markers, i.e. HIV, Syphilis, Hepatitis B virus (HBV) and Hepatitis C virus (HCV). This round also collected relevant data on the background characteristics, HIV/AIDS-related knowledge, services uptake, and risk behaviour through a focused tool.

Several rounds of mapping and size estimation and Bio-Behavioural Surveillance Surveys (BBSS) among High-risk Group (HRG) have duly complemented the HSS under NACP<sup>[22,23,24,25,26]</sup>. The system disseminates these sentinel Surveillance results and consolidates various epidemiological and programmatic data into prevalence, incidence and mortality estimates at District, State and National-levels<sup>[27,28,29,30]</sup>. The results, thus generated, are used to inform the policymakers not only on magnitudes and directions of the epidemic but also on the location and population prioritization<sup>[31,32]</sup>. Various independent global assessments have found India’s HIV Surveillance system as a fully functional system generating the evidence and fully used by the programme for efficient AIDS response<sup>[33,34,35]</sup>.





# HIV SURVEILLANCE IN THE ERA OF SUSTAINABLE DEVELOPMENT GOALS: THE GLOBAL CONTEXT

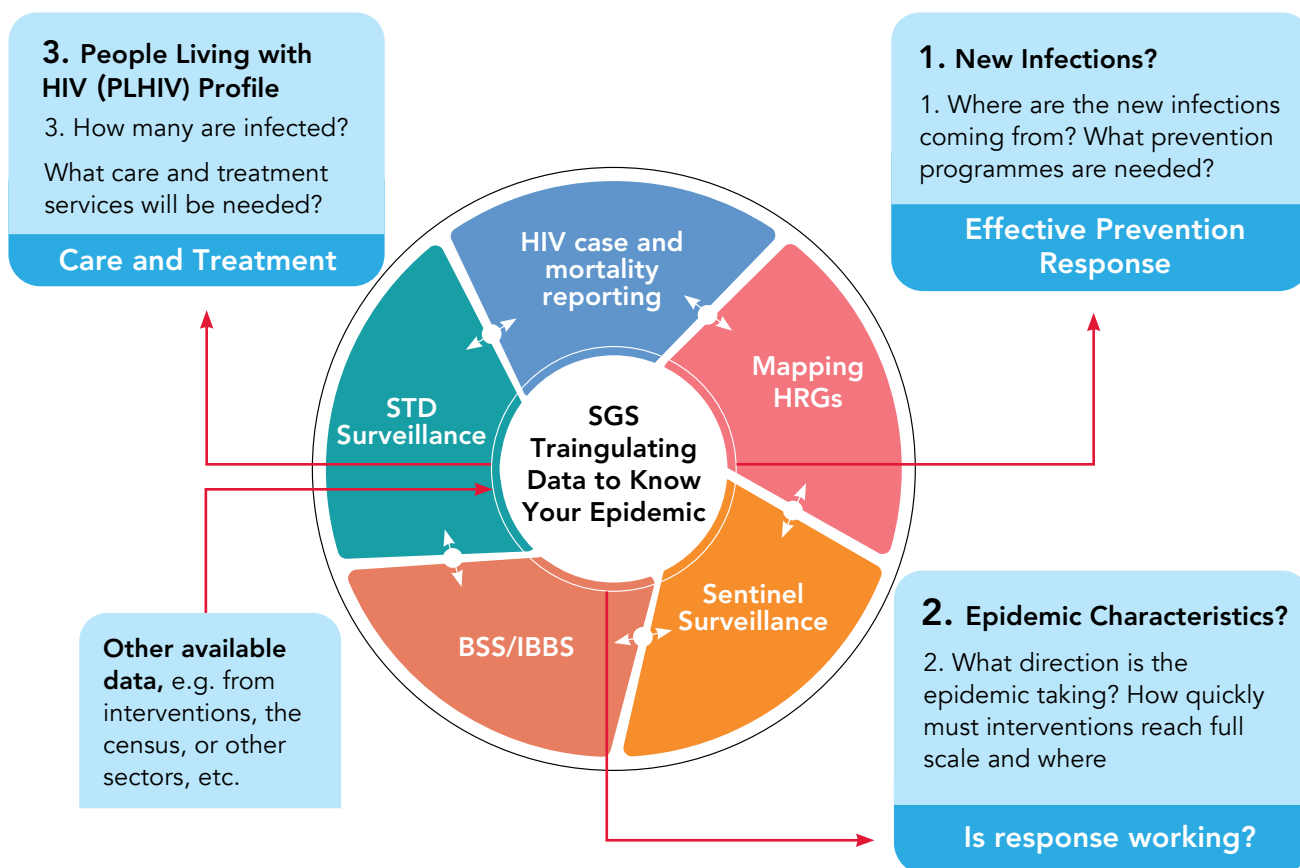
The UN launched the Sustainable Development Goals (SDGs) in 2015, setting the global agenda for the next 15 years towards a better and more sustainable future for all [36]. Ending AIDS as a public health threat by 2030, *inter alia*, is one of the targets under SDG 3 towards attaining good health and well being [37]. Epidemiological indicators of prevalence, incidence and mortality by location and population remain fundamental to monitor the progress made towards the 2030 Endgame[38].

WHO’s publication in 2013 titled “Guidelines for second-generation HIV Surveillance: an update: Know your epidemic” provides a framework for the complete Surveillance system to provide

high-quality epidemiological data for informed decision-making[10]. This framework for Second-Generation Surveillance (SGS) has five components (Figure 1)[39]. These components include:

- i. Mapping of HRGs.
- ii. HIV sentinel Surveillance.
- iii. Behavioural Surveillance Survey (BSS)/ Integrated Bio-Behavioural Surveillance (IBBS) survey.
- iv. Sexually Transmitted Diseases (STD) Surveillance.
- v. HIV case and mortality reporting.

**Figure 1: Components of SGS to know your epidemics**



## 2.1 Mapping and population size estimation of High-risk Groups

HIV epidemic continues to affect HRGs of FSW, MSM, IDU, H/TG persons and prisoners more than the rest<sup>[40,41,42]</sup>. Mapping and Population Size Estimation (MPSE) remains a core Surveillance function, with a frequency of every two to three years, to inform the planning, monitoring and evaluation of interventions that are designed to respond to the impact of the HIV epidemic among the HRG<sup>[10,43]</sup>. Multiple methods including census/enumeration, local area mapping and estimation, capture-recapture, service/unique object multiplier, network scale-up exist. Still, no method is the gold standard and several suggestions have been made for concurrent use of multiple

methods, including keeping size estimation as one of the objectives of the periodic BSS<sup>[43,44,45]</sup>.

Recent advances in information technology, including mobile phones, have provided increased access to the internet opening new avenues for HRGs, especially FSW and MSM, to solicit a client or seek and meet a partner<sup>[46,47]</sup>. Methods adapting the traditional techniques of MPSE are increasingly being used to provide valuable insights into the size of the population operating through the virtual spaces<sup>[48,49,50]</sup>. Learnings from these methods may inform the firming up of guidelines on population size estimation methods in virtual environments.

## 2.2 Sentinel Surveillance

Cross-sectional HSS has been the recommended method since the early days of epidemic monitoring, providing insights into the level and trend of HIV prevalence by population and locations<sup>[51,52,53,54,55,56]</sup>. However, it is essential to customize the population groups under sentinel Surveillance depending upon the at-risk population's local context. Besides population group of FSW, MSM, IDU, H/TG persons, prisoners and pregnant women; migrants males, truckers and persons with STIs are often recommended for inclusion in the sentinel Surveillance in the generalized and concentrated epidemics<sup>[10]</sup>. A complementary periodic population-based survey further strengthens the insights into HIV prevalence in the general population and adjusts the biases into the facility-based HSS<sup>[57,58,59]</sup>.

As HIV control programmes expanded in their coverage and quality, recommendations are growing to use routine HIV testing data for Surveillance purposes in settings following Unlinked Anonymous Testing (UAT) in HSS from an ethical and sustainability perspective<sup>[60,61,62]</sup>. However, evidence has also recommended for a cautious shift given the quality assurance issues<sup>[63,64,65,66]</sup>.

The HSS systems are also dovetailed for collecting brief HIV/AIDS-related behavioural data through a standardised tool to maximize the return from HSS<sup>[67,68]</sup>. There have also been recommendations as well as implementation to integrate Surveillance of HBV and HCV with existing HIV sentinel Surveillance systems as a cost-efficient approach<sup>[65,69,70,71,72]</sup>.

## 2.3 Bio-Behavioural Surveillance Surveys

As noted above, HRGs are FSW, MSM, IDU, H/TG persons and prisoners who are at elevated risk of acquiring HIV infection than the rest population<sup>[73,74,75]</sup>. IBBS are a core component of the second generation to track the risks, behaviours and prevalence among HRGs and other population groups at an increased risk for HIV infection<sup>[10,15]</sup>.

Cluster sampling, as well as Respondent-driven Sampling (RDS), have been recommended for the BSS globally<sup>[72]</sup>. The cluster sampling strategy is the preferred method whenever a

sampling frame exists. Even if a readymade sampling frame does not exist, and if evidence indicates that a large proportion of the target population can be found at the venue and access to the venue is possible, a cluster sampling strategy may be used. However, in locations where there exists neither a sampling frame nor it is possible to construct one, but evidence indicates that the target population is well networked, the RDS approach may be used.

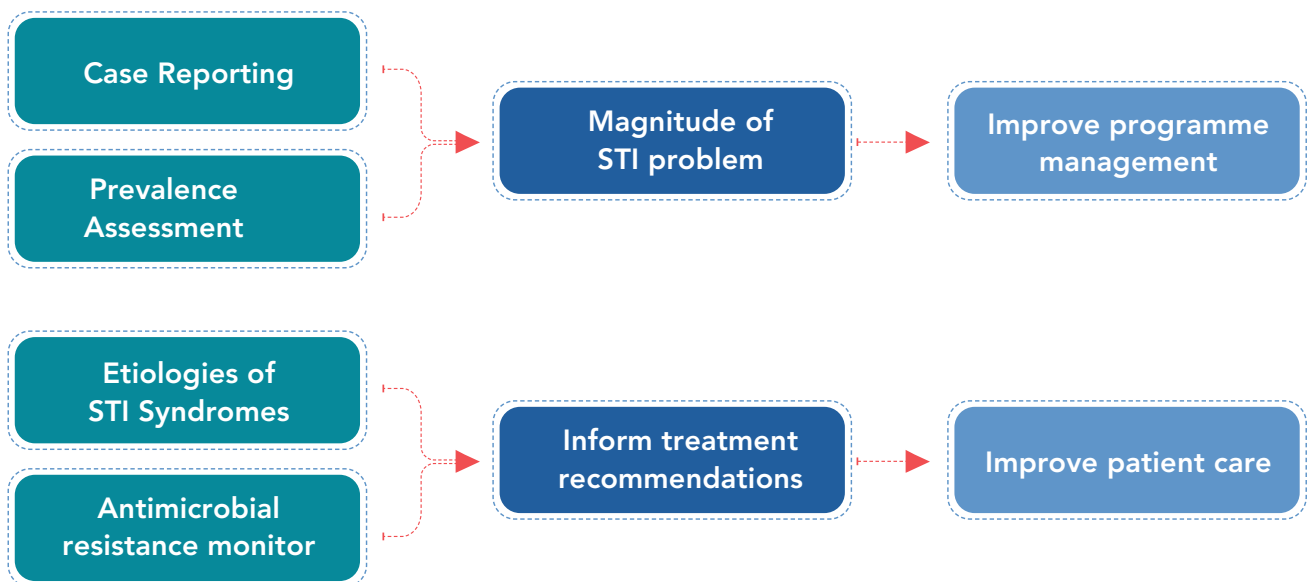
## 2.4 STI Surveillance

Sexually Transmitted Infections (STIs) are indicative of ongoing unprotected high-risk sexual behaviour. For areas where HIV infection is not well established, the high prevalence of STIs is an early warning of the epidemic potential of HIV from sexual transmission. STI Surveillance is, accordingly, a key component of SGS<sup>[10]</sup>, especially in countries with a generalized and concentrated epidemic, STI Surveillance integration with sentinel Surveillance and BBS have strongly been recommended.

WHO's updated STI Surveillance guidelines (2012) outline four core components: case reporting,

prevalence monitoring, etiological Surveillance (primarily Syphilis and Gonorrhoea based on diagnostic feasibility), and Gonococcal antimicrobial resistance (AMR) monitoring customized to the general, bridge and High-risk group population (Figure 2)<sup>[76]</sup>. WHO's global health sector strategy (2016-2021) on STI-linked Surveillance to report the progress on four SDGs (3.2, 3.3, 3.7 and 3.8)<sup>[77]</sup>. Still, STI Surveillance is far from being standardised and its alignment and integration with the HIV Surveillance system are recommended as a practical way forward<sup>[78,79,80]</sup>.

**Figure 2: Objectives and core components of STI Surveillance**

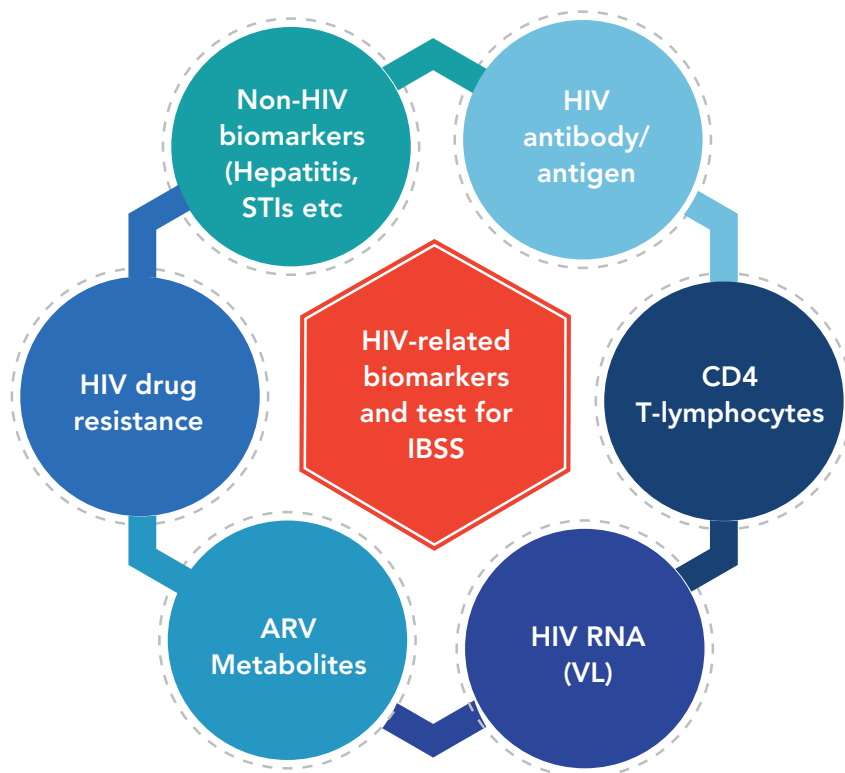


## 2.5 Blood-specimen strategy

The biological sample collected through IBBS is used primarily to indicate the presence or absence of HIV infections through testing for HIV-related antigens or antibodies<sup>[72]</sup>. Additional tests for HIV genomic sequencing (HIV drug resistance or molecular epidemiology), CD4+ T-cell assay (immunosuppression), viral load (VL) (virus transmission potential and the effectiveness of antiretroviral treatment) and Antiretroviral (ARV) metabolites (a marker of Antiretroviral Therapy [ART] or use of Pre-exposure Prophylaxis (PrEP) has been recommended and used in IBBS globally (Figure 3) <sup>[72,81,82,83,84]</sup>.

The type of biomarkers to be tested in IBBS also depends upon the specimen types being collected. Usually, blood specimen, in the form of serum, plasma or Dried Blood Spots (DBS), is collected under BBS, thus serving the need for HIV-related biomarkers (Table 1)<sup>[72]</sup>. However, Surveillance surveys have also collected other specimens like urine, oral fluid, vaginal swabs, rectal swabs, oropharyngeal swabs, urethral swabs, endocervical swabs, etc. <sup>[85,86]</sup>

**Figure 3: HIV-related biomarkers and tests, and their usefulness in IBSS**



**Table 1: Blood specimens – collection, fractions and use<sup>15</sup>**

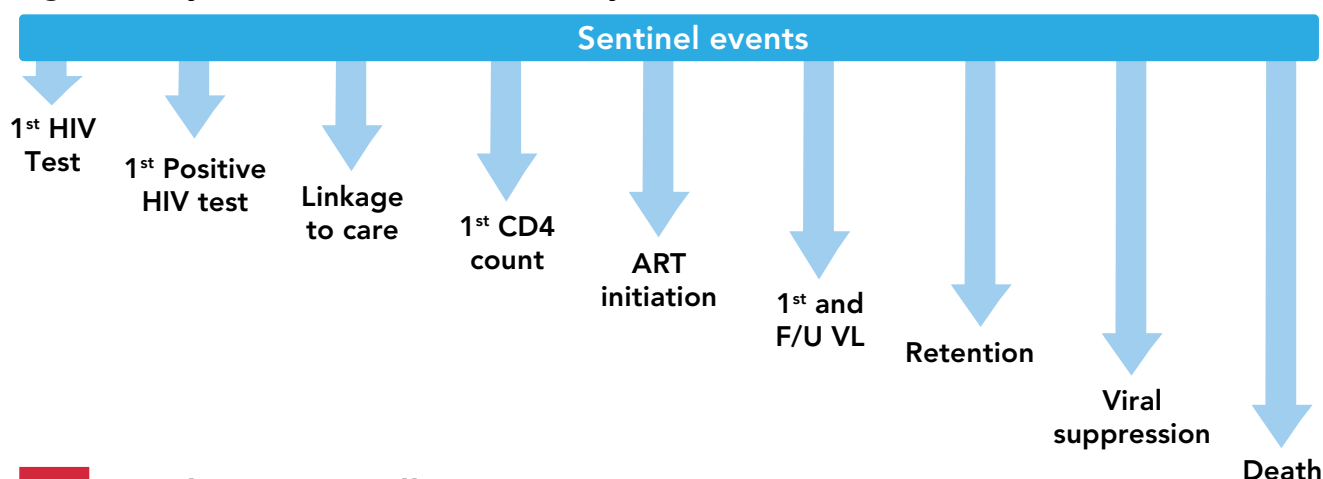
Blood specimen type	Collection container	Blood fraction	HIV rapid test	HIV EIA	HIV recency	VL	HIV DNA PCR	HIV drug resistance	CD4+	Syphilis	Viral Hepatitis
<b>Venous Blood</b>	Vacuum, EDTA	Anticoagulated whole blood	✓						✓		
		Plasma	✓	✓	✓	✓	✓	✓		✓	✓
		DBS		✓	✓	✓	✓	✓			
	Vacuum, EDTA, preservative	Anticoagulated whole blood							✓		
		Serum	✓	✓	✓	✓	✓	✓		✓	✓
<b>Capillary Blood</b>	Capillary or micro collection tube	Anticoagulated whole blood	✓			✓	✓		✓		
		DBS		✓	✓		✓	✓			

## 2.6 HIV case and mortality reporting Surveillance

The availability of individual-level data is improving over the years with the investments made in routine health management information systems<sup>[87]</sup>. Case-based Surveillance (CBS) harnesses this opportunity where longitudinal information for each beneficiary reported from the service delivery points to a central database and is available for epidemiological analysis on key sentinel events since the first HIV test and engagement with HIV care<sup>[88]</sup>. The system has the potential to supplement cross-sectional point-in-time Surveillance surveys providing information on epidemiological indicators of prevalence, incidence and mortality in a very cost-efficient manner (Figure 4)<sup>[89]</sup>.

Reducing AIDS-related mortality is integral to the global AIDS response. In the absence of standardised/sub-optimum availability of direct HIV/AIDS mortality data, especially in the low and middle-income group from civil registration systems, modelled estimates, taking into account the number of HIV infected people on ART and their survival rate, are the primary sources of measuring progress on AIDS-related mortality<sup>[40,90]</sup>. WHO's updated guideline on SGS recommended improving the quality of mortality data providing practical guidance on improving HIV/AIDS mortality<sup>[10,91]</sup>.

**Figure 4: Key Surveillance events for CBS system**



## 2.7 Incidence Surveillance

Sentinel Surveillance has traditionally tracked HIV prevalence. But there is a need to track HIV incidence given the SDG's targets. HIV incidence rate, defined as the number of new HIV infections per 1,000 uninfected population, has been adopted as the primary indicator for monitoring the progress on the 2030 target of ending AIDS<sup>[38]</sup>. Modelled estimates are the mainstay of reporting

progress on the HIV incidence rate<sup>[92]</sup>. Prospective cohort CBS systems, incidence assays (Recent Infection Testing Algorithms, RITA), and using prevalence among 15-24 years olds (or younger age group of 15-19 years olds) as a proxy are other methods under implementation to measure HIV incidence<sup>[93,94,95,96,97,98]</sup>.

## 2.8 HIV burden estimations

HIV estimations synthesize data generated through all Surveillance systems and produce epidemiological estimates on prevalence, incidence and mortality<sup>[99,100]</sup>. Countries use these estimates to inform the planning and resource allocations and assess the progress on SDGs. Globally, UNAIDS-recommended 'Spectrum' model is the most widely used mathematical model for HIV burden estimations<sup>[101]</sup>. Countries are encouraged to produce sub-national estimates to fine-tune their HIV/AIDS response<sup>[102,103]</sup>.

While 'Spectrum' fits an epidemic curve to an observed set of HIV data and only needs size estimates, ARV coverage and HIV prevalence trends, it does not consider the behavioural aspects. Process models (AIDS Epidemic Model (AEM), Goals model, Optima etc.) simulate HIV transmission, require extensive inputs on epidemiology, sizes, behaviour and programmes, thereby providing policy options stimulating in-country discussions of programmes and their impacts<sup>[104,105,106]</sup>.

## 2.9 Ethical considerations

Ethical aspects have been an area of debate in the context of public health Surveillance<sup>[107,108,109,110,111]</sup>. Data collection in public health Surveillance is sometimes without informed consent and has been debated in several fora. However, the need for Surveillance without informed consent has maintained public health's obligation to improve population health, reduce inequities, attend

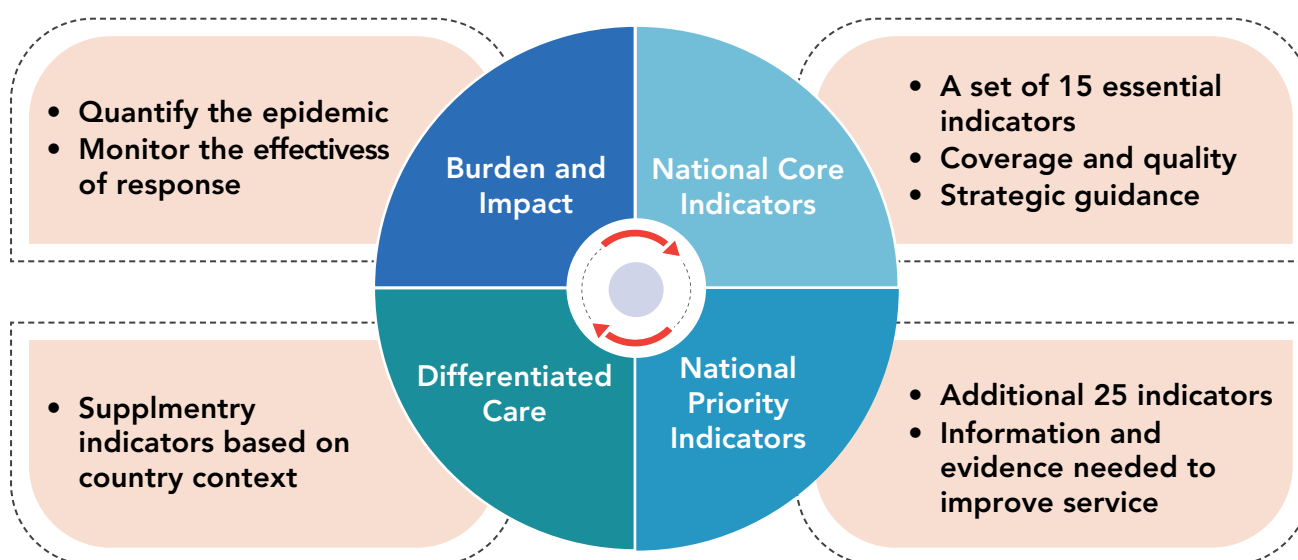
to the health of vulnerable and systematically disadvantaged persons, and prevent harm. WHO's 2017 Guidelines on Ethical Issues in Public Health Surveillance noted "Individuals have an obligation to contribute to Surveillance when reliable, valid, complete data sets are required and relevant protection is in place. Under these circumstances, informed consent is not ethically required"<sup>[112]</sup>. Still, individuals and communities shall be aware of the nature, purpose and details of Surveillance<sup>[110,113]</sup>.

## 2.10 Key Indicators Framework

WHO's 2020 guidelines titled 'Consolidated HIV strategic information guidelines: driving impact through programme monitoring and management'

have recommended four sets of indicators to monitor progress towards the 2030 endgame reflecting the current status of the changing HIV epidemic and programmatic response<sup>[91]</sup>.

**Figure 5: WHO recommended Key Indicator Framework (2020)**



Burden indicators are required to quantify the epidemic and plan the responses, including resources allocation. Impact indicators help to measure the effectiveness of AIDS response towards SDG across the prevention-detection-treatment continuum in terms of HIV infection, HIV-related morbidity

and mortality. Mostly, these indicators are either modelled or derived through different Surveillance surveys.

Table 2 below summarises the critical burden and impact indicators from the HIV perspective.

**Table 2: Burden and impact indicators**

Domain	Indicator
Burden	People living with HIV by risk groups, age and gender.
	HIV prevalence by risk groups, age and gender.
Impact	New HIV infections (per 1,000 un-infected population).
	Final MTCT rate.
	AIDS mortality.

The national core and priority indicators have been grouped into seven strategic objectives. Table 3 below summarises these indicators by strategic objectives:

**Table 3: National core and priority indicators**

Domain	Core Indicator	Priority Indicator
<b>Strategic objective: Reduce new infections among those at substantial risk</b>		
Condoms	1. Condom use (HRG and General population).	1. Condoms distributed.
PrEP	1. PrEP uptake.	1. PrEP continuation (at 3 months). 2. Currently on PrEP.
Other Prevention	1. Coverage of HIV prevention (HRG) 2. Needles and syringes distributed.	1. Coverage of opioid substitution therapy (OST). 2. Safe injecting practices (IDU). 3. Adolescent Girls and Young Women (HIV and Sexual and Reproductive Health) integration
<b>Strategic objective: 95% of PLHIV know their status and are linked to treatment (TL)</b>		
HTS	1. PLHIV who know their HIV status (1st 95). 2. HIV testing volume and positivity. 3. Linkage to ART.	1. HTS index testing and partner notification. 2. HIVST distribution. 3. Know their status (HRG).
<b>Strategic objective: 95% of PLHIV identified on ART and 95% viral suppression of those on ART (AV)</b>		
ART and VL	1. PLHIV on ART. 2. Total attrition from ART. 3. PLHIV who have suppressed VL.	1. New ART patients. 2. Late ART Initiation. 3. VL load testing coverage. 4. Early VL testing (at 6 months). 5. Appropriate 2 <sup>nd</sup> VL test. 6. ARV toxicity prevalence.
<b>Strategic objective: Reduce mortality (TB)</b>		
HIV/TB	1. TB Preventive Therapy (TPT) initiation. 2. TPT completion.	1. TB diagnostic testing type. 2. PLHIV with active TB disease.
<b>Strategic objective: Reduce new infections among children (VT)</b>		
Vertical transmission	1. Viral suppression at labour and delivery 2. Early Infant Diagnosis (EID) coverage.	1. Infant ARV prophylaxis coverage. 2. ART coverage in pregnant women. 3. ART coverage in breastfeeding mothers. 4. Final outcome of Prevention of mother-to-child transmission (PMTCT).
<b>Strategic objective: Reduce co-morbidity and mortality (ST)</b>		
STI	-	1. Syphilis screening coverage (in ANC). 2. Syphilis treatment coverage (in ANC). 3. Cervical cancer screening among women living with HIV.
<b>Strategic objective: Zero discrimination (SD)</b>		
Stigma	1. Avoidance of health care due to stigma and discrimination (HRG).	1. Avoidance of health care due to stigma and discrimination (PLHIV).





# CURRENT STATUS OF HIV SURVEILLANCE UNDER NACP IN THE CONTEXT OF GLOBAL SURVEILLANCE FRAMEWORK

The current status of HIV Surveillance under NACP in the context of the nine aforementioned aspects has been presented in Table 4 below.

**Table 4: Strategic Surveillance areas and their current status under NACP**

Current Status	Limitations	Potentials
<b>Strategic area 1: Mapping and population size estimation of HRGs</b>		
<ol style="list-style-type: none"> <li>The last mapping for FSW, MSM and IDU was done in 2009-11 in select urban areas<sup>[114]</sup>.</li> <li>A separate exercise for H/TG people was conducted in 2012-2013.</li> <li>Periodic 'Re-validation' exercise by State AIDS Control Societies and Technical Support Units' (TSU).</li> <li>NACO piloted programmatic mapping and population size estimation (p-MPSE) to develop an institutional arrangement for MPSE<sup>[115]</sup>. The same has been launched across the country with full domestic funding.</li> </ol>	<ol style="list-style-type: none"> <li>The current p-MPSE will not cover the HRG population exclusively operating through the virtual platform.</li> </ol>	<ol style="list-style-type: none"> <li>Pilot projects are being implemented, which may inform the development of a method with appropriate technical rigour to estimate the size of HRG exclusively operating on the virtual platform<sup>[114]</sup>.</li> <li>Periodic BBS survey may add the component of size estimation to provide more explanatory power to data generated through p-MPSE.</li> </ol>
<b>Strategic area 2: Sentinel Surveillance</b>		
<ol style="list-style-type: none"> <li>The 17<sup>th</sup> round of sentinel Surveillance was implemented among eight population groups: pregnant women, SMM, LDT, inmates at central prison sites, FSW, MSM, H/TG persons and IDU<sup>[21]</sup>.</li> <li>The serum specimen in 17<sup>th</sup> round tested for four bio-markers, i.e. HIV, Syphilis, HBV and HCV. DBS specimen tested for HIV, HBV and HCV.</li> </ol>	<ol style="list-style-type: none"> <li>Facility-based.</li> <li>Potential of provider bias for HRG and bridge population group; especially for safe practices questions.</li> <li>They are limited to eight population groups while data have indicated that there may be other population groups who are at a relatively higher risk than the general population.</li> </ol>	<ol style="list-style-type: none"> <li>For HRGs, as Strengthening Overall Care for HIV Beneficiaries (SOCH) will stabilize and individual data will become available, there is potential to launch CBS in the group. Once stable, CBS will have potential to complement Surveillance among HRGs.</li> <li>ANC HSS Plus shall be continued to be dovetailed as public health good. For HIV program, ANC HSS may inform lab based progress on the second and third 90 and also had the potential to</li> </ol>

Current Status	Limitations	Potentials
<ul style="list-style-type: none"> <li>3. Focussed bio-behavioural questions making 17<sup>th</sup> round as HSS Plus.</li> <li>4. Stable and mature implementation arrangements with seven national and regional public health institutes providing technical rigor. State AIDS Control Societies (SACS) takes the implementation lead. Field-level technical oversights are provided through State Surveillance Team members and Technical Support Units (TSU) (Figure 6).</li> <li>5. Fully domestically funded.</li> <li>6. In-built dissemination.</li> </ul>		<p>inform lab-based incidence trends. The ANC prevalence trend can continue to be calibrated through periodic community-based surveys.</p> <ul style="list-style-type: none"> <li>3. Community-based Surveillance survey in high prevalence north-eastern States focussing on understanding the epidemiological drivers in these States.</li> <li>4. A better understanding of other 'at-risk' population groups through formative research may help identify population groups to be included in Surveillance.</li> </ul>

### Strategic area 3: Bio-behavioural Surveillance Surveys

<ul style="list-style-type: none"> <li>1. BBS surveys for the general population integrated into National Family Health Survey(NFHS).</li> <li>2. For HRG, the methodology for IBSS is inconsistent. In 2014-2015, the world's largest IBBS survey was undertaken<sup>[23]</sup>. In 2020, behavioural Surveillance survey-lite was implemented in select States with different sampling designs<sup>[25]</sup>.</li> <li>3. Stable and mature implementation arrangements with seven national and regional public health institutes providing technical rigour.</li> <li>4. Fully domestically funded.</li> </ul>	<ul style="list-style-type: none"> <li>1. Cluster sampling strategy may miss some of the hard-to-reach population groups.</li> <li>2. The HRG population exclusively operating through virtual platforms not covered under the BSS.</li> <li>3. Frequent changes in sampling strategy make comparison difficult.</li> <li>4. No probability-based data is available for migrants and truckers.</li> <li>5. IBSS focussed only on HRG and bridge population. Need to have IBSS among PLHIV to generate evidence regarding service uptake, drug adherence and other risk-behaviours.</li> </ul>	<ul style="list-style-type: none"> <li>1. Learnings from IBBS, BSS-Lite and HSS Plus may be synthesized to develop a standard method for IBBS providing comparable results over the years among HRG, bridge and PLHIV population groups.</li> <li>2. Bio-behavioural studies for hard-to-reach populations further complement the periodic bio-behavioural sentinel Surveillance.</li> <li>3. Components of size estimation may be added with minimal cost implications which will provide more explanatory context to p-MPSE findings.</li> <li>4. Blood specimen collected through this probability-based sampling strategy has the potential to help to provide evidence on many bio-markers among HRG, including HIV recency and VL.</li> </ul>
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Current Status	Limitations	Potentials
<b>Strategic area 4: STI Surveillance</b>		
<ol style="list-style-type: none"> <li>1. Self-reported STIs-related symptoms included as a part of the behavioural survey data collection tool of NFHS.</li> <li>2. Syphilis as a bio-marker integral to HIV Surveillance under NACP among pregnant women.</li> <li>3. IBBS 2014-2015 among HRG included self-reported STIs-related symptoms as a part of the behavioural survey data collection tool of the NFHS. However, 2020 BSS Lite or 2021 HSS Plus do not collect data self-reported STI-related symptoms.</li> </ol>	<ol style="list-style-type: none"> <li>1. Syphilis is the only STI bio-maker tracked under Surveillance and Epidemiology (S&amp;E) systems under NACP. That is also only among the pregnant women and the prison population.</li> <li>2. No STI-related bio-marker for HRG and bridge population.</li> <li>3. STI Surveillance, an integral component of the second-generation HIV Surveillance system, has a significant scope of improvements.</li> </ol>	<ol style="list-style-type: none"> <li>1. As IT-enabled beneficiary centric uniform information management system will stabilize and individual data will become available, case-based STI reporting may be strengthened to provide a better understanding of STI's disease burden.</li> <li>2. Serum specimens for ANC and prison populations may be leveraged for additional STI bio-markers.</li> <li>3. Surveillance/BBS among HRGs may consider using serum sampling instead of DBS samples subjected to logistical feasibility for a quality specimen.</li> <li>4. There are 10 regional STI training, research and reference laboratories (RSTRRL) under the NACP which has STI Surveillance as one of the mandates. These mandates, resources and functions of RSTRRL may be built upon with active engagement of laboratory division to strengthen the STI Surveillance under NACP in a cost-efficient manner.</li> </ol>
<b>Strategic area 5: Blood-specimen strategy</b>		
<ol style="list-style-type: none"> <li>1. HSS among ANC and prison collect serum specimens. Samples are being tested for HIV, Syphilis, HBV and HCV.</li> <li>2. HSS among HRG and bridge population collect capillary blood through dried blood spot filter cards. Samples are being tested for HIV, HBV and HCV.</li> </ol>	<ol style="list-style-type: none"> <li>1. The use of the DBS method for collecting the blood sample in HRG and bridge population Surveillanc/BBS limits the potential of biomarkers that may be tested.</li> </ol>	<ol style="list-style-type: none"> <li>1. Surveillance/BBS among HRGs may consider using serum sampling instead of DBS samples subjected to logistical feasibility for the quality specimen.</li> <li>2. The Surveillance/BBS survey samples may be used to test for HIV incidence, VL as well as ARV metabolites to provide survey-based estimates of incidence, ART adherence and VLs.</li> </ol>

Current Status	Limitations	Potentials
<b>Strategic area 6: HIV case and mortality reporting Surveillance</b>		
<p>1. HIV case and Mortality Surveillance not under practice in the absence of a unified electronic case record system capturing sentinel events.</p>	<p>1. Mortality estimates are entirely based on modelled estimates and in the absence of mortality Surveillance, there is no mechanism to explain the mortality estimates further.</p> <p>2. The sentinel Surveillance and BBS are implemented every 2-3 years. In the absence of CBS, complementary real-time epidemic evidence is lacking.</p>	<p>1. IT-enabled beneficiary-centric uniform information management system will provide the opportunities to track the sentinel events in an individual of first and follow-up HIV test, HIV positive test results, linkages to ART centres, ART uptake, CD4 and VL first and follow-up tests and death. The system may provide an opportunity to complement the periodic cross-sectional epidemiological Surveillance activities in a very cost-efficient manner.</p> <p>2. HIV is reported under the medical certification of cause of death system of the Registrar General of India. The system may be strengthened to understand approx. number of AIDS-related deaths.</p> <p>3. Care, Support and Treatment (CST) programme has been piloting a viral autopsy project. The learnings may inform the development of mortality Surveillance under the programme.</p>
<b>Strategic area 7: Incidence Surveillance</b>		
<p>1. Biennial modelled incidence is the main source of HIV incidence under NACP. The modelled incidence are provided up to the District-level.</p>	<p>1. Incidence estimates are completely based on modelled estimates. There is a need to have an alternate source of data to further explain the incidence estimates.</p>	<p>1. There are several rounds of data collected under the Surveillance where age-wise data are available. Analysis of prevalence data among 15-19-year-olds over time may improve the explanatory power of modelled estimates.</p> <p>2. CBS tracking sentinel events, as to be made available through SOCH, may further help measure the incidence among HRGs and 'at-risk' populations as a prospective cohort CBS system.</p>

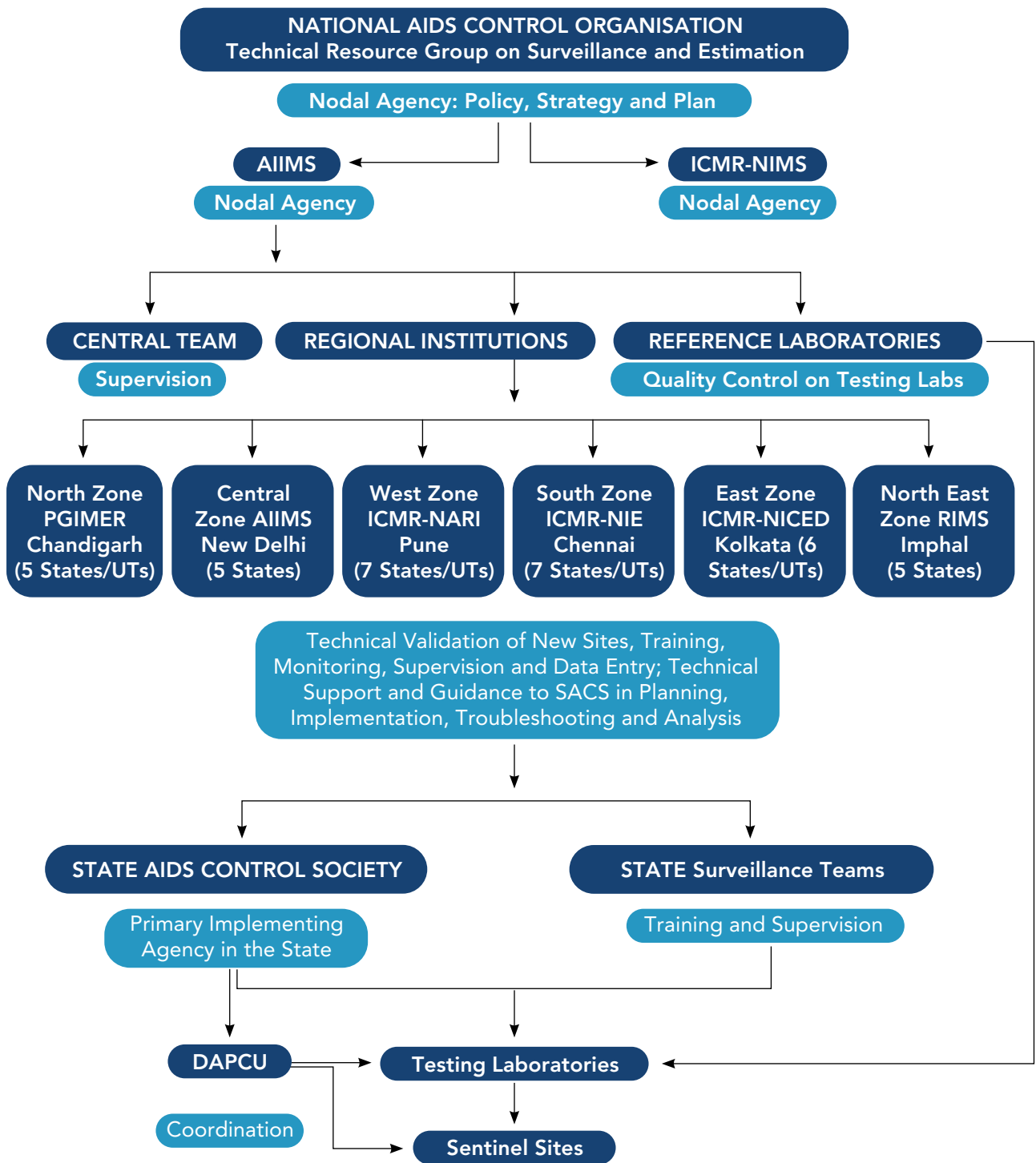
Current Status	Limitations	Potentials
		<p>3. RITA may be applied among sentinel Surveillance/BBS specimens, subjected to availability of kits, to provide additional information on incidence.</p>
<b>Strategic area 8: HIV burden estimations</b>		
<p>1. Spectrum-based modelled estimates are the workhorse of disease burden estimates under NACP. The exercise is done biennially through mature institutional arrangements providing estimates up to the District-level.</p> <p>2. The Spectrum modelling process uses both the community-based NFHS and routine testing data providing very strong prevalence estimates.</p>	<p>1. Incidence and mortality estimates need to be triangulated with alternate data sources.</p> <p>2. No process model-based disease burden estimation.</p> <p>3. The focus of burden estimates is only HIV.</p>	<p>1. The availability of data, especially behavioural data, has increased significantly under the programme. Process models in epidemiologically important States will improve the explanatory powers of Spectrum-based modelled estimates.</p> <p>2. Alternative activities, such as strategic areas 6 and 7 will further help triangulate the HIV burden estimates.</p> <p>3. Spectrum-STI module may be used to provide the disease burden estimates of STIs further.</p>
<b>Strategic area 9: Ethical Considerations</b>		
<p>1. The HSS and BBS surveys among inmates at central prisons, HRG and bridge population, take prior written informed consent from eligible respondents and have all measures in place for data anonymity and confidentiality and respondent protection measures.</p> <p>2. Among ANC, the Surveillance follows a linked anonymous testing strategy without informed consent. However, the population group is made aware of the Surveillance activities through a standard information sheet.</p>	<p>1. None.</p>	<p>1. All future Surveillance activities may continue to maintain high ethical standards in line with the provisions of The HIV and AIDS (Prevention and Control) Act, 2017, ICMR and WHO/UNAIDS guidelines for public health Surveillance under the guidance of the Ethics Committee of NACO's and participating national/technical institutes.</p>

Current Status	Limitations	Potentials
<b>Strategic area 10: Key Indicator Framework</b>		
<ol style="list-style-type: none"> <li>1. Burden and impact indicators               <ol style="list-style-type: none"> <li>A. People living with HIV by risk groups, age and gender</li> <li>B. HIV prevalence by risk groups, age and gender</li> <li>C. New HIV infections (per 1,000 un-infected population) by age and gender</li> <li>D. AIDS mortality by age and gender</li> </ol> </li> <li>2. National core and priority Indicators               <ol style="list-style-type: none"> <li>A. Condom use</li> <li>B. PrEP uptake</li> <li>C. Currently on PrEP</li> <li>D. Coverage of HIV prevention (HRG)</li> <li>E. Safe injecting practices (IDU)</li> <li>F. Progress on first, second and third 95</li> <li>G. Avoidance of health care due to stigma and discrimination (HRG).</li> </ol> </li> </ol>		<ol style="list-style-type: none"> <li>1. Final MTCT rate for HIV</li> <li>2. Know their status, on ARV and virally suppressed (HRG)</li> <li>3. Avoidance of health care due to stigma and discrimination (PLHIV)</li> <li>4. <i>T. pallidum</i> incidence rate</li> <li>5. <i>Neisseria Gonorrhoeae</i> incidence rate.</li> </ol>

HIV S&E has a robust structure for planning, implementation and monitoring at National, Regional and State-levels (Figure 6). NACO is the nodal agency for guiding the epidemic monitoring under NACP. NACO's Technical Resource Group (TRG) and Technical Working Group (TWG) on S&E/Estimation, comprising experts from the fields of epidemiology, demography, Surveillance, biostatistics, and laboratory services, advises NACO on the broad strategy for HIV Surveillance and Estimations. Two national institutes—AIIMS, New Delhi and ICMR-NIMS, New Delhi—support National-level activity planning and coordination. Six public health institutes in India have been identified as Regional Institutes (RIs) for HSS to provide technical support to the SACS for all epidemic monitoring

activities, including identification of new Surveillance sites, training, monitoring and supervision, and improving the quality of the data collected and their analysis. SACS are the primary agency responsible for the implementation of HIV Surveillance activities. Under the leadership of SACS, District AIDS Prevention and Control Units (DAPCUs) coordinates the implementation of HSS activities. Laboratory support to Surveillance is provided by a network of testing and reference laboratories. The reference laboratories provide external quality assurance by repeat testing of all positive blood specimens and 2-5% of the negative specimens collected during Surveillance for a given bio-markers.

**Figure 6: HIV S&E implementation framework under NACP**



ICMR-NIMS: Indian Council of Medical Research-National Institute Of Medical Statistics  
 PGIMER Chandigarh: Postgraduate Institute of Medical Education and Research Chandigarh  
 AIIMS New Delhi: All India Institute of Medical Sciences, New Delhi  
 ICMR-NARI Pune: Indian Council of Medical Research-National AIDS Research Institute, Pune  
 ICMR-NIE Chennai: Indian Council of Medical Research-National Institute of Epidemiology Chennai  
 ICMR-NICED Kolkata:- Indian Council of Medical Research-National Institute of Cholera and Enteric Diseases Kolkata  
 RIMS Imphal: Regional Institute of Medical Sciences Imphal  
 SACS: State AIDS Prevention and Control Societies  
 DAPCU: District AIDS Prevention And Control Units





# INTEGRATED AND ENHANCED SURVEILLANCE AND EPIDEMIOLOGY OF HIV, STI AND RELATED CO-MORBIDITIES UNDER THE NATIONAL AIDS AND STD CONTROL PROGRAMME PHASE-V

Given the contour of SDGs, global recommendations for comprehensive Surveillance systems and S&E being core to the evidence-driven decision making under the NACP since its inception, NACO has formulated a framework for an Integrated and Enhanced Surveillance and Epidemiology (IESE) of HIV, STIs and related comorbidities providing high-quality epidemiological data in a very cost-efficient and cohesive manner maximizing the opportunities available in the existing NACP systems.

The opportunities include:

- i. Programme-driven, owned and fully domestically funded system.
- ii. A very stable, mature, proven, output oriented institutional arrangements for HIV Surveillance under NACP providing actionable data.
- iii. Smooth community facilitated access to eight population groups including the vulnerable population of FSW, MSM, IDU, H/TG persons and prisoners with a rich experience of bio-behavioural data collections.
- iv. Strong laboratory network with a capacity and infrastructures in place for complex bio-markers.
- v. IT enhancements enabling tracking of sentinel events in an individual across service delivery points providing an enabling ecosystem for CBS in a cost-neutral manner.
- vi. Apex, regional and State STI laboratories fully funded by NACP with a mandate to have STI Surveillance.
- vii. Collective leadership to the HIV Surveillance under NACP with full engagements of targetted interventions, basic services division and laboratory services while being anchored by SI (S&E) division.

The integrated and enhanced system aims to provide real-time and cross-sectional epidemiological evidence, thus serving macro and micro needs towards meeting SDG goals. Specifically, the system will measure the level, trends and determinants of HIV/AIDS, STIs and related co-morbidities prevalence, incidence and mortality using methods of the highest scientific rigor.

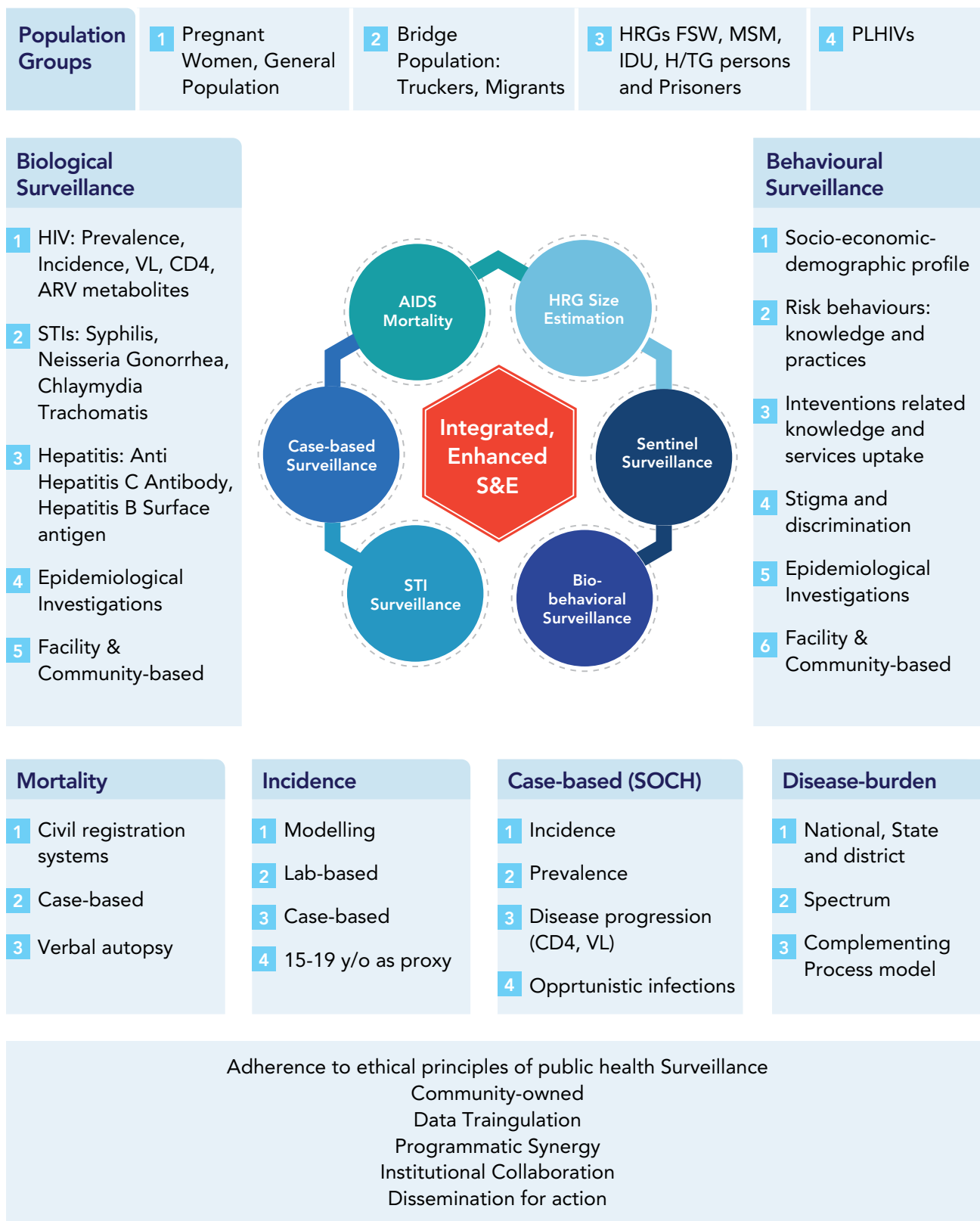
The IESE framework of HIV, STIs and related co-morbidities will build upon the existing systems while adhering to the highest ethical standards. The system will harness programmatic synergy across NACP components while leveraging and augmenting the established institutional arrangements. The system will have enhanced participation of the community in the formulation and implementation of the activities. The data, thus generated, will be disseminated and triangulated to inform evidence-led policy formulation as well as progress monitoring under NACP.

The IESE framework will cover various population group in view of the concentrated nature of the epidemic in the country. This will include low-risk, bridge (truckers, migrants, etc.) as well as high-risk groups including people in prisons and other closed settings. Within the given framework, more population groups will be covered depending upon the epidemiological needs as informed through programmatic and research data. The population group will be covered in both the community and facility settings through the ongoing Programmatic Case-based Surveillance (PCBS) as well as cross-sectional bio-behavioural surveys. BBS will adopt a combination of consecutive, random and RDS approaches depending upon the objectives and the population group under consideration. The bio-behavioural data will be collected to meet both the epidemiological as well as programmatic needs. Given the contours of SDG 3.3 targets, HIV bio-markers pertaining to the prevalence, incidence, VL and CD4 will be the key considerations and mainstay of the IESE under NACP. For the STIs, bio-markers for Syphilis, Neisseria Gonorrhoea and Chlamydia Trachomatis

will be the key considerations. Based on the programmatic, epidemiological and reporting needs, biomarkers of related Co-Morbidities like Hepatitis B, Hepatitis C or any other feasible biomarker will be considered. The data forms will collect information

across the domains of Socioeconomic-demographic profile, HIV/AIDS-related risk behaviours, knowledge and practices, interventions related knowledge and services uptake, stigma and discrimination and co-morbidities related risk behaviour.

**Figure 7: Strategic Framework of IESE under NACP**



The IESE will be implemented by leveraging and augmenting the established institutional structures of S&E under NACP Phase-V. NACO's Technical Resource Group (TRG) (S&E) and Technical Working Group (TWG) (S&E) will provide the strategic leadership, as in previous phases of NACP, to the activities under the IESE framework. The 'Terms of reference' and the constitution of these institutional structures will be updated to reflect the IESE framework along with more diverse membership including those from stakeholders and community. The collective thrust to the IESE framework will be provided by all divisions of NACO in view of the cross-cutting activities and engagements. The S&E (Strategic Information) at NACO will continue to anchor the Surveillance and Epidemiological activities, including the IESE while engaging suitably with all divisions. This will include enhanced engagements with the laboratory services division in view of laboratories requirements under the IESE.

The structure of national and regional institutes will be continued and expanded. AIIMS-New Delhi will continue to be the nodal agency for the S&E and ICMR-NIMS as the nodal agency for HIV estimations under the S&E-NACO. State/UTs reallocation will be done for optimization. The positions of epidemiologists in SACS will be shifted to regional institutes to streamline and strengthen the core epidemiological functions. AIIMS-Bhopal/AIIMS-Jodhpur and AIIMS-Bhubaneswar are proposed to be included as new Regional institutes. Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi will be explored as a nodal institute for STI Surveillance dovetailing their existing capacity as the apex laboratories for STIs.

Appropriate collaborations with the National Viral Hepatitis Surveillance Programme and Registrar General of India will be worked out. SACS will continue to anchor the implementation of activities under the IESE framework with the support of TSUs, State S&E teams, state reference laboratories, RSTRRL and state reference centers.

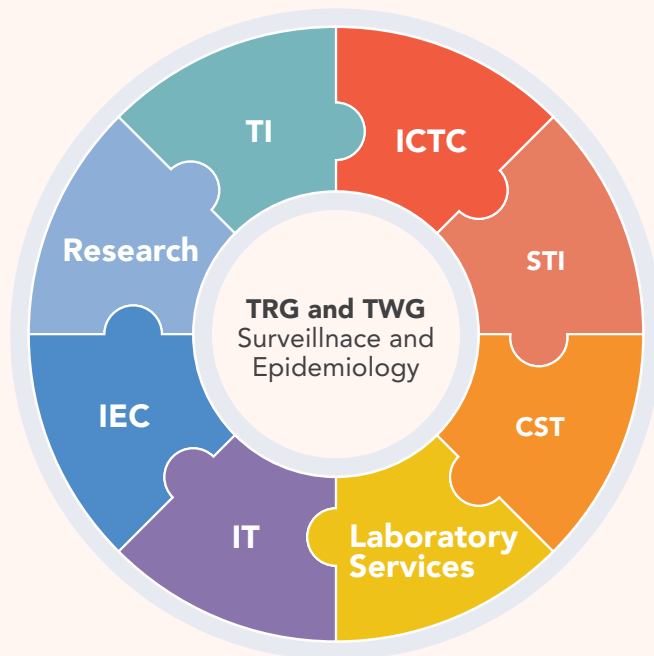
The evidence generated through the IESE framework will be disseminated in the form of factsheets, briefs, reports, and scientific publications covering the domains of:

- i. Levels, trends and determinants of prevalence, incidence, and mortality of HIV/AIDS, STIs and related co-morbidities.
- ii. Burden indicators.
- iii. Impact indicators.
- iv. National core indicators.
- v. National priority indicators. In-depth data analysis on inferential epidemiology along with data triangulation and scientific publications will be integral to the IESE framework.

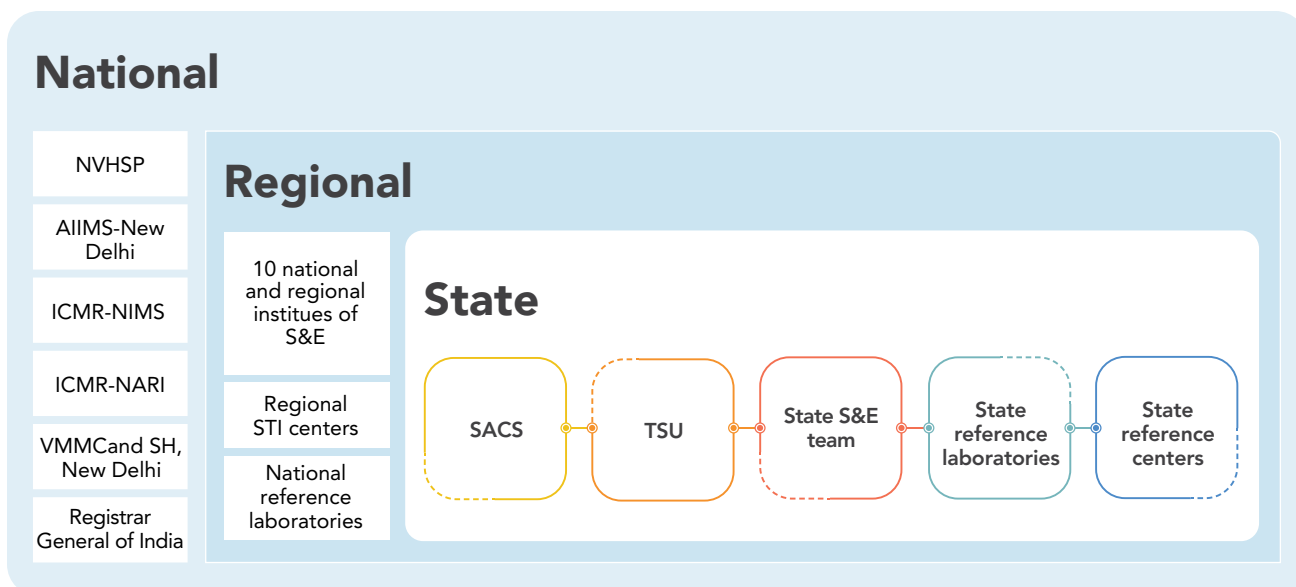
The work will be completely supported by NACO through its approved budgetary framework under the NACP. Need-based complementing funding to support the participation of outside members will be explored through the partners' funding as and when required.

## Implementation framework

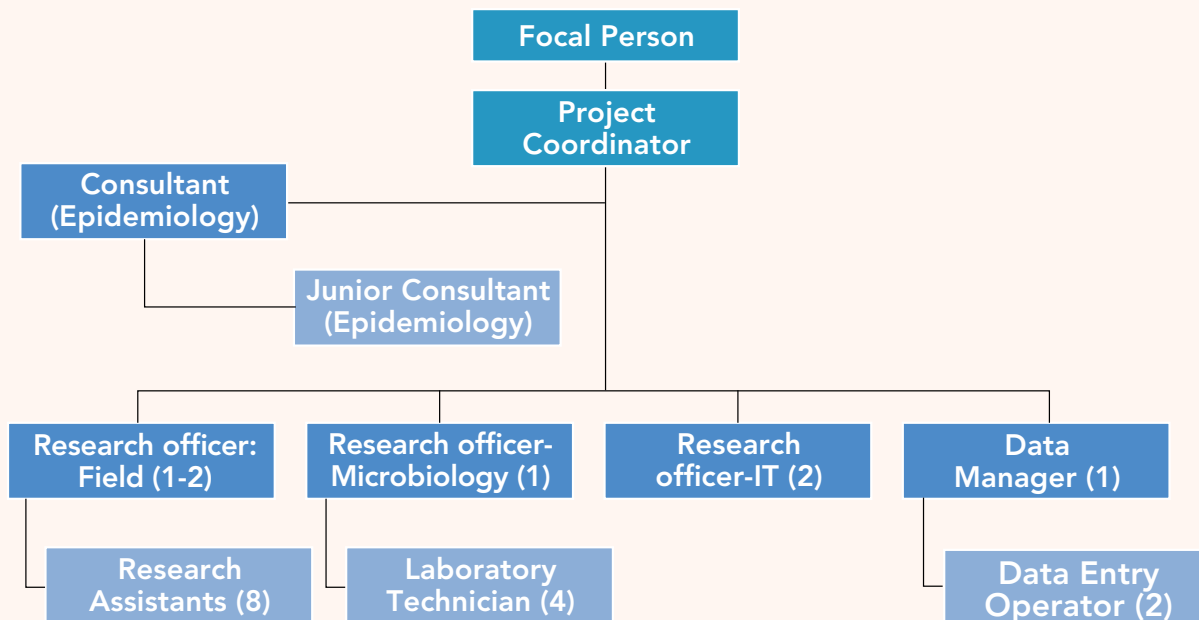
**Figure 8:** NACO as a nodal agency providing leadership



**Figure 9:** Institutional engagements and collaborations



**Figure 10: Project Team at National and Regional institutes of S&E**



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National AIDS Control Organisation has formulated Integrated and Enhanced Surveillance and Epidemiology (IESE) of HIV, STIs and related Co-morbidities to anchor the national AIDS response till 2030. This document provides the strategic framework of IESE under the NACP in India.