Revamping of Public Health Surveillance System in India

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Abstract

Traditionally, India has focused on surveillance of communicable/infectious diseases such as small pox, polio, malaria etc., and the Integrated Disease Surveillance Programme (IDSP), with assistance from state governments, has played a key role in tracking and tracing these diseases. Sustainable progress has been achieved such as smallpox eradication in 1977, polio elimination in 2014 and reduction in the incidence of malaria. However, now the scope of tracking other diseases such as non-communicable diseases(NCDs) like diabetes, hypertension etc. and other emerging/ re-emerging diseases is being increased. Newer surveillance techniques such as participatory disease surveillance (PDS) have emerged.

The surveillance system in India has so far evolved in conducting surveillance within the domains of human health, animal health, and the environment, but in silos. Public Health Surveillance is often viewed as a stand-alone activity, but in reality it cuts across all levels of care-primary, secondary and tertiary and many institutions are involved at different aspects. The ongoing COVID-19 pandemic has emphasized the need to build a robust, unified disease surveillance system in the country that cuts across all the relevant sectors to deal with the disease holistically.

It is envisioned that public health surveillance in 2035 would be based on a Single Surveillance Information System that would collate information from various sources such as national programs like Integrated Disease Surveillance Program (IDSP), National AIDS Control Program (NACP) and National Tuberculosis Elimination Program (NTEP), hospitals and health centres, health insurance records, laboratories, pharmacies, plant and animal disease surveillance, environmental health surveillance, occupational health & injury surveillance etc. The creation of unified e-health records via use of unique health identity number (UHID), as recommended by the National Digital Health Bueprint, forms the foundation for the future of public health surveillance in India.

Keywords: Public Health Surveillance, India

Introduction

Public health surveillance is "the ongoing, systematic collection, analysis, and interpretation of health-related data essential to planning, implementation, and evaluation of public health practice" (Center for Surveillance, Epidemiology, and Laboratory services, U.S. Department of Health & Human Services 2018)

In November 2004, with the assistance from the world bank, the Government of India launched a nationwide disease surveillance programme called 'the Integrated Disease Surveillance Project (IDSP)' for a period upto March 2010(Wikipedia 2021). The programme aimed at early detection and long term monitoring of diseases for enabling efficient policy decisions. Later, the programme was restructured and extended for a period upto March 2012. During the period 2010-2012, the programme focused on nine priority states: Maharashtra, Gujarat, Punjab, Rajasthan, Uttarakhand, Karnataka, Tamil Nadu, West Bengal and Andhra Pradesh. The project continued during the 12th plan (2012-2017) under National Health Mission with domestic budget allocation only(Ministry of Health & Family Welfare, Government of India 2021a).

IDSP Objectives

"*To strengthen/maintain decentralized laboratory based IT enabled disease surveillance system for epidemic prone diseases to monitor disease trends and to detect and respond to outbreaks in early rising phase through trained Rapid Response Team (RRTs)*"(Ministry of Health & Family Welfare, Government of India 2021a).

IDSP Components

- Integration and decentralization of surveillance activities through establishment of surveillance units at Centre, State and District level
- Human Resource Development – Training of State Surveillance Officers, District Surveillance Officers, Rapid Response Team and other Medical and Paramedical staff on principles of disease surveillance
- Use of Information Communication Technology for collection, collation, compilation, analysis and dissemination of data
- Strengthening of public health laboratories
- Inter sectoral Co-ordination for zoonotic diseases

Levels of Surveillance

There are three levels of Surveillance under the IDSP programme which aligns with the three-tier healthcare system in the country: sub-centres (SC) and primary health centre (PHC) at the primary health care level, community health centres (CHC) and sub-divisional hospitals/district hospitals for secondary care and medical colleges and apex institutes as tertiary levels of care.

Figure 1: Three levels of Surveillance

Syndromic (S form)	Presumptive (P form)	Laboratory/Confirmed (L form)
Diagnosis is made on the basis of symptoms/ clinical pattern observed by paramedical personnel and members of the community. Seven main conditions are reported under this including: fever, persistent cough, jaundice, diarrhoea, Acute Flaccid Paralysis/ vaccine preventable diseases, unusual events leading to death/ hospitalisation	Diagnosis is made based on history and clinical examination by Medical Officers. 22 diseases and conditions are listed under the reporting using the P form.	Diagnosis is based on clinical diagnosis confirmed by an appropriate test. 12 diseases are reported under the L form.

Source: Blanchard, James, Reynold Washington, Marissa Becker, Vasanthakumar Namasivayam, K Madan Gopal, and Rakesh Sarwal. 2021. *Vision 2035 Public Health Surveillance in India - A White Paper*. figshare. https://doi.org/10.6084/M9.FIGSHARE.14093323

Conventional IDSP's Data Management Process

Under the traditional IDSP Surveillance system (which is still operational in many states), aggregated data is collected on weekly basis (Monday–Sunday) on epidemic prone diseases. Three specific reporting formats, namely "S" (suspected cases), "P" (presumptive cases) and "L" (laboratory confirmed cases) are filled by Health Workers, Clinicians and Laboratory staff respectively. The data collection is mainly paper based, does not link S, P and L forms and monitors only 13 health conditions. The weekly data provides information related to disease trends and seasonality of diseases. If there is a rising trend of illnesses in any area, it is further investigated by the Rapid Response Teams (RRT) to diagnose and control the outbreak. Data analysis and actions are undertaken at the respective State/District Surveillance Units. Figure 2 shows the conventional IDSP's Data Collection Process.

Figure 2: Conventional IDSP's Data Collection Process
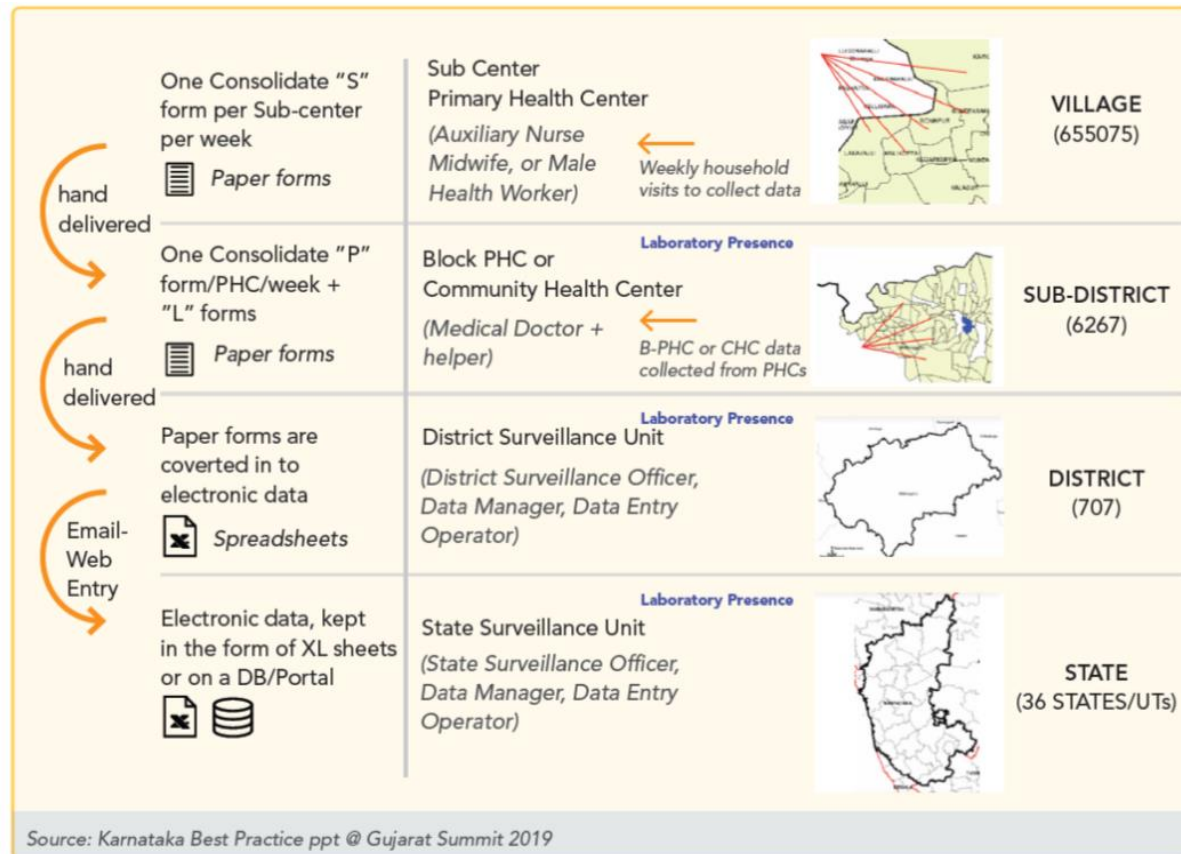
Source: Karnataka Best Practice ppt @ Gujarat Summit 2019

Source: Blanchard, James, Reynold Washington, Marissa Becker, Vasanthakumar Namasivayam, K Madan Gopal, and Rakesh Sarwal. 2021. *Vision 2035 Public Health Surveillance in India - A White Paper*. figshare. https://doi.org/10.6084/M9.FIGSHARE.14093323

Integrated Health Information Platform

With the aim to improve the digital capabilities of the Integrated Disease Surveillance Program (IDSP), Integrated Health Information Platform (IHIP) was soft launched by the Ministry of Health and Family Welfare, Government of India on 26th November 2018(Ministry of Health and Family Welfare, Government Of India 2021). The salient features of IHIP include:
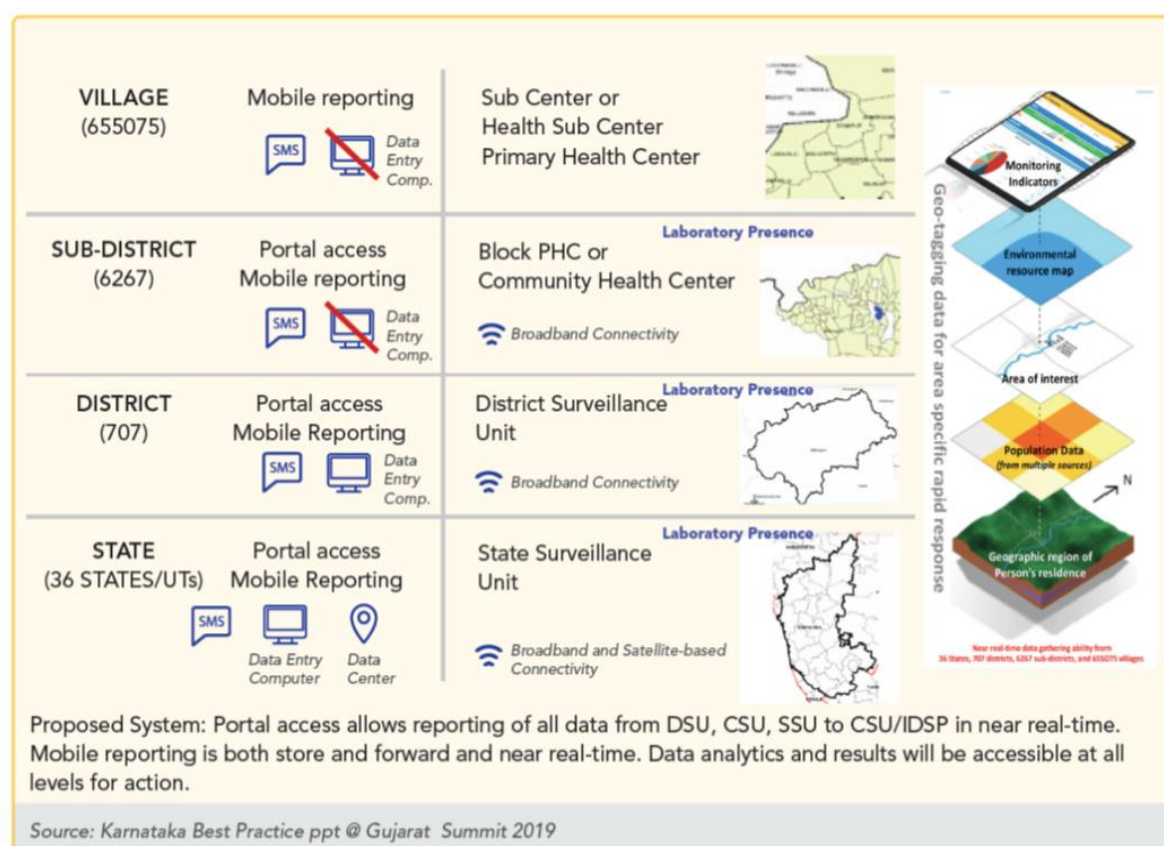
- Captures individualized data that can be disaggregated by age, gender and locality
- Links data from Syndrome, Presumptive and Laboratory, Early Warning Signals 1 and 2 forms
- Captures near real-time or daily surveillance data
- Enables analysis on mobile and electronic devices
- Monitors more than 33 health conditions (see Annexure 1)

The IHIP is an open platform and has the potential to connect with the new National Health Management Information System and eHospital Systems. It has the potential to bring data from various sources such as hospitals, laboratories and research centers etc. under one platform. Data from the IHIP can be used in various ways:

- To describe and analyze geographic variations in diseases in the context of demographic, environmental, behavioural , socioeconomic, genetic, and infectious risk factors.
- To explore geographic locations of persons with their socioeconomic and demographics attributes as data captures geo-coordinates and socio-demographic characteristics.

On 5th April 2021, an upgraded version of IHIP was virtually launched by Dr Harsh Vardhan, the Union Minister of Health & Family Welfare, Government of India(Ministry of Health & Family Welfare, Government of India 2021b). It is the biggest online disease surveillance platform in the world. This advanced digital surveillance platform provide real time, case-based information, posess integrated analytics and advanced visualization capability. The platform is capable of providing analyzed reports on mobile or other electronic devices, initiating and monitoring outbreak activities electronically, integrating with other ongoing surveillance programs and can add special surveillance modules. Figure 3 shows new IHIP real-time data flow process.

Figure 3: New IHIP Real-Time Data Flow Processes

Proposed System: Portal access allows reporting of all data from DSU, CSU, SSU to CSU/IDSP in near real-time. Mobile reporting is both store and forward and near real-time. Data analytics and results will be accessible at all levels for action.

Source: Karnataka Best Practice ppt @ Gujarat Summit 2019

Source: Blanchard, James, Reynold Washington, Marissa Becker, Vasanthakumar Namasivayam, K Madan Gopal, and Rakesh Sarwal. 2021. *Vision 2035 Public Health Surveillance in India - A White Paper*. figshare. https://doi.org/10.6084/M9.FIGSHARE.14093323

Existing Structure of Public Health Surveillance

The existing structure of public health surveillance is viewed as a stand-alone activity, with different institutions responsible for different aspects (see Figure 4). The IDSP platform (now IHIP) has successfully integrated data from Vector Borne Disease Control Program, Diarrhoeal Disease Control Program, Zoonotic infections (rabies/dog bite and snake bite), Vaccine Preventable Diseases and Acute Respiratory Infections. However, data from vertical programs such as National AIDS Control Program (NACP), National TB Elimination Program (NTEP) and Reproductive and Child Health (RCH) program are not yet fully integrated into IDSP (now IHIP). These vertical programmes run their own standalone portals such as SI-NACO for National AIDS Control Program (NACP), Nikshay for National TB Elimination Program (NTEP) and RCH Portal for the Reproductive and Child Health (RCH) program.

Figure 4: Existing Structure for Public Health Surveillance

Technology Platform	Governance	Technical Support & Research	
IHIP SI-NACO	CSU/SSU/DSU CTD NACO NHM/Min. of Health	ICMR CBHI	Centre
Nikshay RCH portal	Directorate of Health Dept. of Health	26 Regional ICMR Institutes 8 NCDC Branches State Reference Labs	State
Vital Event Registration Other	Registrar of births/deaths NVBDCP	District level labs. Referral linkages for specimen collection, transportation & reporting systems.	District

Source: Blanchard, James, Reynold Washington, Marissa Becker, Vasanthakumar Namasivayam, K Madan Gopal, and Rakesh Sarwal. 2021. *Vision 2035 Public Health Surveillance in India - A White Paper*. figshare. https://doi.org/10.6084/M9.FIGSHARE.14093323

Limitations of existing Public Health Surveillance System

Implementation Challenges

The Integrated Health Information Platform (IHIP) is not yet fully functional across the nation. In addition, there are limitations in geographic coverage within states. The geographical coverage of vertical surveillance programs is also limited. Outbreak investigation process and reporting structure is also not uniform. There are issues related to system design as well, for instance,

data on utilization of clinical services by citizens is different from data on disease outbreak notification.

Limited Private Sector Involvement
The involvement of private sector in the public health surveillance is minimal. Further, private sector is a heterogenous involving various types of organization such as stand-alone clinics, smaller nursing homes, medium to large hospitals, medical colleges, corporate institutions, mission hospitals, independent trusts etc. Therefore, it becomes challenging to decide at what levels of care and for what disease conditions should private sector be involved in the public health surveillance.

Programs and Institutions work in vertical siloes
Surveillance data from various health programs such as National AIDS Control Program, National TB Elimination Program, Reproductive and Child Health (RCH) program, Vital registration system etc. are not yet fully integrated with the IHIP. Data from various organizations such as the Central Government Health System, ArmyAirforce/Navy hospitals, Employee State Insurance (ESI) Corporation etc. is also not fully integrated with the IHIP. Further, similar data is being collected by different organizations such as IDSP, ICMR's Virology Diagnostic Research Laboratory Network and the National Vector Borne Disease Control Program (NVBDCP) surveillance network and there is no mechanism to share or make unified use of data. Public health surveillance itself is considered as a stand-alone activity which is not directly related to mainstream healthcare service delivery system(Gopal 2021).

Human Resource and Training challenges
In India, health is a state subject and response of states to fill human resource gaps in the area of surveillance varies. Many a times posts are filled on contractual basis or on deputation due to which there is frequent shortage of staff for surveillance purposes. In addition, India faces lack of training programs in the field of surveillance for public health professionals.

Limited use of media
The use of media for surveillance purposes is limited in the country. Only a few states have functional media scanning cells that help identify disease outbreaks or sudden increase in death or hospitalization rate due to unusal events.

Limited focus on Non-Communicable Diseases
Due to the epidemiological transition, there is a dual burden of communicable and non-communicable diseases (NCDs) in India. Some pilot programs focusing on NCDs like Diabetes, Cancer and Cardiovasular diseases are being done by the NCD division of IDSP. ICMR is also conducting periodic surveys on these conditions. But, full integaration of NCDs within the Public Health Surveillance is yet not operational.

Limited focus on Occupational Health
India's Public Health Surveillance system does not incorporate occupational health as one of its core component. Silicosis, one of the occupational disease, is notifiable under The Factories Act,

but not under the Public Health Act. Further, many doctors do not have even the minimal training on occupation health and disease. Also India's Public Health Surveillance system has not yet included surveillance of injury and accidents, noise induced deafness, muscular-skeletal disorders, air pollution and its effects.

Participatory Disease Surveillance

Participatory disease surveillance (PDS) is one of the novel surveillance strategies adopted by many countries to deal with the COVID-19 pandemic situation(Garg, Bhatnagar, and Gangadharan 2020). Under this surveillance technique, a digital tool is used which helps in surveillance of communicable diseases (Therefore, this technique is also called as Participatory Digital Surveillance). Countries like India which has scarce resources, fragile healthcare system but good telecom support makes a strong case to adopt such a technique to prevent and control the pandemic.

"Aarogya Setu" is a first of it's kind participatory disease surveillance initiative launched by the Government of India. Through this tool, citizens actively self-report symptoms/events and the data could be easily aggregated and further analysed by public health experts for taking appropriate public health intervention. It supplements already existing Integrated Disease Surveillance Program in India. However, certain caution needs to be taken to ensure individual's privacy and participation of digitally excluded populations.

One Health Surveillance

The surveillance system in India has so far evolved in conducting surveillance within the domains of human health, animal health, and the environment, but in silos. However, COVID-19 pandemic has warranted the need for one health surveillance (OHS) system. This one health surveillance (OHS) system should bring together various sectors, disciplines, institutions and specialities under one umbrella to respond to outbreaks holistically. Figure 5 shows routine surveillance strategies across the domains of one-health in India. Efforts should be directed towards bringing them together under one roof.

Figure 5: Routine Surveillance strategies across the domains of one health in India

Domain	Name of surveillance	Salient features	Responsible authority
Human health	IDSP[3]	Form-S (symptoms, based on syndromic approach), Form-P (presumptive cases, based on provisional diagnosis) and Form-L (laboratory cases, based on laboratory-confirmed cases)[5]	NHM, NCDC, MoHFW
Animal health	NADRS[6,7]	FIR, DI cases	MoFAHD
	ADMAS[8]	Early warning of disease incidence or outbreaks and the alert system. Manages disease outbreaks and risk factor databases	NIVEDI, ICAR
Environment	Water monitoring[9]	Physicochemical and bacteriological parameters of surface waters, water lands, and groundwater	CPCB, MoEFCC, and CWC, MoWR
	Water monitoring[10]	Quality monitoring of the drinking water	DoDWS, MoWR
	Soil tests[11]	Physical, chemical, and biological properties of the soil soil health card (nutrient recommendations to farmers)[12]	ICAR, MoA
	Meteorological observations[13]	Weather forecasting and seismology	IMD, Ministry of Earth Sciences
Food	Food quality[14]	Food quality tests through the INFoLNeT	FSSAI, MoHFW, and MoA

IDSP: Integrated Disease Surveillance Program, NHM: National Health Mission, NCDC: National Center for Disease Control, MoHFW: Ministry of Health and Family Welfare, NADRS: National Animal Disease Reporting System, ADMAS: Animal Disease Monitoring and Surveillance, NIVEDI: National Institute of Veterinary Epidemiology and Disease Informatics, ICAR: Indian Council of Agricultural Research, FIR: First information report, DI: Daily incidence, MoFAHD: Ministry of Fisheries, Animal Husbandry and Dairying, MoA: Ministry of Agriculture, IMD: India Meteorological Department, FSSAI: Food Safety and Standards Authority of India, CPCB: Central Pollution Control Board, MoEFCC: Ministry of Environment, Forest and Climate Change, CWC: Central Water Commission, MoER: Ministry of Water Resources, DoDWS: Department of Drinking Water and Sanitation, MoWR: Ministry of water resources, INFoLNeT: Indian Food Laboratories Network

Source: Yasobant, Sandul, Krupali Patel, Deepak Saxena, and Timo Falkenberg. 2020. "COVID-19 in India: Making a Case for the One Health Surveillance System." *Indian Journal of Public Health* 64 (6): 135. https://doi.org/10.4103/ijph.IJPH_488_20

Bedi et al. asserts that "a proactive, coordinated, interdisciplinary and cross-sectoral approach across human, animal and environmental sectors remain the core pillar of One Health framework to mitigate the public health challenges"(Bedi et al. 2021).

Yasobant et al. proposed a step-wise approach to establish one heath surveillance sytem in India(Yasobant et al. 2020). The steps are outlined below:
1. At the early stage, focus should be on risk prediction and hotspot identification.
2. The surveillance data of individual sectors should adhere to a set data standards to ensure sharing of data via an integrated database. In India, platform such as Open Government Data Platform could facilitate integration of data from individual sectors.
3. Multidisciplinary collaborations across sectors are needed, both at policy and the grass-root level, for detailed investigation of risks.
4. During the operationalization, a strong political will, allocation of budget, inter-ministries convergence, robust laboratory networks, and skilled manpower is essential.

Vision 2035 Public Health Surveillance in India

In 2035, India's Public Health Surveillance will:

- Be a predictive[1], responsive[2], integrated[3] and tiered[4] system of disease and health surveillance that is inclusive of prioritised[5], emerging and re-emerging communicable and non-communicable diseases and conditions. Readiness for actions at community, facility and health and governance systems are key aspects of the response.
- Be a system that is primarily based on de-identified individual level patient information which includes health care facility and laboratory data as key sources, amongst others.
- Serve public good through the provision of meaningful 'Information for Action' to relevant stakeholders[6], with due attention to privacy and confidentiality of the individual, and enabled with a client feedback mechanism.
- Provide regional/global leadership in compliance with International Health Regulations and management of events that constitute a Public Health Emergency of International Concern.

> *"Vision 2035 envisages that surveillance will need to graduate from traditional data entry systems based on vertical program implementation, to real-time data capture from existing health records which are integrated using an UHID. Systems could be enabled to transparently and safely exchange data based on standard protocols, determined by the federated governance architecture"*(Blanchard et al. 2021)

Key Building Blocks for Vision 2035: PHS in India

Four key building blocks for Vision 2035 Public Health Surveillance (PHS) in India are:

1. An interdependent federated system of Governance Architecture between the Centre and States
2. Enhanced use of new data collection and sharing mechanisms for surveillance based on unitized, citizen-centric comprehensive Electronic Health Records (EHRs) with a unique health identifier (UHID). As well, existing disease surveillance data and information from periodic surveys will complement this information

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[1] Ability to predict a disease event or outbreak
[2] Ability to respond positively with speed and sensitivity
[3] Implies integration between centre, state and district, as well as between public and private health sectors
[4] Refers to the 3 tier health care delivery system in India; primary care at Health and Wellness centres, sub-centres and primary health care centres, secondary care at first level referral units and district hospitals (few specialities – medicine, obstetrics & gynaecology, paediatrics and emergency care), and tertiary care at medical colleges and apex institutions (all specialists and super-specialists, equipped with high level laboratories for advanced diagnostics and specialist procedures)
[5] Prioritisation is a periodic exercise, repeated every 3-5 years, based on specific objective criteria
[6] Includes clients/patients, governments, academia, industry, media and non-government organisations

3. Enhanced use of new data analytics, data science, artificial intelligence, and machine learning
4. Advanced health informatics

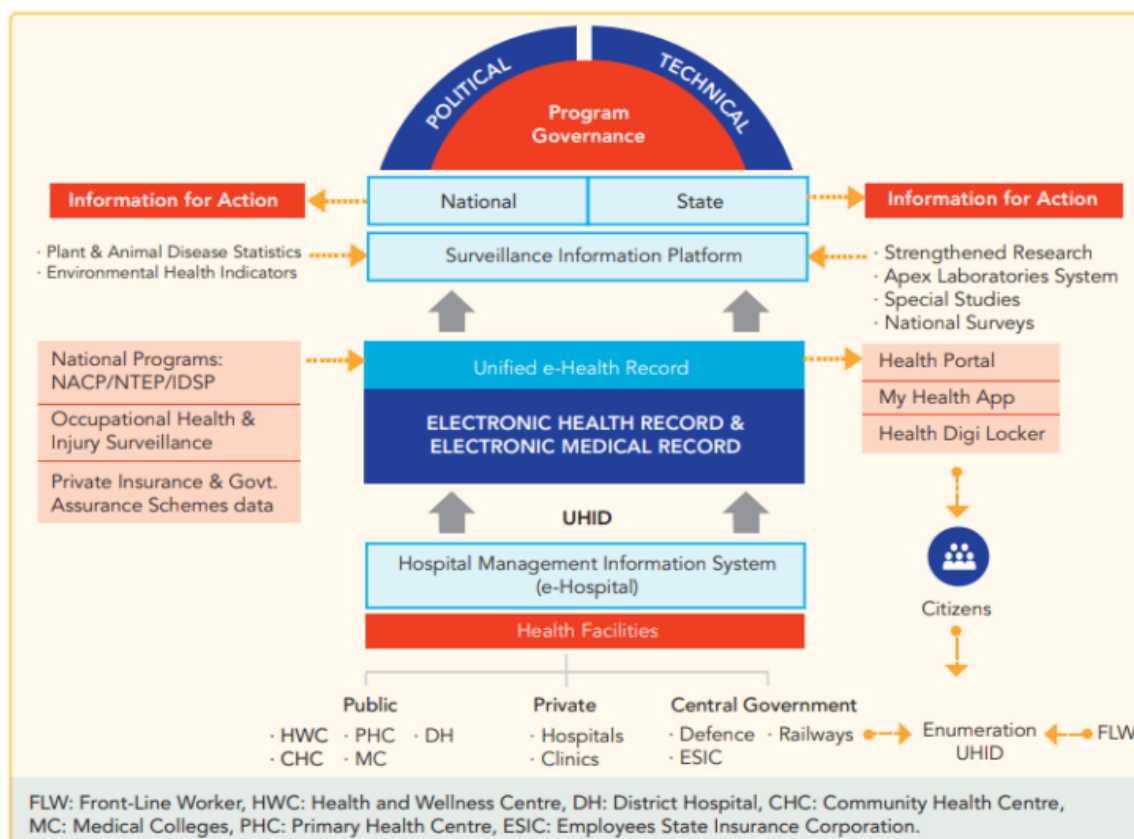**Figure 6: Key Building Blocks for Vision 2035: PHS in India**
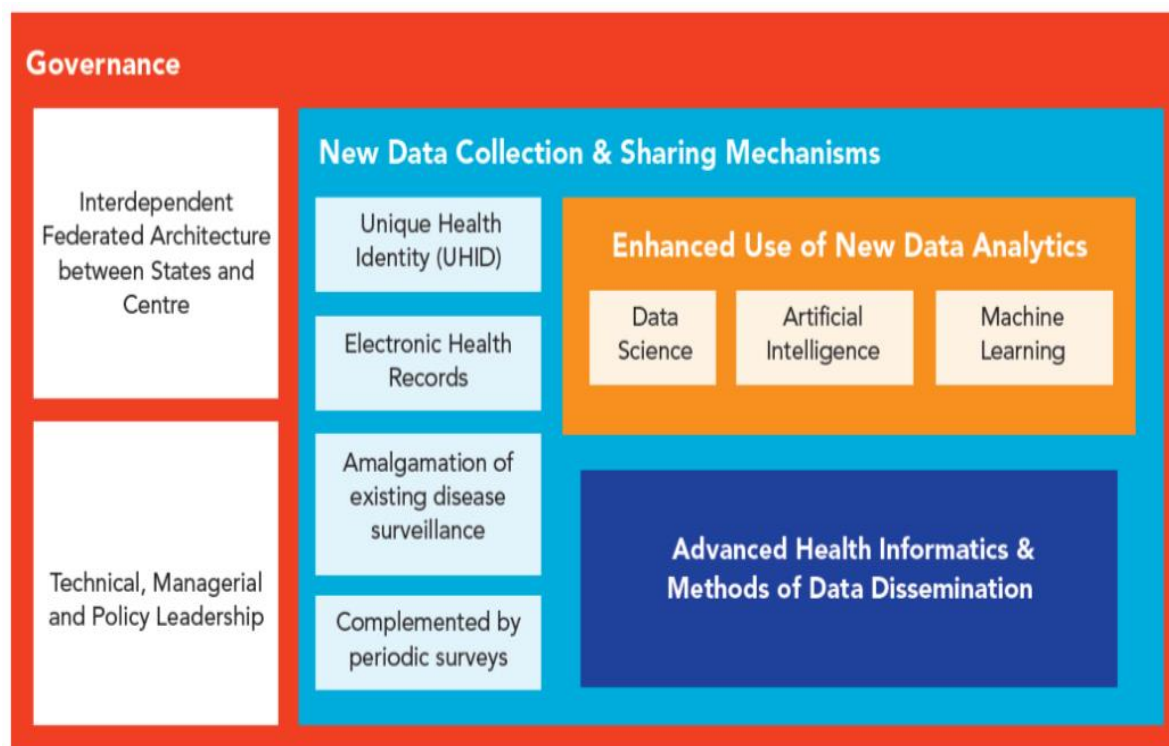
Source: Source: Blanchard, James, Reynold Washington, Marissa Becker, Vasanthakumar Namasivayam, K Madan Gopal, and Rakesh Sarwal. 2021. *Vision 2035 Public Health Surveillance in India - A White Paper*. figshare. https://doi.org/10.6084/M9.FIGSHARE.14093323

The Architecture of Public Health Surveillance in 2035

The proposed architecture for Public Health Surveillance in 2035 is based on Single Surveillance Information Platform that would collate information from multiple sources, primarily driven from electronic health records (EHR) of populations and electronic medical records (EMR) of patients, that are individualised and identified via use of a unique health identifier (UHID). Information from multiple sources such as National Programs like IDSP, NACP and NTEP, hospitals and health centres, PMJAY and other health insurance records, occupational health & injury surveillance, laboratories and pharmacies etc. would be collated into a unified e-health record. The information from this unified e-health record would be integrated with the Surveillance Information System. Data from plant and animal disease surveillance and environmental health surveillance would also be integrated with the Surveillance Information Platform. National surveys and special studies will also be conducted periodically to address gaps within the Surveillance Information System. Figure 7 shows the architecture of Public Health Surveillance in 2035.

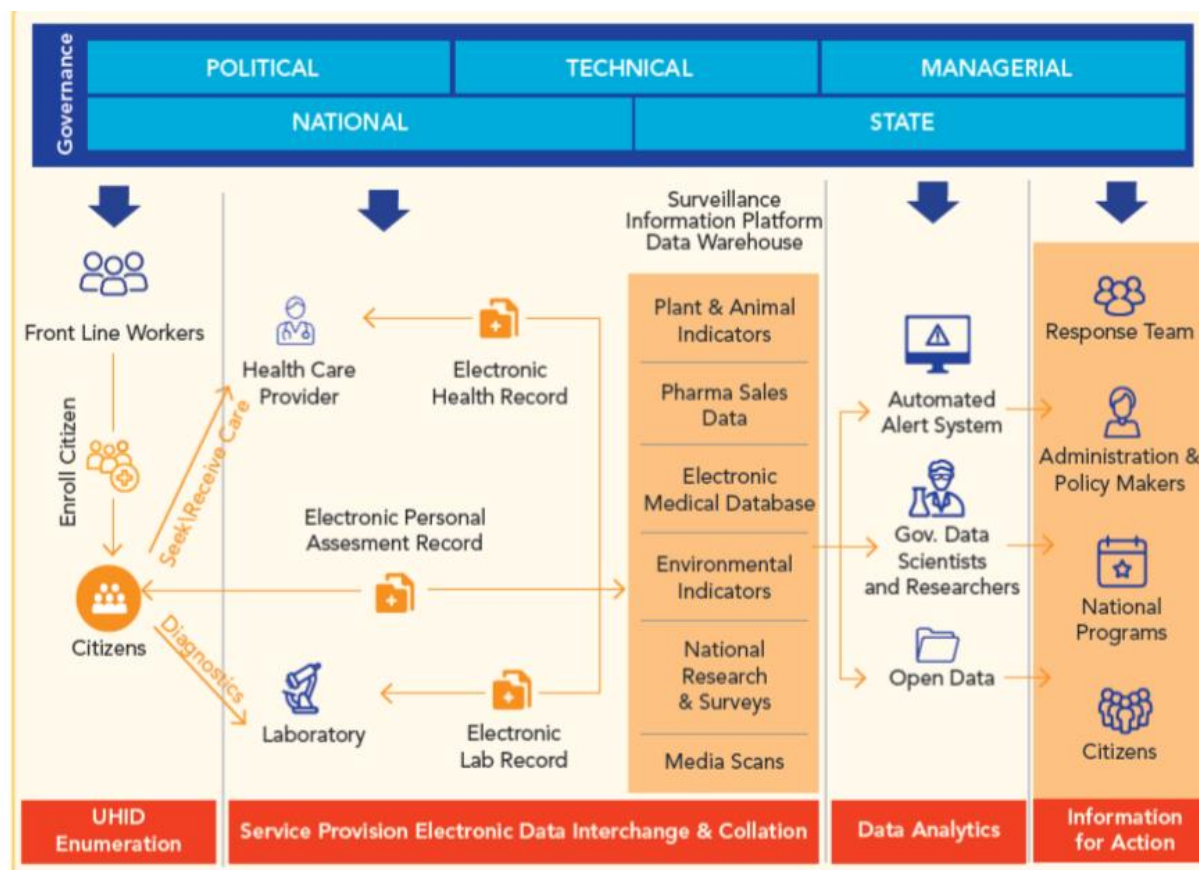**Figure 7: The Architecture of Public Health Surveillance in 2035**

Source: Source: Blanchard, James, Reynold Washington, Marissa Becker, Vasanthakumar Namasivayam, K Madan Gopal, and Rakesh Sarwal. 2021. *Vision 2035 Public Health Surveillance in India - A White Paper*. figshare. https://doi.org/10.6084/M9.FIGSHARE.14093323

The National Digital Health Bueprint recommends the creation of unified e-health records via use of unique health identity number (UHID) and this forms the foundation for the future of public health surveillance in India. Further, the Government of India recently rolled out the Ayushman Bharat scheme which have two components: 1) Establishment of Health and Wellness Centers (HWCs) in the country for delivery of comprehensive primary healthcare and 2) the launch of Pradhan Mantri Jan Arogya Yojana (PMJAY). While the HWCs present an opportunity for conducting surveillance of non-communicable diseases (NCDs), infectious diseases, occupational health and injury, the PMJAY could provide a platform for disease surveillance within the in-patient facilities.

Surveillance is 'Information for Action' and Figure 8 shows the proposed flow of information for Public Health Surveillance in 2035. Public Health Surveillance will undergo a paradigm shift from being a core Government function to one that will make relevant information available to the citizens. It will involve new stakeholders such as private/public institutions (that are academic, research-focused, service-oriented, product development-oriented or policy-centred), media, politicians etc. New dissemination techniques such as use of individually-accessed digital apps,

social media etc. would be adopted. However, privacy and confidentiality of patient information will be an integral part of the process.

Figure 8: Proposed flow of information for Public Health Surveillance in 2035
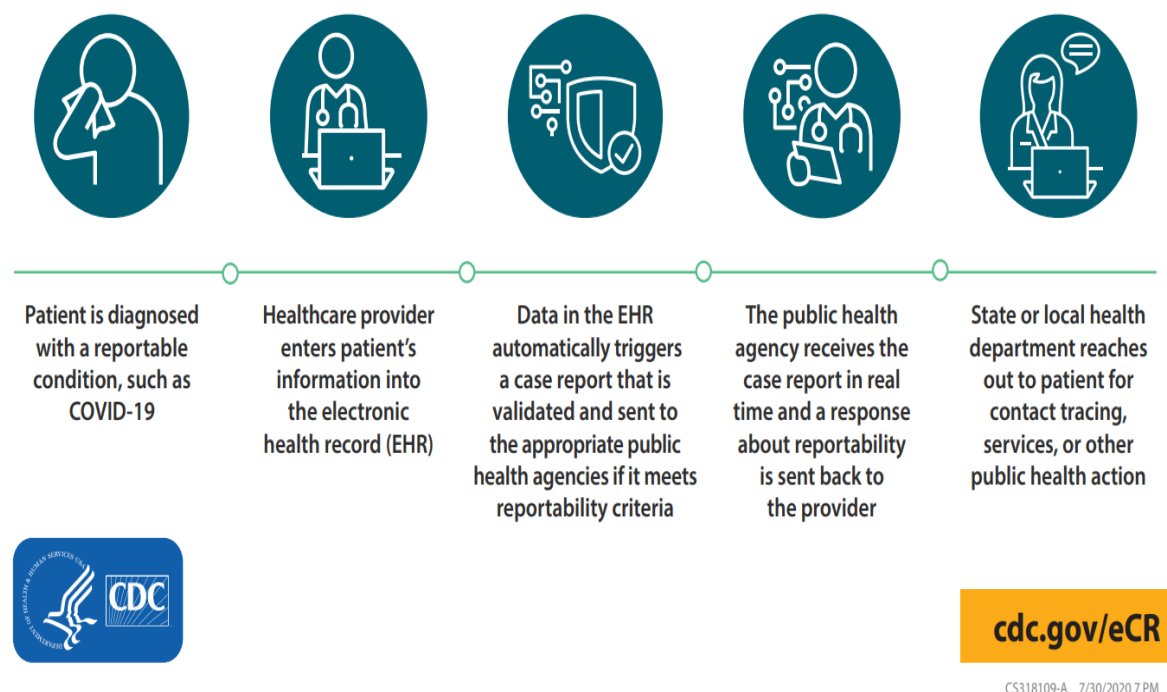

Source: Source: Blanchard, James, Reynold Washington, Marissa Becker, Vasanthakumar Namasivayam, K Madan Gopal, and Rakesh Sarwal. 2021. *Vision 2035 Public Health Surveillance in India - A White Paper*. figshare. https://doi.org/10.6084/M9.FIGSHARE.14093323

Lessons from global best practices

India could learn lessons from **the Electronic Case Reporting (eCR),** a counterpart of IHIP in the United States (as per CDC). eCR allows automated, real-time exchange of clinical information between electronic health records (EHRs) and public health agencies(Center for Surveillance, Epidemiology, and Laboratory services 2021b). eCR runs behind the scenes in the EHRs for the purpose of automatically capturing and reporting necessary information to public health agencies. eCR uses interoperable, standards-based, shared services infrastructure that supports the delivery of data to public health agencies in real time. eCR transfers information to public health agencies for the purpose of tracking diseases, case management and contact tracing. Figure 9 depicts an example of how Electronic Case Reporting (eCR) works(Center for Surveillance, Epidemiology, and Laboratory services 2021a).
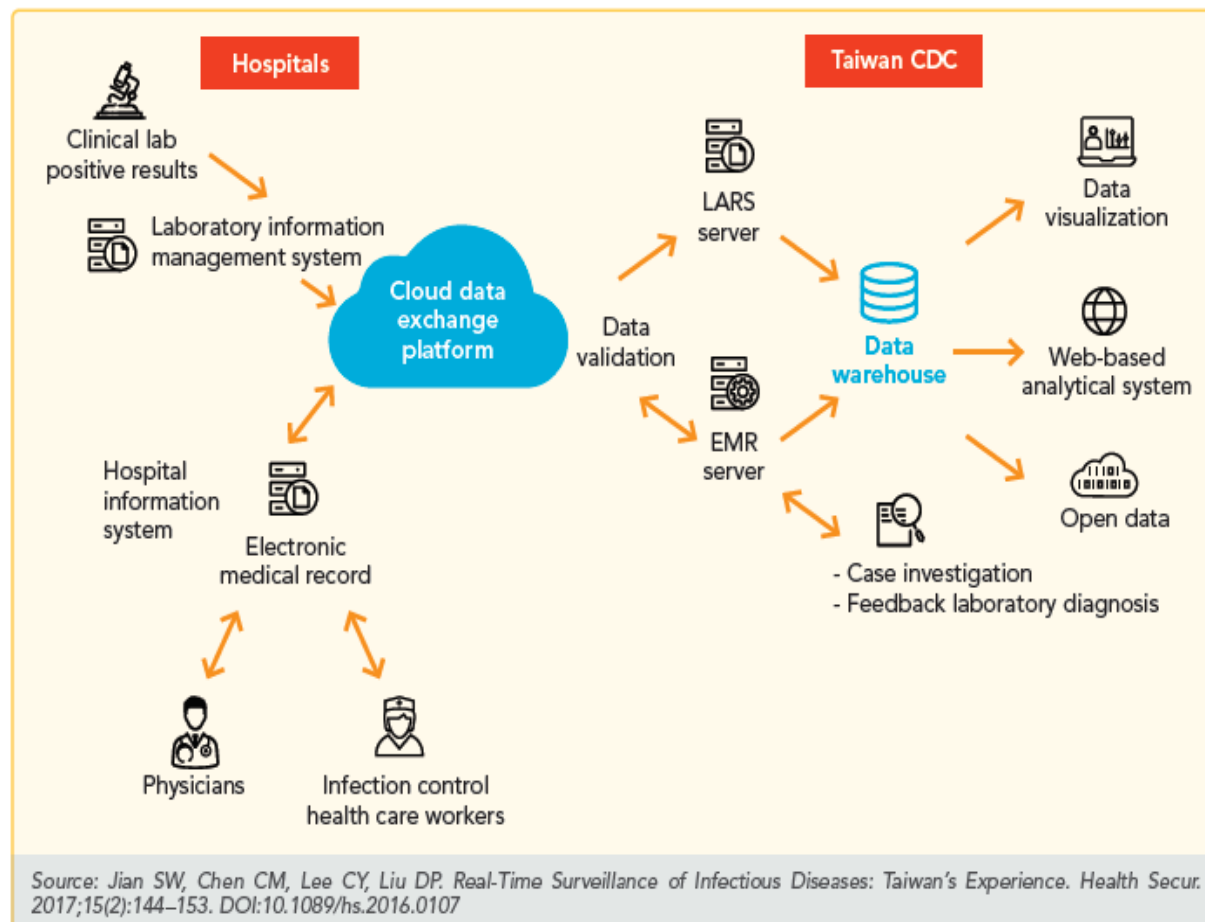
Figure 9: eCR Process

Patient is diagnosed with a reportable condition, such as COVID-19	Healthcare provider enters patient's information into the electronic health record (EHR)	Data in the EHR automatically triggers a case report that is validated and sent to the appropriate public health agencies if it meets reportability criteria	The public health agency receives the case report in real time and a response about reportability is sent back to the provider	State or local health department reaches out to patient for contact tracing, services, or other public health action

cdc.gov/eCR

CS318109-A   7/30/2020 7 PM

Source: Center for Surveillance, Epidemiology, and Laboratory services. 2021a. "How Does ECR Work?" 2021. https://www.cdc.gov/ecr/how-does-ecr-work.html

India could also take lessons from real-time surveillance system of infectious diseases in Taiwan as shown in Figure 10. In order to improve the community based reporting of 20 microoragnisms of public health concern, the laboratory automated reporting system (LARS) was developed in Taiwan. The reporting system uses Logical Observation Identifiers Names and Codes (LOINC) as a standard for reporting information about the positive results from clinical laboratories via the Laboratory Information Management System (LIMS). The data from physicians and infection control healthcare workers is entered into the Hospital Information System. The information from Laboratory Information Management System (LIMS) and Hospital Information System are submitted to the data warehouse of the Taiwan CDC via a cloud data exchange platform. The information is then converted to an open data format and disseminated via the national open data platform(Jian et al. 2017).

Figure 10: Real-Time Surveillance of Infectious Diseases in Taiwan

Source: Jian SW, Chen CM, Lee CY, Liu DP. Real-Time Surveillance of Infectious Diseases: Taiwan's Experience. Health Secur. 2017;15(2):144–153. DOI:10.1089/hs.2016.0107

Source: Blanchard, James, Reynold Washington, Marissa Becker, Vasanthakumar Namasivayam, K Madan Gopal, and Rakesh Sarwal. 2021. *Vision 2035 Public Health Surveillance in India - A White Paper*. figshare. https://doi.org/10.6084/M9.FIGSHARE.14093323

A Federated approach to public health surveillance in Canada is depicted in Figure 11(Public Health Agency of Canada and Pan-Canadian Public Health Network 2016). It shows the core infrastructure elements and collaborative context required to establish a Federated System for Public Health Surveillance in Canada. Lessons could be taken from their approach to build a Federal and integrated Public Health Surveillance System In India.

Figure 11: A Federated System for Public Health Surveillance in Canada
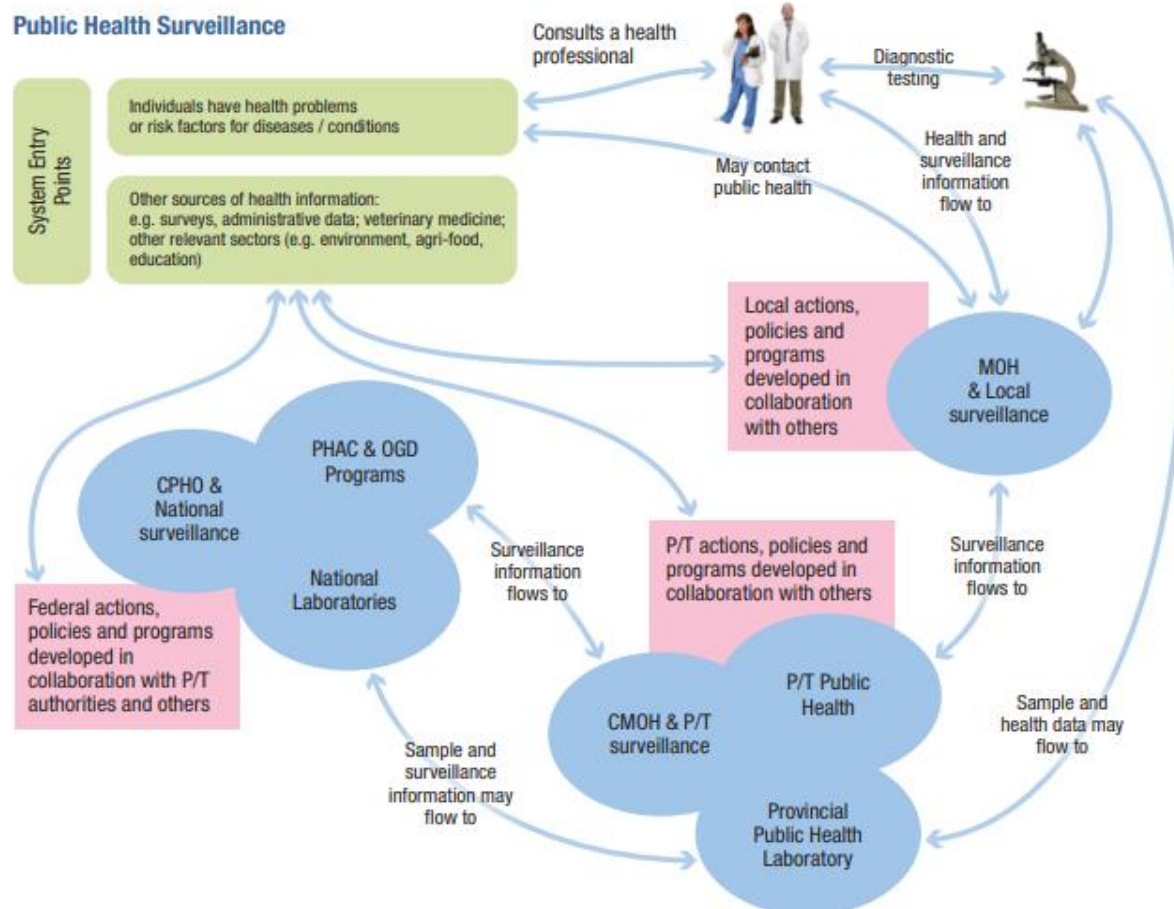
Source: Public Health Agency of Canada, and Pan-Canadian Public Health Network. 2016. *Blueprint for a Federated System for Public Health Surveillance in Canada: Vision and Action Plan.* http://oaresource.library.carleton.ca/wcl/2017/20170509/HP45-11-2016-eng.pdf
Abbreviations used: MOH: Ministry of Health; CPHO:Chief Public Health Officer; PHAC: Public Health Agency of Canada; OGD: Other Government Department; CMOH: Chief Medical Officers of Health;P/T: Provincial/Territorial

## Possible steps towards achieving Vision 2035: PHS in India

Based on India's past experience and global best practices, steps have been recommended to build Public Health Surveillance in India. These steps are not proposed as a sequential process but as a continous cycle. These steps are shown in Figure 12 and are described below:

1. Establish a governance framework that is inclusive of political, policy, technical, and managerial leadership at the national and state level.
2. Identify broad disease categories that will be included under Public Health Surveillance.
3. Enhance surveillance of non-communicable diseases and conditions in a step-wise manner.
4. Prioritise diseases that can be targeted for elimination as a public health problem, on a regular basis.

5. Improve core support functions, core functions, and system attributes for surveillance at all levels - national, state, district, and block.
6. Establish mechanisms to streamline data sharing, capture, analysis, and dissemination for action. These could include the use of situation-aware real-time signals from social media, mobile sensor networks and participatory surveillance systems for eventbased epidemic intelligence.
7. Encourage innovations at every step in surveillance activity.

It is suggested that throughout the process strengthening of human resource capacity, laboratory capacity, manpower, referral networks should be considered. It is envisioned that implementation of this vision could push India in becoming a global/regional leader in the arena of Public Health Surveillance - 'Information for Action'.

Figure 12: Possible steps towards achieving Vision 2035: PHS in India
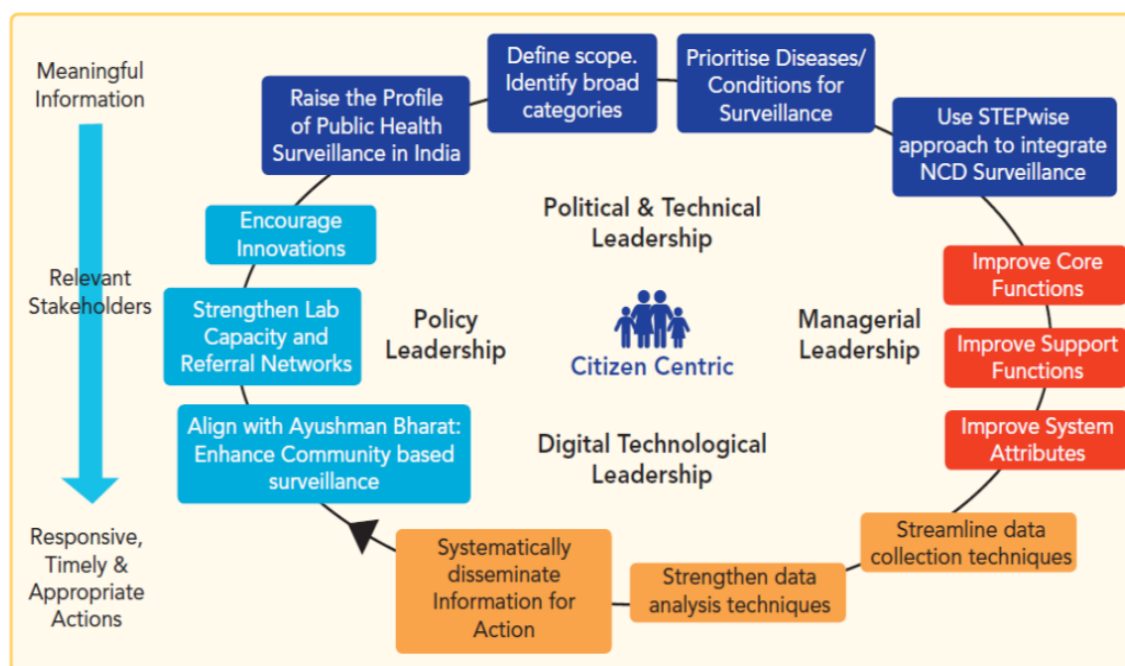
Source: Blanchard, James, Reynold Washington, Marissa Becker, Vasanthakumar Namasivayam, K Madan Gopal, and Rakesh Sarwal. 2021. *Vision 2035 Public Health Surveillance in India - A White Paper*. figshare. https://doi.org/10.6084/M9.FIGSHARE.14093323

Conclusion

While we believe that the public health surveillance in 2035 will have several novel features which will thrust India to become a global/regional leader in the arena of public health surveillance, at the same time it is critical to keep in mind the broad issues to achieve this vision: 1) create a skilled and dedciated health workforce for surveillance activities; 2) strengthen laboratory capacity with new diagnostic technologies such as molecular diagnostics,

genotyping and phenotyping; 3) public-private partnerships should be leveraged; 4) a much higher level of public health spending in general and much higher outlays for surveillance in particular is needed; and 5) lessons should be taken from the countries which have established a real-time integrated public health surveillance system.

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Annexure

Annexure 1: Diseases under Integrated Disease Surveillance Program

L form	Diseases under Presumptive (P form) Surveillance
1. Dengue / DHF / DSS	1. Acute Diarrhoeal Disease (Cholera)
2. Chikungunya	2. Bacillary Dysentery
3. JE	3. Viral Hepatitis (A/E)
4. Meningococcal Meningitis	4. Enteric Fever
5. Typhoid Fever	5. Malaria (PV, PF)
6. Diphtheria	6. Dengue / DHF / DSS
7. Cholera	7. Chikungunya
8. Shigella Dysentery	8. Acute Encephalitis Syndrome (JE)
9. Viral Hepatitis A	9. Meningitis
10. Viral Hepatitis E	10. Measles
11. Leptospirosis	11. Diphtheria
12. Malaria: PV, PF	12. Pertussis
	13. Chicken Pox
	14. Fever of Unknown Origin (PUO)
	15. Acute Respiratory Infection (ARI) / Influenza Like Illness (ILI)
	16. Pneumonia
	17. Leptospirosis
	18. Acute Flaccid Paralysis < 15 Years of Age
	19. Dog bite
	20. Snake bite
	21. Any other State Specific Disease (Specify)
	22. Unusual Syndromes NOT Captured above (Specify clinical diagnosis); eg., scrub typhus