

## INTEGRATED HEALTH INFORMATION PLATFORM: AN ANALYSIS OF FUTURE POTENTIAL, CHALLENGES, AND GAPS FOR MADHYA PRADESH, INDIA

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### ABSTRACT

India still has one of the world's greatest burdens of infectious illnesses, driven by variables such as massive population, significant poverty, subpar sanitation, and impedances in access to basic health care. To overcome this burden, the Integrated Disease Monitoring Project (IDSP), funded by the World Bank, was established by the Union Minister of Health and Family Welfare in November 2004 to strengthen the country's monitoring and response system. Several challenges in the effective utilization of IDSP and the need for elaborated epidemiological data for quick response led to the development and design of a novel Integrated Health Information Platform (IHIP). This platform's future impacts include better surveillance coverage, improved continuous monitoring, better-automated analysis, visualization and displaying of near-real-time data, and closed network linkage of various reporting units such as field staff, medical officers, and laboratory personnel. Data collection under IDSP was paper-based and it produced a weekly surveillance report this includes case-centric data with demographic, clinical, and laboratory details, and links it with IDSP's S, P, and L formats. Developed by the Government of India, with the support from the WHO, this platform integrates the electronic health records of individuals from all parts of India, allowing greater continuity of the treatment, secure and confidential storage of data/records, enhanced illness diagnostics, reduction, and even prevention of medical errors. This paper is intended to study this novel IHIP model of the Government of India, highlight its current challenges, propose possible solutions, and predict future possibilities.

**Keywords:** IHIP, Integrated Health Information Platform, Integrated Disease Monitoring Project, Surveillance.

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### INTRODUCTION

India still has one of the world's greatest burdens of infectious illnesses, driven by variables such as massive population, significant poverty, subpar sanitation, and impedances in access to basic health care [1]. The burden of diseases and their trends has traditionally been hard to track in India, and much harder to detect, diagnose, and control epidemics until they were fairly big. To overcome this burden, the Integrated Disease Monitoring Project (IDSP), funded by the World Bank, was established by the Union Minister of Health and Family Welfare in November 2004 to strengthen the country's monitoring and response system [2]. The project also encompasses relatively technical operations such as computerization, electronic data transfer, and communication along with video conferencing linkages. With the advancement of computerization in public health services, it has become increasingly important to integrate data from all the available sources, to obtain useful information for monitoring, evaluation, and improvement of various health programs. Nevertheless, several challenges in the effective utilization of IDSP and the need for elaborated epidemiological data for quick response led to the development and design of a novel Integrated Health Information Platform (IHIP) [1-3]. This platform's future impacts include better surveillance coverage, improved continuous monitoring, better-automated analysis, visualization and displaying of near real-time data, and closed network linkage of various reporting units such as field staff, medical officers, and laboratory personnel [4]. This paper is intended to analyze this novel IHIP model of the Government of India, highlight its current challenges, propose possible solutions, and predict future possibilities.

### IHIP: AN OVERVIEW

IHIP, an acronym for IHIP, is a near real-time, area-specific, case-based electronic health information updation system, designed to provide automated analyzed reports regarding various epidemic-prone

diseases, hence providing valuable inputs for quick decision-making activities in the concerned geographical area [5].

The Integrated Disease Surveillance Program (IDSP) module of the IHIP initially was the first attempt to integrate different health programs. The Ministry of Health and Family Welfare (MoHFW), the National Centre for Disease Control (NCDC), the Government of India, and, the World Health Organization, soft-launched it in chosen districts of seven states (Karnataka, Andhra Pradesh, Himachal Pradesh, Odisha, Uttar Pradesh, Telangana, and Kerala) as a pilot initiative on November 26, 2018, to enable the production and availability of interoperable electronic health records (EHRs) across the country [6].

### IDSP TO IHIP - THE ROAD AHEAD

India requires a comprehensive information system to monitor new and re-emerging public health hazards, catastrophes, and mass events as part of the International Health Regulations (IHR) to enhance public health surveillance systems. Integration of all the disaggregated public health information resources is essential for a coordinated and immediate corrective response [7]. Further, a unified system for public health surveillance comprising the collection, analysis, and interpretation of real-time health information can effectively assist to plan, implement, and evaluate public health measures.

The IHIP provides a single operating picture of public health surveillance in India by combining the data from numerous health "registries" to provide decision-makers with near-real-time health surveillance data throughout India [8].

According to the Centre for Disease Control (CDC) and the Joint Monitoring Mission of the World Health Organization (WHO), IDSP has an overabundance of fragmented information, where more epidemiological data is necessary for action. IHIP was designed to

bridge the gaps in IDSP by combining health data from various disease control programs, receiving micro-level data on all health events, including communicable and non-communicable diseases, from all public as well as private health facilities across the states and the Union Territories, and to provide geospatial epidemiology. This aids in the pooling of resources with minimal wastage, provision of rapid information, and assistance in quick response with better quality and efficiency in contrast to IDSP [9]. In addition, it also helps in defining and evaluating the illness variations in terms of demographic, environmental, behavioral, socioeconomic, genetic, and infectious risk factors. Thus, IHIP integrates the data obtained digitally from both public and private health sectors and provides automated signals for outbreaks earlier than traditional platforms. IHIP provides regular real-time health surveillance information to the union health ministry, state health ministries, and local governments from any location and on any electronic device (Mobile/Tablet/Computer) with the application and login credentials [10].

Data collection under IDSP was paper-based and it produced a weekly surveillance report based on 13 health conditions, while the IHIP is designed to collect disaggregated case-based data on 26+(15 Syndromes+11 Diseases) priority health issues at various healthcare levels. This includes case-centric data with demographic, clinical, and laboratory details, and links it with IDSP's S, P, and L formats [10]. All the data contained in this portal has the public health surveillance attributes, like person, place, time, health conditions, and also the geolocation for geographic reference [11]. IHIP also supports the graphical representation of data into the integrated dashboard using GIS-based data from reporting health facilities. IHIP also supports the Public Health Surveillance in the context of One Health (human health+animal health+environment) and includes data about not only airports, seaports, railway stations, but also humidity, rainfall, and other near real-time emergency warnings, such as tsunami and earthquakes [12].

IHIP also generates a health condition alert that will be issued automatically depending upon the threshold set for each disease. It also plots automated epidemic curves, and pathogen-wise distribution of cases, along with a generation of health condition alerts, when the number of lab-confirmed cases crosses the threshold for a specific disease [13]. Furthermore, hotspots can be identified from the clusters with the information obtained from GIS tagging of individual cases. In addition to outbreak detection, IHIP aids in fastening the outbreak investigation by selecting a rapid response team from the IHIP portal online, based on the availability of trained members in the particular outbreak area [14].

Overall, it reduces the delay as well as fragmentation of health-related data and information and puts all this information on a single operating platform. The design and development of this platform are solely aimed at strengthening India's Public Health Surveillance System by continuous automated monitoring of the emerging and re-emerging public health threats, disasters, and mass events on a near-real-time daily basis [15,16].

#### IHIP PORTAL - EXPECTATIONS AND REALITIES

Detailed analysis of the Integrated Health Information Portal was done by the author for a month in the state of Madhya Pradesh with the help of the IDSP department, Directorate Health Services, Bhopal, Madhya Pradesh. Due login credentials were utilized for the analysis of the portal both at the state and district levels. The status of IHIP application functionality, reporting status of all S, P, and L forms, skills, and awareness of stakeholders were assessed from June 1, 2021,–December 31, 2021. State-level training conducted for District epidemiologists, District data managers, Medical officers, and Lab personnel was attended to capture the exact picture of their acquaintance with the portal, along with the identifications of various issues faced by them.

As per the reporting status on the IHIP portal from its commencement to the aforementioned last date, it has been observed that there have

been 100% of Syndromic surveillance reports received from villages. Presumptive form reporting was 100%, Laboratory form reporting was 13.56%, and the average percentage of Reporting Units was 100%. Total outbreaks reported through the portal were 48 till the last date [6].

#### IHIP PORTAL: KEY CHALLENGES AND WAY FORWARDS

##### Field-based S form

1. The IHIP application does not support those Anmol tablets (ANM Online tablets provided by Government to each ANM under the RMNCH program) that have android version 5.0 or less. As a result, multiple users with old tablets or versions face frequent issues in login and data syncing. In Madhya Pradesh, there are approximately 11,558 sub-health centers, representing a significantly large chunk of the total number of reporting units in the state [17]. Technical issues, while operating the application, could dampen the enthusiasm as well as a willingness on the part of these reporting units who do not have access to IHIP compatible devices.
2. In the mobile-based IHIP application, the ANM has to enter the relevant data in the S form by flipping through different pages. As per the current field observations, most of the ANMs find it difficult to synchronously move through all the pages of the S form. A single-page entry form, with the option of scrolling from top to bottom, can be a handy S-form up-gradation for the enhanced utilization of the portal.
3. The legitimacy of the data uploaded by an ANM can be an issue, as currently there are no immediate linkages between patients' legal identity credentials and their corresponding data, entered in the application. Mandating of reporting unit-wise (RU) population database with some unique identifiable credential like AADHAR card number should be explored to avoid both the duplication of data and also the possibility of fraudulent data entry. If linked up with the Government of India database of that ID, it will also help to save precious time in filling out the demographic details of each patient. Moreover, this will help in the synchronization of patients' health records with their unique ID [18].
4. As for the Syndromic (S) form entry, the portal captures and displays the date, when the data of the S form is synchronized to the portal, irrespective of the date when the case is being reported in S-form by the ANM. Due to network issues, S-form users experience difficulties in synchronizing the data to the IHIP application. This results in a delay in reporting as well as the response needed. To ensure near real-time reporting, the data synchronization by S-form users through the IHIP application should be time-bounded and this process should be automated too.
5. For the S form inputs through the IHIP application, there is not a provision for the mandatory 'Geo-tagging' of each case. Hence, an ANM can easily skip the geotagging option while entering the necessary details of the reported case, by mentioning either the house number or the house name (Fig. 1). As a result, it will not only

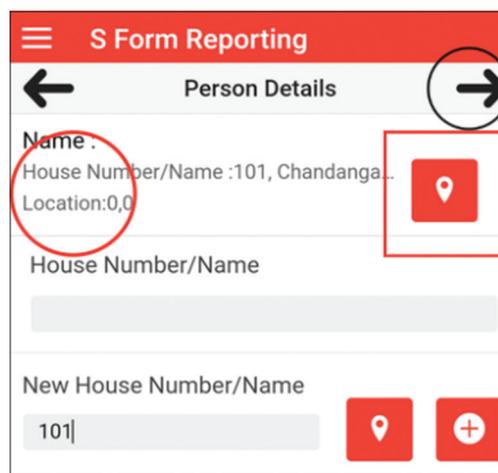


Fig. 1: S form page depicting Geo-tagging option

lead to incomplete information regarding the current location of the patient but also the possibility of fake entry by the ANM from any other location such as her home.

#### Facility-based P and L forms

1. There is no linkage of the S-form with the P-form, and thus, it may lead to the duplication of the data. A person suffering from any disease may be first entered by an ANM in the IHIP portal via S form, whereas that particular patient can be again updated in the same portal as a new/separate/different case through P form entry in the reporting health-care facility of that area.
2. Most of the medical colleges in Madhya Pradesh already have a local health data management portal, namely, Health Information Management System (HIMS). Hence, adding all the patient's details to the IHIP portal simultaneously will lead to a two-fold burden for the user. For its increased acceptance and utilization, IHIP should be able to fetch relevant data from the existing HIMS or it should be remodeled to replace the latter in the coming future.
3. Based on field reviews and training session feedback, the P form users, and medical officers, have expressed their concern over the absence of the differential diagnosis section in the P form. These users can only choose the relevant diagnostic tests in the portal based on the diagnosis made. The addition of a differential diagnosis section will not only aid in determining the actual diagnosis but also will hasten the treatment procedure [12,18].
4. Laboratory users cannot order tests for some diseases which are also covered under different health programs. As an integrated health surveillance platform, IHIP must not restrict L form users to order the relevant tests as per/her judgment.
5. There is no provision for the generation of health events by L form users. L form user test samples to verify and confirm a disease. Thus, he may be the first individual to identify the initiation of an event. He/she should therefore be authorized to generate an event to accelerate the surveillance process. As these users also have access to the database of the diseases, backed by definitive laboratory-confirmed diagnoses, they are in the right position to generate event alerts as per the predefined criteria [10].

#### Events and outbreaks based

1. In the category of outbreaks, the portal fails to provide accurate data for the chosen date range. For example, the date range selected (Fig. 2) is from July 1, 2020 to July 5, 2021, initially. Data presented on the portal is from date November 26, 2018 to July 5, 2021. However, the issue has been fixed after follow-ups.
2. For the investigation of outbreaks, it is a requisite process, on the part of districts, to get approval from the state for the constitution of a new Rapid Response Team (RRT). This may lead to unnecessary delay in immediate action for the incidents that require urgent consideration. Districts can be authorized to create a new RRT for an event requiring urgent investigation and intervention for immediate containment of the outbreak. In addition, a pop-up feature can be added regarding the severity of the outbreak and the status of urgency.
3. The identity of the user who triggered the event alert in the first place is not specified in the "Action Update" section for both ongoing as well as completed outbreaks. This hampers the verification of the event generated. If done, the events generated could not only be validated by the higher authorities but also the person who generated the event can assist the RRT in the ongoing outbreaks, especially in remote areas.
4. Automated alerts for the district level users (District Surveillance Officer/District Epidemiologists) for any event generated by the S and P form users are not available on the portal. Keeping in mind, the importance of immediate action on any unusual health event, an automated alert through message for DSO/DE for any new event should be generated through the IHIP application [10,19].
5. While generating an event alert by the users, no head is available for the information related to the patient's name, contacts, and other details. These details of the patients, reported with unusual health conditions, if available, can prove to be highly supportive for RRTs in timely contact tracing of the patient.
6. At present, there is no role of SSUs in the validation of actions taken and thereafter closure of outbreaks (Fig. 3). To improve the efficiency of the outbreak responsive system, the final outbreak summary report should be shown "Completed" only after it has been digitally verified by the respective State Surveillance Officer (SSO) of that State Surveillance Unit (SSU).

District	Ongoing Outbreak	Completed Outbreak	Total Outbreaks	Total Ongoing/Completed	Event Alerts Pending Actions	Health Condition Alerts Pending Actions	Action
Agar Malwa	0	0	0	---	0	0	View
Alirajpur	0	0	0	---	0	0	View
Anuppur	0	0	0	---	0	0	View
Ashoknagar	0	0	0	---	0	0	View
Balaghat	0	0	0	---	0	0	View
Barwani	0	0	0	---	0	0	View
Betul	0	0	0	---	0	0	View
Bhind	0	0	0	---	0	0	View

Fig. 2: Integrated Health Information Platform dashboard, page depicting information regarding outbreaks

Outbreak ID	Status	Syndrome/Disease	Health Facilities	Preliminary Information	Initiated Date	Sub-District	Verified By	Verified Status	Verified Date
23414021280002-O	Completed	Acute Diarrhoeal Disease	CHC BHIRKANGAON	A total number of 50 cases of acute diarrhoeal disease found in village Seida, PHC Barmata, CHC and Block Bhirkangaon, District Khargone.	14/07/2021	Bhirkangaon		No	
23414021350001-O	Completed	Acute Diarrhoeal Disease	PHC BORAWA ug	A total number of 146 cases of acute diarrhoeal disease were found in India swas area of village Umriya.	25/06/2021	Kasrawad		No	

Fig. 3: EWS outbreak summary status

### General challenges

1. This portal does not share an epidemiologically significant historical database of the districts concerning the outbreaks that have taken place before 2018, that is, before the launch of the portal. Any readily available database of this kind can certainly help the local authorities to develop the necessary insight and accordingly devise a proper strategy for the prevention of future outbreaks.
2. Monitoring of operation of individual facilities and or districts, at a glance, is absent in the dashboard, as it provides only a small portion of required information for the same. All the facilities, in every district, should ideally be able to access this epidemiologically important information at a single point source for immediate action.
3. Tertiary health-care facilities provide services at various points of care units such as an emergency, general/specialized out-patients, and in-patient departments. These departments are the P form reporting units of the aforementioned centers. However, despite having abundant human resources, a key accountable person for regular data updation, in the P-form, at the facility level is not identified. Selection and authorization of a nodal person for all IHIP-related activities in secondary and tertiary care health institutions will be beneficial for its widespread acceptance and utilization [20].
4. Death record data updation is not time-bound in the current portal. It has been observed that death data updation was delayed by some RUs by several months. Immediate identification of a possible cause of death, due to a contagious disease, can have a crucial health-related impact. Death data updation and synchronization should be made time-bound to prevent the disastrous outcome of any deadly disease [10,12].
5. As per the feedback from the field and the training sessions, it was mentioned by district epidemiologists that frequent technical breakdown occurs during utilization of the IHIP application. This result in the loss of the data entered till that point in time.

### CONCLUSION

The digitization of health data aggregation is a positive beginning towards the vision of a comprehensive integrated near-real-time surveillance system. In terms of stakeholders and reporting units, IHIP is the largest online monitoring platform in the world. It unites public and private sector health data sources, right from the root level field workers to facilities such as hospitals, laboratories, and investigation centers, under a single platform. It offers to provide 'One Health' and to shift the pace of data collection positively by real-time monitoring of new infectious disease threats and providing sensible information for effective mitigation strategies. In addition, the system functions as an early warning system for any possible outbreaks and provides valuable assistance for accelerated response to these outbreaks.

Developed by the Government of India, with the support from the WHO, this platform integrates the EHRs of individuals from all parts of India, allowing greater continuity of the treatment, secure and confidential storage of data/records, enhanced illness diagnostics, reduction, and even prevention of medical errors. As with any newly developed technical system, new advancements such as IHIP would require well-trained and motivated human resources to regularize its activities till the desired outcome is obtained.

However, with all its technological advancements, there are some gaps and challenges in IHIP that need to be continuously analyzed and, consequently resolved, for it to be a great success. Most of these challenges do seem to be minor, but keeping in mind the gigantic number of stakeholders involved, plus the humongous data this platform will regularly cater to, these challenges can have a significant impact on the functionality of the platform. Thus, it will be a welcome step, if these gaps are addressed pronto for the successful implementation of the IHIP portal across India.

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### CONFLICT OF INTEREST

None.

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