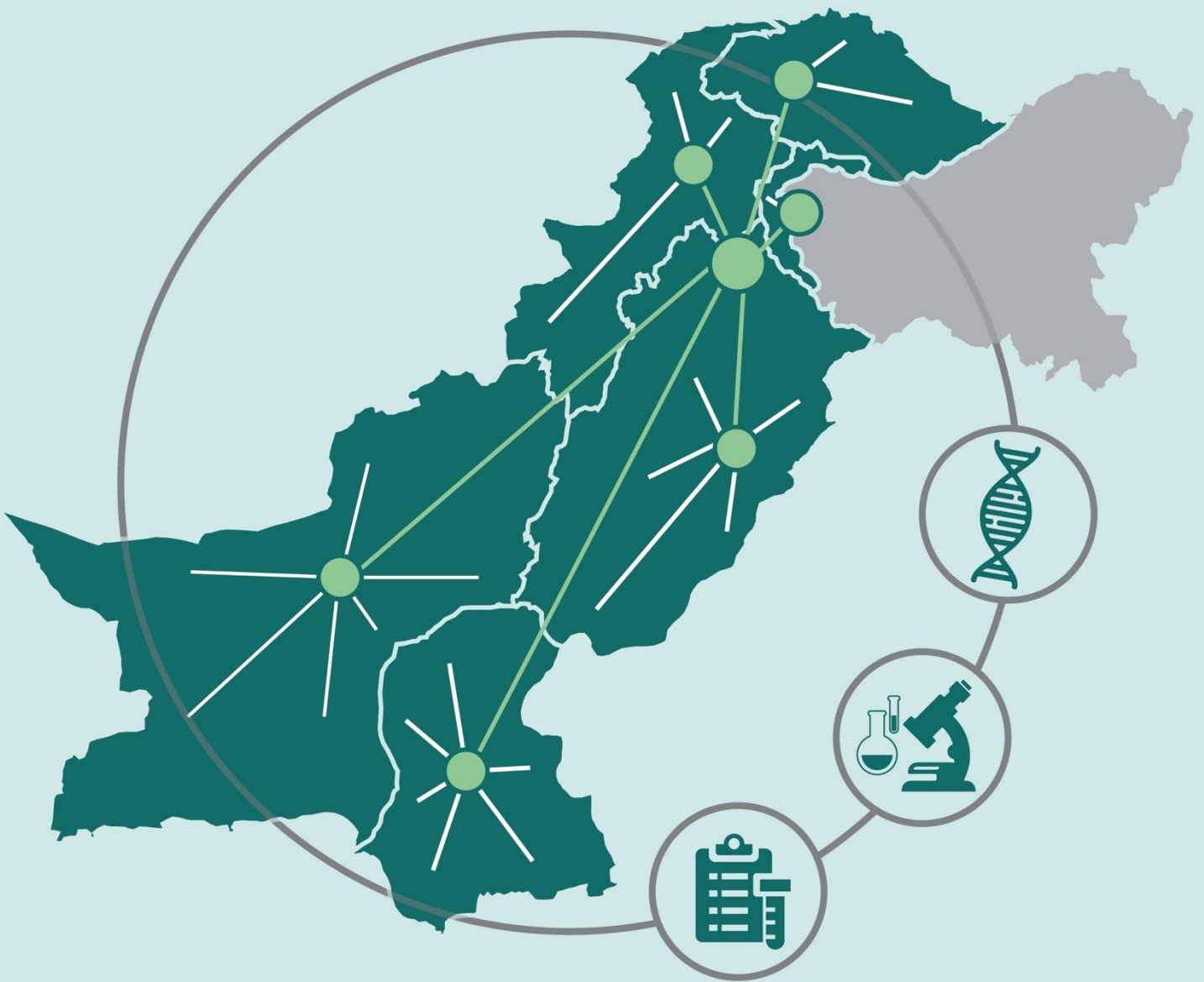




INTEGRATED DISEASE SURVEILLANCE AND RESPONSE (IDSR) ROADMAP FOR DEVELOPMENT OF A NATIONAL IDSR LABORATORY NETWORK IN PAKISTAN



AUGUST 2024

**National Institute of Health
Ministry of National Health Services, Regulations and Coordination**

**INTEGRATED DISEASES SURVEILLANCE & RESPONSE
(IDSR)**

**ROADMAP FOR DEVELOPMENT OF
NATIONAL IDSR LAB NETWORK IN
PAKISTAN**

AUGUST 2024

NATIONAL INSTITUTE OF HEALTH

MINISTRY OF NATIONAL HEALTH SERVICES, REGULATIONS AND COORDINATION

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ACRONYMS AND ABBREVIATIONS

| | |
|---------|--|
| AFP | Acute Flaccid Paralysis |
| AJK | Azad Jammu & Kashmir |
| AI | Avian Influenza |
| AMR | Antimicrobial Resistance |
| DHIS 2 | District Health Information System, Version 2 |
| ELMIS | Electronic Lab Management Information System |
| EQAP | External Quality Assurance Programme |
| GB | Gilgit Baltistan |
| IDSR | Integrated Disease Surveillance and Response |
| IDIMS | Infectious Diseases Information Management System |
| KP | Khyber Pakhtunkhwa |
| LQS | Laboratory Quality Systems |
| LQSU | Laboratory Quality Services Unit |
| MDR TB | Multidrug Resistant Mycobacterium Tuberculosis |
| MoNHSRC | Ministry of National Health Services, Regulations and Coordination |
| NAPHS | National Action Plan for Health Security |
| NIH | National Institute of Health |
| PCR | Polymerase Chain Reaction |
| PHL | Public Health Laboratory |
| PPHL | Provincial Public Health Laboratory |
| RRL | Regional Reference Laboratory |
| TB | Tuberculosis |
| TWGs | Technical Working Groups |
| UKHSA | United Kingdom Health Security Agency |
| WHO | World Health Organization |
| XDR | Extensively Drug-Resistant |

1. BACKGROUND

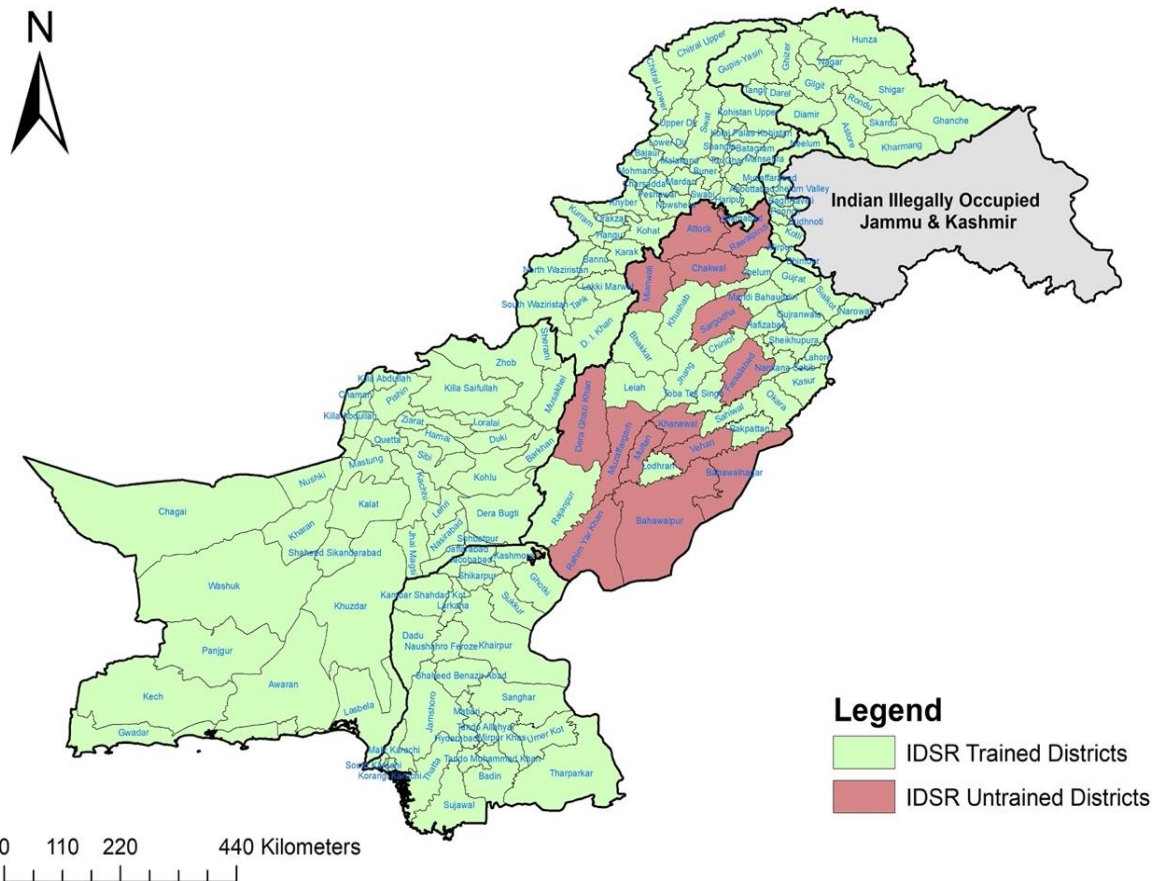
A well performing disease surveillance system is critical for providing practical information for use in planning, implementing, monitoring and evaluating public health intervention programmes.

The main aim of Integrated Disease Surveillance and Response (IDSR) is to strengthen district-level surveillance and response for priority diseases, to integrate surveillance with laboratory support, and to translate information generated from surveillance and laboratory data into specific public health actions.

1.1 IDSR Implementation in Pakistan

The establishment of IDSR in Pakistan aims to improve International Health regulations compliance in Pakistan through protecting public health by ensuring a well-coordinated, prompt, and effective response to public health risks. During its first phase of implementation, National Institute of Health, with support of UKHSA and other partners has been able to establish IDSR network across Pakistan and have nominated Public Health Reference Laboratories across all provinces in the country.

Figure 1: IDSR Trained/Activated Districts of Pakistan



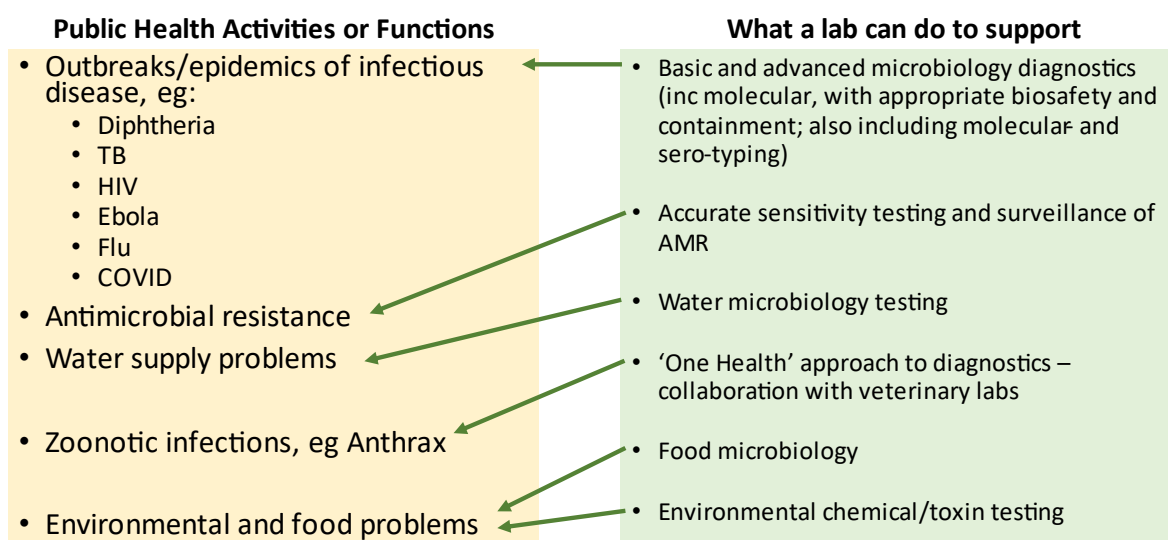
Entering the phase 2 of IDSR, it has become essential to develop robust network of functioning public health laboratories to achieve the goal of enhancing disease surveillance and improving public health outcomes.

1.2 Public Health Laboratories

Public Health Laboratories are an essential component of the IHR regulations. The global Public Health faces significant challenges with the rise of antimicrobial resistance in common pathogens, Multidrug Resistant Mycobacterium Tuberculosis (MDRTB), Extensively Drug-Resistant (XDR) Salmonella typhi. There is also the continuing threat of new and emerging infections which may cause global pandemics. This changing dynamic is the reason for an Integrated Disease Surveillance and Response (IDSR) system and Public Health Laboratories (PHLs) to respond to ongoing and future challenges from infectious diseases.

The functions of a public health laboratory (not always straightforward to define). There is already a lot of work done on relationships between frontline health services and public/private laboratories and NIH labs. There are existing pathways of sample referral and disease surveillance.

Figure 2: Public Health Functions Requiring Laboratory Support



1.2.1 Role of Public Health Lab in the IDSR System

The Functions of a PHL typically include a mixture of reference tests (i.e., specialized tests that frontline laboratories lack the skill, equipment and resource to carry out and pure public health tests, including many tests of typing and subtyping organisms. These tests tend not to inform management of single patients but provide useful epidemiological information.

The key roles and functions of a Public Health Laboratory within the IDSR are as follows:

- **Disease Confirmation and Reporting:** Both clinical and public health laboratories play a critical role in confirming suspected cases of infectious diseases. This is confirmation enables the reporting of cases to the appropriate authorities for rational decision making.
- **Outbreak Detection and Response:** The public health laboratory may directly detect cases or outbreaks of diseases of public health concern. PHLs determine the appropriate specimens and tests required and provide important advice to public health and clinical colleagues on specimen collection, handling, and transport to the laboratory.
- **Monitoring Disease Trends:** Public health Laboratories provide data on disease patterns and trends. By analysing and interpreting laboratory results, they contribute to the surveillance of

infectious diseases. This information is crucial for tracking the incidence and prevalence of specific diseases, identifying emerging threats, and assessing the effectiveness of interventions.

To produce quality results from lab tests for epidemiological surveillance and accurate diagnosis during outbreak response it is essential to work on common disease algorithms and use standard methods. These algorithms include details of the pre-analytical, analytical, and post-analytical phases of the investigation.

For accurate diagnosis of priority diseases standard methods that have been validated nationally (NIH) or internationally should be used and documented as standard operating procedures. In this way all PHLs in Pakistan will be working to the same agreed standards and the microbiology outputs will be reliable for laboratory confirmed diagnosis in outbreaks and for surveillance.

1.3 National IDSR Laboratories Network (IDSR-Lab Network)

An Integrated Disease Surveillance and Response Laboratories Network (IDSR-Lab Network) is composed of laboratories at each level of the health system (health center, district, regional/provincial, national) committed to the proper diagnosis of priority infectious diseases for public health decision making.

The laboratories in a functional IDSR-Lab Network have established data sharing and communication channels for routine communication, exchange of information, and interaction in specified ways with each other, and with the concerned departments.

The national public health laboratory may also communicate and interact as necessary with sub-regional and regional networks and with international collaborating centres.

The aim of the IDSR-Lab Network is to provide strategic advice and share expertise to strengthen national capacity for laboratory services to support disease surveillance and control.

The network for IDSR not only relates to the network of the IDSR hubs across provinces and federal but also relates to the networking of the linkages in particular with the public health laboratories. IDSR will not be effective unless these linkages are robust as part of the network.

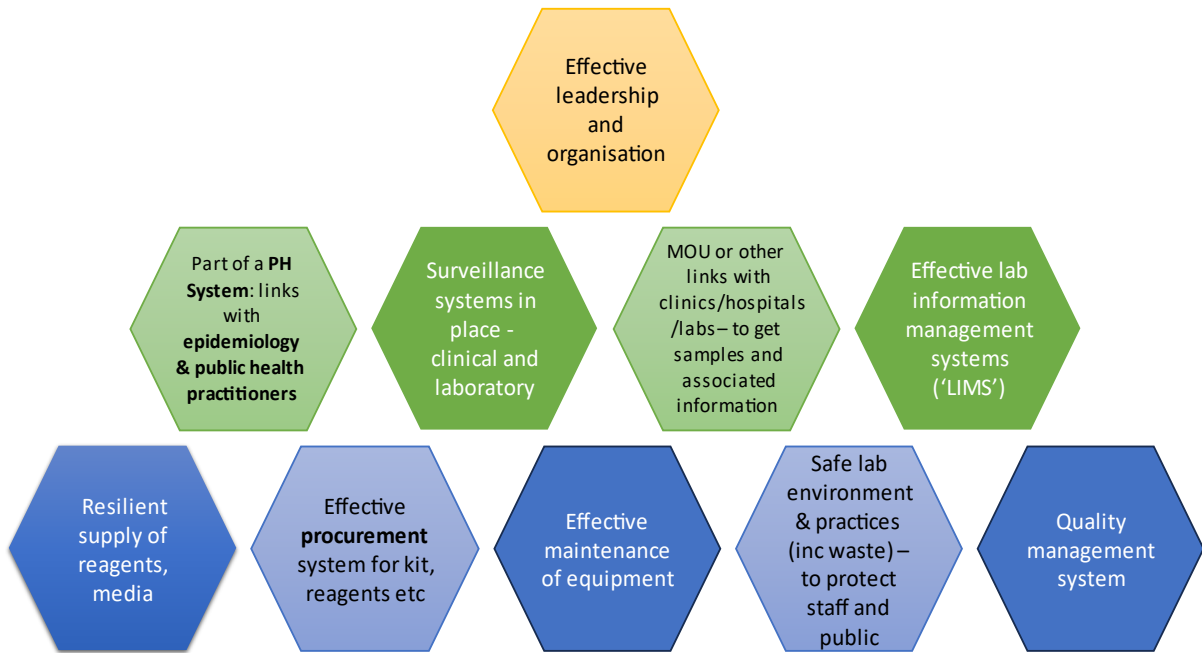
1.3.1 Guiding Principles for National IDSR-Laboratory Network

When establishing an IDSR-Lab Network, the following guiding principles need to be observed.

- **National ownership and leadership:** Provide national ownership and leadership for the IDSR-Lab Network to ensure sustainable and effective implementation of IDSR. The IDSR-Lab Network should be linked with the national multi-disciplinary surveillance coordinating body (e.g., NIH) established to coordinate the implementation of IDSR.
- **National policy on laboratory services:** Establish national public health and clinical laboratory policy that clearly defines roles of laboratories for the different levels.
- **Resource management:** The need for long-term sustained efforts to ensure the budget flow, supply skilled human resources, supply and maintain essential laboratory equipment, reagents and supplies and develop infrastructure development for IDSR-Lab Network.
- **Partnership:** Expanded partnership with clear definition of roles and contributions of each partner at national, intermediate and district levels. Through the National IDSR-Lab Network, establish contact with similar networks at sub-regional, regional and international levels.

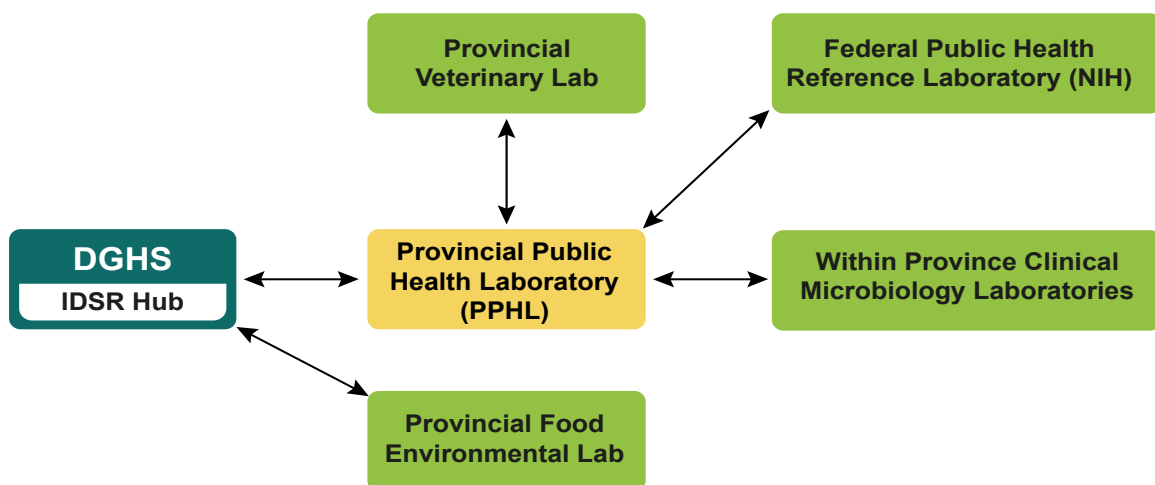
- **Access to quality laboratory services:** Equitable access to quality laboratory services with greater attention to the district level especially in rural, semi-urban and underserved areas.
- **Standardization:** Building on acceptable international standards and norms for quality laboratory tests adapted to suit the local epidemiological context and overall guidance of WHO recommendations in selecting cost effective methods.

Figure 3: Elements of an Effective Public Health Lab



By definition co-ordination across the network is the unification, integration, synchronization of the efforts of group members so as to provide unity of action in the pursuit of common goals. In order for IDSR to be effective coordination across the network needs managed and formalized.

Figure 4: IDSR Hub Networked with PH and Other Labs in a Province



2. THE DIRECTION OF TRAVEL

The mission of Ministry of National Health Services, Regulations and Coordination as well as the National Institute of Health in close collaboration with provincial health departments is to reduce avoidable morbidity, mortality, disability and socioeconomic losses due to epidemics and other public health emergencies in Pakistan by developing and strengthening the IDSR system in the country. Therefore, to provide robust and timely information for early detection, investigation and response to priority diseases, public health emergencies, the Pakistan has developed a 5-year IDSR road map aligned with the National Action Plan for Health Security (NAPHS).

One of the key objectives is to establish a comprehensive National IDSR-Lab Network both at federal and provincial level for early detection, investigation and response to priority diseases and public health emergencies.

The development of Pakistan IDSR-Lab Network requires to involve laboratories that are involved in performing disease specific and also clinical investigations/tests for priority diseases across Pakistan. To support the development of Pakistan IDSR-Lab Network, laboratories may include a single disease programme or a collection of diseases.

The network functions include provision of data sharing, training, supplies, equipment and quality assurance so that tests can be performed, and laboratory data linked to surveillance activities. The result is the availability of timely laboratory data on confirmation of suspected pathogens during routine and outbreak situations. The laboratory data set the stage for an evidence-based investigation and implementation of appropriate control interventions.

2.1 Rational for Pakistan's National IDSR-LAB Network

The Pakistan IDSR-Lab Network will also play a vital role in monitoring of laboratory data for existing, emerging and re-emerging pathogens, as well as for drug resistance pathogens that cause epidemics can provide early warning of public health events.

The laboratory data can also provide information for introduction of new vaccines, updating of existing vaccine composition, and guidelines on treatment and prevention policies and protocols at both national and regional levels. Building laboratory capacity including networking at national and regional levels is therefore essential for successful implementation of the IDSR strategy.

The National Institute of Health in collaboration with UKHSA and other partners is currently working to develop Pakistan IDSR-Lab Network. The laboratory network development focuses initially on public health laboratory diagnostics for selected priority diseases and contributes to sustainable implementation of integrated, multi-disease surveillance and response activities that is based on data sharing for public health action.

The Pakistan IDSR-Lab Network development covers three broad areas:

1. Collecting, analysing, and reporting laboratory data and using this information for public health action.
2. Establishing appropriate, accurate, and sustainable diagnostic practice.
3. Linking public health laboratory diagnostics with local, national, regional and international surveillance activities.

It is critical to efficient use of limited resources that public health laboratories are organized within a national IDSR-Lab Network with appropriate links to local, regional and international laboratory networks.

The initial efforts will be aimed to provide data through organized networks for high priority diseases including cholera, dysentery, meningococcal meningitis, avian influenza (AI), tuberculosis (TB), malaria and plague. As laboratory network activities mature, other etiologic agents specific to local, regional and or international public health threats should be included.

This roadmap identifies key steps to develop a comprehensive network of IDSR-Lab Network across Pakistan with a vision to establish an integrated network of laboratories that enhances the country's public health infrastructure and response capabilities in alignment with IDSR IHR requirements. The main aim is to establish a network of efficient, high quality, accessible IDSR laboratories for the diagnosis and surveillance of priority disease and other communicable diseases across Pakistan.

The establishment of IDSR-Lab Network will be a phased approach. The initial phase will be focused firstly on data flow to include data collection, analyses, and reporting laboratory data and using this information for public health action. Also, the data from laboratory diagnostics will be linked with local, national, regional and international surveillance activities.

The subsequent phase of the network development will be focused on establishing appropriate, accurate, and sustainable diagnostic practice. This phase will include:

- To develop diseases Early Warning System based on signals generated from lab- based data of priority diseases
- To establish linkages between health care facilities and laboratories reporting in IDSR
- To develop referral & feedback mechanism between healthcare facilities and laboratories
- Enhance access to diagnostic services to contain the spread of diseases in the border areas.
- Establish testing capacity and capability development, development of quality assurance system, efficient sharing of data, resources, and expertise among laboratories at the district, provincial and national level.
- Improve capacity to provide specialised diagnostic services and conducting drug resistance monitoring at regional level.
- Improve capacity for disease surveillance and emergency preparedness efforts through the availability of timely laboratory data to provide early warning of public health events; and
- Establish a platform for conducting training and research.

2.2 Objectives

Key objectives include the following:

1. To identify and link potential network of labs in collaboration with federal and provincial PHL
2. To access the baseline capacity and capability of labs in the network.
3. Establish a data flow mechanism based on the baseline capacity and capability (either on DHIS 2 or ELIMS system)
4. To develop a governance and coordination mechanism both at federal and provincial level
5. To identify/develop and strengthen internal and external quality assurance mechanism
6. To work with network labs based on their current capacity and capability to further improve and develop testing capacity

7. To have regular network meetings to identify opportunities for sharing of expertise and resources both in routine and emergency

3. PAKISTAN NATIONAL IDSR-LAB NETWORK

The purpose of a Pakistan IDSR-Lab Network is to establish linked laboratories that share data and improve the performance of laboratories in support of disease surveillance and response.

The scope includes all levels of health labs from public and private sectors within Pakistan, focusing on creating a tiered network that facilitates efficient communication and collaboration across the district, provincial and national labs.

The network in phased approach will also help in provision of training, supplies, equipment, and quality assurance so that tests can be performed, and laboratory data linked to surveillance activities and, essential public health lab functions undertaken.

This will result in timely availability of laboratory data on confirmation of suspected pathogens for timely response by the IDSR system to which it is an integral component.

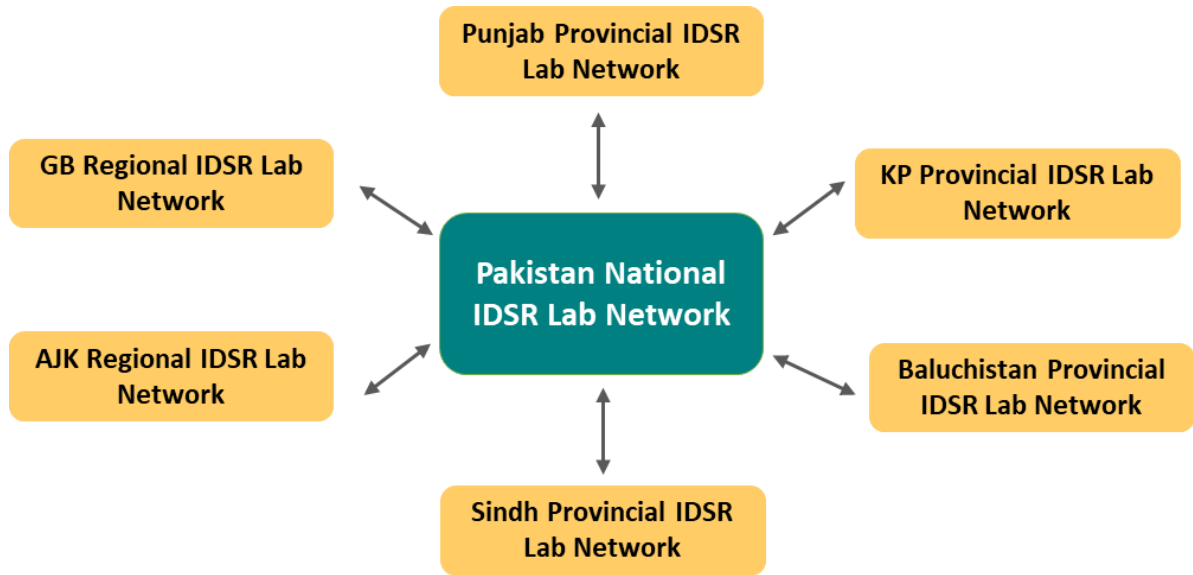
3.1 Membership in the IDSR-Lab Network

IDSR-Lab Network should include teaching or tertiary level hospital laboratories, laboratories of disease specific programmes, private clinical laboratories, and provincial/regional and district hospital laboratories that are performing priority disease testing. In later phases laboratories of AMR, veterinary, food, water and environment will also be included.

3.2 Structure of IDSR-Lab Network

The Pakistan IDSR-Lab Network will be placed under the responsibility of the NIH with linked subnational/provincial laboratory network at each province. The National network will be chaired by NIH with representation from all provincial/ regional network leads while provincial laboratory networks will be led by the relevant provincial public health laboratory lead in each province/region. Figure 5 outlines the proposed laboratory network structure below:

Figure 5: National IDSR Lab Network Structure

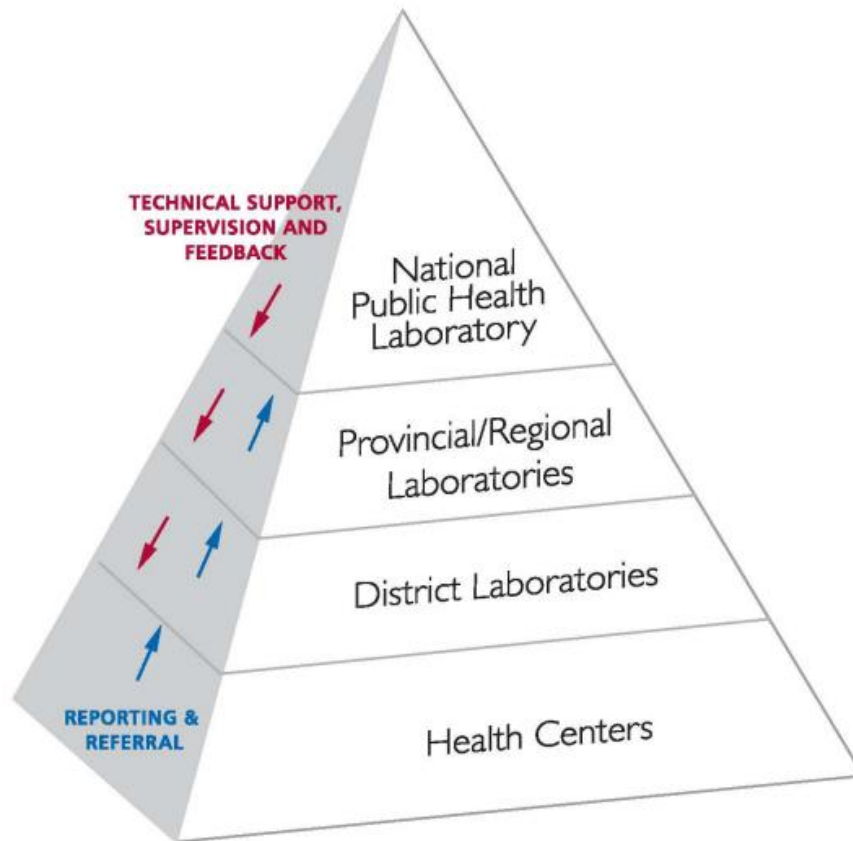


3.3 Tiered Structure of IDSR-Lab Network

The National IDSR-Lab Network will provide technical leadership in public health laboratory services for disease surveillance, prevention and control and for guiding public health policy development both at national and provincial level.

This could be achieved through provision of scientific and technical leadership; establishing contacts with scientific and technical regional and international networks to establish partnerships for surveillance, outbreak alertness and response. The roles and responsibilities hierarchy is outlined in figure 6.

Figure 6: Tiered Structure of National IDSR Lab Network



3.3.1 Role of National Institute of Health (NIH)

National Institute of Health (NIH) is the National Public Health Reference Laboratory in Pakistan and serves as the technical arm of the MoNHSR&C.

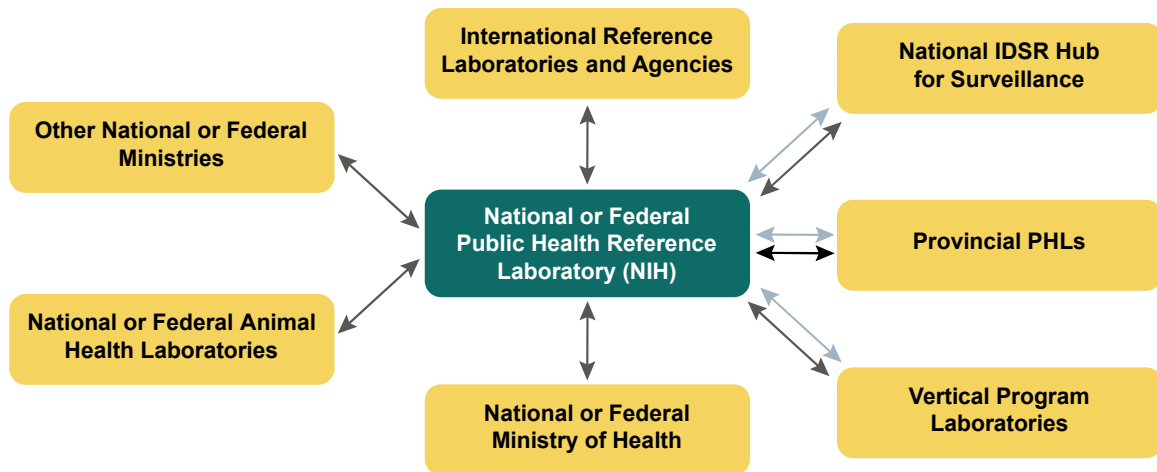
Implementation of the for the Pakistan IDSR-Lab Network roadmap will be the joint responsibility of Federal Ministry of Health/NIH and Provincial Health Departments due to its multidimensional nature and requirements of lab network.

As the apex public health lab structure, NIH shall lead the process, and support any provincial or regional designated laboratories, vertical program laboratories, federal animal health laboratories other federal ministries and coordinates with other international reference laboratories and agencies.

The Network Coordination/Steering Committees needs to be established both at federal and provincial levels in order to ensure effective link between the Federal and Provincial Units, Government, and private sector national and international partners.

The national and provincial IDSR-Lab Network will be linked to the national IDSR system. key linkages and data and information flows for National Ref lab at NIH are shown in the following figure.

Figure 7: National Public Health Reference Laboratory Network Linkages

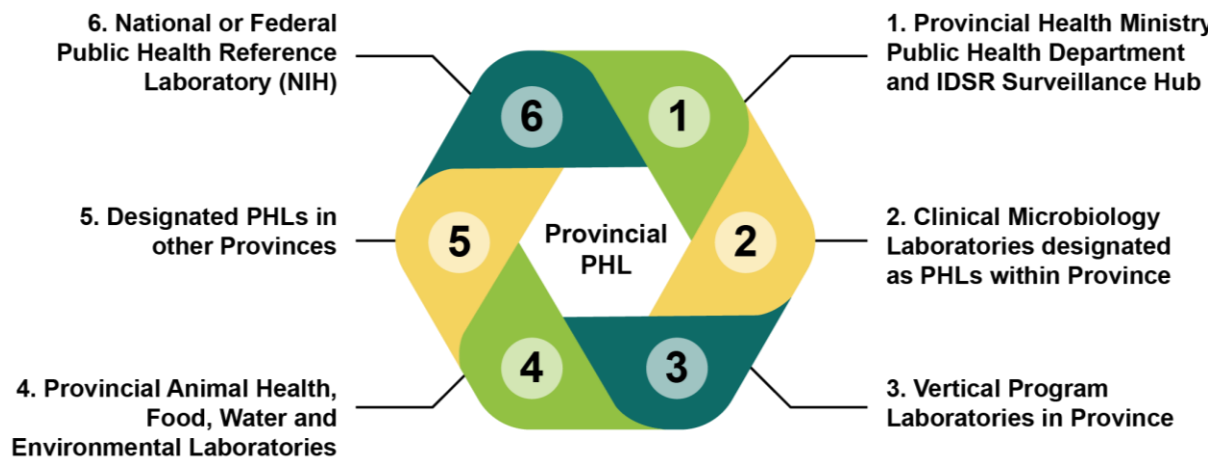


3.3.2 Role of Provincial/Regional Governments

Each province or region has already designated at least one laboratory in the health sector as the PPHL, which serves as the reference laboratory in the national IDSR-Lab Network.

At the provincial level, the provincial IDSR-Lab Network include linkages with federal PHL, designated PHLs and Clinical Labs in the province, PHLs in other provinces, vertical programme labs and labs working on animal health, food, water and environmental aspects.

Figure 8: Key Components of a Provincial Public Health Laboratory Network



3.4 Ongoing Development of a PHL Network in Pakistan

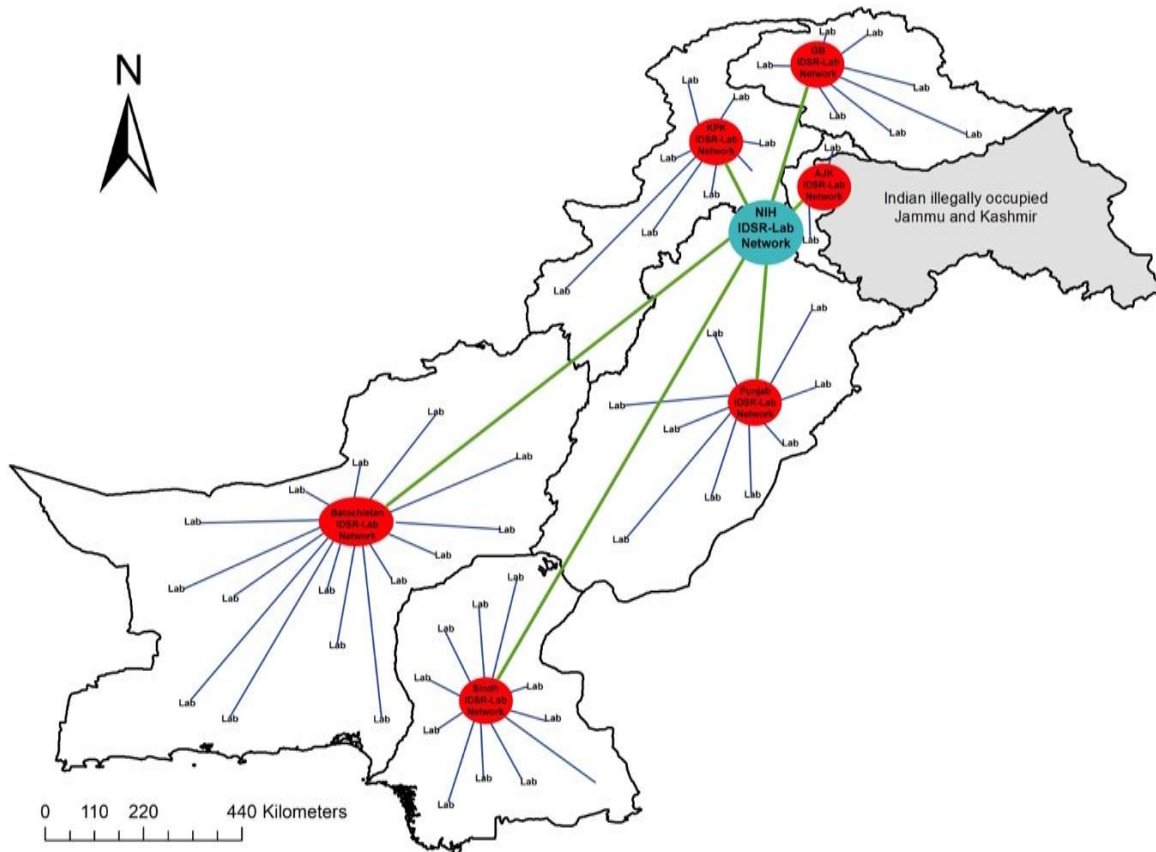
Currently six provincial/regional Public Health Reference Laboratories in Pakistan. Following laboratories are notified/designated as the provincial/Regional public health laboratories:

1. Punjab AIDS control program, Lahore, Punjab
2. Dow university of Health Sciences, Karachi, Sindh

3. Fatima Jinnah Hospital, Quetta, Balochistan
4. Khyber Medical University, Peshawar, KP
5. Abbasi Institute of Medical Sciences, Muzaffarabad, AJK
6. Provincial Headquarter hospital, Gilgit, GB

There are many Public Health Labs in provinces but there is no notified network.

Figure 9: Map of Public Health Reference Laboratories in Pakistan



3.5 Priority Diseases Requiring Laboratory Confirmation

The thirty-five priority infectious diseases that are the leading causes of illness, death and disability in Pakistan. These diseases are divided into three groups: epidemic-prone diseases, endemic infectious diseases, diseases targeted for eradication or elimination.

Epidemic-prone infectious diseases

- Dengue Fever
- Chikungunya
- HIV/AIDS
- Seasonal Influenza
- Leishmaniasis
- Crimean-Congo Haemorrhagic Fever (CCHF)
- Brucellosis
- Cholera
- Anthrax

- Monkey pox
- Pertussis
- Diphtheria
- Meningitis
- Mumps
- Chickenpox /Varicella

Diseases targeted for eradication or elimination

- Acute flaccid paralysis (AFP) Poliomyelitis
- Measles

Endemic epidemics

- Malaria
- Hepatitis A, B, C & E
- Typhoid fever
- Tuberculosis
- Seasonal influenza

4. ESTABLISHMENT & STRENGTHENING THE NETWORK

The establishment of a Pakistan IDSR-Lab Network will be a phased approach beginning with a few laboratories which is performing some of the priority disease tests. These laboratories could be supported to be part of the regional/National internal and external quality assurance programme and provisions could be made for laboratory-based data management. Furthermore, the regional and national PHLs will work with the networked laboratories to develop their capacity and capabilities in priority disease testing including support for domestic and international funding for staff and equipment.

With experience and availability of more resources, the network could be further expanded to the more provincial and district public sector laboratories as well as private laboratories.

The following structures are proposed in roadmap for establishment of IDSR-Lab Network and need to be supported to enhance strengthening of the lab network at the national and provincial/regional level:

- **Governance and Coordination:** National Institute of Health shall lead the process, and support any provincial or regional network, designated laboratories, vertical programme laboratories, veterinary laboratories, other federal ministries and coordinates with other international reference laboratories and agencies to establish the IDSR-Lab Network.

IDSR Steering Committee and TWGs will also ensure effective networking of Federal and Provincial Public Health Reference Labs and networking of public and private sector clinical labs with PPHRLs.

The Network Coordination Committees needs to be established both at federal and provincial levels in order to ensure effective link between the Federal and Provincial Units, Government, and private sector national and international partners. This committee will also report to the IDSR Steering Committee and TWG.

To develop/update a IDSR-Lab Network strategic plan to ensure planning, training and clearly documented operational procedures to ensure prompt communications between public health laboratories and the surveillance teams at national and provincial levels

- **Laboratory data management, information sharing, and communication:** Laboratory data management, information sharing, and communication technologies have the potential to significantly improve data-sharing even in the most remote areas of Pakistan. Such technologies should be available to IDSR-Lab Network. The network member laboratories should have access to personal computers, DHIS 2 platform and its own institutional e-mail account. This will go a long way in enhancing epidemic alert and response by:
 - Capturing and analysing essential laboratory data; maintaining and sharing the data in standardized formats
 - Developing regular exchanges of information and surveillance data with other laboratories within the country and other countries.
 - Supporting a national network capable of receipt, storage, retrieval and analysis of laboratory surveillance data.
 - Facilitating regular reporting of laboratory-confirmed notifiable diseases

- Enabling timely flow of information between different levels and different professional groups within the health system

Mapping of potential zoonotic labs/one health labs and integration of data with IDSR to ensure reliability and consistency of multi-sector diagnostic capabilities

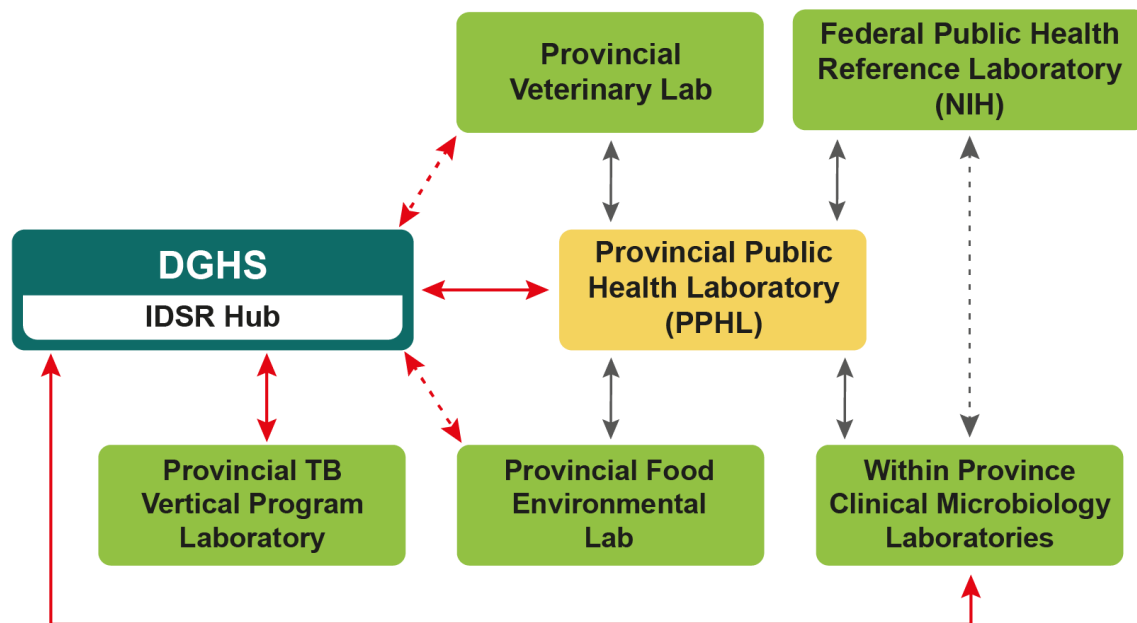
- **Upgradation/establishment of PPHLs as well as clinical labs:** The laboratory management is responsible for ensuring that facilities are built and maintained with appropriate standards commensurate with the laboratory's function and the recommended bio-safety measures. Guidance on this will be developed and provided by the IDSR-Lab Network at National level.
- **Development of clear and agreed referral pathways:** Develop/update protocols for specimen handling, collection, storage/preservation and transportation/referral for all IDSR priority disease in IDSR (molecular, serological, microbiology etc). This will include but not limited to development of clear and agreed referral pathways for specimen/isolates to a Regional Reference Laboratory (RRL) and National Laboratories for confirmation and specialized testing as necessary
- **Quality assurance including quality control:** Develop/update and implement a laboratory quality systems (LQS) plan and guidelines for a laboratory network, accreditations, validation, certification, EQS as well as capacity building Laboratory Quality Services Unit (LQSU) at NIH to develop and implement a laboratory-quality systems' plan and guidelines for a laboratory network that will be comprised of institutions responsible for infectious disease activities. The IDSR-Lab Network member laboratories should participate in a national external quality assurance and control programme (EQAP). The NPHL/NIH will lead on running and supporting the EQAP, overseeing the reliability, reproducibility, and relevance of results from the public health laboratories at all levels of the health system.
- **Equipment requirement for network laboratories:** The IDSR-Lab Network should adopt a list of minimum laboratory equipment for the different levels. Laboratory equipment should be assessed on a regular basis to ensure maintenance, availability, and quality. National and regional government and donor partners are encouraged to mobilize resources to adequately support laboratory capacity for confirmation of causative agents of priority infectious diseases. This ensures the ability to deal with emergencies and to deliver quality surveillance activities.
- **Human resources /capacity building of the PHLN human resources:** The IDSR-Lab Network will work closely with both provincial and regional labs on projections for manpower should ensure that the different categories of laboratory staff are produced in adequate numbers to fill available and future positions. Furthermore, laboratory staff should be trained on specimen collection, transport, and diagnostics (molecular, serological, microbiology etc.) through uniform training programs for. These should be regular capacity building activities for all PHL that are technically supported by NIH and provincial PHLs. Training plan will be developed on priority areas based on training needs assessments.
- **Functional integration vertical programs laboratory data:** Integration of laboratory components of different vertical programs with public health labs for consolidation of surveillance data, workforce development on cross-cutting areas of laboratory systems like BRM, LQMS, AMR and information system. Integration in data reporting at national level has not been possible despite repeated efforts by NIH and is an area of policy action by provincial governments and departments of health.
- **Strengthening provincial network:** Key action of the IDSR-Lab Network will be to strengthen the provincial network to support clinical microbiology laboratories, provincial vertical program laboratories, animal health, food, water and environmental laboratories to ensure requisite support to public health testing.

- **Resource mobilization and coordination of partners:** Funds for the development and continuity of laboratory services will be derived from both the governments and partners' support and collaboration.

4.1 Linkages with Animal Health and Other Sectors

The Provincial IDSR Hub should establish links with animal health, food, and environmental agencies as part of the "IDSR / One Health" initiatives. The data and/or information flows are shown in the figure below.

Figure 10: Provincial Public Health Laboratory Linkages



*Red lines are data/information flows to the information hub
Black lines are the microbiology network links*

4.2 Steps for Establishing National IDSR-Lab Network

A phased approach will be employed to establish and operationalize the network. Table 2 outlines the key steps and actions required to achieve the objective of the National IDSR-Lab Network. Some of the initial steps are highlighted below.

1. **Preliminary selection to assess existing national and provincial laboratories:** Review list of labs which were part of COVID lab network and identify the labs with potential to join the IDSR-Lab Network, based on their demonstrated capacity. Alternately, Provincial PHL officials are the best source to decide/suggest.
2. **Assessment existing national and provincial laboratories:** Mapping of potential clinical and public health labs and establishment of IDSR-Lab Network adopting a standard data reporting platform i.e., DHIS-2/IDIMS/LIMS/ELIMS. Following identification, detailed assessment of the nominated labs will be conducted using a standard tool, advice by the SMEs. Assessment will cover aspects of technical expertise, equipment adequacy, staffing and quality control practices etc.

3. **Governance and coordination structure:** Establish a clear governance and coordination structure to delineate the operational and communication pathways between district labs and provincial labs with a strong linkage from respective health departments. Provincial PHRL will, in turn, connect with the NIH, creating a cohesive and hierarchal network that facilitates coordination, resource sharing and decision making across all levels.
4. **Advanced training and capacity building:** Offering professional development opportunities for lab personnel, including trainings for priority disease pathogens, ELIMS, DHIS-2 etc.
5. **Protocols and guidelines:** Develop standardize guidelines and protocols for lab procedures, sample collection and transport, testing, data flow mechanisms and data sharing.
6. **Implementation:** This phase will initiate the operational activities which are guided by the roadmap and governance structure in previous phase. This will include activation of data-sharing protocols, operationalizing the proposed data flow mechanism, assigning specific tasks to the labs in the network, carrying out capacity building activities and commencement of collaborative efforts across the network.
7. **Monitoring:** Continuous monitoring and evaluation of the progress, identification of the areas for improvement and adjustment. TORs for the Governance structure will include the responsibility of monitoring and evaluation framework.

Table 2 outlines the key steps required to establish the Pakistan's IDSR-Lab Network.

Table 1: Key Steps to Establish IDSR-Lab Networks in Pakistan

| To strengthen national and sub-national laboratory capacity to confirm IDSR priority diseases, events and conditions | | | | Timeline | | | | |
|--|---|--|--|----------|------|------|------|------|
| SN | Key Interventions | Lead Organization | Supporting Organizations | 2024 | 2025 | 2026 | 2027 | 2028 |
| 3.1 | IDSR Steering Committee and TWGs will also ensure effective networking of Federal and Provincial Public Health Reference Labs and networking of public and private sector clinical labs with PPHRLs. (For details see Objective 1) | NIH, Ministry of NHSRC and Provincial Health Departments | Relevant Development Partners and Stakeholders | X | X | X | X | X |
| 3.2 | To develop/update a IDSR Lab network PHLN strategic plan to ensure planning, training and clearly documented operational procedures to ensure prompt communications between public health laboratories and the surveillance teams at national and provincial levels | NIH, Ministry of NHSRC and Provincial Health Departments | Relevant Development Partners and Stakeholders | X | X | | | |
| 3.3 | Upgradation/Establishment of PPHRLs as well as clinical labs across the country | NIH, Ministry of NHSRC and Provincial Health Departments | Relevant Development Partners and Stakeholders | X | X | X | X | X |
| 3.4 | Mapping of potential clinical and public health labs and establishment of PHL network adopting a standard data reporting platform i.e., DHIS-2/ LIMS/eLIMS. | NIH, Ministry of NHSR&C Provincial Health Departments | Relevant Development Partners and Stakeholders | X | X | | | |
| 3.5 | To develop/update and implement a laboratory quality systems (LQS) plan and guidelines for a | NIH, Ministry of NHSR&C, | Relevant Development | X | X | X | X | X |

| To strengthen national and sub-national laboratory capacity to confirm IDSR priority diseases, events and conditions | | | | Timeline | | | | |
|--|---|--|--|----------|------|------|------|------|
| SN | Key Interventions | Lead Organization | Supporting Organizations | 2024 | 2025 | 2026 | 2027 | 2028 |
| | laboratory network, accreditations, validation, certification, EQS as well as capacity building | Provincial Health Departments | Partners and Stakeholders | | | | | |
| 3.6 | To develop/update protocols for specimen handling, collection, storage/preservation and transportation/referral for all IDSR priority disease in IDSR (molecular, serological, microbiology etc) | NIH, Ministry of NHSR&C, Provincial Health Departments | Relevant Development Partners and Stakeholders | X | X | X | X | X |
| 3.7 | Mapping of potential zoonotic labs/one health labs and integration with IDSR to ensure reliability and consistency of multi-sector diagnostic capabilities | NIH, Ministry of NHSRC and Provincial Health Departments | Relevant Development Partners and Stakeholders | X | X | X | X | X |
| 3.8 | To develop a training programme for facilities that work with high-consequence agents | NIH, Ministry of NHSRC and Provincial Health Departments | Relevant Development Partners and Stakeholders | | X | X | X | X |
| 3.9 | Development of standardized/essential/recommended diagnostic list for priority diseases at national and provincial levels. Periodic review and update, new tests e.g., by WHO/CDC, sensitize facilities on recommended tests, add turnaround time and recommended supplies e.g., kits as well | NIH, Ministry of NHSRC and Provincial Health Departments | Relevant Development Partners and Stakeholders | X | X | | | |

