HUMAN RESOURCE IN HEALTH REQUIREMENTS FOR IMPLEMENTING THE NAPHS UNDER IHR-GHSA AT THE FEDERAL LEVEL IN PAKISTAN

Government of Pakistan
Ministry of National Health Services,
Regulations & Coordination

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List of Acronyms

AJ&K	Azad Jammu and Kashmir
AMR	Antimicrobial Resistance
CDC	Centers for Disease Control
CHE	Central Health Establishment
COVID-19	SARS-CoV-2 virus
DEO	Data Entry Operator
EMR	Eastern Mediterranean Region
EPA	Environment Protection Agency
FEDSD	Field Epidemiology and Disease Surveillance Division
FELTP	Field Epidemiology and Laboratories Training Program
GB	Gilgit Baltistan
GHSA	Global Health Security Agenda
GLOF	Glacial Lake Outburst Floods
HE	Health Education
HRH	Human Resource in Health
HWF	Health Workforce
ICT	Islamabad Capital Territory
IDSR	Integrated Disease Surveillance and Response
IHR	International Health Regulations
IT	Information Technology
JEE	Joint External Evaluation
KPO	Key Punch Operator
MIS	Management Information System
MoCC	Ministry of Climate Change
MoNFS&R	Ministry of National Food Security and Research
MoNHSR&C	Ministry of National Health Services Regulations and Coordination
NAPHS	National Action Plan for Health Security
NARC	National Agriculture Research Council
NHEPRN	National Health Emergency Preparedness and Response Network
NIH	National Institute of Health
NVL	National Veterinary Laboratories
PARC	Pakistan Agriculture Research Council
PC-1	Planning Commission 1 Document
PHE	Public Health England
PHEIC	Public Health Emergencies of International Concern
PHLD	Public Health Laboratories Division
PHLN	Public Health Laboratories Network
PSO	Principal Scientific Officer
PSQCA	Pakistan Standard and Quality Control Authority
SDGs	Sustainable Development Goals
SO	Scientific Officer
SSO	Senior Scientific Officer
TWG	Technical Working Group
UN	United Nations
WASH	Water Sanitation and Hygiene
WB	World Bank
WHO	World Health Organization

Executive Summary

Background

The International Health Regulations (IHR) 2005 call on UN member states to work together to prevent, detect, and respond to public health emergencies. More specifically, Article 2 of IHR states the purpose and scope of the Regulations: "to prevent, protect against, control, and provide a public health response to the international spread of disease in ways that are commensurate with and restricted to public health risks, and which avoid unnecessary interference with international traffic and trade." Being a signatory to the Global Health Security Agenda (GHSA), Pakistan was the first country in the World Health Organization's (WHO) Eastern Mediterranean Region and fourth globally to volunteer for Joint External Evaluation (JEE), a complex exercise in which a WHO panel of experts visited Pakistan and conducted a review of 19 Core Technical Areas that impacted health security in 2016. In line with IHR recommendations, the country developed the Five-Year National Action Plan for Health Security (NAPHS) in 2016 with defined goals, objectives, and key activities under each of the 19 Core Technical Areas.

The Ministry of National Services, Regulations and Coordination (Mo NHSR&C) is the lead authority for the conceptualization, coordination, and facilitation of the National Action Plan for Health Security (NAPHS) across the country while the actual implementation lies with the National Institute of Health (NIH). The caveat here is that with the devolution of 'health' to provincial health departments via the 18th Constitutional Amendment, the Mo NHSR&C can only coordinate matters with provinces. However, Mo NHSR&C takes the lead in the federal areas, that is, Islamabad Capital Territory (ICT), Azad Jammu & Kashmir, and Gilgit Baltistan.

Rationale

In 2021 with the promulgation of the National Institute for Health (NIH) Ordinance, the reorganization of the NIH to National Public Health Institutes was initiated with the core functions of disease surveillance and response, public health laboratories, and research. This meant that as per the JEE and NAPHS, which lay out the various functions of IHR-GHSA under the three pillars conceptual framework for Integrated Disease Surveillance (IDSR) that comprises Prevent-Detect-Respond capacities, the newly constituted NIH required an assessment of current and future health workforce capacities in the country.

Against the backdrop of JEE-NAPHS, the World Bank expressed its willingness to provide support for the development of a Human Resource for Health (HRH) requirements-related Technical Assistance to the Mo NHSR&C. This support envisaged documenting the HRH related current status, and circumscribing the needs at federal level for implementing the National Action Plan for Health Security under IHR-GHSA in Pakistan. Therefore, the current report documents the capacities and needs for establishing and enabling the NAPHS mandated functions in relation to IDSR-PHLN (Public Health Laboratories Network) at the federal level in the country with the following objectives:

1. Formulate minimum technical HRH requirements and capacities for NAPHS implementation at the federal level.

2. Map the existing public health workforce (HWF) and animal health workforce for IHR implementation in key areas, including Antimicrobial Resistance (AMR), Integrated Disease Surveillance and Response (IDSR), Zoonotic Disease, Health Workforce, PHLN, Emergency Response Preparedness, Points of Entry, Immunization, Risk Communication, and Food Safety.

3. Conduct a gap analysis at the federal level in view of the NAPHS core capacities and cadres with a view to quantify health workforce/animal health workforce needs, demands, and supply under varied future scenarios for the key technical areas of the NAPHS that are the focus of ongoing work.

4. Define a framework and parameters necessary to develop a HWF/animal health workforce database for NAPHS.

5. Identify existing and required training needs, viz. productive capacity for NAPHS implementation at the federal level, focusing on HWF and animal health workforce.

Methods

In order to achieve the assignment objectives, the process was bifurcated across two broader phases, namely the inception phase and the consultations-analysis-report preparation phase. The inception phase involved meetings with the World Bank Representative, Mo NHSR&C focal persons, and acquisition of related documents. The parameters of the exercise were discussed and agreed upon with the Mo NHSR&C. It was agreed to thematically structure the report around the three pillars framework of IDSR-PHLN and NAPHS priority areas pertaining to Workforce and Human Resource in Health.

The second phase involved consultations with key stakeholders from line Ministries and Departments with reference to IHR (with special focus on available and needed workforce) based on a semi-structured questionnaire. Additionally, a structured sub-tool was used to obtain numbers of HR currently in place and future requirements by expertise and designated work area in relation to IHR. Based on this information, gap analysis provided future requirements in human as well as animal health domains.

Information was obtained from focal points in the following divisions:

1. Ministry of National Health Services, Regulations and Coordination
    a. Chief, Central Health Establishment
    b. Executive Director, National Health Emergency Preparedness an d Response Network (NHEPRN)

2. Ministry of National Food Security and Research (Mo NFS&R)
   a. Senior Scientific Officer, National Agriculture Research Council (NARC)
   b. Director, Livestock

3. Ministry of Climate Change (MoCC)
   a. Senior Consultant, MoCC

Findings

The findings in the report are organized by the three pillars of IDSR:1) Prevent, 2) Detect, and 3) Respond. The gap analysis identified the number of additional health workforce needed in various categories as follows: Prevent: 179, Detect: 170, and Respond: 176.

A detailed breakdown of the health workforce by (i) Functions/ Segment, (ii) Department, (iii) Agency, (iv) Available (out of total sanctioned posts), (v) Vacant (out of total sanctioned posts), and (vi) Required additional (non-sanctioned posts), is provided in Tables E1 to E3 below.

1. Prevent

The Central Health Establishment (CHE) has significant gaps in performance. Mainly there is a requirement for fumigators and sanitation workers. The Pakistan Agricultural Research Council (PARC) currently does not have any HR that can perform Prevent functions. Specifically, the main requirement is for laboratory and IT personnel.

The Field Epidemiology and Disease Surveillance Division (FEDSD) highlighted the need for various cadres of scientific officers to enable the department to perform Prevent functions. NEPHRN needs one deputy director level administrative support. This position already exists; however, the individual is placed in another department.

Table E1: HRH Gaps in Prevent Functions

	Type/Category of HR	HR Required	Existing/Available HR	HR gap to be filled
Central Health Establishment	Sanitary Inspector	10	5	5
	Sanitary Worker	64	36	28
	Fumigator	73	14	59
	Fumigation Cooly	97	41	56
PARC	Lab Assistant (Immunization)	9	0	9
	Assistant Scientific Officer (Food Safety)	7	0	7
	Lab Technician (Biosafety)	7	0	7
	Assistant MIS Officer (Immunization)	3	0	3
FEDSD	PSO Health Education	1	0	1
	SSO Health Education	1	0	1
	SO Health Education	2	2	0
	PSO Workforce Development	1	0	1
	SSO Workforce Development	1	1	0
	SO Workforce Development	1	0	1
	SO Disease Surveillance	1	0	1
	SO Biostatistics	1	0	1
NEPHRN	Deputy Director (Admin)	0	1	0
	TOTAL	**279**	**100**	**179**

SO – Scientific Officer
SSO – Senior Scientific Officer
PSO -Principal Scientific Officer

2. Detect

The HR requirement for the Detect function has been recorded by all departments. The main categories are Epidemiologists, Statisticians, Public Health, Laboratory and IT personnel. These skilled personnel are required to strengthen the disease surveillance components of IHR related activities.

Table E2: HRH Requirements and Gaps in Detect Functions

	Type/Category of HR	HR Required	Existing/Available HR	HR gap to be filled
Central Health Establishment	Data Entry Officer	17	0	17
	Health Technician	39	5	34
	Lab Assistant	10	0	10
PARC	Senior Scientist (Research)	6	0	6
	Scientific Officer (Research)	7	0	7
	Lab Attendant (Research)	9	0	9
	DEO / KPO	6	0	6
	Assistant Scientific Officer	14	0	14
	Technical Officer / Engineer	3	0	3
	Scientific Officer (AMR)	8	2	6
NIH	Scientist	11	2	11
	Technologist	15	0	15
	Technician (other)	8	0	8
	Biomedical Engineer	2	0	2
	Epidemiologist/ Public Health Expert	2	0	2
	Statistician	4	0	4
FEDSD	PSO Epidemiology	0	0	0
	Disease Surveillance Officer	**1**	**0**	**1**
	Medical Officer	**1**	**1**	**0**
	Research Officer	**1**	**0**	**1**
	SSO Epidemiology	**1**	**1**	**0**
	SO Epidemiology	**2**	**2**	**0**
	PSO IDSR	**1**	**0**	**1**
	SSO IDSR	**2**	**0**	**2**
	SO Surveillance	**2**	**1**	**0**
	SSO IT	**1**	**0**	**1**
	SO IT	**2**	**0**	**2**
	SSO Networking	**1**	**0**	**1**
	SO Networking	**2**	**0**	**2**
	SSO Statistics	**1**	**1**	**0**
	Statistical Officer	**2**	**0**	**0**
	Statistical Assistant	**1**	**0**	**1**
	SSO One-Health	**1**	**0**	**1**
	SO Entomology	**1**	**0**	**1**
	SO Veterinary Epidemiology	**1**	**0**	**1**
	SO Environmental Health	**1**	**0**	**1**
NEPHRN	Deputy Director (Information Technology)	**0**	**1**	**0**
	TOTAL	**186**	**16**	**170**

DEO: Data Entry Operator
KPO: Key Punch Operator

3. Respond

The main cadres identified for the Respond function are medical officers, paramedics, coordination and communication experts as well as laboratory personnel.

Table E3: HRH requirements and Gaps in Respond Functions

	Type/Category of HR	HR Required	Existing/Available HR	HR gap to be filled
Central Health Establishment	Medical Officer	109	59	50
	Nurse	12	0	12
	Dispenser	60	26	34
	Quarantine Assistant	80	21	59
PARC	Senior Scientific Officer (IHR coordination)	1	0	7
	Communication Specialist	3	0	3
	Lab Technician (Emergency Response)	1	0	1
	Lab Assistant (Emergency Response)	1	0	1
	Lab Attendant (Emergency Response)	3	0	3
FEDSD	SSO Coordination	1	0	1
	SO Coordination	1	0	1
	SSO Communication	1	0	1
	SO Communication	1	0	1
NEPHRN	Deputy Director (Information Technology)	**2**	*	**2**
	TOTAL	**282**	**106**	**176**

Conclusions

This review concludes that most of the departments in both animal and human health sectors have urgent HR requirements among existing sanctioned posts as well as for additional workforce. Further, the training needs of the requisite workforce need to be considered.

The training needs identified for fulfilling the requisite functions of IHR-GHSA in accordance with the NAPHS at the federal level, pertain to 13 areas segmented across the three pillars of Prevent, Detect and Respond. Among these pillars, the areas of preparedness, immunization, food safety, and biosafety and biosecurity pertain to Prevent; the areas of Surveillance and Epidemiology, mapping and data collection, AMR and National Laboratory Systems pertain to Detect; while Emergency Operations pertain to Respond, respectively. The areas of Entomology and Zoonotic diseases, Statistics/Biostatistics, Communication and Coordination, and Information Technology and networking are cross-cutting domains across all three pillars of Prevent, Detect and Respond.

The current capacity to supply sufficient numbers of fresh graduates (diploma and/or degree holders) for allied health sciences already exists across both the human and animal health sectors at the federal level. These graduates can be engaged through partnership with the Pakistan Nursing Council (PNC) and its accredited institutions on the human health side. On the animal health side, the Pakistan Agriculture Research Council's Directorate of Training, and its Institute of Advanced Studies in Agriculture have the required capacities to train sufficient numbers of personnel that have been identified by the respective departments.

Trainings by the National Institute of Health-NARC and their subsidiary departments across the 13 specialized areas can be supplemented by existing training resources at NIH and PARC. Furthermore, it is essential that personnel acquire emerging skills and learn from regional and global best practices in their respective areas. Partnerships and support for this purpose can be garnered through the UN sector, specialized organizations such as CDC-USA/PHE/CDC-China, and reputed international universities. Such partnerships will ensure continuous skill enhancement and fulfillment of training needs for the entire health workforce at the federal level, and are expected to leverage and instill best possible technical capacities at the federal level for IHR-GHSA requirements that are aligned with the National Action Plan for Health Security.

1. INTRODUCTION

1.1 Background

Pakistan along with all UN member states has been a signatory to the International Health Regulations (IHR) 2005 which calls for countries to work together to prevent, detect, and respond to public health emergencies under the IHR (2005). The signatory countries have also agreed to work towards Universal Health Coverage and to build resilient health systems which can adapt and respond to the challenges posed by outbreaks and other health hazards and emergencies of national and international concern.

The purpose and scope of the IHR (2005) are very broad. According to Article 2 of the IHR, the purpose and scope of the Regulations are "to prevent, protect against, control and provide a public health response to the international spread of disease in ways that are commensurate with and restricted to public health risks, and which avoid unnecessary interference with international traffic and trade." To this end, the IHR (2005) contains rights and obligations for countries (and functions for WHO) concerning national and international surveillance; assessment and public health response; health measures applied by member countries to international travelers, aircraft, ships, motor vehicles, and goods; public health at international ports, airports and ground crossings (together referred to as "points of entry"); and many other subjects.

The IHR 2005 require all countries to acquire core capacities to prevent, detect, and respond to public health events and emergencies of national and international concern. Pakistan is the first country in the WHO's Eastern Mediterranean Region and fourth globally to volunteer for Joint External Evaluation (JEE). The Government of Pakistan under the overall lead of the Ministry of National Health Services Regulations & Coordination (NHSR&C) conducted the JEE from April 27, 2016 to May 6, 2016 (Table 1).

Table 1: JEE Assessment—Themes and Technical Areas

THEMATIC AREAS	PREVENT	DETECT	RESPOND	OTHER
Technical Areas	1. National legislation, policy and financing 2. IHR coordination and advocacy 3. Antimicrobial resistance 4. Zoonotic diseases 5. Food safety 6. Biosafety and biosecurity 7. Immunization	8. National Laboratory Systems 9. Real-Time Surveillance 10. Reporting 11. Workforce Development	12. Preparedness 13. Emergency Response Operations 14. Linking public health and security authorities 15. Medical counter measures and personnel deployment 16. Risk communication	17. Points of entry 18. Chemical events 19. Radiation emergencies

The process included comprehensive collaboration between the federal and provincial/federating areas in both health and non-health sectors. The evaluation of national IHR core capacities was derived from joint discussions between external experts and government peers/counterparts for the 19 technical areas in the JEE Tool. The JEE results and targets are summarized below.

Table 2: JEE for IHR-GHSA in Pakistan: Scores of 19 Core Technical Areas and Monitoring Framework

Capacities	Indicators	Score	
		Baseline 2016	Target 2022
National legislation, policy and financing	P.1.1 Legislation, laws, regulations, administrative requirements, policies or other government instruments in place are sufficient for implementation of IHR	2	4
	P.1.2 The state can demonstrate that it has adjusted and aligned its domestic legislation, policies, and administrative arrangements to enable compliance with IHR (2005)	3	4
IHR coordination, communication and advocacy	P.2.1 A functional mechanism is established for the coordination and integration of relevant sectors in the implementation of IHR	3	5
Antimicrobial resistance	P.3.1 Antimicrobial resistance (AMR) detection	1	3
	P.3.2 Surveillance of infections caused by AMR pathogens	1	3
	P.3.3 Health care associated infection (HCAI) prevention and control programs	1	3
	P.3.4 Antimicrobial stewardship activities	1	3
Zoonotic diseases	P.4.1 Surveillance systems in place for priority zoonotic diseases/pathogens	3	4
	P.4.2 Veterinary or Animal Health Workforce in place	3	4
	P.4.3 Mechanisms for responding to zoonosis and potential zoonosis are established and functional	2	3
Food safety	P.5.1 Mechanisms are established and functioning for detecting and responding to foodborne disease and food contamination	2	3
Biosafety and biosecurity	P.6.1 Whole-of-Government biosafety and biosecurity system is in place for human, animal, and agriculture facilities	2	3
	P.6.2 Biosafety and biosecurity training and practices	2	3
Immunization	P.7.1 Vaccine coverage (measles) as part of national program	2	4
	P.7.2 National vaccine access and delivery	4	5
National laboratory system	D.1.1 Laboratory testing for detection of priority diseases	4	5
	D.1.2 Specimen referral and transport system	3	4
	D.1.3 Effective modern point of care and laboratory-based diagnostics	2	3
	D.1.4 Laboratory Quality System	2	3
Real-time surveillance	D.2.1 Indicator and event-based surveillance systems	3	4
	D.2.2 Interoperable, interconnected, electronic real-time reporting system	2	3
	D.2.3 Analysis of surveillance data	2	3
	D.2.4 Syndromic surveillance systems	4	5
Reporting	D.3.1 System for efficient reporting to WHO, FAO, and OIE	2	4
	D.3.2 Reporting network and protocols in country	2	4
Workforce development	D.4.1 Human resources are available to implement IHR core capacity requirements	3	5
	D.4.2 Field epidemiology training program or other applied epidemiology training program in place	3	4
	D.4.3 Workforce strategy	2	4

Capacities	Indicators	Score	
		Baseline 2016	Target 2022
Preparedness	R.1.1 Multihazard National Public Health Emergency Preparedness and Response Plan is developed and implemented	1	3
	R.1.2 Priority public health risks and resources are mapped and utilized	1	3
Emergency response operations	R.2.1 Capacity to activate emergency operations	2	3
	R.2.2 Emergency Operations Center operating procedures and plans	2	3
	R.2.3 Emergency operations program	3	4
	R.2.4 Case management procedures are implemented for IHR relevant hazards	2	3
Linking public health and security authorities	R.3.1 Public health and security authorities (e.g. law enforcement, border control, customs) are linked during a suspect or confirmed biological event	3	5
Medical countermeasures and personnel deployment	R.4.1 System is in place for sending and receiving medical countermeasures during a public health emergency	4	5
	R.4.2 System is in place for sending and receiving health personnel during a public health emergency	4	5
Risk communication	R.5.1 Risk communication systems (plans, mechanisms, etc.)	1	3
	R.5.2 Internal and partner communication and coordination	2	3
	R.5.3 Public communication	2	3
	R.5.4 Communication engagement with affected communities	2	3
	R.5.5 Dynamic listening and rumor management	3	4
Points of Entry (PoE)	PoE.1 Routine capacities are established at PoE	2	3
	PoE.2 Effective public health response at Points of Entry	2	3
Chemical events	CE.1 Mechanisms are established and functioning for detecting and responding to chemical events or emergencies	2	3
	CE.2 Enabling environment is in place for management of chemical events	2	3
Radiation emergencies	RE.1 Mechanisms are established and functioning for detecting and responding to radiological and nuclear emergencies	5	5
	RE.2 Enabling environment is in place for management of radiation emergencies	5	5

No Capacity – 1: Attributes of a capacity are not in place. Color Code: **Red**

Limited Capacity –2: Attributes of a capacity are in the development stage (some are achieved and some are ongoing; however, the implementation has started). Color Code: **Yellow**

Developed Capacity – 3: Attributes of a capacity are in place; however, there is the issue of sustainability measured by lack of inclusion in the operational plan in National Health Sector Planning (NHSP) and/or secure funding. Color Code: **Yellow**

Demonstrated Capacity – 4: Attributes are in place, sustainable for a few more years and can be measured by the inclusion of attributes or IHR (2005) core capacities in the national health sector plan. Color Code: **Green**

Sustainable Capacity – 5: Attributes are functional, sustainable and the country is supporting other countries in its implementation. This is the highest level of the achievement of implementation of IHR (2005) core capacities. Color Code: **Green**

Baseline: JEE Report 2016
Target: JEE Report 2022

The JEE results and recommended priority actions have guided Pakistan in developing the Five-Year National Action Plan for Health Security (NAPHS) with the aim of establishing a strong public health system to meet the standards for IHR core capacities. The JEE was followed by strengthening and establishment of coordination mechanisms with the National IHR Task Force redesignated as the National Multisectoral Taskforce for IHR (2005) and GHSA; nomination of focal persons from federal non-health Ministries; notification of National Institute of Health and the Mo NHSR&C as the two focal points for IHR-GHSA; and counterpart notifications of Provincial IHR Task Force in four major provinces. These steps are now contributing towards the initiation and conduct of federal and provincial level activities outlined in the NAPHS in a coordinated and harmonized manner.

1.2 National Action Plan for Health Security

In keeping with the JEE assessment findings and recommendations, the development of the Five Year National Action Plan for Health Security commenced with the formulation of a technical working group (TWG) by the Mo NHSR&C. An extensive and comprehensive process was then undertaken with involvement and participation of relevant technical experts and focal persons from the health and non-health sectors at the federal and provincial/ federating areas in six consultative workshops across 2016. The National Action Plan for Health Security defines the goal, objectives, and key activities under each of the 19 technical areas.

The implementation of the NAPHS considers a set of guiding principles and core values such as country ownership and leadership; community participation; gender and human rights principles; equity in access to services; strengthening partnerships; fostering intersectoral collaboration; evidence-led shared responsibility; transparency; resilience and dynamism. Funds for implementation of the plan were expected to come from national and provincial resource envelopes as well as to be supported by development partners. The National Health Security Plan would be a coordination platform, anchored under the guidance of the Mo NHSR&C. Furthermore, the National Institute of Health (NIH) in Pakistan had already been designated by the Ministry as the National Focal Point for IHR in 2014 with a National Focal Person to manage day-to-day matters.

Progress towards the attainment of the targets set out in this national action plan was envisioned to be evaluated quarterly, annually, at midterm and end term. Data was to be collected through surveillance systems in human and animal health, annual reviews/assessments and reporting, after action reviews, exercises and simulations, and joint external evaluations and other relevant assessments, as well as periodic supervision and facility-based surveys/assessments. For some technical areas, there was a need to reconceptualize and reorganize the managerial and support mechanisms and structures at national, provincial and district levels including, the defining of a clear supervisory mechanism and roles of various decentralized levels and involvement of the community.

1.3 IHR-GHSA and Role of the Federal Government in a Devolved Health System

Pakistan is a Federation with three levels of government namely Federal, Provincial and District. There are four major provinces; Punjab, Sindh, Khyber Pakhtunkhwa, and Balochistan. In addition, there are three regions / federating areas including the Islamabad Capital Territory (ICT), and Gilgit Baltistan (GB) which come under the jurisdiction of the Federal Government; whereas, Azad Jammu and Kashmir (AJK) is an autonomous region with its own government. In 1971, the federal and provincial governments were made responsible for the delivery of health care with implementation carried out by the district administrations. The Constitution of Pakistan (1973) specified the subjects that come under the respective domains of the federal and provincial governments. Constitutionally, the provision of health services has always been the responsibility of provincial governments while the stewardship role was assigned to the Federal Government. The main responsibilities of the Federal Government were policy and strategy development, international commitments, monitoring and evaluation, health communication, advocacy and information, and the prevention of cross-border

transmission of diseases. The provincial governments' primary responsibility is provision of health services, including planning, management and oversight, financing, implementation, medical education and training, monitoring and supervision, and regulation.

In 2011, the 18th Amendment to the Constitution of Pakistan resulted in devolution of the social sectors, including health to the provinces; and the Federal Ministry of Health was abolished. However certain functions were retained by the Federal Government including coordination in health, international treaties and agreements (SDGs, IHR, AMR, etc.), Cross-Border Transmission of Disease including Surveillance, Research & Statistics, Drug Regulations, Export/ Import of Goods and Services, and Health Regulatory Bodies. The mandate for priority setting, strategy development, management of vertical programs and initiatives were devolved to the provinces. Government funds are channeled through three levels—federal, provincial and district. Provinces get their share from the Federal Consolidated Fund as per National Finance Commission Award; however, decisions about health sector allocations are made by the provinces themselves.

In this devolved scenario, the development of NAPHS through a consultative approach with all the provinces and regions of the country, reflected the mutually agreed role of the Federal Government in the context of International Health Regulations—Global Health Security Agenda (IHR-GHSA). This role mandates the Federal Government establish IHR-GHSA capacities at the federal level, as well as technically and financially (where/if possible) support the provinces in accomplishing the same across the 19 technical areas. In this regard the NIH (National Focal Point for IHR) at the federal level, and Director General Health Office Ministry of National Health Service, Regulations and Coordination (Mo NHSR&C) are the two major entities that work towards conceptualization, coordination, and facilitation in the implementation of NAPHS across the country.

1.3.1 Consultative development of priority diseases list for surveillance and response

One of the key agenda items in the post JEE scenario for the national Mo NHSR&C was to consultatively develop a list of priority diseases for surveillance and response. This list was premised to align with the provincial and regional contexts and encompass human as well as zoonotic diseases. In this regard, a set of consultative meetings were held with each province and region of the country across 2017; and in December 2017 the said list comprising of 33 priority human and 8 zoonotic diseases was notified at the national level. The priority disease list has become a part of NAPHS, and the Federal Government in the milieu of a devolved health system was able to initiate implementation of NAPHS, based on the notification of this list.

1.4 Health Workforce in NAPHS

Among the 19 core technical areas of the IHR-GHSA-based JEE, the health workforce was one of the key areas. This core technical area included the subdomains of:

1. Human resources that are available to implement IHR core capacity requirements
2. Field Epidemiology Training Program or other applied epidemiology training programs in place
3. Workforce strategy

Across these three subdomains the country scored sub-optimally in the former two, while the score for workforce strategy was low. In Pakistan's JEE report, the evaluation team reflected, *"Workforce development: This is a major challenge highlighted at both the federal and provincial levels. There is a need for human resource policies and strategies that include projected needs, establishing eligibility criteria, efficient recruitment, and development of a career ladder to improve retention for various categories of public and animal health professionals."* The JEE report also circumscribed the following priority recommendations (Figure 1):

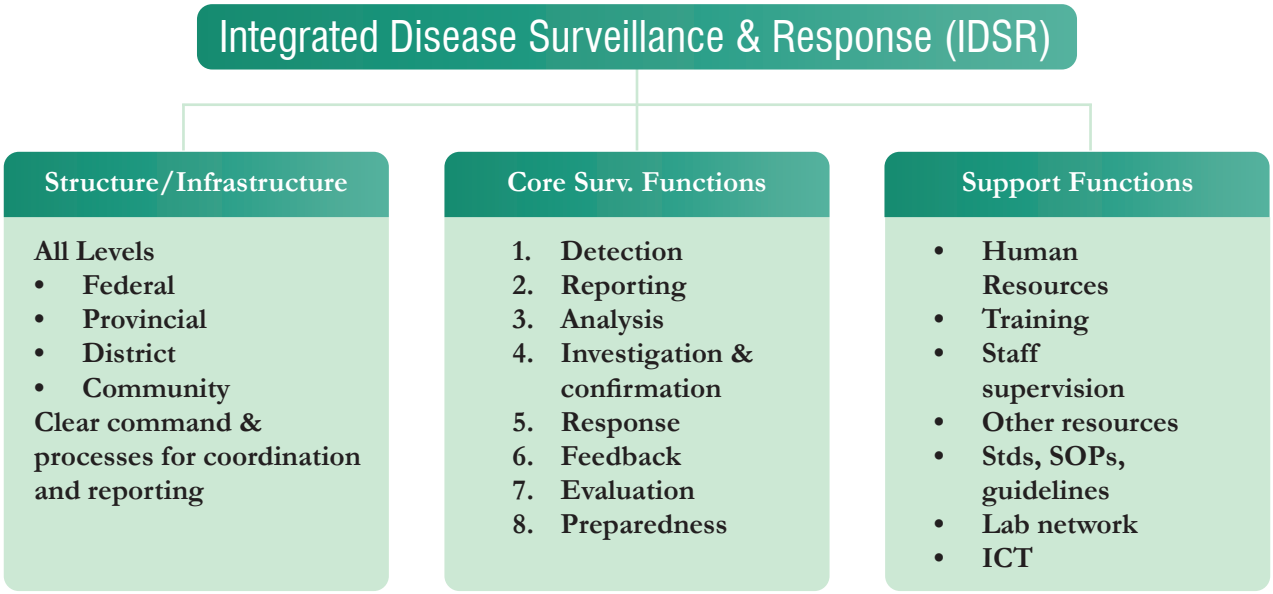
1. Develop a comprehensive public health workforce policy to address specific public health workforce targets (based on national or WHO-EMRO targets) for various cadres, strategy for training, recruitment and retention

2. Develop specific eligibility and qualification standards

for various cadres of public health workforce both in human and animal health

3. Develop career structure for effective placement and retention of eligible and qualified candidates

Figure 1: Three Pillars of Integrated Disease Surveillance & Response



Source: A. Wilson (2016). Gaining a Consensus on Surveillance and Integrated Disease Surveillance and Response (IDSR) in Pakistan. Published position paper: Public Health England.

In light of the above recommendations, the National Action Plan for Health Security highlights the key activities that relate to the development/enhancement of the workforce. These activities include:

1. Improving animal health workforce
2. HR capacity development following FELTP transition to NIH
3. Essential HR requirements for epidemiologists and data analysts needed in the system to be met through NIH-based trainings

Keeping these priority activities in view, it is understood that the workforce development components include strengthening from the context of "One Health approach", in which zoonotic and human diseases related surveillance and prevent-detect-respond functions are conducted efficiently in light of the IHR-GHSA initiative.

1.5 Rationale

The Joint External Evaluation proscribes the key areas related to the health workforce, while the NAPHS aligns its framework with the JEE recommendations. Both of these sentinel documents lay out the various functions of IHR-GHSA under the three pillars conceptual framework of Integrated Disease Surveillance (IDSR).

The three pillars framework relates to the embedding of Prevent-Detect-Respond capacities within the health system and through strengthened linkages across other related sectors falling under the 19 technical areas of IHR-GHSA.

The three pillars framework in Pakistan was adopted in the country for IHR-GHSA and specifically for IDSR-PHLN, after consultations with the provinces and through support of Public Health England (PHE) and the CDC-USA supported Field Epidemiology and

Laboratory Training Program (FELTP) during 2017-18. All the provincial health departments contributed in the consultations along with representatives/focal persons from provincial and federal levels, and other related Ministries and Departments of Pakistan. The related ministries involved in the process included:

1. Ministry of Foreign Affairs
2. Ministry of Climate Change
3. Ministry of Food Security and Research
4. Ministry of Planning Development and Special Initiatives
5. Ministry of Law and Justice
6. Ministry of Industries and Production
7. Ministry of Ports and Shipping
8. Ministry of Federal Education and Professional Training
9. Ministry of Interior and Narcotics Control
10. Strategic Planning Division
11. National and Provincial Agriculture Research Councils
12. Pakistan Atomic Energy Commission
13. National and Provincial Disaster Management Authorities
14. Ministry of Commerce

In addition to the health sector, each of the above sectors reflected the huge gap in the current availability and the critical need for skilled human resources in the country to conduct respective IHR-GHSA functions.

Against this backdrop of JEE-NAPHS, the World Bank offered to provide support for the development of a Human Resource in Health (HRH) requirements-related Technical Assistance to the Mo NHSR&C. This support envisioned to document the HRH related current status, and circumscribe the needs at federal level for implementing the National Action Plan for Health Security under IHR-GHSA in Pakistan. The current capacities and needs are documented with the focus of establishing and enabling the NAPHS mandated functions in relation to IDSR-PHLN at the federal level in the country.

1.6 Objectives

The key objectives of ascertaining the HRH requirements at the federal level for implementation of NAPHS in Pakistan were to:

1. Formulate minimum technical HRH requirements and capacities for NAPHS implementation at the federal level
2. Map existing public health workforce (HWF) and animal health workforce for IHR implementation in key areas, including AMR, IDSR, Zoonotic Disease, Health Workforce, PHLN, Emergency Response Preparedness, Points of Entry, Immunization, Risk Communication, and Food Safety
3. Conduct a gap analysis at the federal level in view of the NAPHS core capacities and cadres with a view to quantify health workforce/animal health workforce needs, demands and supply under varied future scenarios for the key technical areas of the NAPHS that are the focus of ongoing work
4. Define a framework and parameters necessary to develop HWF/animal health workforce database for NAPHS
5. Identify existing and required training needs, viz. productive capacity for NAPHS implementation at the federal level, focusing on HWF and animal health workforce

2. ASSIGNMENT PROCESS

In order to achieve the assignment objectives, the process was bifurcated across two broad phases, namely the inception phase and the consultations-analysis-report preparation phase (Table 3). It is imperative to mention that the assignment included a detailed documentation of the existing status of various areas of the workforce, in relation to the IHR-GHSA JEE report and in keeping with the NAPHS. It was mutually agreed that this would be narrated/depicted in a manner to highlight the key supplementation of the identified workforce gaps across both the public health domain and clinical sciences domain within the health sector; and for the workforce requirements across various related sectors covered within the 19 technical areas.

Table 3: Phases and Outputs of the Assignment

Inception phase	
Output 1	1. Pre-inception meetings with the World Bank Representative and the Mo NHSR&C focal persons, and acquisition of related documents 2. Parameters of exercise discussed and agreed with the Mo NHSR&C
Output 2	Inception report developed and finalized. The report was to specify the assignment objectives and process, which was thematically structured around the three pillars framework of IDSR-PHLN and NAPHS priority areas pertaining to Workforce and Human Resource in Health.
Consultations, analysis and report preparation phase	
Output 3	1. Semi-structured questionnaire-based meetings and data/documents acquisition from line ministries and departments with reference to IHR (with special focus on available and needed workforce) 2. Use of a structured sub-tool of the questionnaire to conduct and summarize the HR in key IHR implementing ministries at the federal level with gap analysis and proposed HWF/animal health workforce database framework
Output 4	1. Existing productive capacity of human and animal health workforce in the context of IHR in the country 2. HWF/animal health workforce training requirements for the specified technical areas with gap analysis at the federal level
Output 5	Draft and final reports

2.1 Inception Phase

The inception phase of the assignment was divided across the following key activities:

1. Pre-inception meetings with the World Bank Representative and the Mo NHSR&C focal persons and acquisition of relevant documents
2. Parameters of exercise discussed and agreed with the Mo NHSR&C and World Bank
3. Inception report developed and finalized

2.1.1 Pre-inception meetings

Initial consultative and exploratory meetings were conducted during the early part of the inception phase in order to have a common understanding and mutual agreement of the assignment parameters. The meetings were held to understand the priorities of the Mo NHSR&C as well as to have an insight of the key deficiencies of the workforce. Furthermore, relevant background documents related to the IHR-GHSA in Pakistan were acquired during these meetings.

An initial set of meetings with Mo NHSR&C personnel were conducted during the first week of June, 2020

to further understand the intricacies and dimensions of the assignment exercise from a federal-level perspective. The meetings also facilitated an in-depth understanding of the Ministry's expectations in relation to the assignment. Insights regarding the parameters of the exercise and its expected layout were discussed in detail. Views on mutually agreeable domains of work and areas of special focus were exchanged. The meetings also facilitated the structuring of the inception report.

Mutual understanding on parameters of assignment

One of the key and immediate outcomes of the meetings was an understanding at the federal level that the exercise warrants development of a document that aligns with the three pillars framework of IDSR and the NAPHS, as well as embeds the Prevent-Detect-Response functions for Public Health Emergencies of International Concern (PHEIC), and epidemics/pandemics at the federal level in the country.

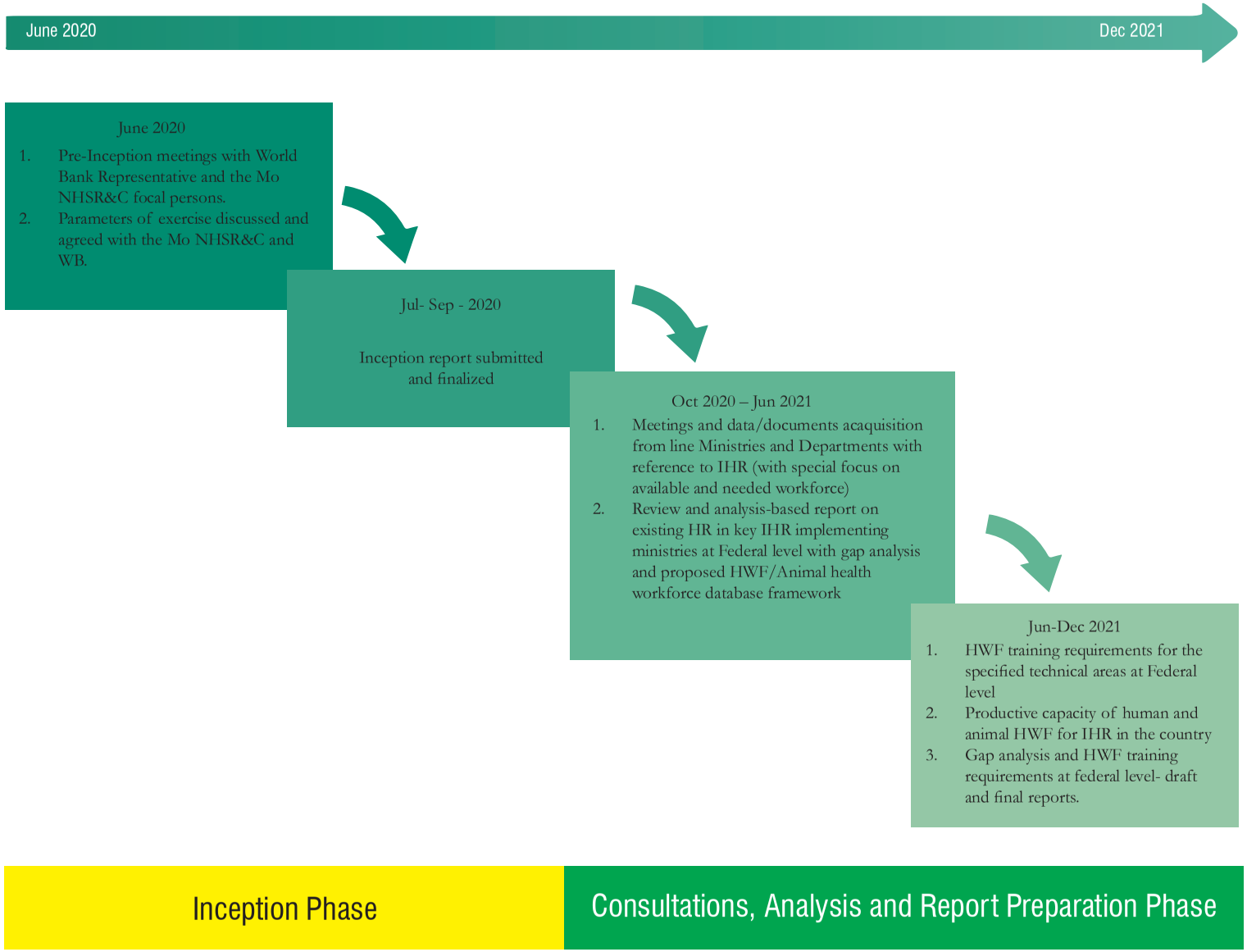
Given the diversity of IHR related coordination and development of linkages as one of the key undercurrents across all the 19 technical areas, it was agreed that to document all aspects of the workforce at the federal level, the following dimensions were to be prioritized (but not limited to)

1. Health sector (public health and clinical sciences)
2. Antimicrobial resistance
3. Animal health workforce
4. Public health laboratories
5. Disease surveillance-related health information flow
6. HR in other line ministries

2.1.2 Inception report

The inception report was drafted in light of the review of documents, the set of pre-inception meetings and discussions, and developing a common understanding/consensus on the overall parameters of this assignment. The inception report was structured across the assignment process/approach. Activity-wise timelines were proposed, and approved by the Mo NHSR&C and World Bank personnel. The process/approach of the assignment is illustrated in (Figure 2).

Figure 2: Phase-wise Layout of the Assignment and Workplan



2.2 Consultations, Analysis, and Report Preparation Phase

This phase was structured according to the following steps:

1. Meetings and data/documents acquisition from line departments with reference to IHR (with special focus on available and needed workforce)

2. Review and analysis-based preparation of report on existing HR in key IHR implementing ministries at the federal level with gap analysis and proposed HWF database framework

3. HWF/animal health workforce training requirements for the specified technical areas at federal level

4. Gap analysis and HWF/animal health workforce training requirements at federal level draft and final reports

2.2.1 Meetings and acquisition of data/documents

Meetings were scheduled with various federal level departments to understand and document the core capacities, respective roles, historical and current functions being undertaken, the available/engaged human resources, and required human resources with reference to IHR-GHSA and the NAPHS. The following personnel and departments were contacted:

1. Ministry of National Health Services, Regulations and Coordination
   a. Chief, Central Health Establishment
   b. Executive Director, National Health Emergency Preparedness and Response Network (NHEPRN)
   c. Chief, Field Epidemiology and Disease Surveillance Division (FEDSD), NIH
   d. Chief, Public Health Laboratory Division (PHLD), NIH
2. Ministry of National Food Security and Research (Mo NFS&R)
   a. Senior Scientific Officer, National Agriculture Research Council (NARC)
   b. Director, Livestock
3. Ministry of Climate Change
   a. Senior Consultant, MoCC

The meetings were conducted based on a semi-structured key informant tool and a structured quantitative sub-tool. The semi-structured tool covered the themes of designated-perceived role of the department/agency, the historical and current functions and responsibilities, and the human resource available with details of their roles in relation to the IHR functions. Additionally, the respondents were asked to share views and information related to the existing gaps in HR (levels and skills sets) to fulfill the designated functions of International Health Regulations by that department/agency. The quantitative sub-tool was utilized to document the function-wise/role-wise numbers of human resource available, the sanctioned-filled-vacant posts, and additional types and levels of HR needed. Such information was then used to derive the challenges faced and the gaps in filled posts, vacant posts, and types/levels of skills sets-based additional requirements. This information was also used to map/document the identified HR needs and gaps, and to propose approaches to be adopted for filling them and thus to be able to enhance the IHR core capacity.

2.2.2 Review and analysis-based report on existing HR

The acquired information and documents were reviewed and analyzed to prepare a health workforce database framework that reflects the existing needs gap-related facets for IHR-GHSA at the federal level.

2.2.3 Health and animal health workforce training requirements

In addition to the requirements of the workforce, the assignment also documented the trainings and existing skills sets/qualifications of available IHR-GHSA personnel in the health sector at the federal level (Mo NHSR&C and its attached/subordinate/autonomous departments). The documentation was used to align the functions/responsibilities within the health sector and to identify the needs and gaps in IHR core capacities and skills sets. Such analyses contributed toward development of a summarization matrix for attached/subordinate/autonomous departments' training requirements in the short, medium, and long term. The job descriptions of department/subdepartment available staff were acquired for the purpose from the key informants. These job descriptions were used to map the available staff's knowledge, skills and abilities.

3. HEALTH WORKFORCE REQUIREMENTS AT FEDERAL LEVEL

The International Health Regulations and the Global Health Security Agenda, provide an avenue for countries to proactively work toward strengthening their systems in human and animal health and other related sectors. This is envisioned to enhance the ability of such countries to prevent-detect-respond to events such as endemic diseases in a geographical location, epidemics, pandemics, and public health emergencies of international concern (PHEIC). The enhancement of requisite human resources in both human and animal health sectors is one of the essential undercurrents that enables countries s to stay prepared and gain the capacity to prevent the occurrence of such events. Furthermore, the availability and deployment of skilled HR across the various tiers of health and related sectors enables countries to operationalize and maintain high levels of vigilance and surveillance for early detection of such events and to respond in a swift, efficient and effective manner, in order to minimize the spread, while reducing the effects and sequelae of diseases among those who get affected.

3.1 Federal Level Departments Engaged in IHR-GHSA

3.1.1 Directorate of Central Health Establishment

Under the leadership of the Ministry of National Health Services, Regulations and Coordination (NHSRC), the mandate of the Directorate of Central Health Establishment (Do CHE) is to effectively prevent the international spread of diseases with global impact and comprehensively implement the International Health Regulation (2005) to ensure minimum interference to international travel and trade. Th Directorate functions through the Central Medical Board, Preventive Health Care and Curative Health Services of laboratory and diagnostic facilities at Medical Centers, and Dispensaries at points of entry/ crossings. The Do CHE plays a significant role in International Health Regulations (IHR) and has been recognized for its services to reduce the effect of the COVID-19 pandemic in Pakistan.

3.1.2 Pakistan Agricultural Research Council

Under the leadership of the Ministry of National Food Security and Research (Mo FS&R), the Pakistan Agricultural Research Council (PARC) is the apex national organization working in close collaboration with federal and provincial institutions to provide science-based solutions to agriculture and animal husbandry sectors for the food security of Pakistan. At present, PARC has seven divisions: five technical divisions that are Plant Sciences, Animal Sciences, Social Sciences, Natural Resources, Agricultural Engineering, and two service divisions— Finance, and Coordination & Monitoring. The activities of various technical divisions related to the statutory functions of PARC are managed by in-house research establishments of PARC and through countrywide cooperative research programs and PSDP (social development schemes funded through the Government of Pakistan) funded projects. The functions of PARC as laid down in the 1981 Ordinance are primarily: to undertake, aid, promote and coordinate agricultural and food sector research; to arrange expeditious utilization of research results; to establish research to address the gaps in existing programs of agricultural and animal sciences research; to arrange trainings and establish/enhance capacities and skills in the agriculture and animal sectors; and, to establish and maintain a resource center (reference and research library).

3.1.3 Public Health Lab Division

The Public Health Laboratories Division (PHLD), based at the National Institute of Health (NIH-Pakistan) provides diagnostics and laboratory-related technical support to the public and private sectors for timely detection, prevention, and control of infectious

diseases during outbreaks and epidemics. This Division comprises various departments of Virology/Molecular Biology, Hematology, Microbiology, Cytogenetics, Parasitology, Histopathology, Chemical Pathology, Immunology, and Reproductive Physiology. The Division also provides necessary diagnostic facilities for the zoonotic diseases. The PHLD delivers routine and specialized laboratory services for public health issues including communicable diseases such as Dengue, Polio, Congo, SARS, Measles, Avian Influenza, Hepatitis, HIV/AIDS, and in recent times has made a major contribution toward COVID-19. The PHLD also provides technical and financial support to the provinces and regions of the country for establishing a Public Health Laboratories Network (PHLN). This network comprises six provincial/ regional reference labs already established with the support of CDC-USA, 36 PHL at the divisional level, and is also linked with the private sector laboratories. In addition, 155 District Disease Surveillance and Response Units (DDSRUs) will be linked with the National PHLN. The PHLD has established quick and efficient linkages and supported enhancement of capacities across both the public and private sectors included in the PHLN during the recent COVID-19 pandemic in the country. The network has effective reporting linkages with the PHLD in this regard (daily-weekly-monthly).

3.1.4 Field Epidemiology and Disease Surveillance Division

In 2013, the former Epidemic Investigation Cell (EIC) of NIH was upgraded to the Field Epidemiology & Disease Surveillance Division (FE&DSD) of NIH. This Division comprises four sections: Surveillance & Response Section, One Health Hub, IHR Coordination Section, and the Field Epidemiology/ Workforce Development Section. The FE&DSD is responsible for responding to alerts/outbreaks and epidemics, national and international events of public health significance and providing the required feedback to the concerned stakeholders.

3.1.5 National Health Emergency Preparedness and Response Network (NHEPRN)

The National Health Emergency Preparedness and Response Network (NHEPRN) was established in January 2011 by the then Ministry of Health, Government of Pakistan, to deal with health-related Emergency Management including Preparedness, Response, and Recovery. After devolution in June 2011, NHEPRN was transferred to the Cabinet Division; however, since May 9, 2013 NHEPRN is an attached department of the Mo NHSR&C.

3.1.6 Ministry of Climate Change (MoCC)

The Ministry of Climate Change is one of the key stakeholders in the IHR-GHSA, given it's role in the intersectoral domains of water resource management, sanitation (solid and liquid waste management), environmental pollution/degradation (ambient and household-based), and improving primary reliance on clean fuels. The MoCC through its National Climate Change Policy (2013) and the ensuing national framework for implementation of the national policy endeavors to fulfill the requisite functions in relation to IHR.

The MoCC envisages to ensure that climate change is mainstreamed in the economically and socially vulnerable sectors of the economy and to steer Pakistan toward climate resilient development. To achieve this goal, in addition to the National Climate Change policy, Mo CC has developed some key policy level documents that pertain to National Forest Policy, National Sanitation Policy, National Rangeland Policy, National Environmental Policy, and National Drinking Water Policy. In line with these policies, some of the key areas in which the Ministry is currently working relate to:

1. Climate resilient urban human settlements
2. Employing geomatics and spatial reference systems for monitoring climate change and sustainable development
3. Water Sanitation and Hygiene (WASH) strategic planning and coordination
4. Glacial Lake Outburst Floods (GLOF-II)
5. Sustainable Forest Management

6. Pakistan Snow Leopard & Ecosystem Protection

7. National Ozone Unit

8. Introduction of Carbon Pricing Instruments

There are a few affiliate departments that are attached with MoCC that include Pakistan Environmental Protection Agency (Pak EPA), Global Impacts Study Center, Islamabad Wildlife Management Board, and the Zoological Survey of Pakistan.

3.2 Roles and Functions of Federal Level Departments

3.2.1 Departments involved in IHR-GHSA

The **Central Health Establishment (CHE) department** has been actively involved in the COVID-19 pandemic response under the mandate of IHR. With the support of the Ministry of NHSR&C, CHE has developed Standard Operating Procedures (SOPs) for airports, land-crossings and seaports, ensuring preventive and curative measures. As a department involved in IHR-GHSA work, CHE has been responsible for maintaining the core capacities of IHR, some of these capacities are to be maintained at all times whereas the rest only during public health emergencies.

The **PARC** is actively involved in promoting and conducting research regarding the biotic and zoonotic diseases and surveillance that may affect global populations. The department also utilizes research-based results to reduce the Antimicrobial Resistance (AMR) under the IHR-GHSA agenda.

The **PHLD** at NIH oversees and regulates the Labs Systems/ Network across Pakistan as one of the core capacities of IHR. For GHSA, the Division includes functions in the technical areas of Biosafety, Biosecurity, and AMR.

The **FE&DSD** at NIH is a signatory to the IHR agenda at the national level and is also responsible for One-Health, disease surveillance (IDSR), risk assessment, and public health emergency operations. FE&DSD also maintains a data repository for disease surveillance and response. Furthermore, it is responsible for conducting both short- and long-term trainings under the Field Epidemiology and Laboratory Training Program (FELTP).

The **NHEPRN** aims to strengthen the overall capacity and capability of the country to effectively manage all health-related aspects and therefore is responsible for developing the health policies for communities/ individuals affected by health emergencies and disasters.

The **MoCC** is mandated to contribute toward the preservation of the environment and to arrest the process of environmental degradation in the country. It is primarily focused on conservation of existing natural resources (for example, forests, wildlife, water sources/reservoirs) and their further enhancement, and prevention of environmental degradation (for example, afforestation, safe sanitation, and appropriate disposal of liquid/solid waste).

3.2.2 Functions of departments involved in IHR National Action Plan

In relation to the IHR National Action Plan, the Ministry of NHSR&C has developed a PC-1 (a government funding planning document), for strengthening the Points of Entry (PoEs) and upgrading CHE in relation to prevent-detect-respond capacities. The costed PC-1 has been submitted and approved in line with the IHR National Action Plan for Health Security (NAPHS).

The specific functions of PARC include Poultry Diseases Surveillance, Zoonotic Diseases Surveillance, Antimicrobial Resistance (AMR) Agenda, and Laboratory Systems/ Networking.

PHLD is responsible for carrying out the public health testing of priority diseases including vector-borne diseases, vaccine preventable diseases, water- and food-borne diseases. It provides the laboratory support/ assistance for outbreak investigation. PHLD provides the surveillance support (lab-based surveillance) for influenza, Rota virus, measles, polio, etc. along with reference testing. In relation to IHR, one of the functions of PHLD is to coordinate antimicrobial resistance surveillance data for diphtheria, water-borne diseases, etc.

The FE&DSD is responsible for various functions in relation to the IHR National Action Plan, such as:

- Surveillance including vigilance and monitoring of the disease trends to initiate alerts and prepare international tools for disease surveillance and precautionary measures
- Health Education regarding preventive measures among the risk groups for communicable diseases
- One-Health Hub
- Identifying vectors for disease transmission along with monitoring the impact of climatic change on vectors and their spread/disease transmission
- Developing and disseminating an Integrated Disease Surveillance and Response (IDSR) weekly report by FE&DSD based on the data collected from piloting of all health facilities for 8 diseases in 11 districts. Lack of trained health workforce in the facilities is a major challenge for data collection and monitoring. The weekly data is received, analyzed, and reported.
- Generating and disseminating seasonal alerts in order to inform/alarm potential disease risks across the relevant departments and provincial governments
- Generating advisories as soon as a disease outbreak is reported and passing information on to the health care commissions to ensure the availability of requisite medicines. Efforts are being made to strengthen the real-time reporting mechanism.
- Developing and maintaining a Data Repository Hub (currently for aggregated data only) for IDSR information that will also link with workforce development initiatives in this domain across the country.

The NHEPRN has a vital role in health emergencies and disaster response. It has linkages and coordination with the Government, private and development sector including national and international Nongovernmental Organizations (NGOs). The NHEPRN has an allocated budget to support various preparedness activities and provides 50 percent support to the provinces for preparedness and response activities such as training of human resources at provincial and federal level, purchasing of essential medicines for emergencies, etc. The remaining 50 percent of preparedness activities are carried out by the provincial government in case of health emergencies/ disasters.

The Ministry of Climate Change, is mandated to contribute toward the preservation of the environment, that influences the ambient environment and climatic conditions. It is empirically known that climatic change and environmental degradation influence numerous sectors of the economy as well as the populace in a myriad ways, including population health (for example, higher prevalence of respiratory illnesses where air pollution levels are higher; higher incidence of diarrheal diseases where clean/safe drinking water is less commonly available; higher prevalence of undernutrition in food insecure areas where climatic changes influence crop/ staple food production). As part of global initiatives, MoCC is aligned with Sustainable Development Goal (SDG) 13 that relates directly to "climate action", while it also relates to SDG 6 (clean water and sanitation) and SDG 7 (affordable and clean energy). The MoCC is the governmental arm to ensure achievement of these SDGs for Pakistan, and contribute toward the IHR-GHSA agenda including ensuring that a "Multihazard National Public Health Emergency Preparedness and Response Plan is developed and implemented".

3.2.3 Categories of human resources

The Directorate of CHE has various categories of human resources to provide medical services, preventive health, and curative care services (Table 4). To cater to the clinical roles, CHE has sanctioned positions for medical officers, nurses, paramedics and support staff. To perform the preventive health activities and for services provided to combat COVID-19, the CHE has designated health officers, quarantine assistants, fumigators, and support staff. The approved PC-1 for the upgradation of CHE suggests new post categories such as data entry operators, data analysts, epidemiologists, etc. to overcome the shortage of human resources to fulfill the roles of the department. However, these posts need to be created from the recurrent budget. Furthermore, at present a major

HR gap exists due to lack of higher-level posts such as Additional Director, Deputy Directors, Assistant Directors that is greatly impacting the functions of the department. CHE through the Ministry of NHSRC has requested the Establishment / Finance Division to create these posts to improve task efficiency and fulfilment by the DoCHE in the regular and health emergency response activities.

Table 4: Human Resources that are Sanctioned, Available, Vacant, Required, at the Central Health Establishment

S.No	Type/Category of HR	Government Pay Scale Level	HR Required	Existing/ Available HR	HR gap to be filled
1	Medical Officer	17	109	59	50
2	Nurse	16	12	0	12
3	Data Entry Officer	12	17	0	17
4	Sanitary Inspector	12	10	5	5
5	Dispenser	9	60	26	34
6	Quarantine Assistant	9	80	21	59
7	Health Technician	7	39	5	34
8	Lab Assistant	5	10	0	10
9	Fumigator	5	73	14	59
10	Fumigation Cooly	1	97	41	56
11	Naib Qasid	1	36	24	12
12	Chowkidar	1	45	21	24
13	Sanitary Worker	1	64	36	28
		Total	**652**	**252**	**400**

The PARC consists of seven divisions and human resources with diverse skill sets and expertise. The various categories of human resources consist of; Senior Scientific Officer, Scientific Officer, Assistant Scientific Officer (Table 5). All these positions are as per the required qualification/ expertise, for example, Microbiologist, Virologist, Molecular biologist, etc. These senior posts are supported by the staff that includes Lab Technicians, Lab Assistant, Lab Attendant. In addition to these, there are posts for general administration such as Administration Officer, Office Assistant, Store Office, Procurement Officer, Data Entry Officer, Driver, Office Attendant, Generator, Naib Qasid.

Table 5: Human Resources that are Sanctioned, Available, Vacant, Required, at the National Agriculture Research Council

Agency/ Department	Segment	Functions	Category HR	Available (out of total sanctioned posts)	Vacant (out of total sanctioned posts)	Required additional (non sanctioned posts)
PARC	Poultry Diseases Surveillance	IHR Coordination, Communication and Advocacy	Senior Scientific Officer	1	0	7
		Antimicrobial Resistance	Scientific Officer	2	2	8
		Zoonotic Disease	Communication Specialist	0	0	3
		Food Safety	Technical Officer / Engineer	0	0	3
		Biosafety and Biosecurity	Assistant Technical Officer / Assistant Engineer	0	0	3
		Immunization	Assistant MIS Officer	0	0	3
		National Laboratory System	AO/ Admin. Officer	0	0	3
		Real-Time Surveillance	Assistant Scientific Officer	0	0	14
		Reporting	Office Assistant	0	0	3
		Workforce Development	DEO / KPO	0	0	6
		Preparedness	Jr. Auditor	0	0	3
		Emergency Response Operations	Lab Technician	1	0	12
			UDC	1	0	0
			Lab Assistant	1	0	12
			Driver	0	0	6
			Electrician/ Technician	0	0	6

Agency/ Department	Segment	Functions	Category HR	Available (out of total sanctioned posts)	Vacant (out of total sanctioned posts)	Required additional (non sanctioned posts)
			Guard/ Chowkidar	0	0	3
			Lab Attendant	3	0	12
			Naib Qasid / Office Attendant	0	0	3
			Sweeper/ Janitor	0	0	6
PARC	Poultry Diseases Research	Antimicrobial Resistance	Senior Scientist	1	0	6
		Zoonotic Disease	Scientific Officer	0	0	7
		Food Safety	Assistant Scientific Officer	0	0	7
		Biosafety and Biosecurity	Lab Technician.	0	0	7
		Immunization	Lab Assistant	0	0	9
		National Laboratory System	Lab Attendant	0	0	9
			Total	**10**	**2**	**161**

DEO/KPO – Data entry operator/Key Punch operator
UDC – Upper Division Clerk

The National Veterinary Laboratory (NVL) at the NARC conducts livestock related research. Future requirements show that NVL will need technical personnel in the categories of scientific officers, laboratory technicians, laboratory attendants for surveillance and response related activities. Additionally, scientific officers, laboratory technicians and attendants will also be required for conducting research.

Table 6: Human Resources that are Sanctioned, Available, Vacant, Required, at the National Veterinary Laboratory

Agency/ Department	Segment	Functions	Category HR	Available (out of total sanctioned posts)	Vacant (out of total sanctioned posts)	Required additional (non-sanctioned posts)
NVL	Livestock Diseases Surveillance	IHR Coordination, Communication and Advocacy	Senior Scientific Officer	1	1	1
		Antimicrobial Resistance	Scientific Officer	2	0	4
		Zoonotic Disease	Communication Specialist	0	0	1
		Food Safety	Technical Officer / Engineer	0	0	1
		Biosafety and Biosecurity	Assistant Tech. Officer / Assistant Engineer	0	0	1
		Immunization	Assistant MIS Officer	0	0	0
		National Laboratory System	AO/ Admin. Officer	0	1	1
		Real-Time Surveillance	Assistant Scientific Officer	0	0	2
		Reporting	Office Assistant	2	0	2
		Emergency Response Operations	Lab Technician	6	0	8
			UDC	1	0	1
			Lab Assistant	0	0	0
			Driver	1	0	0
			Electrician/ Technician	0	0	1
			Guard/ Chowkidar	1	0	0
			Lab Attendant	6	0	4
			Naib Qasid / Office Attendant	2	0	0
			Sweeper/ Janitor	2	0	3

Agency/ Department	Segment	Functions	Category HR	Available (out of total sanctioned posts)	Vacant (out of total sanctioned posts)	Required additional (non-sanctioned posts)
	Livestock Diseases Research	Antimicrobial Resistance	Senior Scientist	1	0	2
		Zoonotic Disease	Scientific Officer	1	0	3
		Food Safety	Assistant Scientific Officer	0	0	1
		Biosafety and Biosecurity	Lab Technician	1	0	4
		Immunization	Lab Assistant	0	0	0
		National Laboratory System	Lab Attendant	0	0	3
			Total	**27**	**2**	**41**

The PHLD has various categories of human resources such as Biomedical Engineering Scientist (both clinical and nonclinical scientists), Virologist and Microbiologist (both long- term and short- term as per need), Public Health experts, Epidemiologist, and Statistician (Table 7). These positions are sanctioned and occupied. Additional HR requirements have been specified for the technical positions as well as for the support staff members for PHLD to perform its IHR-GHSA function efficiently.

Table 7: Human Resources that are Sanctioned, Available, Vacant, Required, at the Public Health Laboratories

Agency/ Department	Segment	Functions	Category HR	Available (out of total sanctioned posts)	Vacant (out of total sanctioned posts)	Required additional (non-sanctioned posts)
NIH	Public Health Laboratory	Public Health Testing	Scientist	09	02	11
			Technologist	06	0	15
			Technician (other)	13	0	08
			Attendant/ Sweeper	14	0	14
			Biomedical Engineer	0	0	02
			Epidemiologist/ Public Health expert	0	0	02
			Statistician	0	0	04
			Total	**42**	**02**	**56**

The main categories of workforce at FE&DSD pertain to the domains of Surveillance, IDSR (no sanctioned workforce as of now for IDSR), Information Technology, and Information, Communication and Health Education (Table 8).

The Surveillance Division was established on an "as per need" basis, and as a consequence, the current workforce is comprised of makeshift positions, where staff are appointed by temporary arrangements from other divisions to get the tasks done (only three to four senior level posts are sanctioned under NIH). There is an urgent need to create sanctioned positions of the senior and support staff as well as need for their trainings and capacity building (Table 9).

Table 8: Summary of HR Functions, Available, Vacant, and Required for Field Epidemiology and Surveillance, FELTP Program and Communication-Coordination for IHR

Agency/ Department	Segment	Functions	Available (out of total sanctioned posts)	Vacant (out of total sanctioned posts)	Required additional (non-sanctioned posts)
NIH	FEDSD	Chief	1	0	0
Epidemiology/ Surveillance	Epidemiology/ Surveillance	PSO Epidemiology	1	0	0
	Surveillance	Disease Surveillance Officer	1	0	1
		Medical Officer	1	1	0
		Research Officer	1	0	1
	Epidemiology	SSO Epidemiology	1	1	0
		SO Epidemiology	2	2	0
	IDSR/ EBS	PSO IDSR	0	0	1
		SSO IDSR	0	0	2
		SO Surveillance	2	1	0
	Information Technology	SSO IT	1	0	1
		SO IT	2	0	2
		SSO Networking	0	0	1
		SO Networking	0	0	2
	Health Education	PSO H.E	0	0	1
		SSO H.E	0	0	1
		SO H.E.	2	2	0
	Statistics/ Biostatistics	SSO Statistics	1	1	0
		Statistical Officer	2	0	0
		Statistical Assistant	1	0	1
	Epidemiology - One Health	SSO One-Health	0	0	1
		SO Entomology	1	0	1
		SO Veterinary Epidemiology	1	0	1
		SO Environmental Health	0	0	1

Agency/ Department	Segment	Functions	Available (out of total sanctioned posts)	Vacant (out of total sanctioned posts)	Required additional (non-sanctioned posts)
Workforce Development/ FELTP	Workforce Development/ FELTP	PSO	0	0	1
	Workforce Development	SSO	1	1	1
		SO WFD	0	0	1
		SO Disease Surveillance	0	0	1
		SO Biostatistics	0	0	1
Coordination and Communi-cation	Communication	PSO	0	0	1
		SSO Communication	0	0	1
		SO Communication	0	0	1
	Coordination	SSO Coordination	0	0	1
		SO Coordination	0	0	1
		Total	22	9	28
SO – Scientific Officer SSO – Senior Scientific Officer PSO- Principal Scientific Officer					

Table 9: Number of Staff Positions as per FELTP Strengthening Component of PC-1

S. No	Position	Number(s) required
1	Program Head / Administrator	01
2	Logistic/Admin. /Procurement Officer	01
3	Internal Audit/ Finance Officer	01
4	IT Support Officer	01
5	Accounts/Finance Manager	01
6	Internal Audit/Finance Assistant	01
7	Admin./Procurement Assistant	01
8	Cleaner/Office Boy/Office Assistant	03
9	Support staff for Hostel, Kitchen and Rooms (Security Guard)	06
10	Epidemiologist @ Position of Professor	01
11	Biostatistician @ Position of Associate Professor	01
12	Quantitative Research Officer @ Position of Associate Professor	01
13	DSRU & Course Coordinator @ Position of Assistant Professor	01
14	External Faculty Members @ 3/month @ Position of Professor	06
15	Federal and Provincial TSOs/Mentors/Supervisors @ Position of Assistant Professor	12
	TOTAL	40

The NHEPRN has a large workforce with 48 sanctioned positions (Table 10). Despite the large number of sanctioned HR, the rationality of the sanctioned positions as per the aim of the organization may not be justifiable. The department has a scarcity of technical staff with only a handful of technical positions including Director General (1 position), Director (1 position), Deputy Directors (4 positions). Of these positions, all are filled but most of the personnel, especially technical officers, are working within the Mo NHSR&C on attachment while still being on the payroll of NHEPRN. The remaining positions, out of 48 sanctioned seats, are nontechnical and mainly support staff positions.

Table 10: Summary of HR Functions, Available, Vacant and Required, for NHEPRN

Agency/ Department	Segment	Functions	Category HR	Available (out of total sanctioned posts)	Vacant (out of total sanctioned posts)	Required additional (non-sanctioned posts)
NHEPRN	Admin. Section	Management	Director General (DG)	1*	0	0
			Director	1*	0	0
		Preparation of PC-1	Deputy Director (Admin.)	0	1	0
	IT Section	Mapping, Data collection	Deputy Director (Information Technology)	0	1	0
	Training and Public Health	Conduct training and public health related activities	Deputy Director (Training/ Public Health)	0*	2	0

*The DG, Director, and Deputy Directors working in Mo NHSR&C on attachment

The Ministry of Climate Change, with reference to the IHR-GHSA related functions/roles is envisaged to directly or indirectly contribute toward the core technical areas of:

- Preparedness
- Emergency response operations
- Risk communication
- Food safety
- Biosafety-biosecurity
- Chemical and radiation emergencies
- Zoonotic diseases
- Realtime surveillance
- Workforce development

Interaction with MoCC during the course of the assignment revealed that no dedicated human resources are currently allocated for IHR-GHSA related functions and roles. There is generally an activity-wise designation of responsibility within the existing office bearers/staff members for activities related to IHR-GHSA. Such designation of responsibility is commonly based on an event-by-event/case-by-case basis for the activities being undertaken by other departments/domains in which MoCC is included as part of the technical working groups or contributes as a stakeholder.

It was emphasized that dedicated human resources need to be identified/designated for the core IHR-GHSA functions at the national and provincial levels.

3.2.4 Main challenges of IHR related work

One of the major challenges faced by the DoCHE is the lack of adequate skilled workforce. The HR that is already recruited is not skilled in tasks specific to the IHR-GHSA agenda. This deficiency is further supported by the lack of skill-based, in-service and refresher trainings for those who are currently engaged with the Directorate of CHE. Efforts have been made to resolve these issues through the PC-1 under the categories of Human Resource and Core Capacities Trainings. Skilled human resource is an important area to work on in order to achieve the futuristic vision of DoCHE, that is, to develop the quarantine facilities on each of the 19 Points of Entry in the country, which cannot be achieved till the gaps of skilled workforce are addressed.

"Main challenge is skilled HR. Designated equipment is a manageable challenge but HR is unmanageable in our current capacity"—Director, CHE

The main challenges identified by the PARC to achieve the IHR-GHSA agenda, primarily relate to the lack of sanctioned human resources followed by the lack of salary structure, that is, minimum/low salaries leading to issues of retention of skilled human resources. It was cited that PARC has a lack of timely and sufficient funds that create hindrances in the research work which is further aggravated by the lack of supportive infrastructure. It was further mentioned that a few laboratories are under development despite which the space to conduct research would remain insufficient. There is an utmost need to develop BSL-III level laboratories and recruit skilled human resource to expedite research work.

"Approval of projects and funding is a main issue: for example, evaluation of zoonotic diseases was not approved saying it is not the prime focus of the department"— SSO, PARC

The PHLD identified a lack of understanding regarding the importance of IHR and GHSA as one of the major challenges to achieve the IHR agenda. Lack of understanding about the concept of the laboratory systems/systems approach has further worsened the situation. The 12 essentials of the laboratory quality management systems despite being quite important have not been implemented.

A respondent from FE&DSD highlighted lack of work plan(s) and sanctioned posts as a major challenge. He further added that there is an extreme shortage of skilled workforce for the IHR discipline. In order to achieve the IHR requirements for real-time surveillance in the context of One-Health and risk communication, trained and skilled human resources are required.

The FELTP program is one of the main conduits for training and supplementing epidemiological and outbreak investigation/emergency response skills across the HR tiers working in the public and private sectors of the country. The goal of the FELTP program is to support an efficient mechanism for continuous monitoring of the national disease scenario with special reference to the nationally agreed upon and notified priority diseases including vaccine preventable diseases, and the contributing/risk factors so as to take timely/ advance actions to prevent illness, control outbreaks, and initiate/coordinate response in events of outbreaks, and promote health. This support is to be supplemented with capacity development of public sector provincial and national level health providers/ managers through the FELTP training program. The program, since 2006 has been implemented at the National Institute of Health (NIH), Pakistan premises, and run through direct technical and financial support of the Centers for Disease Control (CDC), USA. The program as per mutual understanding between the CDC, USA and National Institute of Health, Mo NHSR&C is due to be transitioned under the auspices of the Field Epidemiology and Disease Surveillance Division (FEDSD) at the NIH. As per the understanding between the CDC-USA and NIH-Mo NHSR&C, the program costs and management will be taken over by the NIH-Mo NHSR&C through a recently approved PC-1 of the Government; and, it is subsequently planned to be funded through recurrent budgetary allocations of the Government of Pakistan, in the post-PC-1 completion scenario. The transition process, which was planned to be initiated from 2017 has however, faced delays. Given the gradually reducing CDC-USA support for the FELTP program and delays in the PC-1 approval during the last th ree years, the programmatic activities and training processes have markedly reduced. With the recent approval of PC-1 (November 2021), it is anticipated that in the coming two years

the program will be transitioned as per the requisite process.

A respondent on behalf of NHEPRN informed that the main challenge of HR is the lack of placement of individuals in the department despite having the available positions. Most of the technical staff, despite being paid and benefited by NHEPRN, are placed in the Mo NHSR&C to provide technical support. This affects the budget of NHEPRN which has to bear the load of salaries, allowances, and benefits of the employees while not being able to avail their services in the department. This also prevents NHEPRN from conducting its requisite functions in relation to IHR-GHSA.

A respondent from MoCC shared that currently there is limited priority consideration and progress towards the roles and functions related to IHR-GHSA. Given the core functions of MoCC, as a first step such prioritization needs to be imbibed within the MoCC and its affiliate departments at the national and provincial levels. Such prioritization of IHR-GHSA functions will give an impetus to the agreed upon activities in relation to IHR-GHSA, and the efforts toward fulfillment of the role/functions for environment protection and climate change.

3.2.5 Efforts to fill sanctioned but vacant posts

In 2017, an assessment was carried out to check the status of human resources availability across the department of DoCHE. As a result, it was found that 189 sanctioned positions were vacant and those filled were disproportionately deployed across the main office and points of entry in the country. For example, around two-thirds of staff (575) were placed in Karachi and majority of them were deployed in the clinical set-up. The DoCHE was managing 24 dispensaries centrally in 2017 that were reduced to 6 functional dispensaries. Out of the 18, some were closed while the remaining were shifted to the management of the Points of Entry (PoE) across the provinces/regions of the country. A plan was developed to recruit HR for vacant positions and deploy them to the dispensaries that were shifted to the PoEs. The DoCHE advertised the positions and recruited the individuals. The newly recruited staff was trained in November 2019. This trained workforce played a major role in Pakistan's fight against the COVID-19 pandemic.

The PARC has a total of seven sanctioned posts (PSO-1, SSO-1, SO-2, Lab Technician-1, Lab Attendant-2) out of which two posts are currently vacant (PSO-1 and SO-1). There are some administrative and political hindrances to filling these two posts. In addition, there is no sanctioned post for drivers, thus temporary makeshift arrangements are being made to meet the demand. The makeshifts are available through contractual posts. Efforts are being made by PARC to acquire sanctioned posts through regularization of these posts. For this, a PC- 4 has been submitted under the NDB surveillance project that proposes 15 sanctioned posts to meet human resource challenges. If approved, the department will get 15 new sanctioned posts and increased human resources.

The Chief of PHLD highlighted the two prominent improvements made to the PHLD in 2017 and 2019, respectively through which all the sanctioned posts, except for two posts, have been filled. The aforementioned two vacant posts are senior level promotion posts for which no eligible candidates have been nominated as yet.

"Yes, two improvements in 2017 and 2019, respectively through which all the sanctioned posts have been covered except for two posts. These two vacant posts are senior level promotion posts — no eligible candidate available"—Chief, PHLD

The FE&DSD has recently received approval for its PC-1 for IDSR that it submitted in May 2021 that amounts to PKRs4.5 billion. Based on this approval, efforts have to be initiated to regularize the proposed HR positions.

Director, NHEPRN mentioned that one of the positions of Deputy Director IT is vacant and efforts are being made to fill it. In this regard, the file for recruiting a suitable candidate has been moved for approval.

3.2.6 Efforts to acquire additional posts for IHR

Efforts have been made by the DoCHE to combat the challenges related to human resources by acquiring

additional positions through PC-1. The DoCHE proposed to the Ministry of NHSR&C to sanction 402 posts against which only 5 positions were created. The remaining 397 positions were to be provided under the regular positions; this case is under consideration with the Ministry of Finance for the past one year. The DoCHE has developed and submitted for approval a plan to revamp the department to the Ministry of NHSR&C for which a decision is currently awaited.

The PARC mentioned that regarding the acquisition of IHR specific posts for PARC there is a lack of focused efforts for dedicating and acquiring IHR related human resources. Further, the available sanctioned positions are general posts to carry out research activities at PARC departments. The recruitment process to fill these vacant posts was initiated but due to administrative and political hindrances was halted; and, there are no active efforts being undertaken to acquire IHR specific workforce to carry out the IHR-GHSA agenda at PARC.

No significant efforts have been made by the PHLD for the acquisition of additional posts. The Department suggested that these efforts could be linked to the recently approved restructuring ordinance of NIH that proposes National Health Labs and CDC, with overlapping functions under IHR and would require additional human resources.

"Current sanctioned posts are not in the context of IHR and are merely ad hoc arrangements. Need for a full-time focal person with IHR expertise —Chief, PHLD

The PC-1 for IDSR has been submitted by FE&DSD for approval. On approval of the plan and the proposed (28) positions, efforts will be made to regularize them. For workforce development, the Division is currently providing FELTP training. The Division envisions and aims to initiate a four-tier approach:

1. Risk Communication
2. Public Health Labs
3. One-Health Tier
4. IDSR

The NHEPRN has developed a report that captures the work done by the Department since its inception and highlights the lack of rationalization of sanctioned positions under the Department. The report suggests rationalizing the available sanctioned positions and reducing them to 30 positions as compared to the currently sanctioned 48 positions. NHEPRN further suggests adding more technical positions (Director/ Deputy Directors) to the HR and reducing the strength of support staff. The report is in the finalization stage and will be then submitted for approval.

3.2.7 Main challenges in fulfilling workforce needs

The main challenges highlighted for the DoCHE were:

- Delays in approval of PC-1 by the Ministry of Planning
- Delays in the approval and release of funds by the Ministry of Finance
- Current recruitment criteria / rules not in line with the IHR-GHSA agenda
- Sanctioned posts not in line with the evolving organizational mandate
- Lack of departments' capacity to manage HR and train them for core capacities/ specific skills in the area of IHR-GHSA
- Temporary deployment of HR from the provinces as a support or makeshift arrangement. As soon as the HR are trained for the core capacities, they are posted back to their provincial set-ups. This leads to a waste of time, training, resources, and the constant gap of a skilled workforce at the directorate level.
- Lack of more options such as donor-supported HR positions specific for IHR-GHSA

Another main challenge identified by a key informant was that IHR is not recognized as a primary mandate or responsibility in PARC or so has not been communicated by the Ministry of National Food Security and Research and the Ministry of NHSR&C. Important issues such as the lack of approval of projects, delayed initiation of funds and lack of continuous funding (insufficient funds) for the projects and long-term programs are

some of the major hindrances to seeking and securing requisite HR capacities. The lack of in-service training was also mentioned as a major challenge to having the requisite skills set among the available workforce followed by the lack of a comprehensive plan for orientation and refresher courses for technical HR that are to be engaged under the IHR-GHSA.

At the PHLD, one of the challenges faced by the Division is that the current sanctioned posts in PHLD are not specific to the IHR-GHSA and are merely under ad hoc arrangements. The Division lacks a full-time focal person with IHR expertise thus obstructing advocacy and communications for the IHR agenda.

FE&DSD identified the lack of timely approval of work plans and recruitment of a skilled workforce as a major challenge. It further informed that the lack of designated or sanctioned positions is a huge gap in the Implementation of the IHR National Action Plan.

"Lack of timely approval of work plans and workforce. Lack of designated workforce"— PSO, FEDSD

Lack of rationalization of the current workforce as per the aim of the department and nonplacement of technical staff within the department were the two major challenges highlighted by the NHEPRN. Similar challenges were shared in relation to the function and responsibilities of MoCC.

3.2.8 Key steps/ initiatives for acquiring workforce for IHR

In order to have the requisite workforce for IHR-GHSA, the DoCHE suggested that the Ministry of NHSRC should develop a dedicated cell to resolve HR related issues in the associated departments. The functions of the cell must align with HR recruitment, training, and capacity building of the skilled workforce and to ensure a follow up. It was further suggested that these gaps in acquiring the skilled workforce can be addressed by making DoCHE an autonomous body. DoCHE would then have the authority to build the capacity to recruit, train, and deploy HR as per the department's role and the IHR mandate.

In order to achieve the IHR-GHSA agenda, the PARC suggested the following measures:

- The Ministry of NHSR&C should take the lead in the IHR agenda and all the funds from government or donors should be placed under its jurisdiction. It should then allocate the funds to the line Ministries or Departments and oversee the financial utilization and its alignment with activities.
- Timely approval of the projects and release of funds is critical.
- IHR specific evaluation and assessment of HR is necessary to identify the needs as well as types of training.
- Role-specific posts should be created for IHR, and human resources should be recruited against these specific positions.
- Short-medium-and-long-term recruitment should be implemented as per the NAPHS. Those recruited and trained under short-term projects could be assessed for their capacities and may then be shifted to the regular positions. This would help in retaining the trained human resources and skilled workforce.
- In order to ensure the implementation and sustainability of IHR-GHSA, there must be a law/ regulatory framework to avoid the pitfalls from frequent changes in regulations as per the changing political leadership. This will ensure the continuity of activities as per the NAPHS.

The PHLD suggested that there is a need to restructure the system focusing on an IHR-specific workforce, and that the current scientists with laboratory core capacities should be assigned the role of IHR coordination. It recommended capacity building of the existing workforce through training, sensitization regarding the importance of IHR, and a lab-systems approach. This should be followed by an understanding of the importance of IHR reporting and risk assessment tools. It recommended that the recently established Public Health Lab Systems in the provinces should carry out an HR profiling and HR needs assessment that would contribute toward strengthening the health system and to IHR core capacity building.

The FE&DSD made the following recommendations to strengthen the IHR workforce:

- Establish a team of skilled and focused workforce at the FE&DSD to strengthen the IHR core capacities
- Create regular positions for the skilled workforce through an approved budget to ensure the sustainability of the IHR-GHSA
- Create a combined action plan for all diseases rather than have separate action plans for each, and human surveillance components be added to this action plan
- Strengthen the system to support the implementation of these work plans
- Support FELTP-trained individuals in the government sector for career structure and growth to ensure HR retention and services in the field

To have the requisite workforce for IHR, NHEPRN suggested:

- Rationalization of human resources in the department by adding more technical positions to carry out the preparedness and response activities. The department's HR must include a Technical Director overseeing the technical areas such as public health activities and training. Positions such as Nontechnical Director along with Deputy Director, Administration and Deputy Director, IT must be created and utilized by the department.
- The DG, NHEPRN should hold the power and authority to use funds, without a certain limit, as per the emergency requirement. Constraints in funds approval in case of emergencies reduces the efficiency of the emergency response and adversely affects the population.

To have the requisite HR for IHR-GHSA functions, the MoCC recommended that organizational prioritization needs to be instilled within the Ministry and its affiliate Departments. Furthermore, the MoCC also needs to enhance coordination and strengthen linkages with other departments/ministries for intersectoral interventions. Such coordination is essential to fulfill/ furnish the HR requirements for its respective roles and responsibilities.

Furthermore, IHR-GHSA progress-related activities need to be initiated for the all concerned departments to regularly review performance against given roles and functions. The MoCC needs to initiate internal reviews with reference to the recruitment of existing and required HR for IHR-GHSA functions and to ascertain the gaps that need to be filled within the Ministry and its affiliate Departments.

4. DOMAINS OF TRAINING NEEDS FOR IHR-GHSA AND NAPHS AT FEDERAL LEVEL

A total of 13 functions/roles based on thematic areas under the NAPHS were identified for the training needs of federal level departments. These thematic areas were envisaged in relation to the required workforce and their respective domains of capacity building under the three pillars of Prevent-Detect-Respond (Table 11). Among these thematic areas, four each specifically pertained to the domains of Prevent and Detect respectively, while another four were identified as cross-cutting thematic areas across the three domains.

Table 11: Thematic Areas of Workforce and Capacity Development Requirements

<table>
<tr><th rowspan="2">S. No.</th><th colspan="3">NAPHS domains and its functions/roles based on thematic areas</th></tr>
<tr><th>Prevent</th><th>Detect</th><th>Respond</th></tr>
<tr><td>1</td><td>Preparedness</td><td>Surveillance & Epidemiology (IDSR/EBS*)</td><td rowspan="4">Emergency Response Operations</td></tr>
<tr><td>2</td><td>Immunization</td><td>Mapping and data collection</td></tr>
<tr><td>3</td><td>Food safety</td><td>Antimicrobial resistance</td></tr>
<tr><td>4</td><td>Biosafety and Biosecurity</td><td>National Laboratory systems</td></tr>
<tr><td>5</td><td colspan="3">Entomology and Zoonotic Diseases</td></tr>
<tr><td>6</td><td colspan="3">Statistics/Biostatistics</td></tr>
<tr><td>7</td><td colspan="3">Communication and Coordination including Health Education and Reporting</td></tr>
<tr><td>8</td><td colspan="3">Information Technology and Networking</td></tr>
</table>

*IDSR - Integrated Disease Surveillance and Response
EBS - Events-based surveillance

Under each of the thematic areas, workforce requirements across multiple cadres were identified for performing the mandated functions and roles for NAPHS in accordance with the One-Health approach for human and animal health. The department-wise details of HWF requirements and their training needs are presented in the subsequent sections of this report.

4.1 PREVENT—HWF and Training Needs

The first area of training pertains to the pillar, "Prevent" which is the function of agencies and departments that have the capacity to address health emergencies.

4.1.1 Preparedness

The first category of training in relation to the pillar Prevent is "preparedness" (Table 12). Workforce requirements suggest that for "preparedness" mainly support functions are required as mentioned by nearly all stakeholders. Such capacity enhancement is required for all existing staff, but specifically by NARC. These support functions require tailored training packages that encompass not just technical aspects, but also modules to enable support staff to understand the dynamics of health emergency situations, and how to utilize their

support work in an emergency situation when it arises. The identified staff for the purpose as per NARC, does not include technical personnel but support personnel, who need knowledge and skills enhancement.

Table 12: Preparedness Function by Position, Department, and Agency showing Workforce Requirements and Training Needs

Position	Segment/ Functions	Department	Agency	Available (out of total sanctioned posts)	Vacant (out of total sanctioned posts)	Required additional (non-sanctioned posts)
Auditor (Jr.)	Preparedness	Poultry Diseases Surveillance	NARC	0	0	3
Upper Division Clerk	Preparedness	Poultry Diseases Surveillance	NARC	1	0	0
Driver	Preparedness	Poultry Diseases Surveillance	NARC	0	0	6
Electrician/ Technician	Preparedness	Poultry Diseases Surveillance	NARC	0	0	6
Guard/ Chowkidar	Preparedness	Poultry Diseases Surveillance	NARC	0	0	3
Naib Qasid / Office Attendant	Preparedness	Poultry Diseases Surveillance	NARC	0	0	3
Sweeper/ Janitor	Preparedness	Poultry Diseases Surveillance	NARC	0	0	6
			Total	**1**	**0**	**27**

4.1.2 Immunization

Under prevention, "immunization" is a critical function that has been highlighted by the Poultry and Livestock Diseases Research Departments at NARC. The requirement is to train nine positions of Laboratory Assistants and three positions of Assistant MIS Officers (Table 13). Although not explicitly mentioned by departments of human health during this study, it is obvious that the function of immunization and the need for training of staff working on human health is also warranted. In view of the recent COVID-19 vaccination initiatives, and other disease specific immunization drives in the country (for example, Polio and Measles campaigns), the Polio Program and Expanded Program on Immunization (EPI) staff were engaged along with the workforce of respective departments of health across the provinces and regions of the country including the Capital Territory at the federal level. In the short term, vaccination staff were employed along with setting up special/mass vaccination centers. In this milieu, the support staff performed various functions including registration, reporting, coordination, infection prevention, etc. Trainings on the requisite functions that are performed by support staff in the immunization function need to be institutionalized at the federal level.

For Laboratory Assistants training will be designed

and conducted with respect to immunization administration/vaccine administration, recording and reporting, as well as infection prevention measures. The Assistant MIS Officers post-recruitment will receive training on the immunization-related management information system layouts, data imputation, data management and security, and derivation of outputs/results (Table 13).

Table 13: Immunization Function by Position, Department, and Agency showing HWF Requirements and Training Needs

Position	Segment/ Functions	Department	Agency	Available (out of total sanctioned posts)	Vacant (out of total sanctioned posts)	Required additional (non-sanctioned posts)
Laboratory Assistant	Immunization	Poultry Diseases Research	NARC	0	0	9
Laboratory Assistant	Immunization	Livestock Diseases Research	NVL	0	0	0
Assistant MIS Officer	Immunization	Poultry Diseases Surveillance	NARC	0	0	3
Assistant MIS Officer	Immunization	Livestock Diseases Surveillance	NVL	0	0	0
			Total	**0**	**0**	**12**

4.1.3 Food safety

Food safety training requirements were identified by the Ministry of Food Security and Research and for the agriculture and poultry/livestock sectors. These are primarily required for the HWF of NARC and NVL. The NARC will require training for seven Assistant Scientific Officers and three Technical Officers in its Poultry Diseases Research Department, whereas NVL will require training for one Assistant Scientific Officer and one Technical Officer in its Livestock Diseases Research Department (Table 14). These technical staff members from both NVL and NARC need to be trained for early identification of food contamination and threats to food security, especially contaminants and organisms that are known to cause/transmit illnesses among humans and animals/poultry.

It is imperative to note that the food safety domain includes food hygiene and food handling in relation to the food/catering industry which is a function of district and provincial level management through Food Authorities across provinces of the country. In the federal territory the function of food safety is implemented through the district administration and by food inspectors and monitoring staff members, who on a regular basis make visits to food outlets, restaurants, and hotels for the purpose. The Directorate of Health, in the Capital Development Authority (CDA) is the mandated department and is headed by the Director General.

More importantly, food safety in the context of IHR also pertains to ensuring safety of food stockpiles and safe transport and distribution mechanisms. In ICT, the food department is mandated to regulate the business of food grains including purchase, storage, sales, transfer, milling, and quality control in the Islamabad Capital Territory. This department operates under the auspices of the district administration.

Testing services for food safety are conducted by the NVL and NARC on behalf of the food department and CDAs of the Directorate of Health.

Table 14: Food Safety Function by Position, Department, and Agency showing HWF Requirements and Training Needs

Position	Segment/ Functions	Department	Agency	Available (out of total sanctioned posts)	Vacant (out of total sanctioned posts)	Required additional (non-sanctioned posts)
Assistant Scientific Officer	Food Safety	Poultry Diseases Research	NARC	0	0	7
Assistant Scientific Officer	Food Safety	Livestock Diseases Research	NVL	0	0	1
Technical Officer / Engineer	Food Safety	Poultry Diseases Surveillance	NARC	0	0	3
Technical Officer / Engineer	Food Safety	Livestock Diseases Surveillance	NVL	0	0	1
			Total	**0**	**0**	**12**

Hence, training of workforce for food safety at the federal level is for the set of personnel working under the auspices of the capital administration, NARC and NVL. The workforce can be trained through the Pakistan Agricultural Research Council. In view of the proximity of the federal territory and Rawalpindi district, the Arid University in Rawalpindi could be another institute, the resources of which can be employed for training the workforce in aspects of food security. Additionally, institutes in the private sector across all major urban centers including Islamabad, offer food hygiene and food handling courses and certifications. The latter avenue may be explored for training of the implementation arm of the workforce that is working under the capital administration.

Decisions on extent and scope of training will need to be taken in consultation with the Pakistan Standard and Quality Control Authority (PSQCA) under the Ministry of Science and Technology. PSQCA is the standards setting and regulating authority for Pakistan. Training may focus on the framing, publishing, amending/ revising or withdrawal of Pakistan Standards in relation to food products that fall under this domain.

4.1.4 Biosafety and Biosecurity

One of the critical areas of the "Prevention" domain are aspects related to Biosafety and Biosecurity. During the course of the study, Biosafety and Biosecurity were identified as markedly neglected areas. There is almost no staff allocated/responsible for these functions on the animal health side, and most (15 out of the 16 HWF positions mentioned) are additional requirements under this area.

To fulfill the biosafety and biosecurity functions at the NARC, the Poultry Diseases Research Department requires training for seven Laboratory Technicians and three Assistant Technical Officers. The NVL requires training for four Laboratory Technicians and one Assistant Technical Officer for the Livestock Diseases Research Department (Table 15).

Table 15: Biosafety and Biosecurity Function by Position, Department, and Agency showing HWF Requirements and Training Needs

Position	Segment/ Functions	Department	Agency	Available (out of total sanctioned posts)	Vacant (out of total sanctioned posts)	Required additional (non-sanctioned posts)
Laboratory Technician	Biosafety and Biosecurity	Poultry Diseases Research	NARC	0	0	7
Laboratory Technician	Biosafety and Biosecurity	Livestock Diseases Research	NVL	1	0	4
Assistant Technical Officer / Assistant Engineer	Biosafety and Biosecurity	Poultry Diseases Surveillance	NARC	0	0	3
Assistant Technical Officer / Assistant Engineer	Biosafety and Biosecurity	Livestock Diseases Surveillance	NVL	0	0	1
			Total	**1**	**0**	**15**

Training of technical staff members on Biosafety and Biosecurity requires highly skilled trainers. With the support of Public Health England and Fogarty International, the National Institute of Health in Pakistan conducted trainings for these aspects during 2017; and in 2018 in partnership with COMSTECH and Pakistan Biological Safety Association. The same avenues may be utilized for training NVL and NARC staff on Biosafety and Biosecurity.

4.2 DETECT—HWF and Training Needs

4.2.1 Surveillance and Epidemiology

The functions of Surveillance and Epidemiology are the responsibility of the subdepartments of NIH, namely, FEDSD, PHLD, and FELTP; while NARC, NHEPRN, and NVL are responsible for the animal-livestock/agriculture sectors (Table 16).

Table 16: Surveillance and Epidemiology Functions and Department-wise HWF Requirements and Functions-wise Training Needs

Position	Functions/ Segment for training needs	Department	Agency	Available (out of total sanctioned posts)	Vacant (out of total sanctioned posts)	Required additional (non-sanctioned posts)
Chief	Epidemiology/ Surveillance	FEDSD	NIH	1	0	0
Principal Scientific Officer	Epidemiology/ Surveillance	FEDSD	NIH	1	0	0
Principal Scientific Officer	IDSR/ EBS	FEDSD	NIH	0	0	1
Disease Surveillance Officer	Surveillance	FEDSD	NIH	1	0	1
Medical Officer	Surveillance	FEDSD	NIH	1	1	0
Research Officer	Surveillance	FEDSD	NIH	1	0	1
Senior Scientific Officer	Epidemiology	FEDSD	NIH	1	1	0
Senior Scientific Officer	IDSR	FEDSD	NIH	0	0	2
Senior Scientific Officer	One Health	Epidemiology - One Health	NIH	0	0	1
Scientific Officer	Surveillance	FEDSD	NIH	2	1	0
Scientific Officer	Epidemiology	FEDSD	NIH	2	2	0
Scientific Officer	Disease Surveillance	FELTP	NIH	0	0	1
Scientific Officer	Veterinary Epidemiology	Epidemiology - One-Health	NIH	1	0	1
Scientific Officer	Environmental Health	Epidemiology - One-Health	NIH	0	0	1
Assistant Scientific Officer	Real-Time Surveillance	Poultry Diseases Surveillance	NARC	0	0	14
Assistant Scientific Officer	Real-Time Surveillance	Livestock Diseases Surveillance	NVL	0	0	2
Deputy Director (Information Technology)	Mapping, Data collection	IT Section	NHEPRN	0	1	0
Epidemiologist/ Public Health Expert	Testing & sequencing- based Epidemiology	PHLD	NIH	0	0	2
			Total	**11**	**6**	**27**

There is a need for 27 additional positions and five currently vacant positions for surveillance and epidemiology that need to be filled across the three human health departments of NIH and one of NHEPRN, and two animal health sector departments of NVL and NARC. A total of 38 technical resource persons of various cadres needs to be trained (27 + 11) on surveillance and epidemiology that encompass the technical areas of IDSR, Surveillance and EBS, Epidemiology, One-Health, Veterinary Epidemiology (livestock and poultry diseases) and on methods of mapping and data collection.

The surveillance and epidemiology related trainings may be conducted under the auspices of the FELTP program that is housed at the National Institute of Health. The FELTP program is currently being transitioned/ handed over from the Centers for Disease Control (CDC-USAID) to the NIH through to Government of Pakistan's own financing and strengthening efforts. The trainings should be segmented into shorter and longer version formats that extend to generic skills as well as disease specific skills that could be bifurcated as:

1. On-the-job training of existing staff members (such as Continued Skills Enhancement/Training Program(s))

2. Induction training of new appointees for vacant and additional positions

3. Ongoing capacity building activities for disease specific surveillance

It is pertinent to mention that under the recent pilot initiative of IDSR that is being supported by Public Health England for strengthening the surveillance and epidemiologic skills at the FEDSD-NIH (since 2018 to date), a seven modules-based curriculum has been finalized in consultation with the National Institute of Health (NIH, Pakistan), the latter being the focal body for disease surveillance and response in Pakistan. The same has been used to train workforce at the federal level and from the provinces during 2019-21 period.

4.2.2 Antimicrobial resistance

The "Detect" segment of the health workforce requires technical officers within the health network with the capacity to monitor and detect emerging health threats. While some of the positions are available and filled (6) an additional 20 positions will be required to fulfill the requirements for appropriate implementation of NAPHS.

The NARC will require training of six Senior Scientific Officers and eight Scientific Officers for the Poultry Diseases Research Department. NVL requires training of three Senior Scientific Officers and six Scientific Officers for the Livestock Diseases Research Department (Table 17).

Table 17: Antimicrobial Resistance Function and Department-wise HWF Requirements and Functions-wise Training Needs

Position	Functions/ Segment	Department	Agency	Available (out of total sanctioned posts)	Vacant (out of total sanctioned posts)	Required additional (non-sanctioned posts)
Senior Scientific Officer	Antimicrobial Resistance	Poultry Diseases Research	NARC	1	0	6
Senior Scientific Officer	Antimicrobial Resistance	Livestock Diseases Research	NVL	1	0	2
Scientific Officer	Antimicrobial Resistance	Poultry Diseases Surveillance	NARC	2	2	8
Scientific Officer	Antimicrobial Resistance	Livestock Diseases Surveillance	NVL	2	0	4
			Total	**6**	**2**	**20**

4.2.3 National laboratory system

A critical component of the "Detect" function is the development of the National Laboratory System that is essential for the establishment of a well-functioning surveillance system. Three agencies have an important role in this: (i) NIH, (ii) NARC, and (iii) NVL. Various training modules will need to be developed for technical positions such as Laboratory Attendants, Scientists, Technologists, and Biomedical Engineers.

NIH shared that it will additionally require 11 Scientists, 15 Technologists, 8 Technicians and 2 Biomedical Engineers (Table 18), while NARC will require an additional 9 Laboratory Attendants to be trained, and NVL will require training for 3 additional Laboratory Attendants (Table 18).

Table 18: National Laboratory System Functions and Department-wise HWF Requirements and Functions-wise Training Needs

Position	Functions/ Segment	Department	Agency	Available (out of total sanctioned posts)	Vacant (out of total sanctioned posts)	Required additional (non-sanctioned posts)
Laboratory Attendant	National Laboratory System	Poultry Diseases Research	NARC	0	0	9
Laboratory Attendant	National Laboratory System	Livestock Diseases Research	NVL	0	0	3
Administrative. Officer	National Laboratory System	Poultry Diseases Surveillance	NARC	0	0	3
Administrative Officer	National Laboratory System	Livestock Diseases Surveillance	NVL	0	1	1
Scientist	Public Health Testing	Public Health Laboratory	NIH	9	2	11
Technologist	Public Health Testing	Public Health Laboratory	NIH	6	0	15
Technician (other)	Public Health Testing	Public Health Laboratory	NIH	13	0	8
Attendant/ Sweeper	Public Health Testing	Public Health Laboratory	NIH	14	0	4*
Biomedical Engineer	Public Health Testing	Public Health Laboratory	NIH	0	0	2
			Total	**42**	**3**	**56**

4.3 RESPOND—HWF and Training Needs

4.3.1 Workforce development

Department-wise and cadre-wise training requirements for workforce development to strengthen the "Response" component of disease surveillance are provided in Table 19. The departments of NIH, NARC, and NEHPRN have highlighted the need for positions that will work on strengthening the organizational workforce across the respective departments. In this regard NIH requires three additional positions at PSO, SSO and SO levels (one each) for the FELTP department. The NARC will require six additional positions at the level of DEO/ KPO for Poultry Diseases Surveillance.

NHEPRN does not require additional personnel for workforce development. It should be noted that the two positions of Deputy Director already available are not vacant; however, these two positions have been seconded to the Mo NHSR&C and therefore the tasks they are supposed to conduct at NHEPRN are compromised (see Table 19). It is suggested that either the seconded technical staff members are reverted back to the NHEPRN, or their replacements be placed in the requisite positions for this department to be able to fulfill the roles of these positions.

Table 19: Workforce Development and Training Functions by Position, Department, and Agency showing HWF Requirements and Functions-wise Training Needs

Position	Function/ Segment	Department	Agency	Available (out of total sanctioned posts)	Vacant (out of total sanctioned posts)	Required additional (non-sanctioned posts)
PSO	Workforce Development	FELTP	NIH	0	0	1
Senior Scientific Officer	Workforce Development	FELTP	NIH	1	1	1
Scientific Officer	Workforce Development	FELTP	NIH	0	0	1
DEO / KPO	Workforce Development	Poultry Diseases Surveillance	NARC	0	0	6
Deputy Director (Training/ Public Health)	Conduct training and public health related activities	Training and Public Health	NEPHRN	2	*	0
			Total	**3**	**1**	**9**

The study noted that workforce development at the departmental levels would need the personnel performing these functions, to constantly work towards identifying emerging training and capacity development needs, and then to modulate their working for planning, organizing, and conducting these capacity development activities in partnership with various institutes/organizations.

4.3.2 Emergency response operations

The requirement of personnel for emergency response operations was starkly evident during the COVID-19 pandemic. The suspected zoonotic origin of the SARS CoV-2 virus amplifies the need for the establishment of well-staffed Emergency Response Operations at both NARC and NVL.

NARC will require 12 additional positions of Laboratory Technicians to strengthen Emergency Response Operations at the Poultry Diseases Surveillance Department (Table 20).

Table 20: Emergency Response Operations Functions by Position, Department, and Agency showing HWF Requirements and Functions-wise Training Needs

Position	Function/ Segment	Department	Agency	Available (out of total sanctioned posts)	Vacant (out of total sanctioned posts)	Required additional (non-sanctioned posts)
Laboratory Attendant	Emergency Response Operations	Livestock Diseases Surveillance	NVL	6	0	4
Laboratory Technician	Emergency Response Operations	Poultry Diseases Surveillance	NARC	1	0	12
Laboratory Technician	Emergency Response Operations	Livestock Diseases Surveillance	NVL	6	0	8
Laboratory Assistant	Emergency Response Operations	Livestock Diseases Surveillance	NVL	0	0	0
Upper Division Clerk	Emergency Response Operations	Livestock Diseases Surveillance	NVL	1	0	1
Driver	Emergency Response Operations	Livestock Diseases Surveillance	NVL	1	0	0
Electrician/ Technician	Emergency Response Operations	Livestock Diseases Surveillance	NVL	0	0	1
Guard/ Chowkidar	Emergency Response Operations	Livestock Diseases Surveillance	NVL	1	0	0
Naib Qasid / Office Attendant	Emergency Response Operations	Livestock Diseases Surveillance	NVL	2	0	0
Sweeper/ Janitor	Emergency Response Operations	Livestock Diseases Surveillance	NVL	2	0	3
			Total	**20**	**0**	**29**

The proposed training needs pertain to coordination across multiple sectors for arranging/securing required resources, developing inventories, developing implementation plans, harmonizing supply chain mechanisms for logistics, and reporting/recording mechanisms. The latter would entail linking with surveillance operations as well as multitier syncing of response operations data with the surveillance functions. Regular progress reviews are anticipated to be an essential feature of emergency operations functions. The proposed capacity development for workforce entails planning, implementing, and coordinating, measuring, analyzing, and reporting on response functions. Each of these capacity development functions would warrant contextualized trainings for the workforce in the animal and human health sectors respectively. In view of the segments for capacity development, multiple sources/institutes may be considered for trainings such as the Communicable Disease Centers (CDC) Institute-NIH Pakistan, which is the focal point for communicable diseases and their control. In view of the recent establishment of this entity, support may be sought from partner academic institutes such as the Health Services Academy Pakistan, the Aga Khan University, The Institute of Public Health, Punjab, etc. The above institutes can develop contextualized training modules to impart trainings. Arrangements amongst the respective institutes could involve:

1. Long-term contractual/collaborative arrangements
2. Batch-wise training
3. Initial trainings that are followed up with regular refresher courses
4. Training as and when needed

Avenues for Emergency Operations related training of the workforce may also be explored through development partner agencies that have global and demonstrated expertise in emergency operations. Such partners may include UN agencies, CDC-USA, Public Health England, and/or INGOs who already have requisite training materials developed and tested across diverse settings and can benefit the emergency operations related preparedness for federal level agencies engaged in IHR in Pakistan.

4.4 Interrelated Workforce Training Requirements

4.4.1 Communication

Communication is a pivotal part of any health emergency response, and also in the context of IHR-GHSA. Most agencies are reported to be currently deficient in this respect (Table 21).

NARC will require one Senior Scientific Officer (SSO) positions to manage IHR Coordination, Communication, and Advocacy related matters along with three Office Assistant positions to cater to reporting needs. Similarly, NVL has highlighted an additional requirement of one SSO and two Office Assistants who are expected to support these functions.

Table 21: Communication Function by Position, Department, and Agency showing HWF Requirements and Functions-wise Training Needs

Position	Functions/ Segment	Department	Agency	Available (out of total sanctioned posts)	Vacant (out of total sanctioned posts)	Required additional (non-sanctioned posts)
PSO	Communication	IHR/ GHSA	NIH	0	0	0
PSO	Health Education	Epidemiology/ Surveillance	NIH	0	0	0
Senior Scientific Officer (SSO)	Communication	IHR/ GHSA	NIH	0	0	0
Senior Scientific Officer	Coordination	IHR/ GHSA	NIH	0	0	0
Senior Scientific Officer	Health Education	Epidemiology/ Surveillance	NIH	0	0	0
Senior Scientific Officer	IHR Coordination, Communication and Advocacy	Poultry Diseases Surveillance	NARC	1	0	0
Senior Scientific Officer	IHR Coordination, Communication and Advocacy	Livestock Diseases Surveillance	NVL	1	1	1
Scientific Officer	Communication	IHR/ GHSA	NIH	0	0	0
Scientific Officer	Coordination	IHR/ GHSA	NIH	0	0	0
Scientific Officer	Health Education	Epidemiology/ Surveillance	NIH	2	2	2
Office Assistant	Reporting	Poultry Diseases Surveillance	NARC	0	0	0
Office Assistant	Reporting	Livestock Diseases Surveillance	NVL	2	0	0
			Total	**6**	**3**	**20**

Table 21 provides the additional workforce requirements as shared by NIH. It shows that NIH will need one Principal Scientific Officer (PSO) each for the functions of Communication and Health Education; one SSO each to perform the function of Communication, Coordination and Health Education; and one SO each for the functions of Communication and Coordination.

In view of the diverse sets and levels of communication strategies and activities that need to be adopted for IHR-GHSA functions, personnel may be apportioned across the dimensions of:

1. Public Health awareness and risk communication at the population level
2. Organization (for example, media channels, Ministry of Information-Broadcasting, etc.)
3. Advocacy
4. Health Education of human and animal health workforce

The Epidemiology and Disease Surveillance Institute, and the CDC at NIH Pakistan could be the focal entities for organizing such capacity building in partnership with the Pakistan Agriculture Research Council (PARC). Organizations and partner agencies having demonstrated expertise in disease prevention and control related communication may be the entities who can further supplement such efforts and initiatives.

4.4.2 Information technology and networking

The use of Information Technology (IT) and networking is fundamental to not only the timely generation of information but also the speedy and regular relay of the same information to decisionmakers during health emergencies as well as a matter of routine. NIH will need additional personnel to perform IT related functions at the Epidemiology/ Surveillance Institute. These positions will be required at the level of SSO (1) and SO (2) (Table 22).

A similar need has been recorded for networking at the Epidemiology/ Surveillance Department. One SSO and two SOs for networking will be required (Table 22).

Table 22: Information Technology and Networking Function by Position, Department, and Agency showing HWF Requirements and Functions-wise Training Needs

Position	Functions/ Segment	Department	Agency	Available (out of total sanctioned posts)	Vacant (out of total sanctioned posts)	Required additional (non-sanctioned posts)
Senior Scientific Officer	Information Technology	Epidemiology/ Surveillance	NIH	1	0	1
Senior Scientific Officer	Networking	Epidemiology/ Surveillance	NIH	0	0	1
Scientific Officer	Information Technology	Epidemiology/ Surveillance	NIH	2	0	2
Scientific Officer	Networking	Epidemiology/ Surveillance	NIH	0	0	2
			Total	**3**	**0**	**6**

In this milieu, it is noteworthy that the Epidemiology and Surveillance Institute of NIH is in the process of establishing a data center and engaging Information Technology (IT) and networking personnel. Furthermore, digitization of processes is also being undertaken at the NVL and NARC. These IT related enhancements for IHR-GHSA across the human and animal health sectors at the federal level, warrants capacity development initiatives, since IHR-GHSA skills related experts and personnel are scarce in the country. The workforce needs to be trained on disease surveillance and other disasters related management of IT functions, in addition to the development of IT skills. Such trainings can be imparted by the human and animal health sectors respectively by themselves, or through recognized professionals/training institutes/ universities, and national and international level development partner agencies. It is noteworthy, that the CDC-USA, CDC-China and Public Health, England have been engaged by Pakistan for extending such support in recent years, and they may be considered as preferential partners for the purpose.

4.4.3 Statistics/Biostatistics

NIH will require bio/statisticians for the additional positions of SO (1), Assistants (1), and Statistician (4) (Table 23).

Disease patterns related analytics and execution of other health related analyses for IHR-GHSA functions entails specific workforce capacity development in relation to all three pillars of Prevent, Detect and Respond.

Table 23: Bio/Statistics Function by Position, Department, and Agency showing HWF Requirements and Functions-wise Training Needs

Position	Functions/ Segment	Department	Agency	Available (out of total sanctioned posts)	Vacant (out of total sanctioned posts)	Required additional (non-sanctioned posts)
Senior Scientific Officer	Statistics/ Biostatistics	Epidemiology/ Surveillance	NIH	1	1	0
Scientific Officer	Biostatistics	FELTP	NIH	0	0	1
Statistical Officer	Statistics/ Biostatistics	Epidemiology/ Surveillance	NIH	2	0	0
Statistical Assistant	Statistics/ Biostatistics	Epidemiology/ Surveillance	NIH	1	0	1
Statistician	Public Health Testing	Public Health Laboratory	NIH	0	0	4
			Total	**4**	**1**	**6**

Training needs pertain to, but are not limited to:

1. Establishment of threshold levels for notifiable diseases and endemic illnesses
2. Derivations and illustrative and GIS-based depictions for early identification of outbreaks/ hazards/evolving disasters
3. Linkages with other databases (across animal and human health sectors) and extraction of data outputs that pertain to diverse sets of sectors for efficient prevention, detection and response
4. Circumscribed derivations for operational level and management/policy level personnel for anticipated threats, and any ongoing outbreaks/hazards as per routine and for fulfillment of emerging data/ analysis needs

Trainings of such nature are already conducted at the NIH at the federal level through technical support of CDC-USA, and the function is being transitioned during 2021-22 to the Epidemiology and Surveillance Institute of NIH. The said institute has demonstrated capacity to impart such skills to public health professionals in the public and private sectors. Additionally for acquisition of emerging and new skills sets, training needs may also be fulfilled both for the animal and human health sectors through partnerships with national and international academic institutes, UN agencies (for example, World Health Emergencies (WHE) division and Division of Science, Information and Dissemination (SID) of WHO).

4.4.4 Entomology

Workforce skilled in Entomology is currently lacking at NIH, NARC, and NVL (Table 24). NIH requires one additional SO. NARC requires seven additional SOs and three Communication Specialists, while NVL requires three additional SOs and one Communication Specialist (Table 24).

There are special Entomology sections/ subdepartments in both the human health and animal health sectors which have training needs for existing as well additionally required staff members. In view of such specialized field, it is pertinent to mention that there are 17 public sector universities that have specialized Entomology departments across the country. The most geographically adjacent university with reference to the Federal Territory is the Arid University, Rawalpindi (12 kilometers from NIH, Islamabad). Given the smaller number of proposed personnel that are to be engaged/involved for the Entomology function under IHR-GHSA, the above University or any alternative/better ranked institute may be formally engaged for fulfilling training needs. Support and technical assistance for addressing these training needs may also be solicited from other national and international partners involved in the domains of Neglected Tropical Diseases, and Entomology related vector-borne diseases.

Table 24: Entomology Function by Position, Department, and Agency showing HWF Requirements and Functions-wise Training Needs

Position	Functions/ Segment	Department	Agency	Available (out of total sanctioned posts)	Vacant (out of total sanctioned posts)	Required additional (non-sanctioned posts)
Scientific Officer	Entomology	Epidemiology - One Health	NIH	1	0	1
Scientific Officer	Zoonotic Disease	Poultry Diseases Research	NARC	0	0	7
Scientific Officer	Zoonotic Disease	Livestock Diseases Research	NVL	1	0	3
Communication Specialist	Zoonotic Disease	Poultry Diseases Surveillance	NARC	0	0	3
Communication Specialist	Zoonotic Disease	Livestock Diseases Surveillance	NVL	0	0	1
			Total	**2**	**0**	**15**

4.5 Conclusion

Human resources for health (that is, the health workforce or HWF) is one of the primary pillars that determines the efficiency and performance of a health system, and more specifically, the amicable conduct of specialized functions in relation to IHR-GHSA. Unfortunately, the sectors of health, agriculture, and animal husbandry/livestock that relate to One Health segment of IHR-GHSA in Pakistan, reflect an inadequate and unequal distribution of human resources. This study identified that there is a major lack of available requisite workforce across the considered segments/departments at the federal level. Furthermore, among the available personnel, there is inadequate knowledge and lack of IHR specific skills. This reflects a major challenge for implementation of the IHR National Action Plan in the country at the federal level. Deficiency in HWF Availability is further augmented by limited budget, delays in the approval and release of funds, insufficient positions, and lack of capacity building training that are some other major challenges.

Key respondents from all the organizations recommended recruitment of human resources in regularized positions supported by the Government and capacity building training programs along with in-service training of the current and prospective workforce as a sustainable solution for achieving the IHR-GHSA agenda. There is an urgent need to strengthen the health system in order to provide a supportive and conducive environment for the implementation of the IHR National Action Plan while ensuring adequate functionality and sustainability

PHLD, in particular, suggested capacity building of the existing workforce through training, and sensitization regarding the importance of the IHR and lab systems approach. This should be followed by developing an understanding of the importance of IHR reporting and risk assessment tools. It was also suggested that the recently established Public Health Lab Systems in the provinces should carry out an HR profiling and HR needs assessment that would contribute toward the health system and to IHR core capacity building. Similar suggestions were made by the FE&DSD, NHEPRN, PARC, and CHE. In this regard, it is imperative that a pool of epidemiologists as per the recommended ratio of 2:100,000 population should be engaged/trained along with other technical staff members to establish a robust triad of prevent-detect-response functions in the IHR-GHSA domain.

5. SUMMARY OF KEY FINDINGS

The summary findings for IHR related human resources are organized under three major domains: (1) Prevent, (2) Detect, and (3) Respond. The tables in this report provide information for each organization/ department and identify the number of HR required, existing HR and the gap by category/ type of HR. An important consideration in this regard is that some of the human resources may have overlapping functions across the three domains. For example, it is logical to assume that HR for communication while primarily placed under the Respond domain, may also overlap with communication personnel in the Prevent domain as and when the situation arises.

5.1 Prevent

CHE has significant gaps in its ability to perform designated Prevent functions. Mainly there is a requirement for or fumigators and sanitation workers. PARC currently does not have any HR that can perform Prevent functions. In this regard the main requirement is for laboratory and IT personnel only.

FEDSD has highlighted the need for various cadres of scientific officers to enable the department perform Prevent functions. NEPHRN needs one Deputy Director level administrative support; the position already exists, but is placed in another department (Table 25).

Table 25: Prevent Functions-Related HRH Gaps

	Type/Category of HR	HR Required	Existing/ Available HR	HR gap to be filled
Central Health Establishment	Sanitary Inspector	10	5	5
	Sanitary Worker	64	36	28
	Fumigator	73	14	59
	Fumigation Cooly	97	41	56
PARC	Lab Assistant (Immunization)	9	0	9
	Assistant Scientific Officer (Food Safety)	7	0	7
	Lab Technician (Biosafety)	7	0	7
	Assistant MIS Officer (Immunization)	3	0	3
FEDSD	PSO Health Education	1	0	1
	SSO Health Education	1	0	1
	SO Health Education	2	2	0
	PSO Workforce Development	1	0	1
	SSO Workforce Development	1	1	0
	SO Workforce Development	1	0	1
	SO Disease Surveillance	1	0	1
	SO Biostatistics	1	0	1
NEPHRN	Deputy Director (Admin.)	0	1	0
	TOTAL	**279**	**100**	**179**

SO – Scientific Officer
SSO – Senior Scientific Officer
PSO- Principal Scientific Officer

5.2 Detect

The HR requirement for the Detect function was recorded by all departments. The main categories are Epidemiologists, Statisticians, Public Health, Laboratory and IT personnel (Table 26). These variously skilled personnel are required to strengthen the disease surveillance components of IHR related activities.

Table 26: Detect-Related HRH Requirements and Gaps

	Type/Category of HR	HR Required	Existing/ Available HR	HR gap to be filled
Central Health Establishment	Data Entry Officer	17	0	17
	Health Technician	39	5	34
	Lab Assistant	10	0	10
PARC	Senior Scientist (Research)	6	0	6
	Scientific Officer (Research)	7	0	7
	Lab Attendant (Research)	9	0	9
	DEO / KPO	6	0	6
	Assistant Scientific Officer	14	0	14
	Technical Officer / Engineer	3	0	3
	Scientific Officer (AMR)	8	2	6
NIH	Scientist	11	2	11
	Technologist	15	0	15
	Technician (other)	8	0	8
	Biomedical Engineer	2	0	2
	Epidemiologist/ Public Health Expert	2	0	2
	Statistician	4	0	4
FEDSD	PSO Epidemiology	0	0	0
	Disease Surveillance Officer	1	0	1
	Medical Officer	1	1	0
	Research Officer	1	0	1
	SSO Epidemiology	1	1	0
	SO Epidemiology	2	2	0
	PSO IDSR	1	0	1
	SSO IDSR	2	0	2
	SO Surveillance	2	1	0
	SSO IT	1	0	1
	SO IT	2	0	2
	SSO Networking	1	0	1

	Type/Category of HR	HR Required	Existing/ Available HR	HR gap to be filled
	SO Networking	2	0	2
	SSO Statistics	1	1	0
	Statistical Officer	2	0	0
	Statistical Assistant	1	0	1
	SSO One Health	1	0	1
	SO Entomology	1	0	1
	SO Veterinary Epidemiology	1	0	1
	SO Environmental Health	1	0	1
NEPHRN	Deputy Director (Information Technology)	0	1	0
	TOTAL	**186**	**16**	**170**
DEO: Data Entry Operator; KPO: Key Punch Operator.				

5.3 Respond

The main cadres identified for the Respond function are medical officers, paramedics, coordination and communication experts as well as laboratory personnel (Table 27).

Table 27: Respond-Related HRH Requirements and Gaps

	Type/Category of HR	HR Required	Existing/ Available HR	HR gap to be filled
Central Health Establishment	Medical Officer	109	59	50
	Nurse	12	0	12
	Dispenser	60	26	34
	Quarantine Assistant	80	21	59
PARC	Senior Scientific Officer (IHR Coordination)	1	0	7
	Communication Specialist	3	0	3
	Lab Technician (Emergency Response)	1	0	1
	Lab Assistant (Emergency Response)	1	0	1
FEDSD	Lab Attendant (Emergency Response)	3	0	3
	SSO Coordination	1	0	1
	SO Coordination	1	0	1
	SSO Communication	1	0	1
	SO Communication	1	0	1
	Deputy Director (Training/ Public Health)	2	*	2
	TOTAL	**282**	**106**	**176**

5.4 Summary Recommendations to Fulfill Training Needs for IHR-GHSA

The identified training needs for fulfilling the requisite functions of IHR-GHSA in accordance with the NAPHS at the federal level, pertain to 13 areas, segmented across the three pillars—, Prevent, Detect and Respond. Of these pillars, the areas of preparedness, immunization, food safety, and Biosafety and Biosecurity fall within the purview of Prevent; Surveillance and Epidemiology, mapping and data collection, AMR and National Laboratory Systems fall within the purview of Detect; while Emergency Operations fall within the purview of Respond, respectively. The areas of Entomology and Zoonotic diseases, Statistics/Biostatistics, Communication and Coordination, and Information Technology and networking are cross-cutting domains across all three pillars (Table 11).

This review concluded that most of the departments in both animal and human health sectors had urgent requirements for filling existing sanctioned posts as well as for additional workforce. Engagement of the requisite workforce, also requires training needs to be met among the 13 areas of work.

Current capacities to supply sufficient number of fresh graduates (diploma and/or degree holders) for allied health sciences already exist across both the human and animal health sectors at the federal level. These graduates can be engaged through partnership with the Pakistan Nursing Council (PNC) and its accredited institutions on the human health side. On the animal health side, the Pakistan Agriculture Research Council's Directorate of Training, and its Institute of Advanced Studies in Agriculture have the required capacities to train sufficient numbers of personnel as projected by the respective departments during the course of this review.

Trainings through the National Institute of Health-NARC and their subsidiary departments across the 13 specialized areas can be appropriately supplemented through employment of existing training resources at NIH and PARC. Furthermore, it is essential that to acquire emerging skills and learn from regional and global best practices in the respective areas, partnerships and support can be garnered through the UN sector, specialized organizations such as CDC-USA/PHE/CDC-China etc. and reputed international universities. Such partnerships will ensure continuous skills enhancement and fulfillment of training needs for all health workforce at the federal level, and is expected to leverage and instill best possible technical capacities for IHR-GHSA requirements that are aligned with Pakistan's National Action Plan for Health Security.

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