Comprehensive assessment of Pakistan's health information system 2017

World Health Organization

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Foreword

In 2010, as part of structural reforms introduced in the 18th Amendment to the Constitution of Pakistan, the Government of Pakistan devolved responsibility for public health to the country's provinces and regions. The Ministry of National Health Services, Regulation and Coordination was established in 2013 to execute the federal functions related to health. The Ministry was given the mandate to provide a common strategic vision for health for the entire country. The resulting National Health Vision 2025 document provides medium-term guidance for the development of the health sector in the country.

Through the Vision 2025 initiative, the government aims to provide health services that are efficient, equitable, accessible and affordable to the entire populace. The Ministry of National Health Services, Regulation, and Coordination supports this aim through: coordinating efforts at national and international levels in the field of public health and population welfare, including fulfilling international obligations and commitments; providing oversight of provincial and national health regulatory bodies; and enforcing drug regulations including regulation of medical professions and education.

The federal ministry and the provincial departments of health are working together to improve the health of all citizens by ensuring delivery of quality health services through a resilient and responsive health system. Such a system is envisioned to support national efforts to achieve the health-related targets of the Sustainable Development Goals. Innovative technologies are being gradually incorporated into the health system in order to provide timely and reliable information to support evidence-based decision-making at the district and provincial levels, through health and management information systems.

Building on the emerging needs of the health system, a Health Planning, Systems Strengthening and Information Analysis Unit has been established within the Ministry to better coordinate and manage health information data through an integrated online health information platform. This platform, the Pakistan Health Information System, serves as a national level knowledge hub based on the District Health Information System, monitoring and evaluation, surveys and programme data.

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Preface

The strengthening of health information systems is a priority for WHO in the Eastern Mediterranean Region. Since 2012, WHO has been working with Member States to agree on priority actions to strengthen health information systems. Intensive work with Member States has resulted in a clear framework for health information systems and 68 core indicators that focus on three main components: 1) monitoring health determinants and risks; 2) assessing health status, including morbidity and cause-specific mortality; and 3) assessing health system response. The regional core indicators were endorsed by the WHO Regional Committee for the Eastern Mediterranean at its 61th Session in 2014. Since then Member States have started to adopt and report on the core indicators. Efforts are also being made to improve the capacity of Member States in reporting on core health indicators and the additional eight indicators related to Goal 3 of the Sustainable Development Goals.

In order to support Member States to meet their national, regional and international obligations in reporting health indicators, a number of comprehensive assessments have been conducted in the Region since 2016 to identify key gaps and strategies to strengthen health information systems. The first comprehensive assessment was conducted in Jordan followed by Libya and Pakistan. The assessment identified gaps in the health information system and generated recommendations and priority actions aimed at complementing WHO's efforts to improve country health data systems. Other focused interventions include WHO support in building capacity in death certification, ICD coding and use of the district health information system platform to enhance the reporting of routine data.

We hope this report will guide decision-makers in the Ministry of National Health Services, Regulation and Coordination and all development partners and stakeholders in planning and implementing effective interventions to strengthen the health information system in Pakistan. WHO expects that the priority areas identified during the assessment and ongoing strategies to improve civil registration and vital statistics systems, including the quality of cause of death data, will enhance Pakistan's efforts to monitor the health situation and sustainable development indicators.

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Abbreviations

CCM	Country Coordination Mechanism
CDC	Centers for Disease Control and Prevention
cLMIS	Contraceptive Logistics Management Information Systems
DHIS	District health information system
DHS	Demographic and health survey
HIS	Health information system
HIS	Health management information system
ICD	International Classification of Diseases
IRIS	A system for automated coding of cause of death
LHW	Lady Health Worker
LMIS	Logistics Management Information Systems
LQAS	Lot Quality Assurance Sampling
MICS	Multiple indicator cluster survey
NACP	National AIDS control programme
SDG	Sustainable Development Goals
STEPS	WHO STEPwise approach to surveillance
TB	Tuberculosis
ToR	Terms of reference
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
vLMIS	Vaccines Logistics Management Information Systems

Executive summary

The role of health information systems (HIS), including civil registration and vital statistics (CRVS) systems, is widely acknowledged in generating health information data for monitoring programmes and performance, quality of care, planning, policy-making and other areas. HIS and CRVS systems provide decision-makers with regular and continuous information on the coverage and utilization of health services and mortality statistics, including causes of death. At the subnational level, HIS data enables countries to assess equity in the provision of health services.

Assessment approach

With the support of WHO, preparations for this comprehensive assessment began in December 2016 with a scoping mission aimed at informing strategic planning and development of terms of reference (TOR) within the context of the devolution. The scoping team identified a number of key strategic areas: establish/strengthen and move towards a unified system; strengthen coordination among various systems and stakeholders; and strengthen the capacity of staff in data collection, analysis, information transmission, use and dissemination. Building on the scoping mission, this comprehensive assessment was commissioned by WHO in July 2017 as part of efforts by the Ministry of National Health Services, Regulations and Coordination to strengthen and integrate HIS and implement measures aimed at preparing the country to meet its reporting obligations on core health indicators at the national, regional, and international levels.

With support from the Ministry and two international consultants, a team from WHO conducted the assessment in two parts: two-day field visits to the provinces and a two-day national workshop in Islamabad. The assessment team reviewed: the extent to which Pakistan's health information system (HIS) adheres to sound policy and institutional environment; how data sources are used; availability of strong institutional capacity for data collection, management, analysis, use and dissemination; and implementation of effective mechanisms for review, data use and action. The assessment methodology was based on the approach developed by the WHO Regional Office for the Eastern Mediterranean for comprehensive assessment of HISs. During the assessment, discussions were guided by the WHO Monitoring and Evaluation Assessment and Planning tool, which provides an overview of the weaknesses and strengths of a country's monitoring and evaluation systems and enables identification of priority actions based on those findings. Pursuant to the growing interest in Pakistan to implement the district health information system version 2 (DHIS-2) as a technology for the health management information system, the assessment team also provided guidelines for transitioning from DHIS 1 to DHIS-2 to support the integration of systems and enhance information gathering, analysis and use for decision-making.

Findings

During the assessment, the team made a number of observations related to HIS operations. The main strengths of the HIS include the existence at federal level of a Health Planning, Systems Strengthening and Information Analysis Unit, which could function as a knowledge management hub for the production of national level aggregated data for: reporting and monitoring health situation and trends; applying international standards for several institution and population-based HIS data sources; producing regular DHIS reports; creating dashboards for dissemination of information; and establishing other regular reporting mechanisms. The review team also documented the existence of respective notifiable disease lists and significant HIS infrastructure in selected provinces. Information from census and surveys conducted by the Pakistan Bureau of Statistics and other development partners is more commonly used than the routine HIS data. In particular, the 2017 population census is a milestone in enriching population data sources as the previous census was conducted in 1998. The 2013 assessment of the CRVS assessment also provided an opportunity to identify interventions for improving the system.

Despite a number of positive attributes of Pakistan's HIS, only 40% of the system's components fulfil the attributes of a functional HIS; hence it has multiple and multidimensional weaknesses. Pakistan does not have mechanisms for local level decision-makers and community members to analyse and use facility-based and community-based information to develop responsive and appropriate service delivery strategies and community-based interventions. There is also a lack of: systematic feedback to subunits; web-based systems (e.g. DHIS) across all facility reporting systems; a harmonized system of facility assessments; and regular and independent data quality assessments. Key gaps also relate to: lack of transparent and

accessible health data; lack of systems for coding of causes of death (for example, IRIS); non-use of verbal autopsy to generate nationally representative cause of death statistics; limited triangulation of data from all relevant sources; and lack of effective processes to support analysis and use of data at subnational level, among others. While the main body of this report documents detailed priority actions and a timeline for implementation, the following are the overarching recommendations emanating from the assessment:

► Governance

  – Constitute a functional national steering committee to oversee development of an HIS plan, e-health strategy, clear Standard Operating Procedures (SOPs) and data management standards.

  – Development of a monitoring and evaluation plan, endorsed by all stakeholders and with clearly defined indicators to be monitored.

► Infrastructure and support

  – Develop a multisectoral CRVS strengthening plan to address the recommendations identified during the CRVS comprehensive assessment.

  – Develop a detailed DHIS 2-readiness capacity-building plan for provincial and district health managers on how to apply DHIS data to improve their management.

► Data management and standards

  – Define health indicators required to fulfil international and national, provincial, and local commitment and goals.

  – Review and update the priority list of notifiable diseases, including case definitions and ensure that these are disseminated to all relevant staff and stakeholders.

  – Develop an integration plan for vertical programmes to ensure that Pakistan has a seamless system to meet national, regional and international obligations for core health indicator reporting.

  – Integrate public health surveillance and response systems across the country.

► Quality assurance

  – Develop SOPs for data management and

analysis, including terms of reference (ToRs) for staff responsible for data management and analysis to ensure that expectations are matched with performance.

  – Conduct regular data analysis, independent reviews of data, and performance reviews at the national and subnational levels, including active engagement of civil society and incorporating results from the reviews into decision-making.

► Data dissemination and use

  – Develop an integrated web-based HIS system to address fragmentation challenges by ensuring that all provinces are able to report and access the data to monitor their progress and experience sharing.

  – Raise awareness on importance of data and conduct training of trainers on data use and analysis.

Way forward

The priority actions presented in this report provide an opportunity for the Ministry, in collaboration with other stakeholders and development partners, to develop short-term, mid-term, and long-term plans to enhance the HIS. Key to achieving an enhanced system is for Pakistan to design interventions that can improve current HIS operations without a great deal of change. This can be achieved through establishing a functional national HIS coordinating committee and a technical subcommittee with representation from provinces, regions, and involvement of stakeholders and HIS specialists. In order to accelerate the HIS improvement plan, it is important for the Ministry, provincial departments of health, and other stakeholders to review the findings and priority actions of this assessment and reach a consensus on an agreed set of recommendations. Once agreement has been reached, the next step will be to cost interventions, estimate the number of people and days needed to implement recommendations and, where necessary, identify individuals to be trained, materials/equipment to be purchased, and proposed timeframe, which are consistent with the roadmap of key priority actions presented in Section 7. Once established, the HIS technical subcommittee can prepare a detailed costing and development of an HIS improvement plan. The timelines for implementation of the interventions can be adjusted depending on local circumstances.

1. Background

1.1 Overview of the health situation in Pakistan

Pakistan is the sixth most populous country in the world, with a population of over 213 million people as per the 2017 census results. The infant and under-five mortality rates are 69 deaths per 1000 live births and 86 deaths per 1000 live births, respectively. Over the period 1998–2017, Pakistan's population has been growing at an annual rate of 2.4%. At this rate, the population of Pakistan has increased by more than half over the past 20 years.

Administratively, Pakistan comprises four provinces (Punjab, Sindh, Khyber Pakhtunkhwa, and Balochistan) and four regions (Federally Administrative Tribal Areas, Islamabad Capital Territory, Azad Jammu and Kashmir, and Gilgit Baltistan). There are substantial social and economic inequities between and within regions and provinces which affect the equitable coverage of population with health services.

In 2011, the 18th Amendment to the Pakistan Constitution fully devolved health and education from the federal level to the provinces and regions, respectively. Accordingly, health care systems – with planning health care delivery structures, programmes, and services – have been devolved to the provincial level. The devolution of health to the provinces created challenges in addition to opportunities. The Ministry of National Health Services, Regulation and Coordination is taking a new role as indicated in the Federal Legislative List Part I and Part II. The Ministry is mandated to provide overall guidance and stewardship to the health sector and federal support will lead to more equitable health system coverage, in line with provincial priorities.

The national health vision (2016–2025) acts as the overarching vision for the health sector and is aligned with the country's Vision 2025 and international health priorities, and is based on provincial realities. The vision statement specifies: "To improve the health of all Pakistanis, particularly women and children, by providing universal access to affordable, quality, essential health services which are delivered through a resilient and responsive health system, capable of attaining the Sustainable Development Goals (SDGs) and fulfilling its other global health responsibilities".

Some of the challenges facing the health system include: low financing of health services; high level of out-of-pocket spending by individuals and households; maldistribution of human resources for health; and lack of specialized health workers.

The national health vision aims to address these challenges. Specifically, its objectives are to: provide a unified vision to improve health while ensuring provincial autonomy and diversity; build coherence between federal and provincial efforts by consolidating progress, learning from experience, and moving towards universal health coverage; facilitate synchronization across international reporting and treaties; ensure coordination for regulation, information collection, surveillance, and research on improved health systems; and create a foundational basis for charting and implementing SDGs, in partnership with other sectors.

To improve the quality of health information, the following actions are proposed.

▶ Innovative technologies will be incorporated into district health information systems to facilitate evidence-based decision-making. Provincial and national platforms for transforming evidence into policy will also be encouraged.

▶ Governments will build coherence across health information systems, and will invest in systems to monitor progress towards the SDGs and national health targets, and record vital statistics such as birth and death registration.

▶ The national health vision calls for a transition from medical to national health research that prioritizes areas according to local requirements. A central hub will be created to act as an information repository, develop standards and conduct lot quality assurance sampling (LQAS) with assistance from provinces. This hub will promote evidence-based decision-making, policy formulation, and health systems research.

- Information systems at national, provincial, and district levels will be strengthened to create an effective, integrated disease surveillance and response system, with a focus on an early warning system.

- A collaborative mechanism will be established for high-quality research on national priority areas and to regulate the research environment.

1.2 Overview of the health information system in Pakistan

The role of HISs, including CRVS systems, is widely acknowledged in generating health information data for programme monitoring, performance monitoring, quality of care, planning and policy-making. HIS and CRVS systems provide decision-makers with regular and continuous information on the coverage and utilization of health services and mortality statistics, including causes of death. At the subnational level, HIS data enables countries to assess equity in the provision of health services.

Routine health statistics are collected at the district and the provincial levels through the district health information system (DHIS) and programme management information systems. The structure of the HIS in the country remains fragmented with a number of vertical and multiple information systems that are not integrated at the subdistrict, district, provincial and national levels. The implementation and consistent use of the DHIS as the main system across all the provincial departments of health is the key to ensuring that health-related data are generated for policy and planning at the facility, district, provincial and national levels.

The Government of Pakistan developed a health management information system in 1992. Based on the study aimed at improving the management information system in the health sector (2004–2007), a new health information system based on the DHIS protocol was developed and rolled out across the country in a phased approach since 2005 in Khyber Pakhtunkhwa, Punjab, Balochistan, and Sindh provinces, Federally Administered Tribal Areas, and Azad Jammu and Kashmir regions. The

DHIS is one of the mainframe health recording and reporting systems undergoing some digitization at the reporting and management levels in Sindh, Punjab, Khyber Pakhtunkhwa, and Balochistan provinces and also in Azad Jammu and Kashmir and Federally Administered Tribal Areas. Work is currently under way to digitize the DHIS in Islamabad Capital Territory and Gilgit Baltistan regions. Pakistan is also currently working towards integration of an AIDS/tuberculosis (TB)/malaria-specific management information system into a single platform and linking it with the Pakistan HIS. In the next phase, a gradual shift to DHIS-2 is being planned across the country in order to build coherence across health and management information systems, and implementing an integrated disease surveillance and response system across the country.

1.2.1 Health information system in provinces and regions

Khyber Pakhtunkhwa province
There is an operational DHIS and a biometric attendance system for human resources across the province in all public sector health facilities and health offices. Additionally, logistics management information systems (LMIS) for contraceptives (cLMIS), vaccines (vLMIS) and tuberculosis (tLMIS) are operational. Other management information systems include those focused on the Lady Health Worker (LHW) programme; monitoring and evaluation dashboard/the key performance indicators system; maternal, newborn and child health; Expanded Programme on Immunization (EPI); and human resources (HR management information system). An integrated disease surveillance and response system and a fully functional case-based system for TB are being implemented in selected districts of the province.

At the time of the review, there was no systematic reporting mechanism at the tertiary care level in the province; and data from such facilities are shared with the provincial DHIS cells in different templates and are not comparable with DHIS data collected through the primary and secondary level facilities. The Khyber Pakhtunkhwa province DHIS cell

publishes data from primary and secondary facilities through bulletins on a quarterly basis.

Punjab province

The DHIS, Lady Health Workers management information system, maternal, newborn and child health management information system, nutrition information system, EPI management information system, e-Vaccination, key performance indicators system for individual health professionals, disease surveillance system, dengue surveillance system, cLMIS, vLMIS, tLMIS, medicine and equipment inventory system, prescription information system, human resource management information system, health watch (monitoring of monitors), monitoring evaluation agents, reporting system, biometric system, electronic-basic health unit are functional in Punjab province.

Sindh province

The online DHIS, Lady Health Workers management information system, cLMIS, vLMIS, tLMIS are functional in Sindh province. The province has a monitoring and evaluation system/key performance indicators system, maternal, newborn and child health management information system, and family planning management information system in place. Components of these management information systems are displayed on the provincial dashboards. There is a need to integrate other vertical programme management information systems into the DHIS, integrate tertiary care hospital information systems and integrate information from private sector hospitals.

Balochistan province

An online DHIS has been functional in all districts of Balochistan province since January 2016. Maternal, newborn and child health management information system, cLMIS, vLMIS and tLMIS are also implemented in some districts of Balochistan. Access to the provincial dashboard is provided to provincial and district health managers. At the time of the review, there were efforts to link the provincial dashboard with three tertiary care hospitals; to facilitate this linkage, software was purchased, and hardware and networking installation and capacity-building were in process.

There is a need to link the DHIS with vertical programmes and there are plans to establish DHIS cells at district headquarter hospitals.

Azad Jammu and Kashmir, Islamabad Capital Territory, Federally Administered Tribal Areas and Gilgit Baltistan regions

An online DHIS has been implemented in all districts of Azad Jammu and Kashmir and linked with a national dashboard. There is no DHIS in the Islamabad Capital Territory region. In Federal Administered Tribal Areas, a paper-based DHIS is working and moving towards computerization, and a nutrition management information system is ongoing as a pilot project. Gilgit Baltistan has a partially implemented health management information system and there is no DHIS. Gilgit Baltistan is also moving towards implementation of a paper-based DHIS with subsequent plans for computerization.

Across all provinces, data are not collected from the private sector. This gap is critical given the context of notifiable diseases such as TB and polio whose programmes have partial linkages and regular reporting from the private sector as well. Furthermore, non-reporting from parastatal institution-managed hospitals and military hospitals is also a challenge.

1.2.2 Vertical programme management information system

The national TB control programme from the federal level is implementing DHIS-2 as a reporting system in some districts of Pakistan. The Directorate of Malaria Control is also in the process of developing a reporting mechanism using DHIS-2 for selected districts. The national AIDS control programme is also collecting data through an online reporting tool from antiretroviral therapy sites. The Prime Minister's national health programme has an online case-based system that is operational and maintained at the federal level. The nutrition programme is collecting data through an online reporting tool from some districts of Khyber Pakhtunkhwa and Federally Administered Tribal Areas.

2. Purpose and objectives of assessment

In view of the recognized and constitutional need for national coordination and standard setting, and following comprehensive stakeholder consultations, the Ministry of National Health Services, Regulations and Coordination established a Health Planning, Systems Strengthening and Information Analysis Unit which houses the National Health Information Centre in July 2015. This unit is a knowledge management hub for producing national level aggregated data to fulfil the constitutional mandate of reporting on international agreements such as the International Health Regulations (IHR 2005), antimicrobial resistance and the SDGs. It is an overarching umbrella to which the National Health Information Resource Centre, Think Tank, Health Sector Reform Unit/Policy and Strategic Planning Units are linked.

One of the Ministry's aims is to strengthen and integrate the HIS through its role of coordination by providing a joint platform for discussion and consensus-building with the provincial and regional departments of health. Recognizing challenges associated with the HIS, such as fragmentation and data quality, the Ministry is keen to implement measures aimed at unifying the various systems and preparing the country to report on the indicators required for reporting and monitoring at the national, regional, and international levels. In this context, preparations for this assessment began with a scoping mission from 13 to 16 December 2016 with the support of WHO. The scoping mission aimed at informing strategic planning and development of TORs – within the context of the devolution – for this assessment to review the national health and management information systems. This assessment was therefore aimed at supporting Pakistan's efforts to monitor health development and enhance its reporting capacity on the 100 core health indicators, the 68 regional core indicators, and the health-related SDGs.

The scoping team identified a number of key strategic areas to establish/strengthen and move towards a unified system and strengthen coordination among various systems and stakeholders, and build staff capacity in data collection, analysis, information transmission, use and dissemination.

Following the recommendations of the scoping mission, the key objectives of this assessment were to:

▶ document different information systems and data sources for the HIS in order to identify areas for improvement, particularly on information flow across the country;

▶ identify ways to address fragmentation of the HIS and management information system; and to make recommendations to streamline mechanisms for regular reporting from provincial to federal level;

▶ identify modes and mechanisms to address: the challenges of integrating the vertical management information systems into the current DHIS; linkages with the national HIS; alignment with the SDG 3 indicators; and the 68 regional core health indicators;

▶ identify new and missing indicators in the existing DHIS with relevance to new initiatives and international obligations;

▶ explore enabling factors for a transition to DHIS-2 considering that some provinces are planning to scale-up the current DHIS 1 to accommodate the multiple management information systems to enable generation of holistic HIS reports;

▶ map out key stakeholders to constitute the national HIS coordinating committee and establish a technical subcommittee at the federal level with representation from provinces and regions;

▶ identify coordination and monitoring oversight mechanisms for building functional linkages between federal and provincial levels; health and non-health actors; public and private health sector; public and parastatal bodies;

▶ identify system strengths and weaknesses related to capacity-building, data collection, and analysis; including mapping ways to strengthen capacity and promote the culture of evidence-based decision-making at the district, provincial, and national levels.

The results of the assessment are expected to help the government develop a prioritized and detailed roadmap for HIS improvement and reporting of core indicators at the national, regional, and international level.

3. Assessment methodology

In line with the ToR, the assessment team implemented a methodology that aimed at: developing common understanding of available information systems and databases; assessing the strengths and weaknesses of these components and operations within HIS; and providing recommendations consistent with WHO and HIS standards, indicator frameworks and guidelines. The methodology followed an approach developed by the WHO Regional Office for the Eastern Mediterranean for comprehensive assessment of HIS (Fig. 1). During the assessment of Pakistan's HIS, discussions were guided by the WHO monitoring and evaluation assessment and planning tool[1] which provides an overview of the weaknesses and strengths of the country monitoring and evaluation systems and enables identification of priority actions based on those findings.
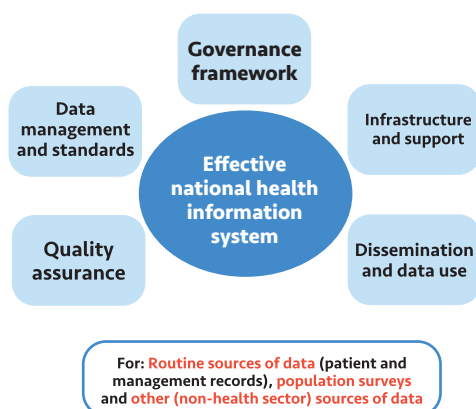
Fig. 1. Effective national health information system

3.1 Document reviews

Prior to the mission, the assessment team reviewed documents provided by the Ministry, documents available in the public domain, and the scoping mission report. Some documents were also received during the meetings.

3.2 Field visits

From 24 to 25 July 2017, the assessment team visited eight facilities (two rural health centres, four basic health units, and two hospitals) in Balochistan, Punjab, Khyber Pakhtunkhwa, and Sindh provinces. The assessment team members met with managers of facilities, service providers, and HIS officers. The team members took notes on discussions and findings, which were later assimilated and analysed.

3.3 Health information system assessment workshop and working groups

A two-day workshop was conducted in Islamabad, Pakistan on 27–28 July 2017 to learn and document different systems (manual and automated) focusing on information systems directly relevant to the Ministry's interests. During the workshop an overview of the information systems was made by the Ministry. Four working group sessions were held focusing on key issues of a functioning HIS: policy and governance; data sources (CRVS, routine HIS, disease surveillance); institutional capacities; and mechanisms for review, data use and decision-making. Presentations from the Ministry, including discussions during working group sessions focused on the types of systems used, challenges related to data collection and flow, data quality, timeliness and efficiency in data flows, challenges in reporting compliance, analysis and interpretation, capacity of staff, use of information for decision-making, and difficulty of assembling information from different sources at all levels. The assessment team also provided guidelines for transitioning from DHIS 1 to DHIS-2 to ensure that Pakistan has an improved and integrated HIS that enhances information gathering, analysis and use for decision-making.

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[1]   Monitoring and evaluation assessment and planning tool. Geneva: World Health Organization; 2017 (in press).

3.4 Synthesis of findings, recommendations, and report preparation

In addition to the document reviews and the information gathered during the discussion and working groups with Ministry officials and other stakeholders, the team also used technical judgements and grouped the findings according to the thematic areas of the assessment and planning tool.

4. Key findings

Enhanced management of health information is an important step to achieve better health outcomes in Pakistan. Evidence-based decision-making can be realized if a country has a functional and comprehensive HIS. The growing demand for health-related information by policy-makers, programme managers, donors, nongovernmental organizations, other stakeholders and the public at large calls for establishment and enhancement of a unified and well-defined system of data collection and reporting from the health facility to the national level.

Pakistan, as is the case with most countries, uses a HIS to serve multiple users and a wide range of purposes. The discussion of the key findings on the HIS focused on two key components: observations from the provincial field visits, and a quantitative assessment on the availability of key attributes of a functional HIS. Key priorities for improvement are identified in later sections based on findings reported in this section.

4.1 Observations from field visits

The field visits aimed at understanding the operations and functionality of the various components of the HIS at the provincial level and identify areas for improvement. This approach aimed at addressing the overarching assessment objective of identifying mechanisms to unify various HISs and preparing the country to report on the indicators required for reporting and monitoring at the national, regional, and international levels. For each province, a summary of the key findings

are presented (strengths and weaknesses) related to the four functional areas of: policy and governance; data sources; institutional capacities; and mechanisms for review, data use and decision-making.

4.1.1 Punjab province

In Punjab province, the review mission held meetings at the Directorate of General Health Services, with the Policy and Strategic P lanning Unit, and all vertical programmes (EPI, TB, AIDS, malaria, and integrated reproductive, maternal, newborn and child health), the DHIS cell, Punjab Information Technology Board and Development Partners (USAID DELIVER Project).

The review team also made a two-day visit to Lahore, the capital of Punjab, with the support of the WHO country office. The visit was facilitated by the WHO provincial office in Punjab. At the beginning of the mission a detailed meeting was held at the Directorate of General Health Services on the first day of the visit, in which a brief introductory meeting with the Directorate was held followed by a set of presentations by all the vertical programmes and Punjab Information Technology Board-supported dashboards.

Field visits were also made to the rural health centre in Chung and the basic health unit in Maraka on the outskirts of Lahore to understand operational information recording and reporting mechanisms among primary level health facilities. Meeting with facilities in charge and all personnel involved in service provision and recording/reporting processes were conducted, and visits to all sections/segments of the health facilities were made. A summary of the key observations across the four components of a functional HIS are presented in Table 1.

Table 1. Key observations on the HIS in Punjab province

Key HIS component	Strengths	Areas for improvement
1. Sound policy and institutional environment	A sound framework exists in the province for reporting and data flow mechanisms in the public sector facilities (community, primary and secondary levels). Regular reporting mechanisms are available for EPI which has been digitized through provision of android-based eVacc application. 26 notifiable diseases are reported in the disease surveillance system with mandatory reporting on a daily basis. The provincial health department is in the process of updating the priority diseases based on the recommendations of the Chief Minister in Punjab.	Although the highest level political leadership is engaged in reviewing and using for evidence-based decision-making, there is no integrated HIS- related policy in the province. Develop a policy-based holistic system for inclusion of tertiary care level facilities within the routine HIS. Develop policy for private sector to report their data to the district and/or provincial HIS. Enhance coordination mechanisms related to disease surveillance system and human resources management information systems between Punjab Information Technology Board and the Department of Health.
2. Data sources	Various data sources are reported through the DHIS, e.g. Lady Health Workers management information system, maternal, newborn and child health management information system, community midwives management information system, TB, malaria, and HIV. These are reported on a monthly-basis (see full list of data sources and attributes in Annex 1). The Punjab Information Technology Board leads the disease surveillance system and deploys electronic devices at public health facilities for human resource attendance and management (biometric devices deployed at health facilities), disease surveillance system, and inventory management system for all primary health care facilities. Conducts biannual Punjab health survey focusing on provincial EPI coverage, maternal, newborn and child health service delivery, family planning services and facility functionality. Other national and subnational surveys include the Pakistan demographic and health survey (DHS), multiple indicator cluster survey (MICS), and Pakistan's Bureau of Statistics.	

Comprehensive Assessment of the Health Information System

Key HIS component	Strengths	Areas for improvement
3. Strong institutional analytical capacities	Capacity for analysing health-related information is evolving, with department level availability of trained human resources and equipment/software being less than optimal. Funding available for developing several vertical programmes.	Recruit/train more skilled staff for analysis due to the increased availability of data from vertical programmes.
4. Mechanisms for data use, review, and action	The Policy and Strategic Planning Unit in Punjab houses third party monitoring and evaluation data, obtained onsite verification of the pre-set indicators for health facility functionality by third party monitoring and evaluation agents. Regular quality checks within the DHIS system based on the LQAS methodology, with feedback mechanism established between the DHIS provincial cell and the district coordinators managing DHIS data. Dashboards/illustrative web-based interfaces exist for various information systems and monitoring and evaluation dashboards. These focus on descriptive analyses and presentation through easily understandable bar and pie charts. Parameters and guidelines for use of HIS based information at the facility, district and provincial levels are defined/in-built for the respective systems. Regular (monthly and bi-monthly) stock-take meetings headed by the Chief Minister to review the progress on key health indicators and performance of the health sector are held at the provincial level. The forum is used to take corrective measures/decisions for the health sector in the province.	Need to mobilize technical expertise (e.g. biostatisticians) within the Department of Health and the vertical programme for detailed analyses, triangulation and regular data quality review of existing data sources. Improve implementation of guidelines for use of HIS data for decision-making at all facility levels. Enhance feedback mechanisms on paper-based and DHIS reports submitted to the district and provincial DHIS units. Develop mechanisms and guidelines for regular review of information systems based data at the district and provincial levels. Develop standardized mechanisms and obligations for information-sharing with parliamentarians, the community, and for provincial and area health departments to share data with the federal level Ministry of National Health Services, Regulation and Coordination. DHIS dashboards of provincial and area health departments should be linked with national level dashboard.

4.1.2 Sindh province

The key objectives of the HIS provincial review team was to identify the area of improvement in the current state of HIS systems within the province, and ways to address the fragmentation of the HIS and management information system, as well as to make recommendations to address the challenges of integrating the vertical system into the current DHIS and further transition into DHIS-2. The review team visited several points of care units and participated in meetings with the authorities in Karachi and Hyderabad in Sindh province to address the mission objectives.

Visits and meetings

During the provincial visit, the review team met with programme directors and managers in Karachi and were briefed on the LHW, TB, malaria, nutrition, EPI, HIV/AIDS and maternal, newborn and child health programme activities. Additional briefings were also made with staff from HIS and provincial disease surveillance and response unit departments, John Snow Inc., and USAID.

Meetings were also held with the Interactive Research and Development staff at Indus Hospital in Karachi; and the review team was briefed by the Research and Development team from IRD on three projects. First was the Zindagi Mehfooz, a mobile-based application to support the immunization programme, including a basic registry, a geo-tracker, and family-reminder with almost 150 000 children under coverage in Shikarpur district. At the time of compiling this report, the Zindagi Mehfooz

application was scaled up across the entire province with support from WHO. Second, the Thrive Consortium, an open smart register platform to support computerized family planning on tablet devices by LHWs. This project is currently in the feasibility stage in Pakistan (Korangi town, Karachi), Bangladesh, and Indonesia, supported by WHO. And lastly, the Electronic Integrated Management of the Childhood Illnesses, a tablet-based project to identify children at high risk of dropout using "artificial intelligence" based on certain factors. The eIMCI was being piloted in Shikarpur district. All three projects were examples of applications that enable direct registry-level data entry and that can be further connected to higher level aggregate platforms such as DHIS.

In Hyderabad district, meetings were held with district officials including visits to primary and secondary facilities belonging to the Department of Health and the People's Primary Healthcare Initiative. The facilities visited were basic health unit Latifabad No. 10, People's Primary Healthcare Initiative basic health unit Sehrish Nagar, and two hospitals (Shah Latif Hospital, and Sindh Government Hospital Qasimabad). The Hyderabad visit also included meetings with health authorities at the province level. A summary of the key observations across the four components of a functional HIS are presented in Table 2.

Table 2. Key observations on the HIS in Sindh province

Key HIS component	Strengths	Areas for improvement
1. Sound policy and institutional environment	Meetings to discuss health indicators. Feedback procedures implemented through a report or letter transmitted from the district health office to the facilities reporting data outlining feedback on the reported data in terms of errors identified or checked with the aim of improving the data collection process; however, this does not motivate staff who perform well. Use of DHIS "green book" and John Snow Inc. standard operational procedures. The green book is the DHIS manual provided by the DHIS team and is mostly suitable for staff working on the DHIS system. Availability of strategic plan for HIS/MIS/DHIS and plans to upgrade their system.	Developing standard/policy-setting or HIS steering committee at the district/province. No incentive/reward-based feedback for the DHIS initiative. Developing strategic/operational plan at the district, provincial, and national level regarding DHIS implementation or expansion. No local/provincial/national guideline/manual on DHIS data entry tips/standards/cautions. Therefore, more than 95% of people working on the DHIS are left alone with no written guide. Strategic plan for the health and management information systems and the DHIS should be reviewed carefully for possible areas of potential support, and also used as a case study for other provinces.
2. Data sources	The only evidence of electronic direct data entry was from the maternal and child health Interactive Research and Development Department and also the open smart register platform project with the vaccinators with limited range of engagement. Plans to upgrade the DHIS system started with reviewing and including 29 indicators into the current DHIS system. The team believes that the Sindh province has the capacity to fully upgrade the system to DHIS-2.	No single electronic medical record or registered data system in place except for the private sector centres, such as Aga Khan University and Indus hospitals. Important prerequisites of data quality are missing: neither hospitals nor any clinics or vertical programme use any type of data standard, including non-use of International Classification of Diseases (ICD) or ICD-related data coding and terminology or national identification numbers for individuals or for health events. No involvement of private sector in HIS activities. Despite their high proportion in Sindh health service provision, private sectors have not been defined or foreseen in the province agenda as a major source of health information Address fragmentation of data by linking several not-interlinked vertical management information system programmes. This is partly being addressed through the monitoring and evaluation scoring system that presents district-based or monthly-based performance in the province.

Key HIS component	Strengths	Areas for improvement
3. Strong institutional analytical capacities	There are epidemiology experts at the province, but no strong proof of fairly acceptable routine DHIS data analysis procedure were found. Instances where analysis is done, it is commonly limited to simple frequency tables/bar graphs at provincial level, or monthly comparable tables.	Increase the number of staff and enhance analytical skills of existing staff to conduct detailed analyses of HIS data. Transition to DHIS-2 as DHIS 1.3 (the current version in use) has poor data export and analytical features built in. Therefore, for most analytical purposes data should be exported and analysed with external applications. Enhance semi-advanced to advanced analysis features, which include automated data analysis, crisis discovery and alert issuance, pattern detection, and routine monthly to quarterly report generation.
4. Mechanisms for data use, review, and action	John Snow Inc. developed and deployed SOP guidelines are the only data review plan guideline in use at the district and provincial levels.	Empower informed decision-making and evidence-based management through a well-planned capacity-building programme. Such a plan should be further expanded to involve facility staff as the information first-liners. Define clear roles for the province and the federal government in terms of SDGs and indicators. Define DHIS data-to-action procedures for managers or staff at any level.

4.1.3 Khyber Pakhtunkhwa province

In Peshawar, the review team held meetings with the Director-General, Directorate of Health. This was followed by a detailed consultative meeting with a number of stakeholders, including programme managers for vertical programmes, DHIS cell and an independent monitoring unit. During the visit, discussions were also held with representatives from the Directorate of Health Services, Federally Administered Tribal Areas. The meetings focused on reviewing progress with the DHIS, as well as identifying issues and challenges of the current HIS and strategies used to address the challenges.

Accompanied by senior health officials and WHO provincial staff, the review team also visited a rural health centre. Discussions at the centre were held with the facility in charge and the staff responsible for preparing the monthly DHIS report to understand the current practices and any relevant challenges related to data management. At the end of the two-day mission, a debriefing meeting was held with the Director-General of Health Services, Directorate of Health, to share the key findings of the mission. In all meetings and field visits, discussions were guided by the four HIS functional areas whose findings are summarized in Table 3.

Table 3. Key observations on the HIS in Khyber Pakhtunkhwa province

Key HIS component	Strengths	Areas for improvement
1. Sound policy and institutional environment	Monitoring and evaluation plan defined for progress tracking of the Department of Health. DHIS manual available online.	Ensure the monitoring and evaluation plan is comprehensive and fully functional. Make DHIS manual available not only online but at the primary and secondary level health facilities in printed form for data management staff. Strengthen coordination within the health department, including other line departments such as the Statistics Department for CRVS, armed forces and the private sector. Develop linkages of vertical programmes within the health department to strengthen data management and minimize inconsistencies and duplicate reporting of data. Establish coordination committee at provincial or district level to provide a platform for relevant stakeholders to become engaged and informed. Establish mechanisms for donor coordination, e.g. the Global Fund for AIDS, TB and Malaria is supporting deployment of DHIS-2 for TB and malaria in only a few focused districts and not in the rest of the province. Develop an investment strategy for resource mobilization to improve HIS. Address bureaucratic delays in the system, e.g. a rural health centre was upgraded to Type D hospital but was still reporting by primary health care (PHC) template of DHIS as the records were not updated.

Key HIS component	Strengths	Areas for improvement
2. Data sources	Various data sources exist which are collated using the DHIS and come from primary and secondary health facilities; management information system of vertical programmes like management information systems for LHWs, EPI, community midwives, nutrition-MIS; vaccine LMIS, contraceptive LMIS; monitoring and evaluation dashboard/key performance indicators system, population based surveys, such as Pakistan's demographic and health survey, Pakistan's social and living standards measurement and the multiple indicator cluster survey. The Department of Health has initiated key processes for streamlining information management systems, e.g. integration of management information systems for EPI and v-LMIS, integrated disease surveillance for 20 notifiable epidemic-prone diseases (replacing disease early warning system (DEWS)) and involvement of the independent monitoring unit in various health surveys such as knowledge, attitude and practices and solarisation survey. Tertiary facilities capture data at the individual level for diseases and services.	Numerous information systems in use with minimal convergence to avoid duplication and inconsistencies. Need for defined set of indicators for regular reporting. Include tertiary level facilities in the existing DHIS and promote use of ICD-10. In addition to individual level data for diseases and services, collect data at the tertiary facility level to assess facility performance. Include private sector (formal and informal) in the existing HIS. Enhance community awareness and strategies to improve birth registration.
3. Strong institutional analytical capacities	DHIS scaled up from 12 districts to whole province; and DHIS quarterly and annual reports are produced with simple frequencies of key variables. Information from the DHIS is easily accessible by the media who at times seek clarification on selected indicators from the Department of Health.	Enhance capacity of relevant staff to analyse data at provincial, district, and facility levels. Enhance presentation of DHIS reports by including detailed analyses to inform policy and planning. Develop guideline/SOPs/manuals for data management teams. Enhance capacities of staff to conduct triangulation of existing data from various sources to fully understand the health situation and dynamics. Automate data analysis for the TB programme and replicate for other programmes.

Key HIS component	Strengths	Areas for improvement
4. Mechanisms for data use, review, and action	79 indicators are reported in the DHIS for monitoring. DHIS reports are disseminated to intended users within the Department as well as available online. Khyber Pakhtunkhwa Department of Health has prioritized performance monitoring by establishing an independent monitoring unit with more than 130 field staff and focus on inputs (human resources, medicines, equipment) to track the status regularly. The Department has also defined key performance indicators at the provincial level which are being monitored and summarized in the form of a dashboard which is reviewed regularly by the Health Minister/Chief Minister. An integrated disease surveillance and response reporting system is available and implemented in six districts. 20 notifiable diseases are reported through this system.	Implement data validation and data quality checks in addition to the data quality checks used within the DHIS. Build capacity of staff to prepare for future developments with DHIS-2 and enhance their capacity to conduct detailed analyses and integrate them within the existing quarterly and annual DHIS reports. Implement microplan activities based on results from DHIS reports. Scale up DHIS to include tertiary level and the private sector in order to provide a complete picture of the health information in the province. Enhance dissemination efforts by sharing the DHIS reports with political leadership, parliamentarians and the community. Institute mandatory reporting for provincial health department to report to the federal level so that a country report can be generated in compliance with international commitments.

Specific findings from Federally Administered Tribal Areas

The review mission also met with key stakeholders from Federally Administered Tribal Areas and learned that the DHIS is working in a similar manner to that in Khyber Pakhtunkhwa where manual reports received from facilities and electronic records are maintained at district/agency levels. Available data show that there is apparently a good population-to-health provider ratio in Federally Administered Tribal Areas. However, systemic issues, such as staff availability and absenteeism, electricity and equipment shortage are grave and chronic that the performance of the health sector remains low. The Health Sector Reform Unit in Federally Administered Tribal Areas was established years ago but has become dormant/non-functional and their capacity for monitoring and evaluation is weak. The health directorate is facing serious human resources challenges such as lack of career pathways for officers beyond grade 18 and staff returning to the parent department in Khyber Pakhtunkhwa leaves key posts vacant and the

system dysfunctional. There was a general feeling of lack of adequate support and cooperation from partners.

4.1.4   Balochistan province

With an estimated population of 12.3 million people in 2017, Balochistan's population accounts for 6% of the country's estimated 207.8 million people. There are 1321 public sector functional health facilities, excluding tertiary/provincial hospitals. The public sector provides services through a large network of health facilities, including tertiary care hospitals, secondary care facilities, first level care facilities, that is, rural health centres, basic health units, mother and child health centres, civil dispensaries, and including other preventive and outreach programmes. Balochistan province started operating the People's Primary Healthcare Initiative in 2006–2007 with the main objective of making non-functional basic health units functional with an optimum level of performance with respect to provision of primary health care services. This

initiative was implemented after an agreement with the provincial and district governments where the management of all the basic health units in the province was transferred in phases. The transfer of the management included complete control, use and management of personnel, buildings, and equipment, among other components. Thus, the overarching goal of the initiative was to upgrade the volume and quality of services envisaged to be delivered. Since the inception of the initiative, service delivery has increased considerably and it has the largest possible network of public health facilities. Its overall performance in Balochistan against set targets was considered exemplary: facility utilization rate increased from 84% in 2013 to 87% in 2014, 89% in 2015 and 95% in 2016.[2]

To support district health managers and senior policy officials in evidence-based planning, an information system was established through implementation of the DHIS. The DHIS provides an opportunity for health managers to allocate resources efficiently, prioritize programmes, optimize service provision and evaluate impact of health interventions. However, the design of the information system for tertiary hospitals is yet to be developed. The DHIS is comprised of the provincial DHIS cell at the provincial Health Directorate, headed by a provincial coordinator, who reports to the Director-General of Health Services in Balochistan. The provincial coordinator is assisted by a number of experts in statistics and information technology. A DHIS cell is being set up in each district to coordinate the entire information system in the provincial health department.[3]

During the field visit, the assessment team met with senior officials and representatives from the People's Primary Healthcare Initiative, managers of several vertical programmes such as the TB control programme, EPI, LHW programme, and maternal and child health programme. A field visit was made to Wahdat Colony basic health unit in Quetta district to understand some of the HIS and other service delivery activities at the lowest level of health service delivery. Wahdat Colony basic health unit is one of the People's Primary Healthcare Initiative's basic health units in Quetta.

Various information systems are operating and include programmes related to maternal and child health, malaria, nutrition, TB, HIV/AIDS, EPI and LHWs. In Balochistan, DHIS 1 software is used to collect, process and report health facility information, with one data entry clerk dedicated to DHIS 1 activities in each district. At the facility level, DHIS reporting is paper-based and monthly reporting by basic health units is almost universal, at 99% for 2015 and 2016. Quality assurance procedures are implemented through the LQAS in DHIS. LQAS sampling procedures and analysis are relatively simple and the findings can be used immediately by local managers and health workers. A summary of the key observations across the four components of a functional HIS are presented in Table 4.

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[2] People's Primary Healthcare Initiative Balochistan Annual Report 2016. Volume 12. "Umeed Ki Kiran" Journey with a purpose. Quetta, Balochistan: PPHI Head Office.

[3] District Health Information System Balochistan Annual Report, 2016. Provincial DHIS cell, Provincial Health Directorate, Quetta, Balochistan Province.

Table 4. Key observations on the HIS in Balochistan province

Key HIS component	Strengths	Areas for improvement
1. Sound policy and institutional environment	Linkage of provincial DHIS dashboard with the national HIS dashboard. Willingness of the province to cooperate with federal level to improve the HIS (e.g. implementation of DHIS-2). Availability of district health committees operating under the People's Primary Healthcare Initiative.	Enhance functionality of the private hospital regulatory authority. No coordination mechanisms to support HIS initiatives. In particular, there is a need to improve the coverage and reporting compliance of other vertical programmes.
2. Data sources	Comprehensive coverage of data collection in targeted areas/facilities. Understanding of the importance of integration of various information systems. All data from People's Primary Healthcare Initiative facilities are reported to the district level and used for monitoring.	Duplication of efforts for the People's Primary Healthcare Initiative in areas where DHIS team is working ("parallel systems") Shortage of tools/forms/registers for data collection for reporting of information from facility to district level Completeness of data and timeliness of reporting is a challenge for some facilities. Ensure that data reported by some cadres such as LHWs (mostly using paper-based systems) are included in the DHIS. For example, at the basic health unit level some data from other services (e.g. laboratory) are reported separately under the People's Primary Healthcare Initiative but not DHIS.
3. Strong institutional analytical capacities	Regular release of DHIS annual reports.	Limited staff across all programmes for various functions related to data collection, processing, analysis, and report writing. Enhance data quality measures.
4. Mechanisms for data use, review, and action	Plans under way to review the list of indicators reported at the provincial level and also included in the DHIS. Quarterly review meetings for all vertical programmes. Willingness to have a system that generates alerts for prompt action.	Limited use of information for planning and evidence-based decision-making. Lack of review meetings or HIS coordination meetings to discuss cross-cutting issues (e.g. district health committees across all provinces). Individual vertical programmes collect a lot of information but there is a need to agree on which indicators to include in the DHIS. Limited feedback mechanisms of data collected at the facility level.

4.2 HIS assessment and planning tool: scoring

The HIS assessment and planning tool was used to obtain an overview of the current status of the different components of the monitoring and evaluation platform of the health sector, and to identify a set of priority actions that require further strengthening or development. The tool includes a checklist of attributes of the four main components of a functioning monitoring and evaluation platform: sound policy and institutional environment; well-functioning data sources; strong analytical capacities; and mechanisms for review and action. The tool was presented to the participants in a plenary session.

Participants in the workshop were divided into four groups to score 71 attributes of the checklist, falling under the following categories:

► *Group 1*: Sound policy and institutional environment; and effective country mechanisms for review and action.

► *Group 2*: Well-functioning data sources related to routine health information systems.

► *Group 3*: Well-functioning data sources related to household surveys, census, and CRVS; and strong institutional capacity for data collection, management, analysis, use and dissemination

► *Group 4*: Well-functioning data sources related to disease surveillance and health systems.

Fig. 2 displays results of the scoring of the attributes. Complete scoring results for each component (by working group) are presented in Annex 2.

According to the assessment conducted by the workshop participants, 40% of the attributes of a functioning HIS are not present across all components. Pakistan has recently passed the Public Right to Information Act in a few provinces in the country, which entails availability of information in the public domain. However, no mechanism has yet been devised or established for local level decision-makers and community members to analyse and use facility- and community-based information to develop responsive and appropriate service delivery strategies and community-based interventions. There is also lack of systematic provision of feedback to all reporting subunits, non-use of web-based systems (e.g. DHIS) across all facility reporting systems, harmonized system of facility assessments, regular and independent data quality assessments, functional multisectoral coordination committee, non-reporting of deaths with cause of death through medical certification using the ICD, and lack of IT infrastructure for entering information on the deceased, including the causes of death by individual record.
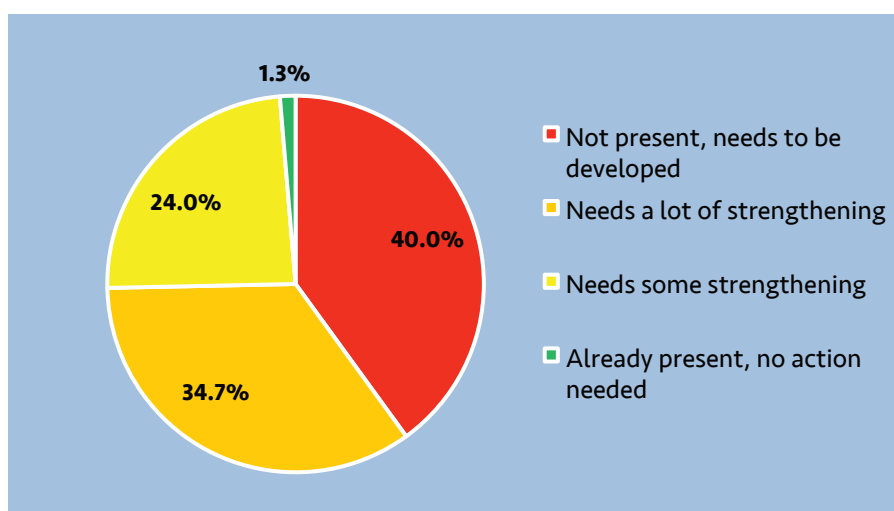
Fig. 2. Summary of scores from the assessment and planning tool

Key gaps also relate to: lack of systems for automated coding of causes of death (e.g. IRIS); non-use of verbal autopsy to generate nationally representative cause of death statistics; limited triangulation of data from all relevant sources; lack of effective processes to support analysis and use at subnational level; and lack of transparent and accessible health data. There is also limited engagement of public health and academic institutions, as well as advocacy groups and the media in dissemination of key health information. Other key attributes which are not present include limited capacity to diagnose and record cases of notifiable diseases, a timeframe to verify an event and report weekly aggregated data defined at all levels, regular analysis of data to detect events involving cases or deaths above expected levels in a particular time and place, integration of all disease surveillance programmes, a reliable and transparent system for tracking availability of human resources, and electronic registry on the health workforce. Routine recording systems for tracking health expenditures, effective mechanisms for review and action, functional laboratory information system, interoperability of health systems information subsystems and their integration into the HIS are also non-existent.

Almost 59% of the attributes need some or significant strengthening, meaning that although key attributes of a good functioning HIS are in place, there is significant room for improvement. This includes key strategic areas such as: improving coordination and monitoring and evaluation mechanisms; strengthening data sources (standards; certification in causes of death; ensuring adequate infrastructure and staffing for a functional routine health information system; enhancing coordination and implementation of surveys; improving health systems monitoring); and building analytical institutional capacities on data dissemination and use.

The only attribute already present and which did not require further action was a comprehensive assessment of the CRVS system.

Table 5 summarizes some of the key issues discussed by component in each of the working groups, aggregated in two main domains: Substantial support is needed (which includes attributes scored as 1 and 2); and some support is needed (score 3).

Table 5. Key areas requiring improvement in the HIS identified in working groups

Key HIS component	Substantial support is needed	Some support is needed
Group 1. Sound policy and institutional environment	The need for monitoring and evaluation plan with clear indicators to be monitored, lack of HIS plan, and no clear SOPs for data collection and monitoring progress. A key priority should be to create a committee to develop the HIS/monitoring and evaluation plan.	There is a weak coordination of HIS and monitoring and evaluation activities due to institutional administrative structures that have been affected by the post-devolution system of governance. Better coordination among vertical programmes is needed; and this can be achieved with the establishment of a committee to develop the HIS plan.
Group 1. Effective country mechanisms for review and action	N/A	A system of joint periodic progress and performance reviews needs to be enhanced, including independent reviews of data, active engagement of civil society and incorporating results from reviews into decision-making.
Group 2. Routine health information systems	Current infrastructure, staffing, supervision and analytical capacities to ensure a functional routine HIS are inadequate. Feedback mechanisms and use of web-based systems across all reporting facilities need to be improved. Key actions to strengthen the routine HIS include training of staff in health departments and at all levels; equipping some provinces with Islamabad Capital Territory equipment and piloting and implementing DHIS-2 nationally; and rolling out an electronic registry for the health workforce.	Although various disease- and programme-specific data are available they need to be integrated into a common national data repository.
Group 3. Household surveys; censuses; CRVS	A functional multisectoral coordination committee should be established to harmonize efforts in improving the HIS. Despite efforts to improve cause of death data, a huge gap in cause of death certification according to ICD coding and use of verbal autopsies to generate national representative cause of death data was identified. While surveys provide a rich source of data for most core health indicators, the lack of coordination mechanisms to support, among other things, development of national survey plans was identified. The need for a census was also identified and current plans and efforts for Pakistan to conduct a census were acknowledged.	Although a CRVS comprehensive assessment was conducted, there is a need to strengthen coordination mechanisms and ensure that CRVS recommendations are addressed. All stakeholders should be actively engaged through the Ministry and the Bureau of Statistics to implement surveys and census. Capacities for analysis of data from surveys and census needs strengthening. Recruitment and training of additional statisticians, demographers and IT specialists in the Pakistan Bureau of Statistics and the departments of health is also needed.

Key HIS component	Substantial support is needed	Some support is needed
Group 3. Strong institutional capacity for data collection, management, analysis, use and dissemination	Analysis of data can be substantially improved. Key interventions should focus on setting up collaborative efforts to strengthen synthesis and analysis of national data from all sources and involve all key HIS stakeholders. Collaborative efforts can also be an opportunity to develop effective processes to support analysis and use at subnational level. Written guidelines and tools should be developed to support analysis and use of data. Ensuring that health data are transparent and accessible by establishing national health observatories and also improving data dissemination strategies were also identified as critical interventions to be implemented.	Although international standards for analysis and presentation of key health indicators exist, there is a need to enhance capacity of staff to use the standards and ensure comparability of results or indicators between populations and over time.
Group 4. Disease surveillance	There are still significant gaps in disease surveillance: the list of priority diseases and syndromes needs to be reviewed and updated in some provinces. In addition, there is a need for improving reporting of priority diseases and conditions. A key priority for the Ministry is to develop standards for case definitions, involve public and private health care facilities and laboratories in the public health surveillance system and improve reporting. Public health surveillance across all programmes should be integrated.	Although the number of staff across public health surveillance might be sufficient, there is limited skilled staff. Capacity-building initiatives will need to be implemented.
Group 4. Health systems information (logistics management information systems, national health accounts, human resources)	N/A	The public financial management system should be strengthened.

A full table summarizing the scores by attribute and component of the monitoring and evaluation platform is included in Annex 3. Identified priorities captured in Table 5 have also been included into the roadmap (Section 7).

5. Addressing fragmentation of the HIS and governance issues

Primary health care services across Pakistan are delivered from basic health units and rural health centres. However, people who only need primary care may directly overburden the secondary or tertiary care hospitals without a referral. Although most services are provided from the same premises, each service is managed independently of other closely interrelated services. The individual responsible for the programme prepares its statistical report and sends directly to his/her supervisor at district level who then reports to the province. The DHIS, which duplicates data with programme-specific reporting, does not substitute the requirements of a vertical management information system. The reports on health promotion activities carried out in the communities, specifically by LHWs, bypass the facilities. The head of the facility is neither fully responsible for all the services the facility collectively delivers nor is there a mechanism for it to know the overall health status of a catchment population or complete performance of the health unit. This way, both the service delivery systems and data management systems are needlessly overly fragmented.

Vertical management information systems are obviously more expensive than an integrated system. However, an integrated system is not suitable for the vertically-managed health programmes in Pakistan. So, the design of the information system is determined by the management design of the health system. Various systems currently in operation have their specific strengths and weaknesses. One common weakness in all is gross underuse of the information that they each collect. If the data were combined from all vertical systems, they could be sufficient for use at all levels within the country, as well as for the reporting to international agencies. A key element missing in both the health and health management information systems is a holistic approach

that could easily be applied simply by changing management practices, without adding any financial burden to the system.

Strengthening the HIS begins with defining indicators and identifying data needs. Then a comparison is made between data needed and data available in current systems. Gaps are identified, data collection tools are modified, or new tools are devised to ensure the collection and reporting of all needed data. These are widely practised and recommended processes, but they do consume time and money in printing, training, and resetting the system and still do not guarantee that the emerging system will function as imagined. Also, such processes face considerable resistance from existing systems. Contrary to this expensive approach, there is a pragmatic way that is conducive for all concerned stakeholders: to simply continue the data collection tools and processes as they are at facility level. Then, instead of management information system-specific individuals sending their statistics directly to their supervisor at the district health office they can be rerouted through the staff in charge at the facility. Then the in-charge staff extract the data from all management information systems into a facility monitoring worksheet and forward the originals to the DHIS focal point at the district level. The focal point, in turn, arranges to enter them into an electronic database, generates analytic reports, and disseminates them for all stakeholders of all levels. This requires the merging of all management information systems with the DHIS at district, province, and national level and introduction of software such as DHIS-2 and linkage with Pakistan's HIS national level dashboard to strengthen governance and assist policy-makers, planners, and health managers in evidence-based decision-making. The data required but not captured by any of the systems can be gradually incorporated through an introduction of a supplementary reporting tool. The current DHIS report would be automatically redundant.

6. Transition to the DHIS-2 platform

Transition to DHIS-2 is inevitable for Pakistan's health information system. Since the 1980s Pakistan has a history of implementing a district to national health information programme, with a focus on the old DHIS platform.

6.1 Key considerations for the transition

There are several reasons for Pakistan to replace this system with the current universal DHIS-2 platform:

► DHIS-2 is the best and only solution worldwide. DHIS-2 is currently the most experienced integrated health management information system available worldwide. It is scalable to every domain size of a country's needs and one of the most supported free HIS systems in the world with many rich resources, plug-ins, and educational materials publicly available. At the time of the review, there were 47 countries using DHIS-2 as their main HIS platform.

► The DHIS-1 platform is outdated. DHIS-2 has been around since 2005 with several iterations of massive upgrades, bringing a totally different environment to address countries' diverse requests over time (the current version is 2.7). There is very limited support, resources, and features for countries in the DHIS 1 family, such as Pakistan. Thus, the DHIS 1 family is technically outdated for sustainable use.

► DHIS-2 brings crucial solutions. DHIS-2 has, after 13 years, many enhancements, features, and tools already built-in. Some of the main potential benefits of DHIS-2 for Pakistan are:

  – *Hybrid data entry technology*: Pakistan's access to the internet and a web-based system vary from one region to another. Even in an area with internet availability, such access may not be trusted as a continuous stable and reliable communication platform. This may compromise the use of web-based technology as a means of service provision.

DHIS-2 has provided hybrid technology to allow its users to work both online and offline without losing data. Using such technology, district users could enter data when they are offline, and the system stores the data and sends it later as soon as the connection is available.

  – *Multi-platform compatibility*: There are several vertical and non-vertical HIS-based programmes currently operational in every province in Pakistan. These programmes, especially on the end-user side are running on different platforms such as mobiles, tablets, and desktops. DHIS-2 is particularly equipped with multiplatform technology, making it usable for every input device. The provincial and district managers can freely decide on the choice of input devices and platforms.

  – *Live provincial-to-national platform*: DHIS-2 is based on a web-based live reporting and monitoring system that enables both geographical and statistical live overview of health indicators in the district, province, and the country. This is a massive upgrade from the current monthly to quarterly report in Pakistan which may not necessarily present a recent trend analysis over time and epidemiological distribution of health issues. According to the latest report (available at www.dhis2.org) there are currently 16 countries which run DHIS-2 in national live status.

  – *Wide system compatibility*: Pakistan currently has many management information systems and vertical programmes which each bring a new stream of data. One of the strengths of DHIS-2 is its capability to communicate with a diverse variety of data sources, enabling the current systems in the provinces and vertical programmes to survive while feeding the provincial to national DHIS-2 platform.

6.2 Pakistan's readiness for the DHIS-2 platform

Transition from the existing DHIS platform to DHIS-2 requires preparedness in all social, technical, and organizational aspects of a country. DHIS-2 is not just a new software version, it is an information-wise agenda for a complementary upgrade of all levels of Pakistan's health system requiring involvement of all stakeholders. To assess readiness, there are critical aspects of DHIS-2 readiness factors that a country needs to take into consideration:

► informed willingness

► roadmap development

► capacity-building

► policy preparedness

► reference data or information preparedness

► standards development

► resource allocation

► technical preparation.

In as much as there are various technical and non-technical requirements to trigger the DHIS upgrade, the *informed willingness* of all authorities and decision-makers is a must. They should all know about the benefits of DHIS-2, what it brings, what it requires, and what it takes to implement the DHIS-2 platform at a fully functioning level. A steering committee should develop a training plan to build the capacity of staff across the country to use DHIS-2. Every actor should become familiar with the new environment and his or her role in it.

As soon as all stakeholders are acquainted with the demands of DHIS-2 implementation, *reference data and information standards* should be prepared or developed by the designated workgroups. Reference data could be population data, catchment areas, GIS data, and facilities and services information. Information standards and protocols should cover coding, terminology, and case definitions required for local to international communications.

As soon as a nationally integrated health information platform becomes operational, questions and concerns regarding data storage and access will arise. To overcome these issues, a *provincial to national information access policy* should be defined, promoted and enforced across the country.

Technical preparedness is the final important step that brings all attempts into real implementation and action, and includes both software and hardware upgrades that enable the new platform to run countrywide.

7. Roadmap of key priority actions

Priority actions were identified during working group sessions, based on the score of the attributes and the qualitative information gathered during the workshop. The priorities were discussed extensively in a plenary session, with substantial input from all stakeholders. The tentative timeframe, and those responsible for the actions and other key actors needed for implementation, were also identified (Table 6).

Table 6. Key priority interventions to enhance Pakistan's HIS

Roadmap of key priority actions			Timetable				
Strategic dimensions	**Key priority actions**	**Responsible/ other actors**	**2017**	**2018**	**2019**	**2020**	**2021**
1. Policy, governance and institutional environment	1.1 Establish a HIS technical working group with representation from the National Health Information Resource Centre, provincial and regional departments of health.	Provincial Department of Health, Ministry of National Health Services, Regulations and Coordination	X				
	1.2 Conduct joint HIS-based technical working group meetings for improved coordination and strengthening of integration/HIS.	Ministry of National Health Services, Regulations and Coordination, provincial Department of Health	X	X	X	X	X
	1.3 Launch a monitoring and evaluation task force.	National/ provincial Department of Health leads National Health Information Resource Centre/ DHIS Coordinator	X				
	1.4 Conduct a monitoring and evaluation workshop at national and provincial level.		X				
	1.5 Develop a monitoring and evaluation plan.			X			
	1.6 Assign technical working groups to work on policy, regulation, human resources for health, quality.			X			
	1.7 Disseminate assessment by current WHO team.		X				
	1.8 Implement recommendations.			X			
	1.9 Harmonize current indicators with global indicators.			X			
	1.10 Align management information systems of vertical programme indicators with the existing DHIS.	Donor working group, Country Coordination Mechanism (CCM)		X			

Roadmap of key priority actions			Timetable				
Strategic dimensions	**Key priority actions**	**Responsible/ other actors**	**2017**	**2018**	**2019**	**2020**	**2021**
	1.11 Develop inventory of partners.			X			
	1.12 Develop common investment framework.	Donor working group, CCM		X			
	1.13 Develop means of measurement			X			
	1.14 Update TORs of the monitoring and evaluation coordination committee.			X			
	1.15 Strengthen HIS legislation and policy.			X			
	1.16 Develop an e-health strategy.				X		
	1.17 Develop and approve SOPs, including data management storing and dissemination of data.						
	1.18 Establish a sound governance mechanism, including defining and implementing data standards.						
	1.19 Develop and update metadata dictionary to permit interoperability.						
Routine health information systems	2.1 Assess current infrastructure in Islamabad Capital Territory (computers, servers, internet facility) software, human resources evaluation, including competencies (technical skills).	Ministry of National Health Services, Regulations and Coordination, provincial, regional Department of Health, WHO, Global Fund, USAID and other donors	X				
	2.2 Recruit national and subnational health information staff.	"As above"		X			
	2.3 Develop IT infrastructure.	"As above"		X			
	2.4 Train national and subnational health information staff.	"As above"		X	X	X	X

Strategic dimensions	Key priority actions	Responsible/ other actors	2017	2018	2019	2020	2021
	2.5 Nominate focal person for supervision (defining the supervisory roles and responsibilities; for two levels of supervision: 1) managerial; 2) technical).	"As above"	X				
	2.6 Develop/review/revision of agreed standard checklists for supervision and use by the supervisors.	"As above"		X			
	2.7 Define indicators and targets with regularity of monitoring and development of framework specifying quality of care.	"As above"			X		
	2.8 Allocate sufficient funds and resources to improve data systems.	"As above"		X			
	2.9 Develop standards for feedback mechanisms.						
	2.10 Identify training needs assessment- topic/themes.		X	X			
	2.11 Develop capacity-building priority list.			X			
	2.12 Develop upgrade plan for transition from DHIS to DHIS-2, including national, provincial/ regional and district level.			X			
	2.13 Develop an integration plan for vertical programmes.			X	X		
	2.14 Roll out DHIS-2, or similar, or strengthen the existing software to all districts/facilities, including capacity-building.			X	X	X	X
Health systems monitoring	3.1 Develop human resources electronic registry with up-to-date data on each individual health worker, including unique identifier qualification and key characteristics and their performance and establish a public health cadre.				X		
	3.2 Establish and implement mechanisms to track health expenditure on an annual basis using the global standard system of health accounts 2011.				X		

Strategic dimensions	Key priority actions	Responsible/ other actors	Timetable				
			2017	2018	2019	2020	2021
	3.3 Strengthen financial management system.			X			
	3.4 Establish and implement routine recording system for tracking private health expenditures.	"As above"	X				
	3.5 Establish mechanism to use the results of health accounts in national and subnational planning processes.				X		
	3.6 Establish/strengthen the logistic and management system.				X		
	3.7 Establish/strengthen laboratory information system.				X		
	3.8. Implement mechanisms to support health system integration.				X		
Surveillance	4.1 Review and update the priority list of notifiable diseases.		X	X			
	4.2 Develop case definition booklet and disseminate to all stakeholders.		X	X			
	4.3 Conduct capacity-building on case definitions.				X		
	4.4 Incentivise training through Pakistan's Medical and Dental Council credit hours for continuing medical education.				X		
	4.5 Develop and enforce legislation for mandatory case detection and reporting from public and private health care facilities, laboratories.				X		
	4.6 Establish a public health laboratories network.				X		
	4.7 Ensure immediate reporting of notifiable disease.		X	X			
	4.8 Define alert threshold and actions for priority diseases and syndrome.				X		

Roadmap of key priority actions				Timetable				
Strategic dimensions	**Key priority actions**	**Responsible/ other actors**	**2017**	**2018**	**2019**	**2020**	**2021**	
	4.9 Strengthen data analysis capacity at tehsil headquarters and district levels.							
	4.10 Recruit sufficient data analysts and epidemiologists at provincial and federal levels.			X				
	4.11 Integrate public health surveillance systems across the country.			X				
	4.12 Review equipment and logistics to perform expected public health and response activities.			X				
	4.13 Develop strategic action plan comprising provision of resources for equipment and logistics.			X	X			
	4.14 Ensure specific human resources recruitment and conduct capacity-building at all levels.			X	X			
Household surveys and censuses	5.1 Develop multisectoral mechanism to coordinate and develop harmonized national health survey plans.	Pakistan Bureau of Statistics, Ministry of National Health Services, Regulations and Coordination		X	X			
	5.2 Implement regular system of health-related household surveys and System of Health Accounts (SHA 2011).	Pakistan Bureau of Statistics, Ministry of National Health Services, Regulations and Coordination and institutional partners			X	X	X	
	5.3 Build capacities of national statistical offices and public health institutes in data analysis.	Pakistan Bureau of Statistics, respective provincial and federal departments.		X	X	X	X	

Strategic dimensions	Key priority actions	Responsible/ other actors	2017	2018	2019	2020	2021
	5.4 Recruit/train additional statisticians, demographers, statisticians.	Pakistan Bureau of Statistics, provincial and federal levels		X	X	X	X
CRVS	6.1 Develop a multisectoral CRVS strengthening plan.	Ministry of National Health Services, Regulations and Coordination, and partners		X			
	6.2 Update CRVS legislation.	Ministry of National Health Services, Regulations and Coordination, Law division, Parliament		X	X		
	6.3 Allocate resources to CRVS priorities.	Provincial and federal government and donors				X	X
	6.4 Develop plan for implementing ICD coding for recording causes of death.	Provincial and federal Department of Health				X	X
	6.5 Conduct capacity-building training for personnel involved in medical certification of causes of death.	Provincial and federal Department of Health					X
Analysis, use and dissemination of data, including mechanisms for review and action	7.1 Assess the existing capacity of DHIS at all levels in terms of data management and analysis.		X	X			
	7.2 Develop guidelines for data analysis requirements; develop relevant job descriptions, ToRs and SOPs for relevant positions.			X			

Roadmap of key priority actions			Timetable				
Strategic dimensions	**Key priority actions**	**Responsible/ other actors**	**2017**	**2018**	**2019**	**2020**	**2021**
	7.3 Elicit commitment from provinces and regions to submit reports and data in a timely manner.		X				
	7.4 Develop data sharing mechanisms and establish seamless data sharing mechanisms and protocols.		X	X			
	7.5 Conduct regular data analysis and performance reviews at the national/subnational levels.			X			
	7.6 Link performance to incentives and remuneration.						

8. Recommendations

The recommendations are aimed at streamlining and strengthening the entire HIS. The improvement plan can be achieved through a well-coordinated approach by the Ministry of National Health Services, Regulations and Coordination, its subsidiary segment of the National Health Information Resource Centre that is housed within the Health Planning, Systems Strengthening and Information Analysis Unit, and all key stakeholders. Implementing effective coordination mechanisms with a comprehensive monitoring and evaluation plan will build an effective HIS with increased access, improved data quality, and ensuring optimal efficiency.

Addressing the recommendations should be made with reference to the detailed roadmap of key priority actions (Section 7). The roadmap should be considered an "implementation plan" of the recommendations. An HIS coordination committee with representation from the respective arms of the health sector (e.g. vertical programmes) and provinces/regions should oversee the progress in implementing the recommendations whereas a technical subcommittee should support the operationalization of priority actions.

8.1 Sound policy and institutional environment

Recommendations and suggested activities in this component are aimed at improving management, coordination, and efficiency for all HIS stakeholders.

► Strengthen functionality and effectiveness of the HIS by ensuring that all stakeholders, with the leadership of the Ministry of National Health Services, Regulations and Coordination, agree on an monitoring and evaluation plan with clearly defined indicators to be monitored, develop a HIS plan, e-health strategy, and clear SOPs and legal frameworks for monitoring progress. This can be achieved through establishment of a functional national steering committee.

▶ Create and operationalize a monitoring and evaluation taskforce or HIS technical subcommittee to develop the HIS/monitoring and evaluation plan and assist in monitoring progress with implementation of the key priority actions.

▶ The Ministry should continue as the lead on HIS strengthening activities by coordinating HIS and monitoring and evaluation activities, holding regular meetings with provincial and regional HIS coordinators and other stakeholders.

▶ Strengthen the functionality of the HIS by establishing sound governance mechanisms, defining and implementing data standards and a metadata dictionary to permit interoperability of information systems.

▶ Develop mechanisms to establish a common investment framework for HIS strengthening both at the provincial/regional and national level.

8.2 Data sources

8.2.1 Health systems, health facility, and community information systems

The core functionality of any HIS rests on strong health systems, health facility and community information systems. These data building blocks need to be managed effectively and valued by all HIS stakeholders.

▶ Assess the current infrastructure needs and ensure that staffing and analytical capacities are consistent with the demands of the HIS at the facility, district, provincial and national level. This can be achieved by training of relevant HIS staff at all levels and purchasing Islamabad Capital Territory equipment to enhance collection, processing, and dissemination of data.

▶ Develop and/or review standards for supportive supervision to enhance functionality of the hospital management system and ensure that data are easily accessed, retrieved, and utilized for decision-making.

▶ Define indicators and targets to support regular monitoring and improve quality of care.

▶ Conduct a training needs assessment and use the results from the assessment to develop a priority list for capacity-building.

▶ Develop an integration plan for vertical programmes to ensure that Pakistan has a seamless system to meet national, regional and international obligations for core health indicator reporting.

▶ Review information system needs and the role of DHIS-2 in improving the data collection, processing, and dissemination for Pakistan's HIS.

▶ Develop an electronic human resources management information system, including registry and mechanisms to track health expenditure in order to improve performance monitoring of health cadres and outcomes and thereby ensure that Pakistan adheres to the global standard system of health accounts.

8.2.2 Disease surveillance

A fundamental function of public health is surveillance to establish rapid informed response mechanisms that can save lives, protect the public and mitigate the impact of disease. The following recommendations aim to strengthen the disease surveillance system.

▶ Review and update the priority list of notifiable diseases, including case definitions and ensure that these are disseminated to all relevant staff and stakeholders. Staff should also be trained on the updated list and case definitions.

▶ Institute legislation for mandatory case detection and reporting from public and private health care facilities and laboratories.

▶ Recruit sufficient data analysts and epidemiologists at the provincial and federal level to support detailed analyses of monthly, quarterly and annual reports.

- Integrate public health surveillance and response systems across the country.

- Develop strategic and action plans for the provision of resources and equipment to support public health and response activities.

8.2.3 CRVS, household surveys and census

Data from the different HIS sources provide an opportunity to support decision-making processes in health policy formulation, planning and implementation. CRVS, population-based surveys and census provide data for the entire population on overall health status and access to health services, among others. There is a rich source of population-based data in Pakistan, with the most recent census conducted in 2017. However, the areas cited below should be the focus for improvement.

- Deploy systems for ICD coding and recording of causes of death by implementing capacity-building training for personnel involved in medical certification of causes of death.

- Develop a multisectoral CRVS strengthening plan to address the recommendations identified during the CRVS comprehensive assessment.

- Strengthen capacities of national statistical offices and public health institutes to conduct analysis of data through training and recruitment of statisticians, demographers and IT specialists.

- Develop multisectoral mechanisms to coordinate and develop a harmonized national household survey plan to enhance collection and generation of national, regional, and international core health indicators including the system of national health accounts.

8.3 Institutional capacity for data management and analysis

Health information systems should not only focus on strong data collection mechanisms but also aim at producing high quality data to support decision-making, policy formulation and action. Health outcomes in Pakistan can be improved by ensuring

that the Ministry of National Health Services, Regulation and Coordination, the provincial and district departments of health, and other stakeholders address the following key areas.

- Assess the existing capacity of the DHIS at all levels with respect to data management, analysis and report generation. This can be achieved by building on the efforts and experience made in developing the Pakistan Health Information System dashboard at the national level and monitoring and evaluation dashboards in Khyber Pakhtunkhwa and Sindh provinces. Once this assessment has been done, a decision should be made on the most optimal solution in light of the positive attributes of DHIS-2.

- Design an architectural framework for implementation of DHIS-2 for regular reporting mechanism, including case-based information.

- Develop SOPs for data management and analysis, including ToRs for staff responsible for data management and analysis to ensure that expectations are matched with performance.

- Establish coordination mechanisms with and seek commitment of provincial departments of health to submit reports and share data in a timely manner.

8.4 Mechanisms for data use, review and action

Data collection and processing can only yield desired outcomes if there are mechanisms to use the data, regularly review them, and implement evidence-based interventions. The following key actions have been identified to strengthen these mechanisms.

- Develop an integrated web-based HIS system to address fragmentation challenges by ensuring that all provinces are able to report and access the data to monitor their progress and experience-sharing.

- Conduct regular data analysis, independent reviews of data, and performance reviews at the national and subnational levels, including active engagement of civil society and incorporating results from the reviews into decision-making.

- Raise awareness on importance of data and conduct training of trainers on data use and analysis.

8.5 Addressing fragmentation of the HIS

Fragmentation of the HIS is one of the main challenges that renders a HIS ineffective. Opportunities to address fragmentation of the HIS in Pakistan exist. This can be achieved by developing and enacting HIS protocol to assemble data from all programmes within a health facility catchment area into a single worksheet and conducting a regular comprehensive review to improve availability, quality, and utilization of health services. At the district level, data from all programmes can be stored in a raw and analysed form and then into a single repository with controlled access to all concerned users of all levels. The following are steps to achieve this.

- Define health indicators that are required to fulfil international and national, provincial, and local commitments and goals.

- Develop integrated data aggregation and performance monitoring worksheets for the use of various categories of health facilities.

- Develop or customize an electronic tool with the capability of storing data required to calculate all of the above indicators.

- Develop an additional reporting tool for missing data in the current management information system.

- Develop data management and data use manual for all types of health facilities, as well as for provincial and district health offices.

- Produce periodic integrated reports.

- Produce special bulletins based on contemporary issues and problems.

- Conduct routine monitoring and evaluation of programme performance.

- Review the performance of the HIS annually or biannually based on existing resources and local context.

8.6 Transition to DHIS-2

Pakistan's growing interest in transitioning to DHIS-2 is consistent with the growing interest in DHIS-2 globally. While DHIS-2 allows countries to customize HIS data collection, aggregation, and reporting, preparations for roll-out need to be carefully planned. For a successful roll-out of DHIS-2 pilot in Pakistan, the following are the key recommendations based on best practices.

- Develop a detailed DHIS 2-readiness capacity-building plan for national, provincial and district health managers (including their associates, i.e. IT/management information systems, data managers and operators) on how to apply DHIS data to improve their management. This should also involve operational staff in charge of first- and second-line data entry on the "how's and why's" of quality data entry.

- Draft a national-provincial SDG-DHIS-2 target plan, agreeing on key action points for the next three years.

- Design, approve, and advocate for a DHIS-2 promotion/incentive plan at the national level.

- Design an architectural framework for a management information system for DHIS-2.

- Design a management information system-DHIS-2 API/Mediator software system with assistance from the DHIS team to communicate to all management information systems and electronic medical record-like data source for data acquisition.

- Define and operate a DHIS-2 certification programme in order to ensure DHIS-2 compatibility in any software/dashboard platform across the country.

- Design and approve a master DHIS-2 roll-out plan which should include the technical, socio-technical, human resources and financial aspects of the implementation and change management.

- A DHIS-2 routine bulletin line should be part of district and province monitoring and evaluation cells to promote and provide feedback on DHIS data.

9. Next steps

Improving the functionality of the HIS requires plans and schedules that outline the components of the system to be developed/enhanced/reformed/used as is, the expected output, costs, responsible parties, and any other recommended areas for strengthening. In Pakistan, developing an HIS improvement plan will require coordination among all stakeholders at the national, provincial, and district level and should also be guided by a strategic plan that takes into account the strengths and opportunities of the current HIS.

The improvement plan for HIS in Pakistan should be based on the information provided in Section 4, including the priority actions in Section 7, and focus on building a comprehensive and integrated system consistent with the key components of a functional HIS: policy and governance; infrastructure and support; data management and standards; quality assurance; and dissemination and data use. The improvement plan for HIS can be implemented and coordinated with the leadership of the Ministry of National Health Services, Regulation and Coordination, in collaboration with provincial and district HIS coordinators and all stakeholders. The Ministry should use the priority actions as background information to develop an HIS strategy and use it to mobilize domestic and external support to improve the HIS.

The roadmap of priority actions and responsible actors presented in this report will support the Ministry, in collaboration with other stakeholders, to develop detailed short-term, mid-term, and long-term plans for HIS strengthening. In order to see immediate effects from the HIS strengthening process and improvement plan, the Ministry and all stakeholders should aim at deploying interventions that can strengthen the existing HIS operations without much change ("quick wins"). This can be developed through involvement of stakeholders and HIS specialists.

In addition to the interventions documented in this report, a critical remaining step is to cost the interventions, their estimated person-days and, where necessary, individuals to be trained or materials/equipment to be purchased, and the proposed timeframe, which should all be consistent with the roadmap of key priority actions in Section 7. This process can be led by the technical subcommittee on the HIS and programmatic HIS experts.

## Annex 1. HIS data sources and their attributes in Punjab province

No.	Health information system/ Management information system	Source of data	Frequency	Status
1	DHIS	Primary and secondary facilities (some tertiary hospitals)	Monthly	Online
2	Lady Health Workers MIS*	LHWs (community-based)	Monthly	Online
3	MNCH*	District data (facility and community- based)	Monthly	Online
4	cLMIS*	Facility-based	Monthly	Online
5	Nutrition information system*	Facility-based	Weekly/Monthly	Online
4	Monitoring and evaluation	Facility-based and community-based	Monthly	
5	Monitoring and evaluation agents reporting system**	Monitoring and evaluation agents of health department (facility knock down criteria, availability of human resources, medicines and equipment functionality)	Monthly	Online
6	Health watch (monitoring of monitors)	Health managers (Executive District Officers Health, departments of health, District Director of Health Services) application-based monitoring data	Real time	Online
7	EPI	Vaccinator (community- and facility-based)	Monthly	Vaccine preventable diseases system being developed
8	vLMIS	Facility-based	Monthly	Online
9	HIV/AIDS	Community- and facility-based	Weekly/Monthly	Online
10	TB control	Facility-based	Monthly	Online
11	Malaria	Facility-based	Monthly	Online
12	Disease surveillance system	Facility-based	Daily and weekly	Online
13	Human resource management information system	Health Department Officers service data	Real time	Online
14	Inventory management system	Facility-based inventory of equipment, fixtures and non-medical consumables	Real time	Online

*LHW, maternal, newborn and child health, nutrition information system and cLMIS have been integrated and reproductive, maternal, newborn and child health and nutrition programme;
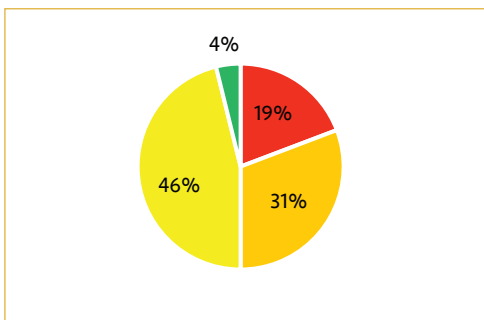
**monitoring and evaluation agents
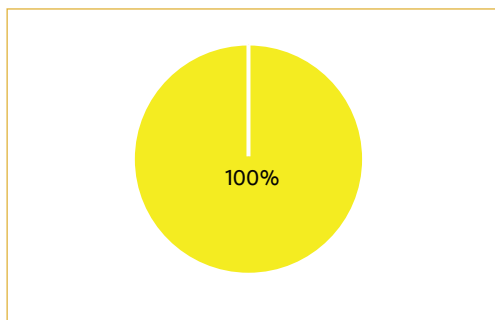
Annex 2. Summary of scores by working group

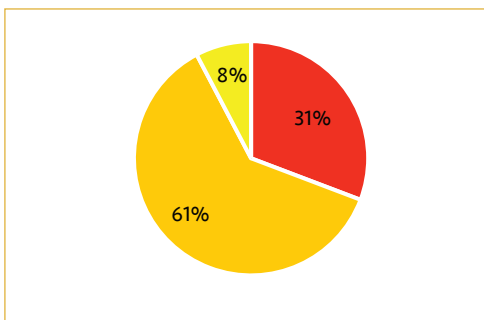### Group 1. Policy and institutional environment
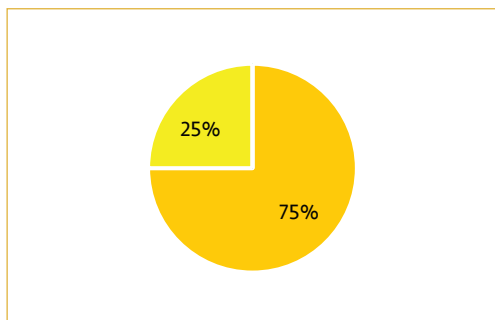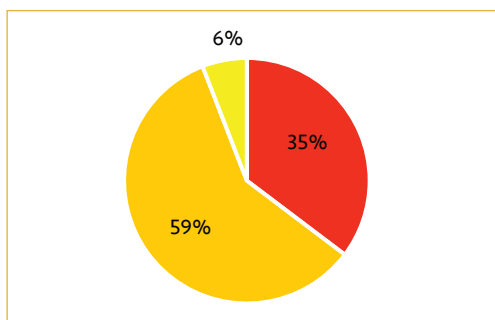

25%
75%

Group 3. Household surveys; census; CRVS

4%
19%
46%
31%

Group 1. Effective country mechanisms for review and action

100%

Group 3. Strong institutional capacities

8%
31%
61%

Group 2. Routine health information systems

6%
35%
59%

Group 4. Disease surveillance

7%
27%
67%

Group 4. Health systems

23%
46%
31%
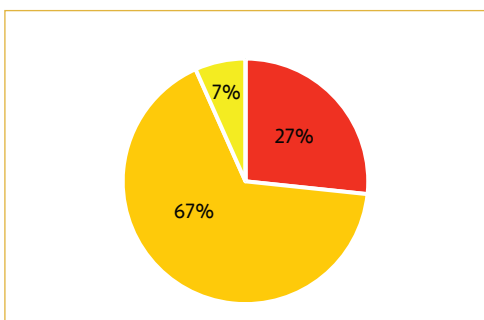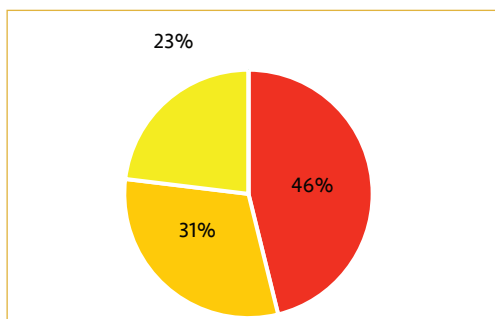
Key

🟥 **Not present, needs to be developed**   🟧 **Needs significant strengthening**

🟨 **Needs some strengthening**   🟩 **Already present, no action needed**

Annex 3. Scoring exercise, by component and attribute

Table 3A. Results of the scoring exercise, by working group and attribute

Component	Not present, needs to be developed	Needs significant strengthening	Needs some strengthening	Already present, no action needed
Policy and institutional environment	-	There is a comprehensive costed monitoring and evaluation plan for the national health sector strategy. The monitoring and evaluation plan has been informed by a recent (< 2 years) assessment of current monitoring and evaluation/HIS. The monitoring and evaluation plan includes a framework that specifies a balanced and limited set of core indicators with well-defined baselines, targets, frequency of measurement and data sources. Disease- and programme-specific monitoring, evaluation mechanisms, including indicators, are aligned with the monitoring and evaluation plan. There is a common investment framework used as the basis for partner and domestic support. There are agreed indicators, means of measurement and targets (developed in collaboration between relevant ministries and agencies) for monitoring and evaluation of health-related SDGs. Existence of an effective country-led coordination mechanism for monitoring and evaluation and review with active involvement and support of relevant development partners, civil society and other actors. There is up-to-date legislation and detailed regulations for health information, including all data sources. There is a national policy/strategy for e-health and Islamabad Capital Territory development and use, including governance and legal frameworks; enterprise architecture; standardization and interoperability; and research and evaluation on e-health.	SOPs have been written that define roles and responsibilities for collecting, managing and disseminating health data, including confidentiality. There is an overall unifying health data architecture and health data collection standards.	-

Component	Not present, needs to be developed	Needs significant strengthening	Needs some strengthening	Already present, no action needed
Routine health information systems	Local level decision-makers and community members analyse and use facility and community-based information to develop responsive and appropriate service delivery strategies and community-based interventions. Feedback is systematically provided to all reporting subunits. There is a comprehensive list of health facilities, with unique facility identifiers and geocodes. Facility reporting systems use web-based systems (e.g. DHIS) when feasible. There is a harmonized system of facility assessments to verify service delivery and quality of care Regular and independent data quality assessments are institutionalized.	There is adequate infrastructure and staffing for a functional routine health information system. Effective supervisions are in place (up-to-date checklist, resources). There is adequate training and capacity-building for a functional routine HIS. There is a system for collection and use of patient management data at the point of service. Data on community-based health programmes are available in formats that are easy to access and linked to facility-based databases.	Disease- and programme-specific data elements and indicators are integrated into the national common data repository.	-

Component	Not present, needs to be developed	Needs significant strengthening	Needs some strengthening	Already present, no action needed
Household surveys; censuses; CRVS	A functional multisectoral coordination committee is in place (national statistical offices, Ministry of National Health Services, Regulation and Coordination, etc.). Hospitals are reporting deaths with cause of death through medical certification using ICD coding. There is IT infrastructure for entering information on the deceased, including the cause of death by individual record. Systems for the automated coding of cause of death are progressively used. Use of verbal autopsy is being gradually expanded to generate nationally representative cause of death statistics.	There are trained resources to conduct verbal autopsies. There are strategies and resources to strengthen the notification of births and deaths and medical certification of cause of death. A coordination mechanism is in-place to coordinate plans for the national census and national surveys. The national statistical office publishes timely and reliable annual population estimates for various demographic and geographic groups (e.g. live births, surviving infants, women of reproductive age by district).	There are an up-to-date legislation and regulations for CRVS. There is a national survey plan and research agenda for household surveys detailing content, sequencing, periodicity, and funding, aligned with the monitoring and evaluation plan and the national health strategy. Household surveys are conducted every 2–3 years to monitor progress on key health indicators of the national health strategic plan.	A comprehensive assessment has been conducted of current CRVS performance. There is adequate country level capacity for census and survey data collection, analysis, report writing and dissemination.

Pakistan 2017

Component	Not present, needs to be developed	Needs significant strengthening	Needs some strengthening	Already present, no action needed
Disease surveillance	The country has adequate capacity to diagnose and record cases of notifiable diseases. Timeframe to verify an event and to report weekly aggregated data is defined at all levels. Data are analysed on a regular basis at the different levels to detect events involving cases or deaths above expected levels for the particular time and place. There is integration of all disease surveillance programmes.	List of priority diseases and syndromes under current national surveillance is defined. Standard case definitions are available for all diseases and syndromes under surveillance. Public and private health care facilities, laboratories and communities contribute to routine case detection. Alert/action thresholds have been defined for priority diseases and syndromes. Equipment and logistics (forms and registers, computers, telephones, communication including internet connectivity, cars and motorbikes) are sufficient and appropriately disseminated in the country to conduct public health surveillance activities.	Sufficient staff is available at all levels to conduct public health surveillance and response.	-

Component	Not present, needs to be developed	Needs significant strengthening	Needs some strengthening	Already present, no action needed
Health systems	There is a reliable and transparent system for tracking the aggregate availability of human resources. These aggregate data on human resources availability, by cadre and by health facility, are widely available for purposes of assessing equity productivity. There is an electronic registry (human resource management information syste") with up-to-date data on each individual health worker including a unique identifier, qualifications and key characteristics (name, birth date, sex, contact, place of work, etc.). Health accounts results are used for policy planning and evaluation, from overall health system policies to health system financing policy specifically. There is a functional laboratory information system. "Health systems" information subsystems are interoperable, or have been integrated, into the health management information system.	Health expenditures are tracked on an annual basis, using the global standard of SHA 2011. There is a logistics information system for tracking commodities, medicines, equipment, and supplies.	There is strong public financial management system, tracking government budgets, disbursements, and expenditures at all levels (from facility to central level). There are country-specific routine recording systems for tracking private health expenditures (e.g. by nongovernmental organizations, enterprises, private insurances, etc.), to replace health accounts annual surveys.	-

Component	Not present, needs to be developed	Needs significant strengthening	Needs some strengthening	Already present, no action needed
Strong institutional capacities	Synthesis and analysis of national data from all relevant sources is conducted using a collaborative approach involving health ministries, national statistical offices, technical experts and public and private sector. There are effective processes to support analysis and use at subnational level. Health data are transparent and accessible. National public health and academic institutions, advocacy groups, and the media are engaged by the Ministry and National Statistical Office to disseminate key health information.	Strong analytical institutional capacity for supporting synthesis of data is in place. At national level, there are periodic performance reviews / analytic reviews based upon robust analysis of health data from all sources including contextual and qualitative information. There is a regular (annual) report of progress and performance that covers progress against the objectives and targets, equity and efficiency. A range of dissemination strategies exist for health information, censuses and vital statistics, including reports, policy-briefs and web-based dissemination.	International standards are followed for analysis and presentation of key indicators in order to ensure comparability of results between populations and over time.	-

Component	Not present, needs to be developed	Needs significant strengthening	Needs some strengthening	Already present, no action needed
Effective mechanisms for review and action	-	-	Regular and transparent system of reviews of progress and performance against national and locally defined priorities with broad involvement of key stakeholders is in place. Independent reviews of data in strategically important programmes, such as maternal, child and perinatal deaths, are conducted regularly. There are systematic linkages between health sector reviews and disease- and programme-specific reviews. Civil society organizations actively and meaningfully participate in country reviews of progress and performance at all levels. Results from reviews are incorporated into decision-making, including resource allocation and financial disbursement. Health information flows include regular feedback and use of data locally to improve services and programmes.	-

This report presents the findings of a comprehensive assessment of Pakistan's health information system undertaken by WHO in 2017 at the request of the Ministry of National Health Services, Regulations and Coordination. Health information systems, including civil registration and vital statistics systems, provide health information data for programme and performance monitoring, quality of care, planning and policy-making. The assessment resulted in a set of recommendations for the Ministry and other stakeholders to develop comprehensive and efficient systems to: monitor health risks and determinants; track health status and outcomes, including cause-specific mortality; and assess health system performance. The recommendations also provide an opportunity for the country to respond to the growing demands for health data to measure progress towards the health-related Sustainable Development Goals.