
Enhancement and digitalization of health information systems in the countries of the Eastern Mediterranean Region: a regional strategy (2024–2028)

Executive summary

National health information systems (HIS) are the foundation of health data, helping to improve health outcomes for people globally through better-informed policies, planning and management of health services. A robust national HIS provides data to understand population health needs, monitor actions and use of resources, and guide health decision-making. However, in many countries of the WHO Eastern Mediterranean Region, HIS do not perform efficiently and health data are often incomplete, fragmented or of inadequate quality.

WHO works to strengthen national HIS through a range of activities, from enhancing the collection of data and information to developing costed action plans to guide investments. One key regional initiative is the comprehensive assessment of national HIS, conducted in half of the countries in the Region since 2016, which has led to identification of key priority areas for enhancing HIS. An effective HIS needs to be powered by the advantages of digital transformation and this requires the development of a digitalized and integrated data system that encompasses the data life cycle, from collection through to analysis, dissemination and use to improve decision-making.

This technical paper sets out a regional strategy for the enhancement and digitalization of HIS in countries of the Eastern Mediterranean Region. The aim is to ensure that countries generate high-quality, timely, relevant, disaggregated and reliable data to inform policies and programmes, as well as to monitor progress on the health-related Sustainable Development Goals (SDGs). The paper proposes four strategic goals and 10 specific objectives related to: (a) national HIS strategies/plans and governance mechanisms; (b) infrastructure and human/financial resources; (c) interoperability and data standards; and (d) identifying inequities and using data for decision-making. Country-level actions are proposed for all HIS stakeholders, with attention given to the use of interoperability and data standards as key opportunities for enhancing HIS in the Region. In addition, a set of indicators is proposed to measure progress in implementation of the regional strategy from 2024 to 2028.

The regional strategy highlights the need for strong governance and enhanced partnerships at the national level. It promotes the sharing and use of data for decision-making and has been developed in line with global calls to enhance national HIS to monitor progress on the health-related SDGs and measure the impact of WHO's General Programme of Work. WHO will provide guidance on making the best use of the available resources to promote digitalization, achieve interoperability, eliminate duplication, avoid gaps and make efficiency gains.

The Regional Committee is invited to endorse the proposed regional strategy for enhancement and digitalization of HIS in countries of the Eastern Mediterranean Region.

Introduction

1. Globally, there is increasing demand for data to monitor progress on national and global health priorities. Monitoring of progress towards universal health coverage and the SDGs can only be achieved if countries have effective national health information systems (HIS) (1). Countries also need timely, reliable, high-quality and country-owned data to inform decisions, policies, operations and evaluations at national, subnational and health-facility level, including rapid response to outbreaks or health threats.

2. Standard data sources for HIS include civil registration and vital statistics (CRVS) systems, medical records, surveillance systems (notifiable diseases surveillance systems, disease and syndrome registries, immunization registries), health insurance claims data (where applicable), administrative records, and medicine- and device-related information, as well as data from surveys (population surveys, provider surveys, facility surveys) and censuses. Data from such sources then need to be analysed and processed into information. In turn, information has to be integrated and interpreted into evidence for decision-making at different levels (2).

3. The COVID-19 pandemic highlighted the importance of a strong national HIS and real-time data. National HIS needed to be robust and agile in areas related to COVID-19 case surveillance, mortality surveillance and identifying prioritized populations for COVID-19 vaccine distribution. This need for data created opportunities for innovative solutions and, at the same time, was a clear reminder of the foundational gaps that remain (for example, in CRVS and cause-of-death reporting) in many national HIS around the world (3).

4. An effective digitalized HIS that collects high-quality and accurate data has several attributes, including being: (a) integrated and drawing data from multiple national data systems; (b) evidence-based with a focus on learning from experiences and evidence; (c) aligned with country needs and global health development efforts towards the health-related SDGs; (d) partnership-based, leveraging coordination and integration at country, regional and global levels; (e) user-friendly and accessible; (f) scalable and flexible; and (g) sustainable (4). Achieving this relies on a number of factors such as country infrastructure, sound legislative and governance structures, and adequate human and financial resources, as well as unified coding and common data standards and interoperability (5).

5. Interoperability is the ability of different applications to access, exchange, integrate and use data and/or data components in a fast and coordinated manner to provide consistent documentation, and to enable timely and seamless portability of information within and between digital and data systems. Interoperability enables different information systems to work together seamlessly across time and organizational boundaries, allowing users to manage and utilize information to improve service delivery and support better health outcomes for individuals and communities (6). A key practical aim of interoperability is to enhance efficiency and reduce errors by diminishing the number of times a piece of data is entered into the system so that the data entered by a user or service provider for a certain objective (for example, maternal care) or conducted assessment (for example, laboratory or imaging assessments) can be visible and used by another provider (for example, child care or noncommunicable disease management) at the same facility or by other facilities, and over time, as needed.

6. In many countries of the WHO Eastern Mediterranean Region, routine HIS do not perform efficiently and health data are often incomplete, fragmented or inadequate, and largely generated by paper-based systems, especially in low-income countries. While some countries have made significant improvements in enhancing their HIS using domestic resources, in other countries the data systems are often donor-driven and rely largely on funding from major initiatives – such as Gavi, the Vaccine Alliance, and the Global Fund to Fight AIDS, Tuberculosis and Malaria – resulting in parallel structures that may not address country needs. In many countries, there are competing and non-compatible data systems that do not necessarily follow the required standards, resulting in duplication of efforts and wastage of limited human, financial and information technology resources. In addition, the HIS may not provide sufficient disaggregation of data to be able to monitor and enhance the health system response to inequities resulting from socioeconomic, gender, ethnic and geographical factors (7).

7. The digitalization of health data has become an integral component of national HIS. Digitalization is not merely the conversion of manual data into a digital format. It refers to the use of digital technology for the collection, storage and transfer of data, as well as allowing for integrated and efficient use of data systems across facilities and organizations. It often involves organizational or institutional changes to ensure that key processes are in line with the digital processes, and to avoid the replication and inefficiency that often accompany non-integrated or incoherent use of digital solutions, with or without accompanying non-digital functions (8). Effective digitalization of HIS depends on national-level plans and governance mechanisms, investment in infrastructure and promotion of data standards at all levels of use. The digitalization process requires an enterprise architecture to align the business processes, data, systems and technologies involved in the design of increasingly complex systems to support the workflow and roles of people within the national HIS. Furthermore, national information policies and regulations should ensure the security of digital data and the consistent management of data protection, privacy, confidentiality and consent (9).

8. The use of digital health data should support national health goals and be closely linked to national monitoring and evaluation plans and HIS plans (9). Despite the increased growth in digital health solutions in most countries over the past two decades, many of the interventions focus on specific disease programmes (such as HIV or malaria) via parallel data systems or on different aspects of the health system (such as surveillance, billing or services) without integration, or they are limited to groups of facilities with no shared meta-data or data linkage standards. All such practices have resulted in fragmented information systems, wastages of resources and lack of timely access to data for health decision-making.

9. This technical paper discusses the enhancement and digitalization of national HIS in the Region within the policy-making context, in alignment with WHO's priorities and the global push to advance efforts toward achieving the health-related SDGs. The paper examines the prospects for and major obstacles to enhancing HIS in countries and proposes a regional strategy, including four strategic goals and 10 specific objectives, to promote the digitalization and integration of HIS to improve their efficiency and effectiveness in generating timely and high-quality data for decision-making.

10. The proposed regional strategy is linked to and benefits from various initiatives and resolutions at the regional and global level. These include resolutions endorsed by the WHO Regional Committee for the Eastern Mediterranean, such as EM/RC59/R.3 (2012) on health systems strengthening, EM/RC60/R.7 (2013) on the improvement of CRVS systems, EM/RC60/R.8 (2013) on monitoring health situation, trends and health system performance, EM/RC66/R.5 (2019) on developing national institutional capacity for evidence-informed policy-making for health, EM/RC68.R3 (2021) on integrated disease surveillance, and EM/RC69/R.6 (2022) on fostering digital health, as well as the global WHO CRVS strategic implementation plan 2021–2025 (10).

HIS status in countries of the Eastern Mediterranean Region and efforts to address the challenges

11. WHO is supporting countries in the Eastern Mediterranean Region to strengthen their national HIS, including Djibouti, Jordan, Kuwait, Iran (Islamic Republic of), Iraq, Lebanon, Libya, Morocco, Oman, Pakistan, Qatar, Saudi Arabia, Somalia, Sudan, the Syrian Arab Republic, Tunisia, the United Arab Emirates and Yemen. The countries of the Region are socioeconomically diverse and therefore national HIS are at different levels of development. Several high- and middle-income countries have made great progress in digitalizing their national HIS, including Bahrain, Egypt, the Islamic Republic of Iran, Jordan, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates. Both in countries with advanced digitalized systems and in those still working on expanding digitalization of HIS there are opportunities for enhancing the process. In countries with an advanced HIS, for example, there are opportunities for better integration of data between different administrative divisions and levels of care. Meanwhile, in countries that are rolling out digitalization, improvements in access to the internet and mobile networks could be further leveraged to allow health workers in remote areas to collect and report health data using a tablet or mobile phone (10).

12. In the Region, WHO supports countries in all areas of HIS, including: CRVS systems and cause of death certification and reporting; hospital health management information systems (HMIS); integrated disease surveillance systems; primary health care; DHIS2 and geographic information systems (GIS); and household and

health facility surveys, among others. A key effort towards strengthening HIS in countries was the endorsement of regional core health indicators by the Regional Committee in 2014 (resolution EM/RC61/R.1), on which countries have been reporting annually to WHO to monitor health and health system performance (11). In 2016, the list of regional core indicators was expanded to include the health-related SDG indicators and, since then, country reporting on the core indicators has improved considerably. However, the indicator reporting process has also highlighted several limitations affecting national HIS. These limitations are in part related to the factors that have shaped HIS development in each country, which are often driven by the reporting requirements of different donors or national programmes and have led to fragmented information systems. Limited funding, inadequate human resources, information technology gaps, high staff turnover, political instability and emergencies have all hampered progress in HIS development. Poor integration of data across different programmes and levels of care, as well as between the public and private sectors, remains an issue. In many countries, hospital or facility-level information systems were developed primarily for managerial and billing purposes. While this has generated a positive impetus for the digitalization of HIS, it has also been a limitation – especially with regards to recording non-billable services and implementation of the required data standards.

13. An important initiative in the Region has been the comprehensive assessment of national HIS to support the development of costed action plans to guide investments. Since 2016, HIS assessments have been conducted at the request of the health ministries in half of the countries of the Region, namely Afghanistan, Djibouti, Iraq, Jordan, Lebanon, Libya, Oman, Pakistan, Somalia, Sudan and Yemen (12). In some countries, planned assessments were delayed or postponed due to the COVID-19 pandemic. The comprehensive HIS assessments provided valuable data for countries and have resulted in extensive action to enhance their HIS. However, the results of the assessments in the 11 countries revealed that major challenges remain:

- none of the countries have adequate laws or legislation for HIS, including on data from the private sector;
- although half of the countries have HIS actions plans, these are inadequately implemented;
- 60% of the countries lack effective national coordination mechanisms for the HIS;
- all countries require enhancement of the HIS infrastructure and human resources;
- health facility master lists are lacking in half of the countries, or do not adequately cover all facilities; and
- architecture, interoperability and data standards are lacking in most countries, or not enforced in practice, affecting the usability as well as the security and confidentiality of data.

14. In addition, WHO has developed the SCORE (Survey, Count, Optimize, Review, Enable) for Health Data Technical Package, which brings together a set of the most effective interventions and tools for addressing critical data gaps and strengthening country health data for planning and monitoring health priorities (13). SCORE was used for rapid HIS assessments during 2018–2020. Fig. 1 compares the status of capacities for the five SCORE interventions in countries of the Region and globally, using a colour-coded scale (14). Countries are expected to transition from “nascent capacity” (red colour) to “sustainable capacity” (green colour) and would benefit from understanding the gaps in their HIS and following SCORE recommendations for improvement. A second round of SCORE assessment is planned for 2024–2025.

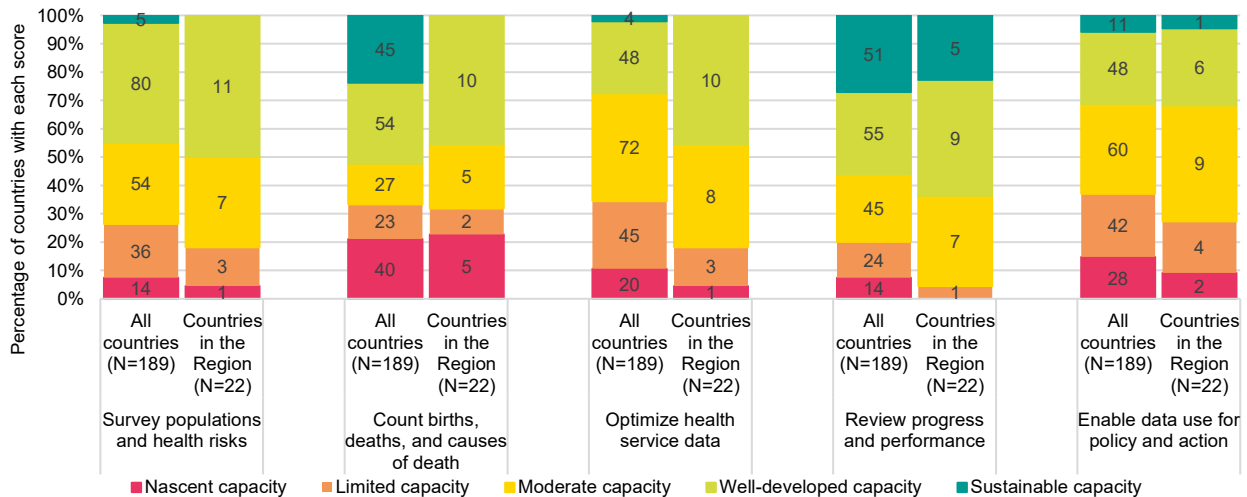


Fig. 1. HIS capacities, globally and for the Eastern Mediterranean Region (SCORE global assessment, 2020)

Source: Extracted from the SCORE dashboard (14).

15. There have been improvements in national CRVS systems since the endorsement of resolution EM/RC60/R.7 and the subsequent interventions implemented in the Region between 2013 and 2017 (15). The regional CRVS strategy supported Member States to strengthen or establish national action plans on CRVS. Country actions have resulted in notable improvements in birth and death registration and the quality of reporting of causes of death: in 2013 the weighted regional averages of birth and death registration were 62% and 23%, respectively, and by 2018 they had reached 70% and 54%, respectively. However, the SCORE assessment results for the Region show gaps remain in counting births, deaths and causes of death; reporting of routine health facility data; and data access and sharing, including using data for decision-making. Due to a lack of resources in many countries, ensuring the completeness and accuracy of cause-of-death identification and reporting, including the implementation of electronic solutions such as the medical certification of cause of death (MCCoD) at health facilities, remains a challenge.

16. An advanced hospital HMIS encompasses electronic medical records, patient registration and appointment management, billing and insurance, payments and finances, inventory management, laboratory and imaging systems, e-prescribing, pharmacy management and telemedicine. These systems need to be integrated and patients should be identified by a unique identifier. Hospital HMIS should be linked with primary health care, and reportable diseases need to be communicated to the health ministry to compile national statistics and investigate subnational variations. While DHIS2 (16) was developed primarily for primary care usage and does not cater for all the needs of a hospital, individual modules can be used at the hospital level for disease-specific data. A WHO study assessing the status of hospital HMIS in the Region in 2022 found large variations in their level of development between and even within countries. Overall, a mix of paper-based and electronic data collection and management systems are being used in hospitals in the Region. Through sustained investments, some countries have been able to develop well-functioning in-house HIS software/platforms. However, a lack of integration, limited use of standards and non-inclusion of the private sector were found to be key limitations of hospital information systems in the Region.

17. Electronic medical records contain the results of clinical and administrative interactions between the health provider and a patient that occur during episodes of patient care (17). Electronic health records are shared patient records that contain historical data compiled from all local medical records, housed in a central repository to enable access by multiple facilities across the health sector domains (6). Use of unique national identifiers and interoperable information systems are prerequisites for the functionality of electronic medical and health records. Although a number of countries in the Region are implementing interventions towards fully interoperable systems, most of these interventions are scattered and localized. Challenges for interoperable system development in most countries of the Region include limited data architecture and expertise at the national level, lack of standard guidelines for system development, and legislation that limits

data sharing and exchange. Also, the existence of legacy systems or use of different national or international information system providers may compound the challenges. Many countries in the Region have embarked on establishing electronic medical or health record systems without the key requirements, resulting in unfulfilled promises and missed opportunities. Sustainable resources are needed to establish integrated electronic medical or health records that extend to all levels of health care.

18. Countries in the Region have been using geographic information system (GIS) applications in areas such as disease surveillance, epidemiology, emergency and disaster response, and service delivery, and to develop sampling frames for household surveys (grid sampling). However, many countries have not yet realized the potential of GIS applications in strengthening their national HIS. This is due to various challenges, including limitations in: availability of trained staff in the public sector; availability of service location data in some settings; funding for GIS activities; coordination among the different partners that have an interest in GIS; and national action plans (18). To help countries to benefit from the use of GIS applications, the WHO GIS Centre for Health has launched the Geolocated Health Facilities Data (GHFD) initiative. The GHFD initiative is a collaborative effort that provides support to countries who need assistance in updating, geolocating, digitizing and/or openly sharing the health facility master list for their country (19). Other WHO initiatives include: hosting GIS software (ArcGIS and QGIS) for use by countries, partners and WHO staff; supporting the processing and delivery of unique satellite imagery to countries; providing relevant mobile GIS tools such as ArcGIS Survey123; and providing technical support to countries and partners for the tailored cartographic maps and geospatial population datasets required for fieldwork, analytics, reports and publications in print and digital formats (20).

19. As part of efforts to strengthen primary health care systems, WHO implemented the Primary Health Care Measurement and Improvement (PHCMI) regional initiative in 2019, in collaboration with the United Nations Children's Fund (UNICEF), World Organization of Family Doctors, and Primary Health Care Performance Initiative, with support from the Bill & Melinda Gates Foundation. The initiative aims to measure and evaluate the performance of primary health care in the Region and determine focus areas for improvement, including delivery of essential health services, based on the collection of accurate, reliable and routine data.

20. The 2021 regional strategy for integrated disease surveillance (21) provides technical guidance for a collaborative approach to communicable disease surveillance systems, including indicator-based and event-based surveillance, with the aim of standardizing case definitions, minimizing duplication and enhancing timely reporting of data in compliance with the International Health Regulations (2005). It guides countries in promoting data sharing under the umbrella of national health information and within the core principles of integrated disease surveillance programmes. WHO also supports the implementation of other data solutions in emergency contexts (for example, the Early Warning, Alert and Response Network) that collect and report surveillance and facility data on selected epidemic-prone diseases. A collaborative surveillance approach focuses not only on communicable and epidemic-prone diseases in the human health sector, but also aims for cross-sector convergence with animal, veterinarian, chemical and food information systems.

21. Population-based surveys, often conducted annually or every three to five years, are a major source of data on the overall health and well-being of populations in low- and middle-income countries. These surveys are also a supportive data source for countries with well-established HIS for the validation of institution-based indicators. Key surveys such as the WHO STEPwise approach to noncommunicable disease risk factor surveillance, Global School-based Student Health Survey, Global Youth Tobacco Survey, Demographic and Health Surveys, Multiple Indicator Cluster Surveys and WHO Study on Global AGEing and Adult Health also provide important data, including measuring inequalities in key populations and on specific health topics. However, surveys are often used as stopgaps rather than in a pre-planned and systematic manner in countries of the Region, resulting in data gaps for many key health-related indicators. In 2017, recognizing the uncoordinated approach of survey implementation in countries, WHO organized a regional expert consultative meeting on developing plans for integrated population-based surveys (22, 23). Since then, a number of countries, including Bahrain, Kuwait, Qatar and Sudan, have developed a national strategy for multisectoral integrated survey plans.

22. Adequate numbers of skilled human resources are fundamental to enhancing and sustaining national HIS. Unfortunately, HIS competencies are limited in many countries of the Region and health care staff are mostly trained

in data entry only. Training the health workforce in other areas of HIS management is feasible, although high staff turnover due to low pay and lack of motivation remains a challenge. An additional issue is ensuring the availability of trained staff outside major urban centres. Several countries and territories in the Region offer academic training programmes in health informatics, including Egypt, the Islamic Republic of Iran, Jordan, Oman, Palestine, Saudi Arabia and the United Arab Emirates. Despite the availability of such training programmes, the supply of trained staff is often inadequate to meet demand both in terms of numbers and competencies. To address the variations in education, training and development of the HIS workforce, and the levels of professionalization among graduates preparing to enter the workforce, the WHO Regional Office for the Western Pacific developed the *Data management competency framework* in 2023 (24), which can also be used as a model in the Eastern Mediterranean Region. The framework provides guidance for countries on the required skills and knowledge for different levels of the health information workforce, helps to identify current competency gaps, measures competency development and helps to identify future competency needs at the country level.

23. WHO has developed SMART (Standards-based, Machine-readable, Adaptive, Requirements-based and Testable) guidelines (25), which are a new approach to documenting system requirements and encoding practice guidelines in a standardized way. Use of SMART guidelines results in standards-based, interoperable systems that can share accurate data and become part of stronger, more sustainable HIS. Digital adaptation kits have been developed on topics such as antenatal care, family planning, HIV, immunization and paediatric emergency care, which can be included in decision support systems to enhance clinical decision-making and improve clinical care.

24. The COVID-19 pandemic underlined the need for timely and reliable data to ensure early detection of health threats, guide decision-making on how to respond, measure disease burden and mortality, assess health system capabilities during a pandemic, and monitor the effectiveness of interventions such as vaccines and infection prevention and control (26). The pandemic clearly demonstrated the value of investment in national HIS as a key component of the health system, and generated strong momentum in all countries for further investment in digital solutions and information structures that provide valid and timely data for national decision-making for health. Further enhancements to HIS are needed in all countries of the Region, capitalizing on the political momentum stimulated by the pandemic and the opportunities that are emerging under digital transformation.

Strategic goals for enhancing and digitalizing national HIS

Strategic goal 1. Develop national HIS strategies/plans and enhance governance and partnership mechanisms

Specific objectives

1.1 National HIS action plans are developed and costed in collaboration with relevant stakeholders.

1.2 National and subnational governance and coordination mechanisms are established and functional.

25. Enhancing and digitalizing national HIS will require mid- to long-term strategies and plans (5–10 years) to guide and coordinate efforts and ensure the engagement of all partners including key national stakeholders outside the ministries of health, such as other providers of health services (for example, the armed forces, insurance organizations or academic institutions) and ministries of information technology. Engagement of the private sector and ensuring its accountability is also an important consideration.

26. A sound governance structure is required to regulate the collection, use, sharing, dissemination and safe storage of data, as well as to coordinate the multiple stakeholders involved in these processes. Clear HIS legislation, policies and strategies are needed to define the roles and responsibilities of stakeholders and ensure their accountability, as well as to ensure patient privacy and confidentiality of information. Legislation is particularly important to ensure the universality and continuity of the CRVS and regular dissemination of data. Good data governance should increase the transparency of the HIS, promote digitalization, ensure the use of unique identifiers at all levels of care, promote integration of different information systems (including newly created ones), regulate access to data and increase trust in the data ecosystem (27).

Strategic goal 2. Invest in infrastructure and secure the necessary human and financial resources required for a sustainable HIS

Specific objectives

- 2.1 Financial resources are identified and mobilized to strengthen the HIS, sustain HIS operations and enhance digitalization of the HIS.
 - 2.2 Human resource capacity for collection, management and use of data is adequate to develop, implement and maintain an integrated national HIS platform.
27. Investment in HIS – not only in data systems, but also in institutional capacity-building for data analysis, quality assurance and effective communication of evidence – is a strategic development investment, and efforts are needed by all stakeholders to ensure sustainable financing.
28. Lack of adequate and sustainable financing has been a key barrier to strengthening HIS in countries of the Region. Another important aspect is the allocation of resources according to need. Each level of the HIS, from the facility to the district and national level, should have the necessary resources to fulfil their functions and retain well-trained staff.
29. Enhancing the national HIS relies not only on the generation and collection of valid data, but also requires well-trained health personnel actively involved in managing, reviewing, analysing, interpreting and acting upon the data. Introducing comprehensive HIS training in medical and nursing curricula and promoting a culture of using local data to solve problems will help to ensure that the next generation of health personnel acquires some core HIS competencies and recognize the value of data in improving health and well-being.
30. Building the capacity of the health workforce in HIS management and providing in-service training to existing HIS staff will require commensurate financial resources. Without the necessary investments, gains will be short-lived. It is therefore critical that countries mobilize internal and external resources to support such efforts. Exclusive reliance on partner funding is not sustainable. National HIS strategies and action plans can act as resource mobilization documents to support funding allocations at the country level.

Strategic goal 3. Promote interoperability of the HIS and implement data standards for health care settings and related information systems

Specific objectives

- 3.1 Appropriate WHO and other internationally recommended, open interoperability standards are used, which meet data usage needs and enable effective functioning of the HIS at all levels.
 - 3.2 Digital health architecture is effective, safe, secure and interoperable for regular data exchange so that all relevant summary statistics are presented on an integrated national HIS platform.
 - 3.3 Electronic medical and health records are effective, safe, secure and accessible for use so that patient care can be provided seamlessly at the different levels and over time, while ensuring confidentiality and privacy.
 - 3.4 Infrastructure and expertise for GIS are available and in use.
31. Interoperability is founded on data security and trust between systems, as well as on governance mechanisms that ensure ethical and justified use of data. Interoperability therefore relies extensively on the use of “standards” that provide a common language, minimum data requirements and system characteristics that help to achieve integration between systems and services. In addition, there are semantic and structural interoperability and data standards that are specific to health care. Semantic interoperability focuses on the meaning and interpretation of data and aims at ensuring that different systems interpret the data consistently and accurately. Structural interoperability focuses on the format and structure of data and aims at ensuring that data can be transmitted and received in a readable and processable format. Examples of WHO-recommended standards and other available standards are provided in Table 1.

Table 1. Semantic and structural interoperability and data standards for health care settings and related information systems

WHO-recommended semantic standards	
International Classification of Diseases and Related Health Problems 11th revision (ICD-11) (28)	ICD-11 is the key classification under WHO Family of International Classifications and includes codes and definitions for diseases, signs and symptoms, abnormal findings, complaints, social circumstances, and external causes of injury, diseases or death. ICD-11 provides a multipurpose and multilingual coherent classification system of 17 000 codable entities with an integrated terminology. The ICD-11 terminology includes a systematically organized computer-processable collection of 135 000 medical terms providing codes, terms, synonyms and definitions used in clinical documentation and reporting.
Anatomical Therapeutic Chemical (ATC) classification (29)	Classification of drugs and medicines included in ICD-11. ACT classifies the active substances into different groups according to the organ or system on which they act and their therapeutic, pharmacological and chemical properties
International Classification of Diseases for Oncology (ICD-O) (30)	Used principally in tumour or cancer registries for coding the site (topography) and the histology (morphology) of neoplasms. ICD-11 incorporates the ICD-O codes for topography, morphology as well as behaviour and grading of the cancer.
International Nonproprietary Names (INN) (31)	Nomenclature system for assigning unique names to pharmaceutical substances, included in ICD-11.
WHO Medical Devices Nomenclature (WHODDN) (32)	Standardized system used to classify and name medical devices, included in ICD-11.
International Classification of Functioning, Disability and Health (ICF) (33)	ICF provides a common language and standardized terminology to describe the impact of health conditions in terms of functioning. ICF classifies and defines functioning domains related to body functions and structures, and activities and participation. ICF also included a classification of environmental factors (i.e. facilitators and barriers impacting on the person's functioning).
International Classification of Health Interventions (ICHI) (34)	As a classification and terminology, ICHI covers a wide range of interventions including medical/surgical, primary care, rehabilitation and public health interventions.
Other semantic standards	
Systematized Nomenclature of Medicine-Global Patient Set (SNOMED-GPS) (35)	Openly available subset of SNOMED Clinical Terms, which is a proprietary clinical health terminology product from SNOMED International. SNOMED-GPS contains a non-hierarchical flat list of around 21 700 concepts to encode clinical terms.
Logical Observation Identifiers Names and Codes (LOINC) (36)	Coding system, created by the Regenstrief Institute, for laboratory and clinical tests, measurements and observations. Linking between LOINC codes and ICHI codes is possible but depends on national information needs and use cases.
GS1 standards (37)	Common language for supply chain data and exchange metadata about medicinal products, devices, commodities and vaccines, including the Global Trade Item Number.
Examples of structural standards	
Health Level 7 (HL7) Fast Healthcare Interoperability Resources (FHIR) (38)	Developed by HL7® International for exchanging health care information electronically. This standard provides standardized resources to form a basis for communicating the structure and meaning of clinical data.
Integrating the Healthcare Enterprise (IHE) profiles (39)	A standard framework for sharing information needed by care providers and patients.
Digital Imaging and Communications in Medicine (DICOM) (40)	A communication protocol and file format for exchanging medical images across systems.
TOGAF Standard (41)	An enterprise architecture framework developed by The Open Group that helps to standardize and de-risk the enterprise architecture development process.

32. Interoperability standards are key for the establishment of person-centred point-of-service systems, such as electronic medical or health record systems. These systems combine the functionalities of an HIS and a decision support system. A core requirement is the use of unique identifiers for patients or receivers of services (national identification number) and providers (clinician identification number), as well as facility-level identifiers (health facility master list). An effective national HIS depends on the use of a comprehensive, up-to-date, geolocated health facility master list. Most of the information needs of local health system decision-makers have a geographical component, from distributing health care resources equitably to identifying disease outbreaks.

33. Electronic medical or health record systems are only achievable where there is functioning interoperability in place in the country between the key information systems for health. Areas where countries should consider integration or interoperability (depending on the country context) include: HMIS at different facility levels (primary, secondary or tertiary care); decision support systems (often included in HMIS or in electronic medical records systems); (integrated) disease surveillance platforms; CRVS systems (especially for MCCoD); cancer and disease registries; human resources for health data systems; financial management

systems (including billing and insurance information); health insurance organization data systems; medicines and medical supplies (including supply chains and inventories); laboratory, imaging and diagnostics information systems; and other information systems used outside or across facilities (for example, accidents and emergencies, pharmacovigilance, zoonotic diseases, e-prescribing) (4).

34. To facilitate interoperability, countries may use nationally developed standards in combination and convergence with international standards (as presented in Table 1). Such standards might include unique codes for medicines or medical devices produced in the country (based on GS1 and ATC), while imported items are identifiable through already existing unique identifiers, enabling identification of fake or falsified products. In addition, countries may have national standards for payment, billing or insurance purposes that will require elaborate coding that should also be linked with ICD-11, ICHI, ICF and other standards.

35. National HIS should include comprehensive facility-based information that adheres to the interoperability standards set at the national level. These systems should ensure the availability of summary health statistics for national or regional decision-makers, while making the data accessible to the legitimate users at different levels (including clinicians responsible for care) in an ethical and secure way.

Strategic goal 4. Identify inequities and promote data use in decision-making

Specific objectives

4.1 Quality health data from routine HIS and population-based sources are available through dashboards and other products, with relevant disaggregation or stratifiers for equity monitoring and leaving no one behind.

4.2 Health information is effectively and regularly used to improve public health policy, health system management and clinical services, ensuring analysis to improve equity.

36. Robust HIS generating disaggregated data and supplemented by household surveys are necessary to achieve the 2030 Agenda for Sustainable Development and its central commitment to leave no one behind. Data on health service utilization and health outcomes disaggregated by key stratifiers (for example, income, gender, age, ethnicity, migratory status, disability, geographical location and other characteristics, as relevant in national contexts) enable identification of population subgroups that experience the worst health outcomes. Disaggregated data are key to identifying hard-to-reach and/or vulnerable groups and can guide public health action to address the identified inequalities and the social determinants of health.

37. Leaders need to promote a culture of data use and decision-making at all levels of the health system. Decision-makers, including service providers and managers at the health centre and community levels, must have access to relevant data and be encouraged to draw upon available evidence for their decisions. This is in line with Regional Committee resolution EM/RC66/R.5 (2019) on evidence-informed policy-making for health, which presents an innovative multi-concept approach for the integrated use of different sources of evidence and data to inform policy-making processes. The approach involves bringing together, in an integrated manner, the different programmes and technical expertise involved in the generation of data and evidence to be used in policy-making processes. Achieving this at the national level requires effective feedback mechanisms, generation of annual statistical reports on health, use of dashboards for visualization and setting up national health observatories. The increasing availability of “big data” (so-called because of their size and complexity), will enable decision-makers to better understand existing data gaps and explore opportunities to harness the power of data and artificial intelligence through aggregation, complex analysis and application of results to new technologies.

The way forward

38. This technical paper highlights four strategic areas for the enhancement and digitalization of HIS in the countries of the Eastern Mediterranean Region: national HIS strategies/plans and governance mechanisms; infrastructure and human/financial resources; interoperability and data standards; and identifying inequities and using data for decision-making. The proposed regional strategy sets out four strategic goals and 10 associated specific objectives to guide country efforts. This approach will allow Member States to clarify the

objectives for their national HIS and guide them in developing action plans, including the application of standardized procedures and tools to progressively digitalize and integrate their systems. It also feeds into regional and global efforts to improve the availability of timely, country-owned and high-quality data for decision-making.

39. Annex 1 identifies suggested actions to be taken by countries, WHO and other development partners to enhance and implement digitalized national HIS in the Eastern Mediterranean Region. It also proposes indicators to measure progress in implementation of the regional strategy from 2024 to 2028. The list of actions is not exhaustive and can be tailored by countries based on their national context and level of development of their HIS.

40. WHO will provide guidance on making the best use of the available resources to promote digitalization, achieve interoperability, eliminate duplication, avoid gaps and make efficiency gains. The proposed regional strategy highlights the need for strong governance and enhanced partnerships at the national level. It promotes data sharing and the use of data for decision-making, and has been developed in line with global calls to enhance national HIS to monitor progress on the health-related SDGs and measure the impact of WHO's General Programme of Work.

41. Member States are encouraged to take the necessary steps to enhance, integrate and digitalize their national HIS, to use the information collected for decision-making and to promote data sharing at the national level – and with WHO and partners – in a timely and transparent manner.

Recommendations

Recommendations to Member States

- Commit to implementing the agreed WHO standards (for example, ICD-11 and others) for digitalizing HIS.
- Engage national stakeholders in implementing effective digitalized information systems that are linked and harmonized at the national level.
- Allocate resources and encourage investment in HIS at the national and subnational levels.
- Build national capacities in HIS-related innovations based on country priorities.
- Support data sharing, evidence generation and the use of data for decision-making.
- Request technical support for the development of digitalized and integrated HIS, including implementation of GIS applications at the national and subnational levels.

Recommendations to WHO

- Develop, adapt and share standards for the digitalization of information systems that fit the various contexts of the countries of the Region.
- Avail the necessary technical and logistic resources for implementation of the regional strategy.
- Support the development of national HIS action plans for related activities (in the short, medium and long terms).
- Provide technical support to Member States, including through the involvement of other United Nations agencies and development partners.
- Support countries in resource generation activities for enhanced information systems for health.
- Report on progress in implementing this resolution to the 73rd session of the Regional Committee and present a final report to the 75th session in 2028.

42. Implementation of these actions by Member States and WHO should be guided by the strategic goals, objectives, related actions and indicators set out in Annex 1.

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Annex 1

Proposed actions and indicators for implementation of the regional strategy

Strategic goals	Strategic objectives	Actions by WHO and other development partners	Actions by Member States	Monitoring and evaluation indicators	
				Baseline	Target
1. Develop national HIS strategies/ plans and enhance governance and partnership mechanisms	1.1 National HIS action plans are developed and costed in collaboration with relevant stakeholders 1.2 National and subnational governance mechanisms are established and functional	<ul style="list-style-type: none"> Develop a regional strategy on enhancing and digitalizing HIS Provide guidance on conducting HIS assessments, developing HIS strategic plans and establishing national HIS steering committees Develop a resource mobilization and communication plan to support countries Provide guidance for establishing governance mechanisms for HIS Provide technical and financial support to countries 	<ul style="list-style-type: none"> Establish a governance structure and coordination processes for HIS stakeholders including the private sector Develop/strengthen legislation or policies for HIS digitalization, data security and privacy, including civil registration and vital statistics (CRVS) and integrated disease surveillance systems Develop national strategic plans and action plans for digitalization of the HIS (both public and private sector), including CRVS and integrated disease surveillance systems Update standards and guidelines for data collection, data quality control, analysis, data sharing and use Develop a resource mobilization and communication plan Introduce a data validation process 	<ul style="list-style-type: none"> Digitalization scattered across programmes Fragmentation of HIS interventions Lack of updated national HIS action plans Lack of standards and guidelines Lack of/weak HIS governance structures Lack of legislation on HIS 	<ul style="list-style-type: none"> Functional HIS steering committee Governance mechanisms established National strategic/action plans to develop an integrated and digitalized HIS using unique national identifiers Developed/updated standards and guidelines Updated national core health indicators Appropriate HIS legislation that includes the private sector
2. Invest in infrastructure and secure the necessary human and financial resources required for a sustainable HIS	2.1 Financial resources are identified and mobilized to strengthen the HIS, sustain HIS operations and enhance digitalization of the HIS 2.2 Human resource capacity for collection, management and use of data is adequate to develop, implement and maintain an integrated national HIS platform	<ul style="list-style-type: none"> Provide technical support for mapping the HIS infrastructure Provide technical support to conduct gap analysis Provide technical support to map existing financial resources for digitalizing the HIS Support countries to conduct HIS staff needs assessment Support the development of HIS competency frameworks and capacity-building plans Provide technical support to strengthen or develop human resource databases Support resource mobilization efforts 	<ul style="list-style-type: none"> Provide required infrastructure (mobile devices, computer, internet connectivity, electricity) at all levels of the HIS Conduct mapping of available human resource skills and estimate costs for developing an integrated HIS Conduct mapping of existing resources for HIS and develop a resource mobilization plan Conduct needs estimates for digitalized and interoperable HIS Allocate national budget for digitalizing the HIS Pool financial resources Ensure clear human resources structure, job profile and qualifications for information technology staff Ensure information technology staff are part of human resources for health 	<ul style="list-style-type: none"> Unequal geographical distribution of infrastructure Fragmented and unpredictable funding for HIS Duplication of efforts and wasted resources leading to inefficiencies Low proportion of domestic funding for HIS Maldistribution of human resources geographically and in programmes Redundancies High turnover of HIS staff Limited staff with appropriate levels of HIS competencies (data management and analysis) at all levels of the HIS 	<ul style="list-style-type: none"> Well-developed and equally distributed HIS infrastructure Increased national budget allocation to the HIS Available resources and donor support pooled and allocated according to needs Revised human resources structure Career path for HIS staff Up-to-date human resource database Trained and qualified technical human resources available

Strategic goals	Strategic objectives	Actions by WHO and other development partners	Actions by Member States	Monitoring and evaluation indicators	
				Baseline	Target
3. Promote interoperability of the HIS and implement data standards for health care settings and related information systems	<p>3.1 Appropriate WHO and other internationally recommended, open interoperability standards are used, which meet data usage needs and enable effective functioning of the HIS at all levels</p> <p>3.2 Digital health architecture is effective, safe, secure and interoperable for regular data exchange so that all relevant summary statistics are presented on an integrated national HIS platform</p> <p>3.3 Electronic medical and health records are effective, safe, secure and accessible for use so that patient care can be provided seamlessly at the different levels and over time, while ensuring confidentiality and privacy</p> <p>3.4 Infrastructure and expertise for GIS are available and in use</p>	<ul style="list-style-type: none"> Harmonize and disseminate data collection, coding and reporting systems and recommended metadata standards Provide relevant training and tools (for example, ICD, ICHI, ICF) Provide guidance on HIS data flow and interoperability standards Provide technical support to countries to map and evaluate current information technology platforms Provide technical support in updating, geolocating, digitizing and sharing the health facility master list Provide tailored cartographic maps and geospatial population datasets 	<ul style="list-style-type: none"> Assess interoperability of existing systems Implement data standards in all health systems Implement interoperability and data exchange protocols between existing electronic systems Link relevant systems using a unique identification system to support data integration Undertake progressive implementation of existing electronic systems Develop/update geospatial technology infrastructure Establish human resource expertise in health informatics Undertake progressive implementation of GIS applications 	<ul style="list-style-type: none"> Paper-based and fragmented platforms Lack of common semantic and structural interoperability standards and definitions, such as ICD-coding and HL7 Absence of linkages between health management information systems and population-based data Limited infrastructure for GIS projects Limited staff expertise in health informatics Limited staff with appropriate levels of GIS expertise 	<ul style="list-style-type: none"> Interoperable information technology platforms and compliance with national and international regulations on data privacy, confidentiality and cybersecurity Wide use of open source platforms to enable interoperability Integrated HIS platform Increased expertise of health informatics staff Increased expertise in geospatial applications Increased use of GIS applications Updated and geolocated master health facility lists
4. Identify inequities and promote data use in decision-making	<p>4.1 Quality health data from routine HIS and population-based sources are available through dashboards and other products, with relevant disaggregation or stratifiers for equity monitoring and leaving no one behind</p> <p>4.2 Health information is effectively and regularly used to improve public health policy, health system management and clinical services, ensuring analysis to improve equity</p>	<ul style="list-style-type: none"> Support countries in creating a culture of information where data are used to identify problems and solutions through training and guidance Provide technical support in publishing and distributing robust periodic health information and reports to all data users and the public Conduct periodic review of national core health indicators and include additional indicators (such as disability indicators) Provide support in monitoring data quality 	<ul style="list-style-type: none"> Collect relevant variables to allow analysis by different dimensions and identify possible disparities Use data to identify and solve problems at all levels of the health care system Publish annual national health statistics reports, including inequalities and data from the private sector Set up national health observatories Build staff capacities in equity analysis Establish a unified data dictionary Involve non-health entities in analysis of data Ensure completeness of data Monitor social protection programmes for populations affected by inequity 	<ul style="list-style-type: none"> Limited competencies of health care staff and, in some cases, health information staff in data analysis and interpretation Limited number of analyses and published reports Lack of national health observatories Low quality of data Limited access to data 	<ul style="list-style-type: none"> Health care staff and health information staff have the competencies to analyse and interpret the data they routinely work with Easily accessible health statistics reports Well-developed national health observatories that include data on vulnerable and other subpopulation groups Personnel trained to collect high-quality data Regular reporting of data Clear data governance and access to promote data use and decision-making