Challenges and opportunities of using DHIS2 to strengthen health information systems in the Eastern Mediterranean Region: A regional approach

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Abstract

Globally, there is acceptance of the role of strengthened health information system (HIS) to inform evidence-based decision-making and improve health services delivery. Within the context of increasing demands to generate data of high quality for monitoring progress towards SDGs, we review challenges and approaches in adopting a regional-based approach to strengthen HIS within the WHO Eastern Mediterranean Region and its 22 member states. The HIS situation in the WHO Eastern Mediterranean Region is mixed: While some countries have developed robust HIS, others lag behind on both technological and institutional dimensions. Technically, most countries have not capitalized on the benefits of ICT advancements such as the internet, cloud, and mobile computing. As a result, systems remain manual or standalone; and data are not shareable. Institutionally, systems are broadly fragmented, with non-standardized data, weak human resources capacity, and limited evidence of data being used to inform action. In order to consolidate efforts to enhance HISs, we recommend leveraging upon innovative information and communication technology (ICT) solutions for data capturing, processing, analysis, and reporting at either the individual or aggregate levels. Countries need to develop such processes in their contexts, while ensuring that they learn and build upon from their neighbors—building network of networks.

KEYWORDS

EMRO, DHIS2, regional approach

1 | INTRODUCTION

Globally, there is a strong acceptance of the role of strengthened health information systems (HIS) to inform evidence-based decision-making and strengthen health services delivery (Lippeveld, Sauerborn, & Bodart, 2000; Savigny & Adam, 2009). Over the last decade or so, various national governments in developing countries have started to make serious investments in strengthening their HIS. These efforts have been supported by global partners such as the Global Fund, World Health Organization (WHO), UNICEF, GAVI, and the Norwegian Government. There now exists a clear consensus that the absence of reliable data on key health issues and determinants compromises development efforts...
as it adversely influences efforts to track key health issues and outcomes, leading to disadvantaged and disenfranchised populations (Okonjo-Iweala & Osafo-Kwaako, 2007). Efforts to strengthen HIS have also been catalyzed by the urgency for nations to monitor and report on the achievement of the millennium development goals (MDGs) and the subsequent sustainable development goals (SDGs)—to be attained by 2030—which requires robust and well-functioning HIS. The need to progress towards achieving universal health coverage (UHC) also requires a robust and a different kind of HIS that have historically not existed. Strong HIS enables the identification of gaps to reduce mortality, improve quality of care, determine the extent of coverage, and track progress of various interventions aimed at achieving these global goals (Pundo, Manya, Mburu, & Braa, 2013).

As various ministries of health (MoH) in less developed countries, and health programs within these ministries, have embarked on different forms of HIS strengthening efforts often funded by multiple development partners, these have led to both positive and negative outcomes. On the positive side, these efforts have been important to spread awareness on the importance and value of computerized HIS and to understand that making them work in practice represents a socio-technical and not only a technical challenge. On the negative side, they have also contributed to the mushrooming of multiple uncoordinated systems, not capable of supporting integrated health systems strengthening efforts. Constraints to this required integration are both technical and institutional, such as the absence of shared standards, the use of multiple development platforms, which are proprietary in nature, programs working in silo-like frameworks only concerned about their own needs and not of the overall health system, and the tremendous capacity challenge that is involved.

To try and address these challenges while also leveraging upon experiences to date, this paper argues for the adoption of a regional approach to HIS strengthening. A regional approach is one in which a group of countries that share some form of geographical and institutional similarities seek to consciously learn and share with each other’s approaches, methods, experiences, products, and resources. The primary advantage of such a regional approach is to enable collective learning, which builds upon different individual experiences and learnings and ensures we do not reinvent the wheel and make the same mistakes. In this paper, we examine how this regional approach could be useful for the 22 countries of the WHO Eastern Mediterranean Region (EMR) to strengthen their respective and collective HIS.

2 CURRENT STATUS OF HEALTH INFORMATION SYSTEMS IN EMR: WHY DO THEY LAG BEHIND?

The EMR consists of three groups of countries sharing similar characteristics, including their HIS structure and operations. Group 1 consists of relatively richer countries, typically with existing HIS typically focused on strengthening clinical information systems, built with significant involvement of insurance and the private sector. Group 2 countries are typically engaged in strengthening both the aggregate and clinical information systems. Group 3 comprises the relatively financially weak countries and are focused on strengthening their aggregated routine HIS. There are thus country-specific variations in HIS, which advocates against the use of a "one shoe fits all" approach.

Even though the different EMR countries have varying focus of attention in their HIS strengthening efforts, they suffer from some similar challenges. In 2013, an HIS situation assessment in the region highlighted that most countries lag behind on both the technological and institutional dimensions. Technically, the systems have not capitalized on the benefits of technological advancements such as the internet, cloud, and mobile computing. As a result, most country systems are manual or standalone; and data are not circulated and shared electronically across the health system. Institutionally, systems are broadly fragmented, with non-standardized data and data flows that are not shared, weak human resources capacity, and very limited evidence of data being used to inform action.

A key challenge remains the limited use of standardized approaches to design, build, and implement HIS, which contributes to the creation of a fragmented array of systems not capable of sharing data with each other. For example, the ICD10 standard is typically not used for mortality reporting, making it next to impossible to develop consolidated national and regional pictures of morbidity and mortality, which impedes effective intervention efforts. Fragmentation of systems is endemic across multiple dimensions. For example, the HIS in countries included data typically for Maternal and Child Health, while other programs such as TB and HIV maintained their own systems and data. Data on other health systems components, such as human resources, finances, and infrastructure, were typically not part of the national HIS. Data collected by entities outside health, such as on Civil Registration and Vital Statistics (CRVS) through the Ministry of Justice or Interior or surveys by the Statistics department, are often not easily available to the HIS and so is also the case with the private sector information that are not visible in the national health systems. Another important challenge identified was the limited use of data collected, with its primary use being to compile the Annual Statistics Yearbook, which was typically too late and macro to be useful for local level decision making. Data collected did not go through adequate quality assurance mechanisms, limiting its use. Skills for analysis and use of data were also rather limited across countries.

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1 Group 1 countries consists of Bahrain, Oman, Kuwait, Qatar, Saudi Arabia, and the United Arab Emirates.
2 Group 2 countries in the Region consists of Morocco, Palestine, Iraq, Syria, Egypt, Iran, Tunisia, Jordan, Lebanon, and Libya.
3 Group 3 consists of Afghanistan, Djibouti, Pakistan, Sudan, Somalia, and Yemen.
3  |  A REGIONAL APPROACH TO HIS STRENGTHENING: THE CASE OF DHIS2

As the health system comprises many different components—such as primary, secondary, and tertiary care programs, finance, human resources, and infrastructure, different kinds of information systems have evolved to support these different needs. For example, there are different types of systems required for processing routine aggregated data from primary care facilities (typically called Health Management Information Systems [HMIS]) or for following patient-based care in hospitals (typically called Electronic Medical Record [EMR] systems), or specific programs (e.g., HIV, TB, and malaria) that have their own particular informational requirements and so also systems for mortality or infrastructure and human resources reporting. By definition, no one system can capture the diverse informational needs of the health systems. This has led to the need to define the need for an architecture (Braa & Sahay, 2012), which provides for a framework of a variety of systems working for meeting their specific needs, while also being capable to share data with a “centralized data repository” or a “data warehouse,” which can then be able to generate all required outputs for the health system.

We discuss two platforms that are particularly relevant and central for health systems strengthening and that have found widespread use in various developing countries and are also being supported by global partners. One is the DHIS2 (District Health Information System Version 2), which is a flexible open source platform developed, evolved, and supported by the University of Oslo, Norway, since more than a decade, and now finds use in different degrees in more than 80 countries (see www.dhis2.org). DHIS2 started out as a platform for building aggregate data based HMIS, but over the years has included a “Tracker” module, which allows individual-based data processing, such as line lists for births, deaths, and notifiable diseases, individual registration, and follow of people under different programs like antenatal care, ART treatment, and TB treatment. The DHIS2 is not a full-fledged EMR system that can connect various services received by a patient in a hospital (such as registration, billing, OPD; IPD, drugs, and laboratory). The other platform to consider is OpenMRS (Open Medical Record System—EMR), which is another widely used open source platform for hospital systems and different types of disease registries. Just like DHIS2 is not naturally suited to be an EMR, the OpenMRS is not designed to be an HMIS or very suitable to support primary health care–based applications.

Within the context of overall HIS in a country, DHIS2 is an appropriate tool to be considered for use by countries with modest HIS and those that are rebuilding their HIS. In particular, DHIS2 should also be considered as a tool to support HIS strengthening at the regional level. Understanding the opportunities offered by DHIS2 can also provide guidance in using other platforms such as OpenMRS within a similar regional framework.

The success of the DHIS2 enabling its adoption in multiple countries can be attributed, among other things, to its strong adherence to principles of a platform. A platform is something you can use to build upon multiple things, including those not originally envisaged using the same technical framework. DHIS2 acts as a platform on several levels (Braa & Sahay, 2012), allowing it to be adapted to a multitude of local contexts and use cases. Its data structures such as data elements, organization units, forms, and user roles can be defined freely through the application user interface without the need for core programming. As a result, DHIS2 supports most major requirements for routine data capture and analysis emerging in a country HMIS while also supporting management functions in particular domains of logistics, laboratory, and finance. DHIS2 is built on a modular design, which allows it to be extended with additional software modules, which can coexist with the core DHIS2, thus providing extra functionality when needed to meet country-specific requirements. Further, to achieve a looser coupling between the DHIS2 service layer and additional software artifacts, a Web application programming interface (API) has been provided, which allows other software products to access and retrieve the full list of data elements and forms in standard formats and build upon them. As a result, third-party developers can develop software using the DHIS2 data model and data without knowing the DHIS2-specific technology or complying with the DHIS2 design constraints. Recognizing this potential for global impact, a consortium of international partners are now jointly supporting the development, implementation, and further evolution of DHIS2 and its supporting resources (for example, training materials and user guides) as a global public good that has been adopted by various national ministries of health, including EMR countries such as Lebanon, Palestine, Libya, Pakistan, and Afghanistan. These countries could benefit through a regional approach, which can coordinate technical support and capacity strengthening processes.

4  |  HOW CAN EMR COUNTRIES BENEFIT FROM DHIS2?

EMR countries, especially in Group 3 with weak HIS, can benefit from the existing strengths and availability of DHIS2-related applications and resources using four distinctive strategies:

1. Adopting a bottom-up strategy: Like Lebanon has done by first introducing DHIS2 for a specific program (non-communicable diseases) and then incrementally expanding to also include other programs.

2. Adopting a top-down approach: Like Pakistan, where they have used the TB program as an entry point but are planning a national integrated framework to implement based on the DHIS2 platform programs for HIV, TB, malaria, and HMIS. A similar approach is also being adopted by the MoH in Libya to reform their existing HIS.
3. Adopting a programmatic-based approach: WHO headquarters in Geneva has now released standardized configuration packages including, metadata, analytical modules, and guidance materials for HIV, TB, malaria, mortality reporting, data quality improvement tool, and EPI based on the DHIS2 platform. Countries can adopt particular components of the configuration package without having to build them from scratch and are not obliged for full-scale national implementation on DHIS2.

4. Adopting a dashboard based approach: Another approach is to only use DHIS2 dashboards and data analytics features, which can be built upon existing systems. However, it would need to be ensured that existing systems are made capable of sharing data with the national DHIS2 data warehouse, which would then generate all required indicators and disseminate them through the designed dashboards.

5 HOW A REGIONAL APPROACH CAN SUPPORT EMR COUNTRIES TO TRANSITION TO DHIS2?

To support transitioning strategies from existing systems to DHIS2, Braa and Sahay (2012) have provided several guiding principles, such as

- **Enabling stakeholder consultation and participation:** Given the multi-stakeholder involvement in national HIS, the WHO Eastern Mediterranean Regional Office (EMRO) can enable consultations and engagement of stakeholders in defining the desired vision and design of the application.

- **Ensuring appropriate infrastructure is in place:** Infrastructure needs to host DHIS2 have to be carefully assessed and catered for, including for scale-up needs. Cloud hosting is a crucial element of the infrastructure, and different options including their pros and cons need to be assessed and the best choice for the country adopted.

- **Ensuring appropriate DHIS2 configurations:** Selecting and adapting existing and tested DHIS2 configurations are available with other countries and also in the WHO headquarters packages. These are available in opensource repositories and can be downloaded and used.

- **Enabling multi-dimensional capacity strengthening networks:** Multi-dimensional capacity building is required spanning domains of technology, data use, server management, and others. The University of Oslo is already running various DHIS2 academies covering these topics and more specialized ones relating to Disease Surveillance, Application development, and Tracker design. Resource materials to conduct these academies are also available, and which can be customized and use, also drawing upon global resources.

- **Planning for piloting, scaling, and evaluating the system:** Scaling is not merely a technical task of expanding numbers and geography but is also about equipping the health system to deal with enhanced complexity at different levels. Formative and concurrent evaluation can help develop important insights into the best and worst practices and serve as inputs to the next stage of the scaling process.

In line with international calls for countries to generate timely, reliable, and data of high quality to monitor progress towards the SDGs, EMRO can play a key role in coordinating and implementing a regional strategy, which can help operationalize the above principles by various mechanisms and strategies. For example, WHO can maintain a database of DHIS2 technical support resources in the region, match country support requests with these resources, and facilitate technical support contracts to meet these needs. WHO can also coordinate with countries to facilitate participation of staff from countries to attend DHIS2 Academies; help countries develop action plans and eHealth strategies using global resources such as the WHO-ITU eHealth strategy toolkit; and by closely coordinating with the University of Oslo who are responsible for managing the DHIS2 core platform, WHO can ensure all new developments and releases are communicated to the countries and technical support provided to adopt these changes.

6 CONCLUSION

As emphasized, countries need to actively engage in HIS strengthening efforts within the context of current global priorities (eg, SDG 3) and the 2015 Summit on Measurement and Accountability for Health which, among other things, called for increased levels and efficiency of investments by governments and development partners to strengthen country monitoring and evaluation frameworks in line with international standards and commitments (O’Neill, Viswanathan, Celades, & Boerma, 2016). The DHIS2 is now an important actor in these global efforts, and the University of Oslo is a collaborating center for WHO to support HIS strengthening efforts in countries, especially those with limited infrastructure and resources. There are various other global initiatives such as the Open Health Information Exchange (www.ohie.org) for building architectures, and efforts of various HIS standard making bodies such as Integrating Health Enterprise (http://IHE.net), and initiatives by WHO such as the Health Data Collaborative.

While countries can consider several options to improve infrastructure for HIS, it is critical to leverage upon innovative ICTs and new ways of doing things to strengthen their systems. New and emerging challenges such as the focus on UHC and CRVS require new types and frequencies of information that arguably cannot be met by traditionally existing HIS. These new ICTs provide possibilities for managing individual level data, share
data across systems, and develop innovative ways of visualization and dissemination of data. However, leveraging on the potential of innovating ICTs is hard-work, requiring significant amounts of time and resources, applied within a robust and sensitively designed governance framework.

In this paper, we have argued that WHO EMRO is best positioned to provide for this governance, while learning from other similar regional approaches. Also crucial is for governance to prioritize the development of overall legal and policy framework for technical and other innovations in health information. These policies can cover areas such as use of electronic devices for data capturing and reporting, at either individual or aggregate levels. Countries need to develop similar such processes in their contexts, while ensuring that they learn and build upon from their neighbors—building network of networks.

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