

Assessment of Sudan's health information system 2020



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WHO Library Cataloguing in Publication Data

Names: World Health Organization. Regional Office for the Eastern Mediterranean

Title: Assessment of Sudan's health information system 2020 / World Health Organization. Regional Office for the Eastern Mediterranean

Description: Cairo: World Health Organization. Regional Office for the Eastern Mediterranean, 2022

Identifier: ISBN 978-92-9274-163-1 (pbk.) | ISBN 978-92-9274-164-8 (online)

Subjects: Health Information Systems | Health Information Management | Health Status Indicators | Health Care Rationing | Health Policy | Program Evaluation – methods | Sudan

Classification: NLM W 26.55.14

This publication was originally published under ISBN 978-92-9022-967- 4978-92-9022-968-1

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Foreword

The Federal Ministry of Health in Sudan recognizes the importance of having a comprehensive and resilient health information system for evidence-informed decision-making, effective health system management and rational allocation of resources. To achieve this, the Ministry continues to collaborate with and form strong coordination mechanisms with all stakeholders and partners.

An integrated health management information system was established by the Federal Ministry of Health in 2013 to reduce parallel reporting and develop a culture of information use among health workers and policy-makers, so that the delivery of health care services is improved. Since 2016, with the deployment of the District Health Information Software version 2 (DHIS2) platform to digitize and accommodate integrated health information, the system has steadily been developing and evolving in the country.

According to the national health sector policy and strategic directions, the national integrated health management information system is intended to ensure the availability of relevant, accurate, timely and accessible health care data to support planning,

coordination, and monitoring and evaluation of health care services. Improving the functionality of the health management information system and the broader health information system is also in line with global, regional and national demands for timely, reliable, high-quality and country-owned data to monitor progress towards universal health coverage.

This health information system assessment is expected to review and clarify the national situation and to identify gaps and challenges affecting implementation, as well as provide a roadmap for achieving goals and targets for efficient monitoring of the health system's performance and progress towards universal health coverage and the Sustainable Development Goals.

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Federal Undersecretary and
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Sudan

Preface

The importance of health information data for programme and performance monitoring, quality of care, planning and policy-making is widely acknowledged. To effectively monitor progress towards the health-related Sustainable Development Goals (SDGs), countries are encouraged to generate reliable data to track progress and inform decision-making. Consistent with its Thirteenth General Programme of Work 2019–2023, the World Health Organization (WHO) is collaborating with Member States to improve their health information systems (HISs), analytical capacity and reporting for universal health coverage. In particular, WHO is supporting countries to develop comprehensive and efficient information systems to monitor health risks and determinants, track health status and outcomes (including cause-specific mortality) and assess health system performance. The Organization is also helping countries to disaggregate data so that progress on gender equality and health equity can be measured.

Since 2012, WHO has been working with Member States to agree on priority actions to strengthen HISs. Through a consultative process and intensive work with Member States, WHO has developed a framework for HISs along with 75 core health indicators that focus on three main components: monitoring health determinants and risks; assessing health status, including morbidity and cause-specific mortality; and assessing the health system response.

As part of WHO's efforts to support Member States to meet their national, regional and international obligations in reporting on health indicators, a number of comprehensive HIS assessments have been conducted in the Eastern Mediterranean Region since 2016 to identify key gaps and strategies to strengthen the HISs. The first of these was conducted in Jordan; this was followed by Libya, Pakistan, Afghanistan, Iraq, Lebanon, Oman and now, Sudan. The assessments have identified gaps in the HISs and generated recommendations and priority actions aimed at improving countries' health data systems.

We hope this report will guide decision-makers in the Federal Ministry of Health, and all development partners and stakeholders, in planning and implementing effective interventions to enhance the national HIS in Sudan. WHO expects that the priority areas identified by the assessment team and ongoing strategies to improve civil registration and vital statistics, including the quality of cause-of-death data, will enhance Sudan's efforts to monitor the health situation in the country and the health-related SDGs.

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Acknowledgements

This report is the product of a remote assessment conducted by WHO and the Federal Ministry of Health represented by the Health Information and Monitoring and Evaluation Directorate, with financial support from the Global Fund to Fight Aids, Tuberculosis and Malaria (the Global Fund). The contributions of all individuals who assisted in this assessment is gratefully acknowledged. Special thanks go to the former Undersecretary for Health, Dr Osama Ahmed Abdelrehim, and the heads of departments in the Federal Ministry of Health for all their help and willingness to make themselves and their staff available. The assessment team also acknowledges the input received from Michelle Monroe and Nathalie Zorzi of the Global Fund and all key stakeholders in identifying strategies to strengthen the national health information system, especially while managing the fallout from the COVID-19 pandemic. The assessment was guided by Dr Arash Rashidian (Director of Science, Information, and Dissemination, WHO Regional Office for the Eastern Mediterranean). Special thanks go to Dr Nima Saeed Abid (WHO Representative and Head of Mission, WHO country office in Sudan) for supporting this assessment and for ensuring that the assessment aligns with WHO's strategic areas of support to Sudan.

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Acronyms and abbreviations

CBS	Central Bureau of Statistics
CRVS	Civil registration and vital statistics
DHIS2	District Health Information Software version 2
ERP	Enterprise resource planning
GDP	Gross domestic product
HIS	Health information system
HRH	Human resources for health
ICD-10	International Classification of Diseases (10th revision)
IT	Information technology
MDR-TB	Multidrug-resistant tuberculosis
MICS	Multiple indicator cluster surveys
NCD	Noncommunicable disease
NMSF	National Medicine Supply Fund
SDGs	Sustainable Development Goals
STEPS	STEPwise approach to NCD risk factor surveillance (STEPS) survey
TB	Tuberculosis
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
WHO	World Health Organization

Executive summary

Overview

Health information systems (HISs), including routine health information systems, population-based surveys, surveillance, and civil registration and vital statistics (CRVS) systems, are key sources of data needed for evidence-based decision-making both at the national and subnational level. With increased data needs nationally and for reporting globally to meet commitments such as universal health coverage and the Sustainable Development Goals (SDGs), there is a critical need to have an HIS that is fit for purpose.

The Federal Ministry of Health of Sudan and the World Health Organization (WHO), with financial support from the Global Fund to Fight Aids, Tuberculosis and Malaria (the Global Fund), undertook a remote assessment of Sudan's HIS to identify priority actions required to strengthen the system to meet data needs. Owing to the onset of the COVID-19 pandemic, which interrupted international travel, a remote assessment was conducted instead of an in-person assessment with a limited complement of stakeholders. Group assessments and individual interviews were conducted between June and August 2020.

The assessment team reviewed the operations of Sudan's HIS in terms of its adherence to sound policy and institutional environment, utilization of well-functioning data sources, availability of strong institutional capacity for data collection, management, analysis, use and dissemination, and implementation of effective mechanisms for review, data use and action. Due to the remote nature of the assessment, a modified methodology was applied using the assessment standards developed by the WHO Regional Office for the Eastern Mediterranean for a comprehensive HIS assessment. The results provide an overview of the weaknesses and strengths of the country's HIS and enable identification of priority actions based on those findings.

Findings

Key observations were made relating to HIS operations in Sudan. One of the main strengths of the HIS is the commitment of the Government to have an integrated health management information system (HMIS), specifically through the District Health Information Software version 2 (DHIS2)¹ platform, and to achieve greater alignment in the implementation of other key data sources, such as household surveys and the civil registration and vital statistics system.

While acknowledging the progress made by the Federal Ministry of Health and other stakeholders, the assessment found that – in all the areas assessed – many critical attributes of a functional HIS require considerable strengthening in Sudan. The detailed priority actions are presented in the main body of the report. The main recommendations arising from the assessment are presented below.

Policy, governance and institutional environment

Sudan needs a critical review of HIS laws and coordination mechanisms to address existing gaps and to clarify the roles and responsibilities of all stakeholders in the collection, reporting and compilation of health information to support the Federal Ministry of Health in fulfilling its stewardship role for managing the health of the population. Infrastructure requirements and the retention of human resources are important aspects that should be considered.

Data sources

Routine facility and community reporting systems

The integration of different programmes in DHIS2 is a key aim for the Federal Ministry of Health. However, there are challenges that need to be

¹ An open source, web-based HMIS platform: <https://dhis2.org>.

overcome before it can successfully include all programmes, especially programmes that have a working parallel reporting system. These challenges include:

- ▶ infrastructure requirements for DHIS2 expansion, including electricity, Internet and information technology equipment needed for increasing coverage to remaining localities and health facilities;
- ▶ updating the standard operating procedures to define roles and responsibilities, data flow and access; this will entail addressing the hesitation of many programmes to hand over control of their data;
- ▶ ensuring that DHIS2 addresses programme data requirements, thus negating the need for parallel reporting systems;
- ▶ improving the capacity of DHIS2 core teams to enable staff to address system issues as they arise rather than relying on external assistance (which might not be timely);
- ▶ ensuring that the disease surveillance system configures its reports in DHIS2 to allow for weekly access to data (instead of current lag times);
- ▶ ensuring a community-based HIS addresses the data needs of existing community-based activities in a simple way that does not put an overwhelming burden on community health workers.

The guiding principles for a comprehensive HIS in Sudan include:

- ▶ an integrated system to address the needs of different programmes;
- ▶ simple, large scale and low cost;
- ▶ a focus on services and activities provided at the community level;

- ▶ linking community information to the routine HIS;
- ▶ a focus on community health workers and community midwives and linking them with health care providers at the facility level, i.e. statisticians and health visitors (mapping of community health workers and staff was accomplished during the preparatory phase).

Household surveys, including health facility survey

The national plan for systemization and integrated surveys was conducted by the Federal Ministry of Health with support from WHO in 2018 and includes surveys undertaken by different programmes and departments at the Federal Ministry of Health. Sustainability of household surveys is a big challenge, given that most of the funding comes from external sources, and therefore the implementation of this plan should ensure the following:

- ▶ internal consensus, commitment and endorsement;
- ▶ clear identification of the roles and responsibilities of the main stakeholders (HIS team, related programmes, state ministries of health, Central Bureau of Statistics, Ministry of Finance and development partners);
- ▶ well-defined coordination mechanisms among health survey stakeholders.

There is a critical need to have a harmonized health facility survey that will assess service availability, readiness and quality across programmes. Some programme-specific surveys are being undertaken; however, it will be important to develop a health facility assessment plan that will take the data needs of all programmes into account. More importantly, the Federal Ministry of Health should conduct a Harmonized Health Facility Assessment based on WHO standards as an independent verification of availability, quality and effectiveness of health facility services across the country.

Civil registration and vital statistics

The CRVS system has laid down some critical foundations (such as the updated death registration system) but work is still needed, especially in terms of cross-ministry partnership, to ensure the system is sustained.

Within the health sector, there are a number of activities that focus on improving the collection and analysis of mortality data, including:

- ▶ training physicians on International Classification of Diseases-compliant certification of death;
- ▶ training of coders on coding and analysis of mortality data;
- ▶ potential introduction of the Startup Mortality List using the DHIS2 platform for hospitals.

A comprehensive review of the birth registration system with stakeholders is under way and a more comprehensive birth notification form in accordance with international standards is being adopted.

Strong institutional analytical capacities and mechanisms for data use, review and action

Strong institutional analytical capacities are required for routine programme monitoring and regular analytical reviews at national and subnational levels. Critical activities to implement include:

- ▶ sustaining regular performance review meetings and supportive supervision at national and subnational levels;

- ▶ establishing an effective data quality system;
- ▶ strengthening the monitoring and evaluation system;
- ▶ improving the availability of analytics, data and reports in the Sudan Health Observatory;
- ▶ training of staff at all levels on how to conduct analytical reviews and efficiently represent data to decision-makers to ensure their use.

Way forward

There are existing opportunities to enhance the operations of the HIS in Sudan. The detailed priority actions presented in the main report will provide an opportunity for the Federal Ministry of Health (in collaboration with WHO and other HIS stakeholders and development partners) to deploy interventions to enhance the HIS in the short, medium and long term. Some of the interventions can be implemented with limited effort, without a great deal of change to the existing systems and with the leadership of the Federal Ministry of Health. However, to ensure effective monitoring of the progress in implementing interventions, a functional national HIS coordinating mechanism should be enhanced to oversee this process. The agreed set of recommendations/priority actions can be costed to facilitate domestic and external resource mobilization. The timelines for implementation of the interventions can be adjusted depending on the local circumstances.

1. Background

The population of Sudan reached 40 204 167 in 2019.² It is estimated that 66% of inhabitants live in rural areas: it is a sparsely populated country, with 25 people per square kilometre. The country has a large population of refugees and internally displaced persons, with over 1.1 million refugees and asylum seekers and 1.86 million internally displaced persons.³

Sudan has a federal system of government, administratively divided into 18 states with 189 localities in these states. The country is characterized by a young population: over 90% are aged under 54 years and 15% under 5 years. Overall, about 49% of the population is female, with women of reproductive age (15–49 years) making up almost 25% of the total population. The total fertility rate, crude birth rate and crude death rate are estimated to be 4.4, 32 and 7 per 1000 population,⁴ respectively.

The political and economic situation in Sudan is fragile. The estimated gross domestic product (GDP) per capita is US\$ 3056 (2017 estimate).⁵ Current health expenditure per capita is US\$ 194 and health spending as a percentage of GDP is 6.3%.⁵ Out-of-pocket expenditures account for more than 70% of current health expenditure.⁵ However, continuing political challenges and widespread poverty – 46.5% of the population live below the poverty line (living on less than US\$ 1 per day)⁶ – mean that the risk of catastrophic health expenditure is high.

In a federal system, the delivery of services by the health and other sectors is managed between the federal, state and locality levels. In the health sector, each state has its own State Ministry of Health. The Federal Ministry of Health is responsible

for setting national legislation, policies, priorities, standards, and for training of health care workers, and has an overall stewardship function over the state ministries of health. The Federal Ministry of Health is also responsible for declaring and controlling epidemics. States have some flexibility and autonomy to develop their own health plans and legislation, but these are done in close coordination with the Federal Ministry of Health. States are responsible for the performance of the localities in their state. Localities are responsible for delivery of primary health care services and for aggregation of health services by facilities in their districts.

The most significant hindrances to leadership functions, especially at the state and locality levels, are the limited budget for management and development, lack of control over financial resources and fragmentation of resources, and weak capacity in management, planning and monitoring (especially at the locality level).

While the Federal Ministry of Health is the largest public provider of health services, there are other sectors involved in the delivery of health services in Sudan, including the National Health Insurance Fund, the Ministry of Defence, the Ministry of the Interior and the General Intelligence Service. Coordination between these different government agencies is critical for efficient delivery of health services. In addition, there is a robust private sector in the country, especially in urban areas.

1.1 Overview of the health situation in Sudan

Sudan is one of several countries in WHO's Eastern Mediterranean Region experiencing a protracted humanitarian crisis. The capacity of the country's

² Central Bureau of Statistics, Sudan, 2019.

³ Sudan factsheet 2019. Geneva: United Nations High Commissioner for Refugees; 2019 (<https://reporting.unhcr.org/sites/default/files/UNHCR%20Sudan%20Fact%20Sheet%20-%20August%202019.pdf>, accessed 31 October 2021).

⁴ World Bank Data: Sudan [online database]. Washington, DC: World Bank; 2019 (<https://data.worldbank.org/country/sudan?view=chart>, accessed 16 July 2020).

⁵ Global Health Expenditure Database. Health expenditure profile, Sudan. Geneva: World Health Organization; 2018 (https://apps.who.int/nha/database/country_profile/Index/en, accessed 16 July 2020).

⁶ Sudan system of health accounts (2015) results with disease specific accounts. Khartoum: Federal Ministry of Health; 2015.

health system to respond to the growing needs of the population is overstretched. Life expectancy at birth (both sexes) is 65.1 years (2016),⁷ the maternal mortality ratio is estimated at 295 deaths per 100 000 live births (2017),⁸ and the under-5 mortality rate at 60 per 1000 live births (2018).⁹ The country did not achieve the Millennium Development Goal target for under-5 mortality. Years of neglect have adversely affected Sudan's health system, leading to underfunding, lack of qualified staff, weak infrastructure, and deficiencies in equipment, medicines and supplies. The country has a high burden of both communicable and noncommunicable diseases (NCDs), with high rates of malnutrition.¹⁰

Sudan's universal health coverage service index was 44.3 in 2017 compared with 42 in 2015.¹¹ Antenatal care coverage (at least one visit) is 74.3%, while coverage by four visits is 57%. Coverage for family planning is only 9%, while the unmet need for family planning is 29%. The proportion of villages covered by community midwives increased from 36% to 72% between 2011 and 2016. Deliveries attended by skilled birth attendants reached around 80%, with 70% taking place at home. In 2010–2014, a slight increase was seen in the use of improved water sources (60.5% to 68.0%) and the use of improved, not-shared, sanitation facilities (27.1% to 32.9%) but this remains a persistent challenge in the country.

The distribution of health workers is uneven in Sudan. Despite the fact that over 70% of the population reside in rural areas, 70% of health

workers operate in urban areas, with 38% in the capital, Khartoum. Moreover, 67% of the staff work in secondary and tertiary care. The great majority work in the public sector, with 9.3% working exclusively in the private sector; dual practice is, however, quite common among public sector employees. High turnover and brain drain of professionals is a major issue facing the health system. The bulk of those leaving the country are physicians, pharmacists and dentists (60% of physicians and 25% of pharmacists).

Regulation of the pharmaceutical sector has been established at different levels (federal and state) with a well-developed drug registration system. However, there are challenges facing all aspects of its management, especially at subnational level. The Supreme Council for Coordination of Pharmaceutical Services was established and a governance framework was developed to improve regulation, coordination and transparency in the pharmaceutical sector.

Slightly more than 76% of the population are covered by health insurance, most of whom are formal sector employees and poor families.¹² Health financing is inefficient due to the presence of fragmented pools, especially those of the Federal Ministry of Health and National Health Insurance Fund, with weak coordination and inadequate leadership. Lack of separation between purchaser and provider has created management inefficiencies and compromised the quality of services. The national health financing policy and strategy and

⁷ World health statistics 2019: monitoring health for the SDGs, sustainable development goals. Geneva: World Health Organization; 2019 (<https://apps.who.int/iris/handle/10665/324835>, accessed 7 August 2020).

⁸ Trends in maternal mortality 2000 to 2017: estimates by WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division. Geneva: World Health Organization; 2019 (<https://www.who.int/reproductivehealth/publications/maternal-mortality-2000-2017/en/>, accessed 7 August 2020).

⁹ Levels and trends in child mortality. Report 2019: estimates developed by the UN Inter-agency Group for Child Mortality Estimation. New York, NY: United Nations Children's Fund; 2019 (<https://childmortality.org/wp-content/uploads/2019/10/UN-IGME-Child-Mortality-Report-2019.pdf>, accessed 7 August 2020).

¹⁰ Sudan health profile 2015. Cairo: WHO Regional Office for the Eastern Mediterranean; 2017 (<https://apps.who.int/iris/handle/10665/254895>, accessed 7 August 2020).

¹¹ Primary care on the road to universal health coverage: 2019 global monitoring report. Geneva: World Health Organization; 2019 (https://www.who.int/healthinfo/universal_health_coverage/report/2019/en/, accessed 31 October 2021).

¹² National health insurance report, June 2020. Khartoum: Government of Sudan; 2020.

¹³ National Health Policy 2017–2030. Khartoum: Government of Sudan; 2017.

the health insurance law were developed to guide health financing reform.¹³

Despite these challenges, the country is determined to address the issues hindering progress in achieving universal health coverage and the SDGs. Policy interventions are in place to promote health across the life course by combating communicable diseases, addressing the rising challenge of NCDs and strengthening the health system in accordance with the six building blocks: governance, financing, human resources for health, service delivery, medicines and technology and health information systems (HISs).

2. Purpose and objectives of the assessment

In any country, a strong HIS is a core requirement for generating the data and information required for tracking progress and performance of national health sector priorities, monitoring inequities, programme monitoring, decision-making, patient care and global reporting. In line with its Thirteenth General Programme of Work 2019–2023, the World Health Organization (WHO) is working with Member States to improve their HISs, analytical capacities and reporting for universal health coverage and the SDGs, including measuring equity in access to and delivery of services.¹⁴

Building on previous HIS advances and strengthening activities, and as part of the 2019 Health Reform Plan initiative to streamline various health initiatives (using the WHO health

system building blocks, of which HIS is one block), a technical working group on the HIS in Sudan identified the following areas for improvement: strengthening governance and coordination for an integrated HIS, using DHIS2 as the unifying platform; reinforcing institutional capacity to collect, compile and use data; improving availability and quality of population data sources, including population-based surveys and CRVS systems; improving governance through the implementation and use of a regular review of progress and performance; strengthening the health research system; adopting modern information and communications technology for a better HIS; and increasing the efficiency of HIS investment by government and partners.¹⁵

While advances have been made on previous commitments to strengthen Sudan's HIS, critical challenges persist that need to be addressed. As part of the continuing HIS reform, the Federal Ministry of Health decided to conduct a comprehensive assessment to understand these challenges and to feed into the development of a new HIS strategy/policy.¹⁶ A comprehensive assessment is also needed to support the country's efforts to monitor its health development agenda and enhance its reporting capacity on the 100 core health indicators (plus health-related SDGs)¹⁷ and the 75 regional core health indicators.¹⁸

At the beginning of 2020, a comprehensive HIS assessment was planned by the Health Information and Monitoring and Evaluation Department of the Federal Ministry of Health, in collaboration with WHO and with financial support from the Global

¹⁴ Thirteenth General Programme of Work, 2019–2023. Geneva, World Health Organization; 2019 (<https://www.who.int/publications/i/item/thirteenth-general-programme-of-work-2019-2023>, accessed 10 November 2021).

¹⁵ Health reform plan: a workshop to streamline health initiatives. Khartoum, Sudan, 28–29 September, 2019.

¹⁶ While there have been other disease-specific or programme-specific assessments over the years, the last full HIS assessment conducted in Sudan was in 2007 by Health Metrics Network. Available at: http://www.sho.gov.sd/controller/knowledge_hub.php?mid=110&sm_id=133&lid=1#.

¹⁷ 2018 Global Reference List of 100 core health indicators (plus health-related SDGs). Geneva, World Health Organization; 2018 (<https://apps.who.int/iris/bitstream/handle/10665/259951/WHO-HIS-IER-GPM-2018.1-eng.pdf%3Bjsessionid%3D328D523A9FE9264322E2A333924FD508?sequence=1>, accessed 17 July 2020).

¹⁸ Monitoring health and health system performance in the Eastern Mediterranean Region: core indicators and indicators on the health-related Sustainable Development Goals. Cairo: WHO Regional Office for the Eastern Mediterranean; 2020 (https://rho.emro.who.int/sites/default/files/booklets/EMR-HIS-and-core-indicators-2019-final_0.pdf%20, accessed 17 July 2020).

Fund. Unfortunately, this full assessment was cancelled owing to the emergence of the COVID-19 pandemic. Instead of a comprehensive HIS assessment, a decision was made to complete the assessment via a desk review of existing information combined with key informant group and individual discussions.

Following consultations with the Federal Ministry of Health, the key objectives of the assessment as outlined in the terms of reference were to:

- ▶ assess the national HIS, including the available databases to increase understanding of the system and identify areas for improvement, particularly with regards to information flow and systems-level use of data;
- ▶ review the different sources of data for the HIS, including population-based and facility-based surveys, special studies, service records and individual records, and surveillance or community systems;
- ▶ provide an understanding of data source content, data elements and associated reporting burden, and how the information systems are used and by whom;
- ▶ assess the strengths and opportunities for improvement of HMIS procedures and domains with respect to management and governance, infrastructure, standards for data management, data collection and processing, and data analysis, dissemination and use;
- ▶ provide recommendations for strengthening the national integrated HMIS in line with global and regional standards, indicator frameworks and guidelines;
- ▶ recommend strategies to build the capacity of the HMIS enabling it to produce core indicators on: disease burden; health access and utilization; mortality; HIV, tuberculosis (TB) and malaria surveillance; and human resources, including responding to the information requirements of the SDGs and universal health coverage;

- ▶ develop a roadmap to strengthen the national integrated HMIS based on the findings and recommendations of the assessment, including a costed and time-bound data improvement plan that targets all the main data bottlenecks.

The results of the assessment will support the Federal Ministry of Health in developing a prioritized roadmap to improve the HIS and the reporting of core indicators at the national, regional and international levels.

3. Assessment methodology

The methodology for this assessment is based on the framework developed by the WHO Regional Office for the Eastern Mediterranean (Fig. 1). However, due to the emergence of the COVID-19 pandemic, this comprehensive assessment was not fully implemented since key elements such as site visits and discussions with HIS staff and stakeholders at the lowest levels of service provision were not conducted. The assessment was conducted as a desk review of existing documents and through key informant interviews (group and individual) instead of the broader comprehensive assessment recommended in the WHO framework. The desk review included using existing HIS and programme-specific assessments (both regional and global) and other key documents such as evaluations, reviews, statistical reports, and health sector plans and strategies.

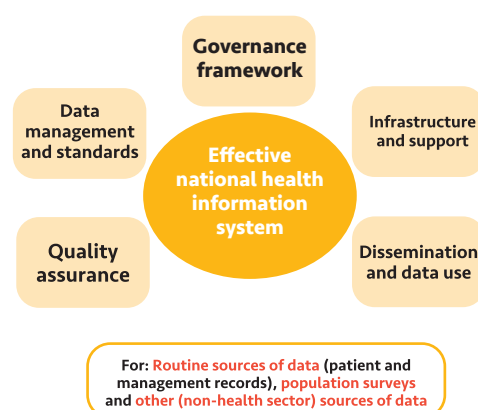


Fig. 1. Adapted model of an effective national health information system

Small group consultations were held online from 8 to 11 June 2020 between Federal Ministry of Health focal points, WHO (Regional Office and country office) and the Global Fund. The list of people who participated in the consultations is available in the Acknowledgements section. Due to the COVID-19 pandemic, it was difficult to include a broader group of stakeholders for the online consultations since working from home had implications on internet connectivity for some stakeholders. The online consultations were supplemented by a desk review of key documents provided by the Federal Ministry of Health and other development partners, and documents available in the public domain. In addition, HIS areas not covered during the online consultations were addressed through desk reviews of documents available in the public domain and other in-country grey literature.

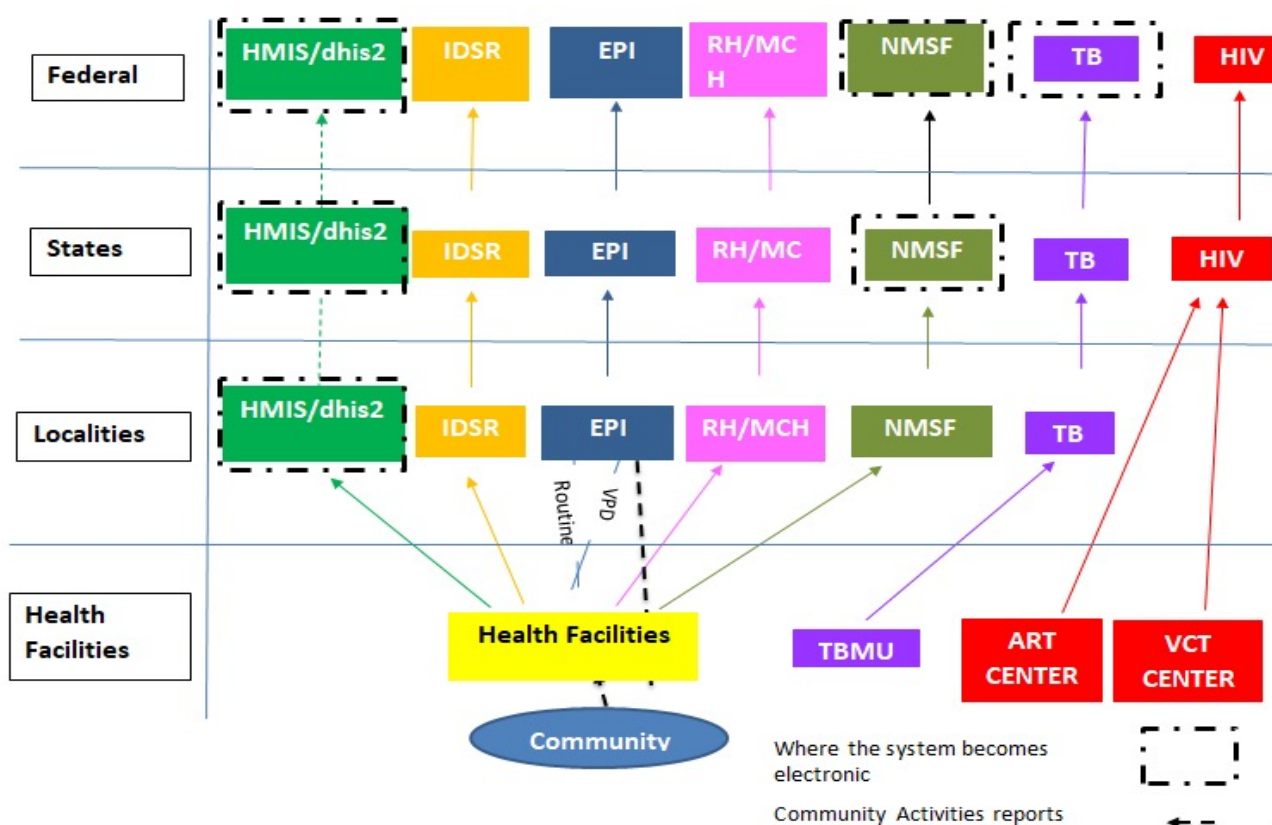
The team consolidated the findings and priority actions as identified by the document reviews

and online consultations. Recommendations on strengthening activities to enhance the HIS in Sudan emanate from the desk reviews and the online consultations.

4. Key findings

4.1 Overview

A well-functioning HIS will ensure that reliable, relevant, up-to-date and timely health and health-related information is available and accessible to health managers at every level of the health care system for use in decision-making, planning and evaluation. This system will also enable planners to monitor the implementation of health plans and measure the health status of the population and changing trends in burden of diseases. Evaluation of the effectiveness of health system performance and



ART: antiretroviral treatment; EPI: Expanded Programme on Immunization; IDSR: Integrated Disease Surveillance and Response; NMSF: National Medical Supplies Fund; RH/MCH: reproductive health/maternal and child health; TBMU: tuberculosis management unit; VCT: voluntary counselling and testing.

Fig. 2. Routine facility reporting systems: overview of HIS data flow across administrative levels

health status is conducted using the products from the national HIS.

While improvements in HISs have been undertaken and continue to be implemented, Sudan's HIS is still plagued by vertical parallel systems for routine health information, which are paper-based up to higher administrative levels and use Excel for data compilation (see Fig. 2), as well as an uncoordinated system of population-based surveys and poor coverage of the death registration system and cause-of-death reporting. Infrastructure issues hinder the modernization of the HIS, particularly at lower administrative levels. Analytical capacity needs to be bolstered at all levels, especially at state and locality levels. Use of data, mainly at lower administrative levels, is hampered by lack of digitization, time-intensive data compilation and reporting practices, and limited analytical capacity. Coordination and governance mechanisms are in place but require full adoption and implementation by all parties. These topics will be further explored in the following sections.

ART: antiretroviral treatment; EPI: Expanded Programme on Immunization; IDSR: Integrated Disease Surveillance and Response, NMSF: National Medical Supplies Fund; RH/MCH: reproductive health/maternal and child health; TBMU: tuberculosis management unit; VCT: voluntary counselling and testing.

4.2 Sound policy and institutional environment and governance mechanisms for review

With different entities besides the Federal Ministry of Health delivering health services, including the military, the police, the National Health Insurance Fund and the private sector, there are gaps and challenges in the overall institutional environment and governance mechanisms of the health sector, such as fragmented service delivery, weak ownership of different stakeholders and lack of clarity in roles and responsibilities. These issues are mirrored in the health information space, with different actors collecting health and health-related information. For example, the Central Bureau of

Statistics has the main responsibility of conducting population-based surveys and the CRVS office is part of the Ministry of the Interior. Changes and improvements to the HIS will need to address the broader institutional environment and governance mechanisms that exist with these different stakeholders (also mentioned in their specific sections of this report, such as surveys and CRVS).

Annex 1 provides a list of attributes that measure the policy and institutional environment for the HIS. Sudan has the National Health Sector Strategy 2017–2020 and a One Health Sector Plan for 2018, which include strategic priorities across different disease and programme areas. There is no efficient monitoring and evaluation plan in either the National Health Sector Strategy or the One Health Sector Plan. There is a need for a common monitoring and evaluation plan that integrates monitoring and evaluation needs across all priorities to determine the key data sources required to successfully monitor progress and performance of the National Health Sector Strategy 2017–2020. A fully costed monitoring and evaluation plan or a costed HIS strategy will provide visibility on the budget requirements to implement/maintain/strengthen the key data sources that provide data for monitoring the health sector priorities.

Criteria for a strong monitoring and evaluation plan include having a core list of indicators, with baselines and targets, and all the key data collection methods and architecture (digital or otherwise) for reporting these indicators. To address this, in 2017 an extensive exercise was conducted with all departments/programmes at the Federal Ministry of Health: 316 indicators were identified covering the determinants of health, WHO's 100 core indicators and the SDGs, together with other programmatic indicators, and a metadata dictionary was developed with details of definitions, measurement, frequency and sources of each of the indicators. A consensus-building workshop was conducted in 2018 including all stakeholders and donor representatives and it was decided that these indicators would form the basis for monitoring health system performance. Tracking of these indicators is not efficient or well-sustained; however, and needs to be enhanced

through stronger commitment and coordination mechanisms.

Sudan continues to have multiple micro-HIS ecosystems that are not linked to each other. Population-based surveys, surveillance, routine facility reporting and facility surveys are conducted in programme/disease areas without a view of the broader HIS landscape. Although some initiatives, such as the Health Reform Plan, have a strong overall vision and discuss a unified HIS architecture with aligned funding and integrated HMIS, population-based surveys and CRVS system, more work is needed to bridge the gap between this overall vision and the data and implementation requirements for monitoring the overall national and programme-specific health priorities.

Overall, Sudan has a strong record in developing key health policies at the national level. On the HIS front, there is a critical need to review and update the 2013 policy and clarify roles and responsibilities at the national and subnational levels¹⁹ to ensure that a unified HIS architecture meets the needs of different stakeholders and provides a strong foundation for governance.

In addition to implementation of these policies at the central level, commitment to adopt them at state level is essential. Strengthening coordination with the states is a priority for the Federal Ministry of Health. Quarterly/biannual reviews and coordination meetings are held with heads of the HIS and monitoring and evaluation representatives in the states. A coordination mechanism was developed and endorsed in 2016; however, it is not systematically implemented. In addition, the Joint Annual Review report²⁰ found deficiencies in institutional arrangements at the state and locality levels. There needs to be a clear stepwise plan to ensure that national HIS policies can be successfully

carried out by the state ministries of health and locality health management departments.

Strengths

- ▶ Strong track record of developing robust policies and strategies.
- ▶ Existing commitments – such as Sudan’s Local Health Compact 2014 – from donors, partners and government to support the One Health Plan and a comprehensive, integrated HIS.
- ▶ Institutionalization of the joint planning and review mechanisms, such as the One Health Plan and the Joint Annual Review, at the national level.

Potential areas for improvement

- ▶ Need for review, update and endorsement of a comprehensive HIS policy with involvement of all stakeholders.
- ▶ Need for review and implementation of laws, regulations and policies for reporting and compliance of private sector and other stakeholders.
- ▶ Coordination mechanisms need strengthening, including clarification of roles and responsibilities across different HIS dimensions (data collection, data review and use) of stakeholders and between different levels of the decentralized health system.
- ▶ Need to update the monitoring and evaluation plan for the National Health Sector Strategy and to identify all key data sources and required resources to implement the strategy.
- ▶ Institutionalization of the joint planning and review mechanisms is needed at state and locality levels.

¹⁹ Clarification of roles and responsibilities would need to touch on many different HIS areas such as surveys, CRVS, routine facility information system, analysis and review, etc.

²⁰ 2016 and 2017 Joint Annual Review report. Khartoum: Federal Ministry of Health; 2017 (http://sho.gov.sd/controller/knowledge_hub.php?mid=110&sm_id=132&lid=1#, accessed 1 November 2021).

- ▶ Mechanisms need enhancing for retention of qualified human resources and reduction of staff turnover.

4.3 Data sources

4.3.1 Routine health information system data sources

Public health surveillance is an umbrella term that includes early warning, detection and response, as well as the more routine monitoring of priority diseases and programme areas. This section will examine both aspects. The term “integrated health information system” is used to refer to the routine programme monitoring that is managed by the Health Information and Monitoring and Evaluation Department/National Health Information Centre in the General Directorate of Planning and Health Development at the Federal Ministry of Health, as well as other parallel vertical programme monitoring systems. “Surveillance” is used to refer to sentinel surveillance, the purpose of which is early warning, detection and response, including sentinel surveillance through integrated disease surveillance and response at the Health Emergency and Epidemic Control Directorate, as well as vaccine-preventable disease surveillance. Given that the public health surveillance functions are split between directorates and departments, the public health surveillance system will need to be examined holistically in order to address challenges and gaps. For example, efficiencies can be gained through streamlined supervision and monitoring and through shared infrastructure costs.

A focus of the 2019 Health Reform Plan is further integration of the HIS, specifically the HMIS using the DHIS2 platform. The establishment, strengthening and expansion of an integrated HIS was adopted in 2014. More than 7000 relevant health staff were trained nationwide between 2015 and 2016. DHIS2 was also adopted in 2014 to accommodate the integrated system, and was officially launched in 2016 after customization, training and distribution of required equipment to the states.

The DHIS2 platform covers 144 out of 189 localities in 17 states, with Khartoum State joining in 2021. Although substantial improvements in reporting rates through the DHIS2 system have been made, from a baseline of 30% of facilities in 2016 to 64% in May 2020, the reporting rates have not changed significantly since the December 2018 levels of 61.5%. While some states have 100% reporting completeness, including Blue Nile, Algazira and Algardarif, other states are not reporting any data. For example, in May 2020 only 122 out of the 144 localities in DHIS2 reported into the system. This was mainly due to a drop in internet connectivity; however, it also indicates a lack of resilience in the routine HIS due to both political and health challenges (the revolution in Sudan and the COVID-19 pandemic).

The ultimate strength of a data system is its use. The Federal Ministry of Health aims to expand DHIS2 to all possible localities and thus increase the total coverage. As the Federal Ministry of Health expands the use of DHIS2 and includes other vertical systems, it will be important to examine and address a few issues, including:

- ▶ ensuring resilience against external challenges (e.g. political and insecurity challenges);
- ▶ systemic issues that affect implementation, such as lack of infrastructure and human resources;
- ▶ ensuring an efficient data quality system is in place and promoting data use.

In the key informant interviews, experts noted differential reporting rates in parallel reporting systems, such as the Expanded Programme on Immunization and reproductive health/maternal and child health programmes, with higher monthly reporting completeness rates. Key informants also mentioned differential reporting rates in states with similar security/political profiles (e.g. in the Darfur states, where West Darfur had higher reporting completeness compared with North, East and South Darfur). Critical first steps for the HIS department will be exploring the reasons that enable other departments to achieve better reporting rates

(e.g. additional incentives) to identify the possible solutions and exploring why localities/states with similar security/political profiles have different reporting rates, as well as testing whether other reporting modalities may be used.

Experts noted that one of the strengths of the system was that regular supportive supervision and refresher HIS training had been maintained; however, they noted systemic issues such as staffing problems and lack of governance, infrastructure and capacity. These issues are reflected in the varying reporting rates in localities/states, as well as in hospitals and primary health care facilities and need to be examined. It is important to maintain field supervision – a necessary variable in strengthening the system – but field supervision is not sufficient on its own and there is a need to ascertain if its practice is consistent across all states/localities. Also, given the realities of the COVID-19 pandemic, field supervision might be more difficult to sustain. Further in-depth desk review of data and remote supervision will need to be explored and enhanced.

Staffing issues for health information at facility, locality, state and national levels can impede reporting rates and system maintenance. Depending on their type, facilities submit between 11 and 13 reporting forms (this does not include completing and maintaining the source registers). In facilities that do not have statisticians for data entry, the reporting burden falls on health care providers and this can negatively affect service delivery. Staffing issues at the locality level will impact data entry into the system and local management of data quality issues. Trained personnel are required at all levels of the system. Calculations on human resources for health often do not take into account the staffing needs for the HIS. To get an overview of staffing needs, a targeted assessment should be conducted on key infrastructure and staffing issues before further expansion (this can be done from Khartoum in coordination with the states and

localities). The results of this assessment would help to guide expansion as well as address staffing gaps.²¹

The DHIS2 platform in Sudan represents the digitized form of the routine HIS and collects an agreed minimum set of data (for the first phase of integrating the HIS) comprising malaria data, some Expanded Programme on Immunization data, laboratory tests, antenatal care data, nutrition data and some human resources data. However, there are still vertical reporting systems in use for the Expanded Programme on Immunization, HIV, leprosy, TB, reproductive health, maternal and child health, community data, oral health and disease surveillance. The weekly disease surveillance reports on TB, leprosy and leishmaniasis are in DHIS2 but are not yet in use. To integrate these other programmes into DHIS2, it will be necessary to ensure their data needs are addressed, including the importing of legacy data. If DHIS2 collects only partial information (e.g. only part of the Expanded Programme on Immunization core set of indicators recommended by WHO for routine health facility data) then parallel reporting systems will continue to flourish. Moreover, DHIS2 does not collect information from facilities run by the army, the National Health Insurance Fund and private facilities. A brief overview of the issues facing the integration of HIV, TB and malaria programmes in DHIS2 is given in Annex 2.

It is essential to have an updated master health facility list. It will be important to ascertain whether all facilities that are part of parallel reporting systems are aligned with DHIS2. A full health facility census was planned in Sudan but has only been partially completed. Phase I of the process was led by the Primary Health Care Directorate and has been completed in 10 out of 18 states. Phase II was planned for 2020, but it is uncertain whether it will be completed owing to the COVID-19 pandemic. An updated master facility list will provide information

²¹ The targeted assessment should be a short process to determine immediate staffing needs. In the long term, more systematic assessment of health information staffing requirements should be put in place.

on the signature domain (geolocation), as well as information on the service domain (what services are being provided and where). In addition, a desk review process was initiated in early 2020 to align the DHIS2 facility list with the National Medical Supplies Fund (NMSF) list. However, this process was interrupted due to the advent of COVID-19 and needs to be completed.

The analytics statistics in DHIS2 provide information for both routine monitoring and reviews. In Sudan; however, there is limited use of certain analytics and visualization features (mainly those for follow-up of reporting rates and for training). This suggests that DHIS2 is mainly being used as a data entry tool, where the data are then used to produce the annual statistical reports. Training on information use has been conducted in Sudan, but data are still not adequately used for monitoring and decision-making at state or locality levels, and training should therefore be expanded to include all end users. WHO has developed minimum standards for the analysis and use of health facility data, including the recommended minimum set of indicators, data quality and key analytics necessary for programme managers.²² Current standards include a data quality app and configuration packages for HIV, TB, malaria, the Expanded Programme on Immunization and reproductive, maternal, newborn, child and adolescent health, some of which have been customized into the DHIS2 system in Sudan. The newly developed COVID-19 module has been installed and a trial was carried out to improve case reporting during the pandemic. Standards are forthcoming for other areas such as nutrition, neglected tropical diseases, NCDs, and early warning and response, in addition to a cross-cutting module. These standards are tool/software agnostic, but they have been programmed in DHIS2 for application in countries that are using DHIS2 as their HMIS system. DHIS2 can support increased use of data if programmes adopt the system and operators have adequate training in its use.

Although customizations are performed by the DHIS2 core team in the Federal Ministry of Health, there is limited capacity for advanced configuration and system administration, which is mostly provided via expert technical assistance. There is a need to build local capacities for expert configuration and administration of DHIS2. In addition, needs assessment of HIS staffing should be conducted (if not done already) and additional staff should be recruited to effectively manage HIS requirements (information technology personnel and HIS personnel).

To build a resilient and integrated HIS, the Federal Ministry of Health has to address the challenges outlined above. The Ministry should utilize interventions that have worked in the past, such as supportive supervision, regular HIS refresher training and improvement of infrastructure and connectivity. However, it will also need to conduct rigorous examination of the challenges to effectively improve data completeness, introduce new interventions such as training on quality/use of data and build stronger governance mechanisms.

Strengths

- ▶ Strong commitment and leadership of the Federal Ministry of Health to a unified health-facility reporting system across all programmes.
- ▶ DHIS2 system is deployed nationwide.
- ▶ Strong record of annual publishing of routine reported statistics.
- ▶ A recent consultancy, supported by the Global Fund, upgraded all instances of DHIS2 being used in the National Data Centre and Federal Ministry of Health to version 2.33 (the latest version at time of upgrade, although version 2.34 has since been released).

²² Analysis and use of health facility data – a toolkit. Geneva, World Health Organization; 2019 (https://www.who.int/healthinfo/tools_data_analysis_routine_facility/en/, accessed 18 July 2020).

Potential areas for improvement

► Governance:

- lack of an overall governance structure has promoted the use of vertical systems and generated inefficiencies;
- incomplete updating of the master health facility list;
- source documents, monthly reports and reporting forms in DHIS2 are not collecting all information necessary for programme management (a potential roadblock for integration);
- perception of poor quality of data in DHIS2, coupled with lower reporting completeness compared to parallel reporting systems.

► DHIS2 server and national core team:

- DHIS2 core team lacks capacity and/or skills for server and database administration;
- server infrastructure (lack of server staging instance, backup licensed firewall) and server hosting issues;
- lack of reference documents to guide the information technology team to execute basic troubleshooting of the server locally.

► Other system issues:

- lack of infrastructure (electricity, connectivity and computers/laptops) in some localities;
- low reporting completeness even in localities with DHIS2 (for example, in fragile states,

including three of the Darfur states and West Kordofan);

- lack of staff at all levels of the system, including an inadequate number of statisticians at the facility level to enter information in the source document and compile timely monthly reports, and limited number of HMIS staff even in localities with DHIS2;
- stockout of source reporting forms contributes to lower reporting completeness, due to high costs of printing and distribution of registers and reports that still depend on donor funding;
- lack of familiarity with DHIS2 and its analytical products at the national level;
- lack of familiarity in using tools such as DHIS2 to support decision-making (for HMIS and programme staff), especially at lower administrative levels;
- low capacities of staff at subnational level;
- non-enforcement of the basic training requirement for statisticians (6 months prior training) affecting capacity of new statistical staff, which leads to recording/reporting issues and produces low quality data at facility level, and low analytical capacity generally.

4.3.2 Sentinel surveillance system

An assessment of the surveillance system was conducted as part of the joint external evaluation of International Health Regulations (IHR 2005)

²³ Joint external evaluation of IHR core capacities of the Republic of the Sudan. Geneva, World Health Organization; 2017 (<https://www.who.int/publications/i/item/WHO-WHE-CPI-2017.15>, accessed 27 July 2020).

²⁴ Weekly surveillance report from week 25 (June 15–21, 2020).

²⁵ These only refer to the integrated disease surveillance system. Any disease- or programme-specific surveillance system (such as for vaccine-preventable diseases) might have different coverage.

core capacities²³ in Sudan. A tracer set of metrics to measure the surveillance system is presented in Annex 3. Sudan has a sentinel-based integrated disease surveillance and response system for early warning and response in 1817 facilities,^{24,25} out of a total of 6118 facilities, including referral hospitals, rural hospitals, health centres and dispensaries – approximately 30% of all facilities – but it is not yet fully functioning. The private sector is not integrated in the sentinel surveillance system. Facilities have to report 25 notifiable conditions, including notifiable diseases on list A²⁶ (reportable within 24 hours) and list B²⁷ (weekly reporting). Reporting is usually done via telephone/mobile from the facilities to the surveillance unit in the localities; the reporting completeness is usually high, although not 100%. However, a comparison of four-week average reporting completeness for weeks 18–21 in 2020 with the same weeks in 2019 showed reporting completeness in 2020 to be more than 20 percentage points lower than 2019. Anecdotally, this drop has been attributed to the COVID-19 pandemic. Service statistics from the surveillance data are only available at the state level and are managed nationally using MS-Excel. There is no evidence of systematic data quality checks that look at completeness, timeliness and consistency. An indicator-based surveillance system that cannot show data at the facility level will face difficulties in responding to outbreaks. A module has been developed in the DHIS2 platform to report on the COVID-19 pandemic. As COVID-19 surveillance is being managed by the Health Emergency and Epidemic Control Directorate, the tracking of the pandemic in DHIS2 can be used as an entry point to collect other surveillance data in the DHIS2 system.

Given that there are many vaccine-preventable diseases in the integrated disease surveillance and response strategy and there are also vaccine-preventable disease surveillance systems, it will be important to examine the burden of collecting and reporting surveillance data more holistically.

In addition, as Sudan defines a new HIS policy/strategy, it will be important to address issues that exist within the surveillance system, as well as how it links with the overall routine reporting system in DHIS2.

Strengths

- ▶ A national, sentinel-based surveillance system is in place with standardized reporting mechanisms and the use of standardized case definitions (suspected, probable and confirmed) for all notifiable diseases.
- ▶ Completeness and timeliness of weekly reporting from sentinel sites is good according to official reports, and 12 of the 25 notifiable diseases are to be reported within 24 hours.
- ▶ During outbreaks, reporting is extended to all health facilities within a defined area and daily zero reporting is applied.

Potential areas for improvement

- ▶ There is no national surveillance system (approximately 30% of governmental health facilities are sentinel reporting sites), and the private sector is only marginally involved.
- ▶ Data are only available at the state level in Excel and are not disaggregated at national level. Data are not accessible in a timely manner to programmes responsible for disease in the integrated disease surveillance and response strategy.
- ▶ Although three-tiered case definitions (suspected/probable/confirmed) exist, reporting and analysis are mostly restricted to suspected cases.
- ▶ There is limited laboratory capacity at the health facility level (locality level) and reliance

²⁶ Acute watery diarrhoea, acute flaccid paralysis, Guinea worm disease, haemorrhagic fever, epidemic influenza, measles, meningitis, neonatal tetanus, epidemic plague, severe acute respiratory syndrome (SARS), epidemic typhus fever, and yellow fever.

²⁷ Anthrax, brucellosis, diphtheria, dysentery, food poisoning, hepatitis A and E, malaria, pertussis, rabies, relapsing fever, adult tetanus, tuberculosis, and typhoid fever.

on the National Public Health Laboratory for confirmation of suspected cases.

- ▶ High staff turnover – with all its negative consequences – remains a challenge at all levels.

4.3.3 Community-based health information system

There seem to be many different community-based health interventions in place. For integrated disease surveillance and reporting, there are approximately 7000 community health workers across the country who support community-based surveillance to identify and alert locality and state surveillance units of any public health events or diseases, identified by case definitions that are pictorial and simple. Home-based case management support for malaria is provided by community health workers. In addition, integrated community case management interventions are managed under the maternal and child health department. The role of integrated community case management is to deliver health services in communities that lack access to health facilities. It is not clear; however, whether all the interventions have been managed separately or if they are part of the same programme. It will be important to ensure that any integrated community delivery of services and surveillance maps all the different activities currently being performed by community health workers, including subnational variations. This will be especially important in trying to determine which data need to be collected and reported by community health workers.

A community-based HIS was piloted in two localities in two states, Red Sea and Sinnar, in 2014 and 2015. Since the pilot phase, the intervention has not been scaled up, although there is a plan to do so. The pilot comprised two phases and included preparation for a community-based HIS: the data collection tools were designed and tested, the data flow pathway was evaluated and the identified community health workers were trained. The first two phases were successfully completed. Plans for phase 3 included setting up a supervisory mechanism and analysing the results of the activities in the first two phases, but this

was only partially completed. The fourth phase, a large-scale implementation, is yet to begin. The piloted community-based HIS was developed jointly with different departments in the Federal Ministry of Health such as surveillance, maternal and child health, emergencies, malaria and health promotion; however, it mainly registered vital statistics (births and deaths). Integrated community case management was linked to the community-based HIS and the required information was captured. Consensus was built in regard to the forms and registers. It is not entirely evident how the community-based HIS will link to the integrated community case management system and how it will replace existing community information systems for home-based malaria care.

The plan for the community-based HIS is to include the reported data in the DHIS2 system. Information and reports from the community level will improve the performance of the routine HMIS in terms of quality of information. However, there are some key considerations that will need to be addressed before implementation of the system.

The community health workers who deliver services in the communities are linked to health facilities. If there are problems in reporting completeness from health facilities, it might also affect reporting completeness in the community-based HIS. For this system to work, the facility reporting completeness will also have to improve unless the community health workers are not connected to any health facility. The community health workers will also need to be trained in both service delivery and data recording.

Strengths

- ▶ The community-based HIS can build on the existing system.

Potential areas for improvement

- ▶ A review of the various community-based health interventions is needed in relation to what should be collected through the community-based HIS.

- ▶ Registers and forms were designed during the pilot phase in 2014–2015; there is a plan to update these to reflect updated service delivery and data collection standards, but it has not yet been formalized.
- ▶ Community health workers will need to be trained on data recording and reporting, in addition to service delivery training.
- ▶ Information flow from community health workers to the locality is through the health facilities; even in the case of excellent data management by the community health workers, if they bring their reports to non-reporting facilities, the information will not be submitted – the success of the community-based HIS depends on the success of the routine facility reporting system.

4.3.4 Regular system to monitor service availability, quality and effectiveness

Although routine HISs provide regular information on utilization of services and are critical to programme managers, they contain self-reported data. A system of independent verification is required to ascertain whether facilities have the needed services, equipment and commodities and are providing quality of care according to standards. This independent review could be health facility surveys or accreditation systems. In countries that do not have well developed and functioning accreditation systems, health facility surveys play that role.

Some national health facility surveys have been documented in Sudan since 2013, which are listed in Annex 4. However, most of these surveys are disease- or programme-specific, such as malaria quality of care and reproductive health commodity surveys by the United Nations Population Fund (UNFPA). There has been only one national cross-cutting facility survey conducted since 2013. There is a critical need to undertake an assessment of service availability, readiness and quality in the broader health sector. If the survey is representative at the national level or state level, it will provide a

quantitative measure of critical needs and service delivery gaps.

WHO has developed the Harmonized Health Facility Assessment, which integrates key indicators from other health facility surveys such as the Service Availability and Readiness Assessment (SARA), the service delivery index (SDI) and the Service Provision Assessment (SPA). A considerable amount of UNFPA information on commodities and information collected through signal functions for the emergency obstetric and newborn care survey is also included. The Service Availability and Service Readiness modules of the Harmonized Health Facility Assessment comprise SARA (although these sections have been updated). The quality of care section includes HIV, TB and malaria. The Harmonized Health Facility Assessment can be used modularly, i.e. not every module needs to be done each time. When planning the next health facility survey, it is recommended that the timing of availability, readiness and quality of care assessments be planned vis-à-vis data needs across programmes. The survey department should have oversight of all health facility surveys. It will also be important to ensure that facilities run by the army, the National Health Insurance Fund and the private sector are included in the sample.

Strengths

- ▶ There is a system for conducting health facility assessments, albeit in an ad hoc manner.
- ▶ There is recognition in the Federal Ministry of Health on the value of conducting an independent health facility assessment to get a cross-sectional baseline of the health care landscape.

Potential areas for improvement

- ▶ Inefficient system with parallel facility surveys.
- ▶ Low use of facility survey results at national and subnational levels.

4.3.5 Other administrative data systems

Health resource tracking

Health resource tracking is not strictly a data source like a survey or routine facility data, but it compiles data from different sources to track the flow of all expenditures in the health system. These data provide planners and decision-makers with key information on resource allocation. By its function, health resource tracking becomes a key data source on health financing.

Institutionalizing health accounts requires the accounts to be conducted regularly. Regular health accounting ensures that policy decisions are based on up-to-date spending information, promotes the use of data and contributes to strengthening analytical capacity. In the last 12 years, since 2008, Sudan has conducted health accounting only three times. The last health accounting using the System of Health Accounts 2011 was conducted in 2015. The challenges facing Sudan in the institutionalization of health accounts include the lack of recent information on private health expenditures, patchy information on private health sector financing, a poor system of tracking finance information (even from public health facilities), and low usage of health accounts information for resource allocation. While new data collection activities on private provider surveys and a household expenditure survey have been identified as priorities by the health financing team, evidence shows that existing data have not been used sufficiently, e.g. the nationally representative Malaria Indicator Survey in 2016 collected data on household expenditures that were never analysed or used.

Strengths

- ▶ There is national level capacity in conducting health accounts.
- ▶ There is a clear vision to develop a national health financing strategy within the overall national health policy (one strategy-one plan), including Health-in-All-Policies.
- ▶ Proven track record in collecting expenditure information from a wide range of stakeholders.

Potential areas for improvement

- ▶ Lack of capacity to analyse and use data for strategic planning, especially at subnational level.
- ▶ Low availability of private sector expenditure data.
- ▶ Poor tracking of routine financing data from the public sector.
- ▶ No plan in place detailing data requirements for resource tracking, including data sources to use or frequency of data collection.
- ▶ No pricing linked to health services to determine the total cost of services being delivered.

4.3.6. Human resources for health information system

Sudan established the National Human Resources for Health Observatory in 2007. The observatory was operational for many years; however, it is not currently functioning. The aim of national health workforce accounts is for countries to generate – and improve the availability and quality of – health workforce data for use during planning, allocation and management of resources. Like national health accounts, this is done by compiling data from many different sources to give a full picture of the health workforce. As the health workforce in Sudan embraces many different public sectors (such as the health ministry, police, army, National Health Insurance Fund and a growing private sector), it is critical to have human resources information across all of these sectors to provide a comprehensive overview of the human resource situation and needs in the country. Sudan publishes detailed human resources statistics in its annual statistical reports (the most recent is from 2018), including subnationally-disaggregated data for a wide array of human resources cadres; however, it lacks information disaggregated by age, sex and public/private facility. The status of some of the key attributes of a robust human resources for health information system are included in Annex 5. Conducting national health workforce accounts

will allow for a better tracking of human resources for health and better visibility of data needs. As the national health workforce accounts have many modules, certain modules can be prioritized over others, such as a comprehensive labour market analysis. Identifying the initial modules will identify data sources that are needed to collect the relevant information on human resources for health, such as population-based labour force surveys, routine HIS and facility surveys. Wherever possible, these can be linked with existing and planned Federal Ministry of Health data collection streams.

While there are standards and benchmarks in place for minimum health workforce requirements (for health service delivery), nothing similar is specified for health information workforce requirements. Anecdotal evidence suggests that statisticians are required at health facility level for data reporting and there are staffing needs at the locality level for DHIS2 data entry. It will be important for the human resources department to take the HIS staffing needs into their calculations.

Strengths

- ▶ Establishment of the National Human Resources for Health Observatory.
- ▶ Established institutions with processes for collecting human resources data (such as the Sudan Medical Council and Secretariat of Sudanese Working Abroad).

Potential areas for improvement

- ▶ Challenges in accessing de-identified human resources data from the army, police or National Health Insurance Fund.
- ▶ Proxies are used for calculating many of the different inputs; therefore, it will be important to determine how these proxies can be improved or supplemented to obtain the required human resources data.
- ▶ Weak coordination among human resources for health key stakeholders (Federal Ministry

of Health, Sudan Medical Council, Sudanese Medical and Health Professions Council, Ministry of Higher Education, Ministry of Labour) and lack of mechanisms for systematic sharing of human resources for health data and information.

- ▶ Lack of database and training needs assessment system in the training institutions.
- ▶ Need for a functional retention policy to reduce high turnover of qualified staff.

4.3.7. Logistics management information system

With the removal of a separate programme-based approach for procurement and supply management systems in 2012, the National Medicines Supplies Fund was established. This fund is parastatal and is the sole agent for the procurement, storing, distribution and monitoring of medicines, testing kits, laboratory reagents, medical consumables and medical equipment for malaria, TB, HIV and free medicines for children aged under five years, other patient groups and other programmes, regardless of the source of funds (although there are a few exceptions).²⁸

An electronic logistics management information system has been implemented but only at the state level. The system is running as a module of the RAMCO Systems enterprise resource planning (ERP) software. Health facilities submit monthly reports to the locality. The localities compile reports from all reporting facilities within their administrative area and send an aggregate locality report to the state level. Data are entered into the electronic logistics management information systems (at the locality level) by the procurement and supply management coordinator.

Any granular facility data are completely lost by the time they are entered into the electronic logistics management information system. This situation masks facility-level problems that need to be addressed, as the aggregate system makes it

²⁸ Such as all malaria commodities (rapid diagnostic tests, insecticide-treated mosquito nets, etc.).

difficult to identify data quality issues unless there are very large, conspicuous errors. Additionally, no published data or reports from the National Medicines Supplies Fund are publicly available.

Given the cost/user for the ERP (approximately US\$ 3000), the National Medicines Supplies Fund is not able to deploy the ERP to the locality level (although the antiretroviral treatment centres enter their data into the system). Having data available at the facility level will be of huge benefit to the National Medicines Supplies Fund, and this is where the DHIS2 platform can support the National Medicines Supplies Fund. For DHIS2, there are benefits, but currently there is limited stock data in the system. There is real benefit for programme managers to have access to stock data for triangulation with service outputs. The integration plan between electronic logistics management information systems and DHIS2 was developed in the first quarter of 2020.²⁹

Given the success of the National Medicines Supplies Fund in integrating procurement and supply chain management across the health sector, there are possible lessons to be learned by the DHIS2 team to achieve the same in the HIS space.

Strengths

- ▶ National Medicines Supplies Fund leadership sees the value in having a system that provides them with granular facility data that can work with the other modules of the ERP system.
- ▶ An implementation plan/roadmap between National Medicines Supplies Fund and DHIS2 is in place.

Potential areas for improvement

- ▶ Technical specifications for interoperability are not yet defined and roles and responsibilities not yet clarified.

4.3.8. Population-based data sources

Population-based surveys

A framework for action is in place, which has identified approximately 300 indicators with standard definitions to monitor national priorities and global commitments. Of these 300 indicators, one third are from household surveys. The availability of nationally representative household surveys (2014–2019) that measured key topics³⁰ of relevance to national and global priorities, with equity stratifiers³¹ and consistent with international standards,³² was examined. The evidence showed there is a system of national household surveys that provide information on key indicators, according to international standards, with at least one data point during 2014–2019 (see Annex 6). While Sudan has been successful in obtaining information on a selected set of key indicators, this success is fortuitous rather than planned. In addition, Sudan still struggles to obtain timely information on key indicators, especially for reporting commitments to WHO. There is little coordination among departments in the Federal Ministry of Health on household survey activities. As household surveys are mostly funded by external partners (see Annex 6), these surveys were implemented as needed during a specific programme cycle and not according to an overall planned implementation.

In Sudan, 316 indicators have been standardized and aligned with indicators for global reporting. The effort to strengthen the HIS includes strengthening of key data sources used to report these indicators. In fact, one third of the 316 indicators are from surveys.

²⁹ Like most other work areas, this has been impacted by the COVID-19 pandemic.

³⁰ Key topics examined were family planning, skilled birth attendance, childhood immunization, anthropometry, malaria prevalence, child mortality, HIV prevalence, TB prevalence, tobacco use, cervical cancer screening, prevalence of raised blood pressure, prevalence of raised fasting blood glucose, health expenditures and water and sanitation.

³¹ Equity stratifiers include wealth/income, education, sex/gender, age/age-group, urban/rural, subnational.

³² These standards include available information on sample design, size, errors, implementation processes, treatment of confidentiality, description of analysis of data, and data and reports publicly available.

Based on the review of indicator reporting (particularly on the regional core indicators), the reporting of both routine facility indicators and population-based indicators requires strengthening.

In order to gain efficiencies and minimize duplication, the Federal Ministry of Health developed a broader national household survey plan. In 2018, a national stakeholder workshop was conducted to systematize and integrate national survey implementation. Representatives from the Federal Ministry of Health, including key technical programmes and the Central Bureau of Statistics, discussed the integration of survey modules to gain efficiencies in the use of resources both financial and human. Some key principles were agreed, including: the need for visibility across all population-based surveys, either planned or conducted; that surveys are conducted according to plan; and that a central coordinating unit manages the process. Currently, the role of this coordinating unit in the Federal Ministry of Health lies with the survey department in the HIS Directorate. It was also agreed that programmes need to be actively involved in the management and implementation of surveys. An inventory of indicators, modules and surveys was developed to decide on the integration mechanism and timetable. A memorandum of understanding has also been drawn up between the Central Bureau of Statistics and the Federal Ministry of Health to define their roles and responsibilities in the process and to improve collaboration between the two ministries. The memorandum of understanding is pending final approval.

Strengths

- ▶ Some, if not all, equity stratifiers were included in all of the national surveys.
- ▶ Reports for many of the surveys are publicly available in the Sudan Health Observatory or

in other websites, e.g. WHO, United Nations Children's Fund (UNICEF).

- ▶ Data for the multiple indicator cluster surveys (MICS) and WHO STEPwise approach to NCD risk factor surveillance (STEPS) surveys are available for bona fide users.
- ▶ A memorandum of understanding has been drawn up between the Central Bureau of Statistics and the Federal Ministry of Health.

Potential areas for improvement

- ▶ Although the lack of public availability³³ of survey reports from vertical programmes (e.g. TB and HIV) and lack of a data access policy and a database with metadata and microdata (when applicable) either in-country or through the International Household Survey Network³⁴ were addressed in the 2018 national survey integration workshop, the policies have not been fully implemented.
- ▶ Final approval for the memorandum of understanding between the Central Bureau of Statistics and the Federal Ministry of Health needs to be agreed.
- ▶ There is a lack of specification of roles and responsibilities between departments in the Federal Ministry of Health.

Census

Sudan has a robust history of population censuses, with censuses being undertaken in 1955–1956, 1973, 1983, 1993 (did not include count of rural areas in the south due to war) and 2008. A new census, planned for 2019, has been delayed due to funding issues and implementation arrangements. Given that this will be the first census after the split with South Sudan in 2011, it will be critical in establishing the new population figures.

³³ Public availability is defined as online access.

³⁴ The International Household Survey Network is being used for metadata and microdata for STEPS surveys (2016) and MICS (2014) (MICS microdata are also available through UNICEF).

³⁵ The microdata are the Integrated Public Use Microdata Series-International (IPUMS-International) subset. IPUMS-International has an inventory of censuses from around the world. Its aim is to preserve, harmonize and disseminate census data.

A post-enumeration survey was not conducted for the 2008 census. The purpose of a post-enumeration survey is to check the quality of the census by resurveying a sample of the enumeration areas within one month of the census. No full report is available for the 2008 census but priority results that provide population information by age, sex and geographic area are publicly available. The micro- and metadata are available from the International Household Survey Network website.³⁵ Population projections are available and published by the Central Bureau of Statistics. Population projections can also be accessed publicly from the annual statistical reports published by Federal Ministry of Health (the latest is for 2019). It includes data disaggregated by sex, age and state.

Strengths

- ▶ History of regular population censuses.
- ▶ Availability of microdata and metadata from the 2008 census.

Potential areas for improvement

- ▶ Better coordination between the Central Bureau of Statistics and the Federal Ministry of Health is necessary for the upcoming census.

CRVS

Rapid and comprehensive CRVS assessments were conducted during 2011–2013, and this led to the development of the first CRVS strategy for Sudan. Birth registration is estimated at 67.3% in Sudan, however, death registration is only about 28%. Overall, 80–90% of deaths occur in the community, with only 10–20% in health institutions. Currently, of the 10–20% of institutional deaths, around 60% are being documented in the annual statistical reports with a known cause of death.³⁶ This is because available data depend on and coincide with reporting from health facilities, which faces many challenges (as mentioned earlier). Community deaths (which account for the majority of deaths)

are usually captured by the civil registration office but they do not include any information on cause of death.

To address the low death registration rate, the Federal Ministry of Health conducted a comprehensive review in 2015 and developed an updated death registration system with the adoption of the new standardized death notification form. Consensus-building was done involving other entities, including the Sudan Medical Council, the Sudan Medical Specialization Board, universities, hospitals and academia, and the system was endorsed in 2016. Doctors and statisticians were trained on the new system and on the International Classification of Diseases (ICD-10) and cause of death. To ensure timely and efficient implementation of the system, many challenges have still to be addressed. Strong political commitment is needed, as well as strong coordination mechanisms between the Federal Ministry of Health, partners, the civil registration authorities, the Central Bureau of Statistics and the Ministry of Justice, among others. An efficient monitoring and evaluation plan is also needed.

Although most deaths in Sudan occur in the community, it is still important to capture high-quality information on facility deaths and cause of death. Capacity-building in analysis of mortality data is also important. WHO recommends the use of the ICD-10 Startup Mortality List³⁷ for the notification of deaths for low-resource settings. Although ICD-10 is used for recording of mortality and morbidity data, as can be seen in the annual statistical reports, this is done using previously developed coded lists for morbidity and mortality. The age group currently used for collection of data hinders the use of analytical software such as ANACoD and Anaconda. As DHIS2 has not been implemented in most hospitals (due to funding and infrastructure needs), no hospital has adopted the use of the Startup Mortality List, although the death

³⁶ Eastern Mediterranean Region: framework for health information systems and core indicators for monitoring health situation and health system performance 2019. Cairo: WHO Regional Office for the Eastern Mediterranean; 2019 (<https://applications.emro.who.int/docs/EMHST245E.pdf?ua=1&ua=1>, accessed 30 July 2020).

³⁷ ICD-10 SMoL (Startup Mortality List) – recommended for use in low-resource settings. Geneva: World Health Organization, 2018 (https://www.who.int/healthinfo/civil_registration/smol/en/, accessed July 18, 2020).

certificate has been programmed in the software platform DHIS2 for training. Given the majority of deaths are in the community, there is a need to develop a verbal autopsy system for community reporting of deaths and cause of death.

The COVID-19 pandemic has enhanced the importance of tackling the challenges in recording cause-of-death registration. Given the low death registration rates and low levels of cause-of-death information from the regular CRVS system, Sudan has introduced a rapid mortality surveillance system to determine suspected and confirmed deaths due to COVID-19. The COVID-19 module developed by the University of Oslo was also customized into the DHIS2 system to help to track cases and improve reporting but faced challenges and obstacles in efficient implementation. WHO and its partners have published the Rapid Mortality Surveillance Guide to help countries track excess mortality.³⁸ This system can show excess mortality in the current period compared with the same period in the preceding year.

While birth registration is required for schooling and other activities, there is neither any incentive nor penalty to report deaths. This issue should be tackled with stakeholders to improve registration rates. Although a comprehensive birth notification form was developed in line with WHO standards by the HIS department, and training of all relevant cadres was conducted in 2019 in collaboration with WHO, it is yet to be implemented. A comprehensive birth registration system review is currently under way with support from UNICEF and with the involvement of all stakeholders to tackle issues regarding birth registration.

Strengths

- ▶ A CRVS strategic plan was developed in 2014 with key strategic priorities.
- ▶ Coordination has improved and several high-level meetings have been held since 2015, the most recent in 2019. These meetings have resulted in commitments and collaboration from

key actors in the CRVS space, including the CRVS offices in the Ministry of Interior, Central Bureau of Statistics, Federal Ministry of Health and the Ministry of Justice.

- ▶ An updated death registration system that addresses issues and challenges has been developed.
- ▶ The CRVS office holds registration campaigns in areas where health facilities do not exist; community leaders in areas where health facilities are not available, such as village heads and teachers, are authorized by civil authorities to notify births and deaths.
- ▶ Officially, no fee is required for death registration or for a death certificate.
- ▶ A legal framework is in place for death registration (Civil Registry Act 2011, Article 23).
- ▶ Review of the birth registration system is under way, supported by UNICEF and including all stakeholders.

Potential areas for improvement

- ▶ Required procedures for implementation of the new death registration system and deployment of the Startup Mortality List in DHIS2 are facing challenges.
- ▶ Lack of capacity to correctly complete and file death certificates and the use of ICD-10 to report deaths in hospitals.
- ▶ Lack of infrastructure such as computers/tablets and sustained access to electricity to ensure consistent recording and reporting.
- ▶ No penalty for not reporting deaths and no requirement to report deaths.
- ▶ Low community reporting of deaths (need for advocacy and verbal autopsy system).

³⁸ Revealing the toll of COVID-19: a technical package for rapid mortality surveillance and epidemic response. Geneva: Vital Strategies and World Health Organization; 2020 (<https://www.who.int/publications/i/item/revealing-the-toll-of-covid-19>, accessed 7 September 2021).

- ▶ Civil registrars are responsible for death registration and printing/collecting notification forms; however, sharing of information with the Federal Ministry of Health faces challenges.
- ▶ Lack of capacity of Federal Ministry of Health staff to ensure quality, analysis and use of vital statistics data, both nationally and subnationally.

4.4 Strong institutional analytical capacities and mechanisms for data use, review and action

4.4.1 Reports and data quality

Results from assessing institutional analytical capacity are presented in Annex 7. Sudan has a robust history in publishing annual statistical reports for a wide range of health indicators. Weekly surveillance reports are produced for 25 notifiable conditions. However, the reports do not show how they treat completeness of data: there is no information on the data quality assurance procedures that have been taken in the production of these statistics. The last review of the health sector strategy to include an analytical report was the Joint Annual Review conducted in 2016–2017. This included the key attributes of an analytical report such as measuring objectives against targets, synthesizing data from all relevant data sources, addressing inequities (some but not all) and highlighting the main findings for consideration for policy and planning. However, the Joint Annual Review also identified sub-par analytical capabilities in the production of reports at state level. Although the Joint Annual Review exercise was followed by the mid-term strategic review of the second health strategy 2017–2020, it is noted that analytical reviews are not always conducted as frequently as planned. Periodically, there are programme-specific reviews and evaluations but these largely seem

to be driven at national level without evidence of analytical inputs from the state level analysts.

4.4.2 Analytical capacity and dissemination of data

Strong institutional analytical capacities are required for routine programme monitoring and regular analytical reviews at national and subnational levels. A programmatic review is broader than the data collected through the DHIS2 (or parallel system). It requires synthesizing data from different sources to describe the overall health situation and using this information for improved patient care or planning purposes. Empowering the monitoring and evaluation systems at all levels and improving the tracking of indicator data are important to strengthen capacities in developing transparent and regular performance and progress reviews based on data. Capacity-building in operational and implementation research should be considered.

During discussions on the data sources, the key informants identified low analytical capacity – especially at the subnational level – as a key priority area to tackle. In 2016, 71 indicators were chosen to be reported biannually at state level, with the aim of strengthening monitoring and evaluation capacity, as well as to promote states’ ownership, empowerment and use of data; however, this still needs further strengthening. Institutional capacity at the Central Bureau of Statistics also needs to be strengthened for survey implementation.³⁹

The Sudan Health Observatory was established in 2013 as a platform for dissemination of health data and information, mainly through an open access website that was launched in 2014 (www.sho.gov.sd). The Observatory was a focal point for developing the national health profile, an exercise initiated by WHO. In addition, the Observatory

³⁹ Improving household surveys and administrative data in Sudan: statistical capacity building. Project information document/identification/concept stage (PID). Washington, DC: World Bank; 2018 (<https://documents1.worldbank.org/curated/en/214361538515752154/pdf/Project-Information-Document-PID-IMPROVING-HOUSEHOLD-SURVEYS-AND-ADMINISTRATIVE-DATA-IN-SUDAN-STATISTICAL-CAPACITY-BUILDING-P167988.pdf>, accessed 29 October 2021).

supervises yearly updates of the regional core indicators in collaboration with the monitoring and evaluation department. Although the Sudan Health Observatory works through coordination with all departments and programmes within the Federal Ministry of Health to update its databases, these mechanisms need strengthening and commitment for timely provision of data and information. During the pandemic, the Observatory website became the official platform for COVID-19 guidelines and protocols for health workers and health education/promotion materials for the public, guiding users to reliable information to help to tackle the infodemic and misinformation.⁴⁰ There is a clear need for capacity-building in information technology to improve the website's analytics, visualization and user-friendliness, as well as server maintenance. Networking with other national, regional and global observatories/repositories also needs to be explored.

4.4.3 Data use

Data use is an area that needs strengthening at all levels. Use of data reduces at the lower administrative levels, with the lowest data use in health facilities. WHO has a package of standards for analysis of routine facility data, implemented in DHIS2, which includes minimum core indicators, the data-quality app, key dashboards and visualizations that can support programmatic use of data. Use of data at the lower levels can be improved through training on the WHO package. Training should be jointly conducted by programme experts and the people working in HMIS/DHIS2. As programmes in Sudan migrate to DHIS2 for aggregate reporting, training on analysis and use of facility data will support its increased use.

In addition, to improve the use of routine health facility data, it is necessary to further build the review function of the teams at federal and state level, especially in the planning sections. The Public Health Institute should be included in this process as they are set up to offer training programmes.

Beyond training programmes, regular review meetings at lower levels are another critical factor in improving data use. For example, when localities bring together facilities for regular review meetings, data issues can be discussed and addressed to help to prevent future problems.

Strengths

- ▶ Establishment of the Sudan Health Observatory as a knowledge hub and platform for sharing information and enhancing transparency and accountability.
- ▶ Strong record of publishing annual statistics/service reports at the national level.
- ▶ Existence of the Public Health Institute, which has capacity to produce analytical reports.

Potential areas for improvement

- ▶ Demonstration and elaboration of data-quality protocols used in the production of review reports (if no data quality protocols are used during the review processes, these need to be added).
- ▶ Strengthening of regular analytical review processes to promote data use.
- ▶ Lack of access/availability of analytics (e.g. through an information portal) impedes regular reviews.
- ▶ Strengthening of coordination mechanisms within the Federal Ministry of Health to ensure timely provision of information and data.
- ▶ Capacity-building in analytics and monitoring and evaluation, and efficient data visualization and presentation, is needed.
- ▶ Functionality of the Sudan Health Observatory and other dissemination strategies.

⁴⁰ Sudan Health Observatory [online database]. Khartoum: Federal Ministry of Health; 2021 (<http://www.sho.gov.sd/corona/>, accessed 7 September 2021).

Table 1. Key priority interventions to enhance Sudan's HIS

Roadmap of key priority actions			Chronogram				
Strategic dimensions	Key priority actions	Responsible/ other actors	2021	2022	2023	2024	2025
Policy, governance and institutional environment	Update HIS policy and strategy taking into consideration strategic plans for eHealth, information and communications technology development and use	FMOH-HIS/WHO	X	X			
	Update legislation and detailed regulations for disseminating health information, including public use, sharing and archiving of all data sources	FMOH-HIS/Office of Federal Minister Health/FMOH legal counsellor/Ministry of Justice		X	X		
	Undertake a review of current HIS laws to address existing gaps (such as involvement of the private health sector, international nongovernmental organizations, army-based facilities, National Health Insurance Fund facilities, etc.) in reporting routine health information	FMOH-HIS/DG planning/Ministry of Justice	X	X	X	X	
	Review and update terms of reference operations of an HIS coordination committee to include all relevant HIS stakeholders (with roles and responsibilities of the various stakeholders)	FMOH-HIS/FMOH Undersecretary/WHO	X				
	Develop a monitoring and evaluation plan of the health sector strategy that identifies key indicators, baselines, targets and data sources to monitor these indicators (aligned with programmes)	FMOH-HIS/DG planning/WHO	X				
Household surveys and censuses	Finalize memorandum of understanding, with clear roles and responsibilities for the Federal Ministry of Health and Central Bureau of Statistics	FMOH-HIS/CBS	X				
	Develop an updated survey plan with key stakeholder engagement	FMOH-HIS/CBS	X				
	Institute regular internal monthly meetings and quarterly meetings with CBS and external stakeholders	FMOH-HIS/CBS/DG planning	X	X	X	X	X

Table 1. Key priority interventions to enhance Sudan's HIS (cont.)

Roadmap of key priority actions			Chronogram				
Strategic dimensions	Key priority actions	Responsible/ other actors	2021	2022	2023	2024	2025
Civil registration and vital statistics	Review and update birth registration system	FMOH-HIS (maternal and child health)/state ministries of health/ CBS	X				
	Implement updated death registration system	FMOH-HIS/ Ministry of Justice/state ministries of health/ CBS	X	X	X	X	X
	Introduce the Startup Mortality List in DHIS2 for all hospitals	FMOH-HIS/DG planning/WHO/DG curative medicine/ state ministries of health	X	X	X	X	X
	Train physicians on ICD-10- compliant certification of death, including Startup Mortality List	FMOH-HIS/ WHO/DG curative medicine	X	X	X	X	X
	Train coders on coding of mortality data	FMOH-HIS/ WHO	X	X	X	X	X
	Ensure availability of infrastructure – computers, tablets – and electricity (provided through the use of solar panels) and connectivity (link to Gavi funding for complementarity)	FMOH-HIS/Gavi/ Global Fund/WHO	X	X			
	Train health ministry vital statistics staff on the analysis of cause of death (tools such as Anaconda)	FMOH-HIS/WHO	X	X	X	X	X
	Train health ministry vital statistics staff on the use of analysis of verbal autopsy tools such as Viber	FMOH-HIS/WHO	X	X	X	X	X
	Conduct awareness-building media campaigns, including video and print materials	FMOH-HIS/DG primary health care/DG planning/ consultant	X	X			
Develop a verbal autopsy system for civil registration officers, cemetery staff and village network individuals	FMOH-HIS/Ministry of Justice/state ministries of health		X	X	X		

Table 1. Key priority interventions to enhance Sudan's HIS (cont.)

Roadmap of key priority actions			Chronogram				
Strategic dimensions	Key priority actions	Responsible/ other actors	2021	2022	2023	2024	2025
Routine health information system – DHIS2		Governance					
	Update standard operating procedures on roles and responsibilities for data collection, management and data quality. Included in the roles and responsibilities should be the role of disease programmes and lower administrative levels	FMOH-HIS/WHO/ Gavi/Global Fund	X	X			
	Establish regular meetings between HIS and programmes on DHIS2 and the facility reporting system	FMOH-HIS/ DG planning/ programmes	X	X	X	X	X
	Update monthly reports and reporting forms in DHIS2 to meet the data needs of current and new programmes for an integrated DHIS2 system	FMOH-HIS/WHO/ Global Fund	X	X	X	X	X
	Import legacy data (e.g. HIV, TB, maternal and child health), and support historical data analysis	FMOH-HIS		X	X		
	Complete the master facility list update (including the report of Phase 1 and implementation of Phase II)	FMOH-HIS/WHO		X			
	Conduct a desk review of data quality using the WHO data quality app in DHIS2	FMOH-HIS/WHO		X	X	X	X
	Improve the review process on the use of data at national and subnational levels	FMOH-HIS/Ministry of Justice/state ministries of health	X	X	X		
	Institute an annual HMIS review meeting with representatives from state, locality, facility and disease programme coordinators (it will be important to coordinate this with any disease-specific meetings that also occur. These should be structured in such a way that there is a general meeting for all and the disease programmes can have breakout sessions to focus on their own programme)	FMOH Undersecretary/DG planning/FMOH-HIS/state ministries of health-HIS	X	X	X	X	X

Table 1. Key priority interventions to enhance Sudan's HIS (cont.)

Roadmap of key priority actions			Chronogram				
Strategic dimensions	Key priority actions	Responsible/ other actors	2021	2022	2023	2024	2025
	Sustain quarterly data review meetings at national levels	DG Planning/ FMOH-HIS/state ministries of health-HIS	X	X	X	X	X
	Increase and improve supportive supervision to health facilities and localities (including updating field supervision checklists) in line with international standards (e.g. WHO checklists for routine supervision, forthcoming)	FMOH-HIS/ WHO	X	X	X	X	X
DHIS2 server and core team							
	Conduct training and capacity-building of DHIS2 core team on server management processes, maintaining database and metadata cleaning	FMOH-HIS/FMOH-IT/ WHO/	X		X		X
	Evaluate the current DHIS2 server environment in terms of hardware and software	FMOH-HIS/IT/WHO	X				
	Set up a backup server and develop and install automated scripts to regularly copy backup files	FMOH-HIS/Ministry of Communications/ Central Digital Information Council	X	X	X		
	Develop a national information and communications technology security plan to guide the upgrade, backup and access criteria	FMOH-HIS/Ministry of Communications/ Central Digital Information Council	X	X			
DHIS expansion and other system investments							
	Transfer to access point name/virtual private network services (direct link to DHIS2 server)	FMOH-HIS/IT	X				
	Make infrastructure investments (PCs, multi-rate digital subscriber line, Internet subscription package) for expansion to 69 localities ⁴⁷ as well as for maintenance and updates to other localities	FMOH Undersecretary/IT/ FMOH-HIS/Ministry of Communications/ Central Digital Information Council	X	X	X		

Table 1. Key priority interventions to enhance Sudan's HIS (cont.)

Roadmap of key priority actions			Chronogram				
Strategic dimensions	Key priority actions	Responsible/ other actors	2021	2022	2023	2024	2025
	Integrate DHIS2 in the logistics management information system	FMOH-HIS/IT	X				
	Plan for adequate supply (printing and distribution) of updated source documents, e.g. registers and reporting forms in facilities and localities	FMOH-HIS/WHO	X	X	x	X	x
	Develop alternate plans for data collection from the remaining 23 localities and how they can be entered into the DHIS2 platform	FMOH-HIS/WHO	X				
	Recruit staff	FMOH-HIS/human resources for health (HRH)	X	X	X	X	
	Operations research and other assessments						
	Conduct a rapid inventory of information and communications technology equipment – power, Internet, computers, mobile network at all levels (conducted remotely)	FMOH Undersecretary/ FMOH-HIS/Ministry of Communications/ Central Digital Information Council/ex-consultant		X	X	X	
	Assess staffing needs, especially in low reporting areas	FMOH-HIS/State Ministry of Health/ FMOH-HRH/ WHO	X	X	X		
	Conduct an analysis on reasons for low reporting completeness – insecurity, staffing, etc.	FMOH-HIS/FMOH-HRH/ WHO	X	X			
	Conduct assessment of key strategies used by parallel reporting programmes that have high reporting rates (such as immunization) to ensure data completeness and quality (at national, state and locality levels)	FMOH-HIS/ programmes/WHO		X	X		
	Conduct capacity-building for statisticians or other health staff on how to fill source documents and complete reports properly, this should be done before the new registers are introduced nationally	FMOH-HIS/ programmes/WHO		X	X	X	X
	Conduct refresher DHIS2 training for statisticians at national and subnational levels, including training on the new programme modules	FMOH-HIS/ programmes/WHO		X	X	X	X
	Conduct training to build analytical capacity and improve data quality (using WHO developed and recommended standards-based training in DHIS2, including data quality training) for national and subnational staff	FMOH-HIS/ programmes/WHO		X	X	X	
Routine HIS – sentinel surveillance	Configure integrated disease surveillance and response reporting forms in DHIS2 and develop key analytics and dashboards	FMOH-HIS/FMOH programmes/WHO		X	X		
	Train integrated disease surveillance and response staff on the use of DHIS2	FMOH-HIS/WHO			X	X	
	Initiate discussions on interoperability of other vaccine-preventable diseases with DHIS2, where possible	FMOH-HIS/WHO	X	X			

Table 1. Key priority interventions to enhance Sudan's HIS (cont.)

Roadmap of key priority actions			Chronogram				
Strategic dimensions	Key priority actions	Responsible/ other actors	2021	2022	2023	2024	2025
Routine HIS – community-based HIS	Examine all the community reporting systems that are in place to determine if the community-based HIS will be collecting data for all these systems or only for some of these	FMOH-HIS/ programmes/WHO		X	X		
	Examine the registers and reporting forms for community health workers and determine if they need to be revised to reflect new standards (e.g. malaria)	FMOH-HIS/ programmes/WHO		X	X	x	x
	Train community health workers in service delivery and data recording and reporting	FMOH-HIS/ programmes/WHO		X	X	x	x
Regular system to monitor availability, readiness, quality	Complete the planned health facility assessment that will document availability, readiness and quality of care of services	DG primary health care/DG Planning/ DG Curative Medicine/DG Pharmaceuticals/ FMOH-HIS/ programmes/WHO		X	X		
	Develop a health facility assessment plan with all programmes that take their information needs into account	FMOH-HIS/ programmes/WHO		X			
Health resource tracking	Conduct a health expenditure survey that has at least dis-aggregation by state (or have a module on health expenditures in another nationwide household survey according to survey plan)	FMOH-HIS/ programmes/ FMOH-Health Economics/WHO		X			
	Conduct outreach to private providers through innovative ways to increase their participation in health accounts guided by resolution EM/RC/65/R.3 on private sector engagement for advancing universal health coverage ¹	DG PHC/DG Planning – FMOH-Health Economics / DG Curative Medicine/FMOH-HIS				X	
	Conduct an assessment to determine if some minimum finance information can be collected through the form used for collecting administrative data in DHIS2	FMOH-HIS/ programmes/ FMOH-Health Economics/WHO			X		
	Develop a structured tool that maps pricing to health services	FMOH-HIS/ programmes/ FMOH-Health Economics/WHO		X	X		
	Conduct training subnationally on health accounts to increase capacity at state level for their production and use	FMOH-HIS/ programmes/ FMOH-Health Economics/WHO				X	X

¹ WHO Regional Committee for the Eastern Mediterranean resolution EM/RC65/R.3 on private sector engagement for advancing universal health coverage. Cairo: WHO Regional Office for the Eastern Mediterranean; 2018 (https://applications.emro.who.int/docs/RC65_Resolutions_2018_R3_20651_EN.pdf?ua=1&ua=1, accessed 1 November 2021).

Table 1. Key priority interventions to enhance Sudan's HIS (cont.)

Roadmap of key priority actions			Chronogram				
Strategic dimensions	Key priority actions	Responsible/ other actors	2021	2022	2023	2024	2025
Human resources HIS	Conduct the national health workforce accounts with a primary focus on a labour market analysis	FMOH-HIS/ programmes/ FMOH-HRH/ FMOH-Health Economics/WHO			X	X	
	Develop a national HRH strategy (that also includes staffing for HIS)	Undersecretary/DG Planning/ DG-HRH/ FMOH-HIS/WHO			X	X	X
	Revive the HRH observatory including data from the Federal Ministry of Health, Sudan Medical Council, Sudanese Medical and Health Professions Council, Ministry of Higher Education with key visualizations and dashboards synthesizing these data	FMOH-HIS/ programmes/ FMOH-HRH/ FMOH-Health Economics/WHO		X	X		
	Conduct capacity-building for staff in data analysis and interpretation of human resources for health information system data	FMOH-HIS/ programmes/ FMOH-HRH/ FMOH-Health Economics/WHO				X	X
Logistics management information system	Develop technical requirements for the logistics management information system module in DHIS and integrate with the National Medical Supplies Fund ERP system	FMOH-HIS/ programmes/ FMOH-HRH/HMIS/ WHO			X	X	
	Conduct training for all relevant personnel (HMIS, procurement and supply management, IT, inventory) on the new module	FMOH-HIS/ programmes/ FMOH-HRH/WHO				X	X
Analysis, use and dissemination of data	Improve the availability of displays, analytics, data and reports in the Sudan Health Observatory	FMOH-HIS/all departments and programmes/WHO		X	X	X	
	Implement regular review meetings that use data nationally and subnationally	FMOH-HIS/ programmes/ FMOH-HRH/WHO	X	X	X	X	X
	Conduct training for national/state level planning staff on how to conduct analytical reviews	FMOH-HIS/ programmes/ FMOH-HRH/WHO		X	X	X	X

Notes: FMOH: Federal Ministry of Health; HRH: human resources for health; HIS: health information system; IT: information technology; ERP: enterprise resource planning.

5. Roadmap of key priority actions

Key priority actions were compiled following discussions with key informants and review of key documents. Priority actions, including the tentative timeframe, responsible actors and other key actors needed for implementation, are presented in Table 1.

6. Next steps

Enhancing HIS operations in Sudan requires a consolidated plan that details the key HIS components, the expected output, financial cost, responsible stakeholders and key recommended areas for improvement. Improving HIS operations can be achieved through the involvement of all stakeholders. An ideal approach would be to also develop a strategic plan that highlights the existing HIS strengths and opportunities and builds on the information provided in Section 5 and Section 6 of this report.

As countries work towards achieving the health-related SDGs, the development of a seamless and well-integrated HIS is critical. The priority actions (Section 6) should provide sufficient background information to develop an HIS strategy that can act as a resource mobilization document to enhance HIS operations. Development of detailed short-, mid- and long-term plans for HIS strengthening should be an overarching priority. The focus should be on implementing HIS interventions that could enhance HIS operations without much change (“quick wins”). The HIS strategy should then be costed based on the type of intervention, the estimated number of person/days, and any other additional materials or equipment required.

The priority actions documented in this report can yield significant results if their implementation builds on the interventions and efforts of the Federal Ministry of Health and other development partners. This approach is consistent with global strategies aimed at forging inclusive partnerships among international agencies, governments, nongovernmental organizations, donors and academics, with the common aim of improving health data.

Annex 1. Policy and institutional environment and mechanisms for review and action

Component	Score	Comments
1.1 Comprehensive costed monitoring and evaluation plan for the national health sector strategy		
1.1.1 There is a comprehensive costed monitoring and evaluation plan for the national health sector strategy.	Needs significant strengthening	There is no properly costed monitoring and evaluation plan for the health sector strategy. However, there is some costing for some of the data sources that produce key indicators, such as the routine HIS.
1.1.2 The monitoring and evaluation plan has been informed by a recent (< 2 years) assessment of current monitoring and evaluation/HIS.	Needs some strengthening	There is a monitoring and evaluation plan that lays out key indicators with baselines, targets and data sources, but it needs to be updated to reflect the new strategy. However, there is an overall vision and the key priorities to strengthen the HIS have been identified.
1.1.3 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.	Needs some strengthening	The current monitoring and evaluation plan only reflects the National Health Sector Strategy (2017–2020). It now needs to be updated to reflect new priorities and any updated data sources.
1.2 There is aligned support for one country-led platform based on national health sector monitoring and evaluation plans and use of common investment framework		
1.2.1 Disease- and programme-specific monitoring and evaluation mechanisms, including indicators, are aligned with the monitoring and evaluation plan.	Needs significant strengthening	Key health priorities, including an integrated HIS, have been brought together in the One Health Sector plan for 2018. However, there is still some fragmentation of HIS activities (not specifically tied to key metrics and data sources required to monitor national health priorities).
1.2.2 There is a common investment framework used as the basis for partner and domestic support.	Needs some strengthening	Based on identified key HIS priorities, the Federal Ministry of Health is trying to ensure a common investment plan on some of the key areas such as DHIS2 and CRVS. However, there are still some parallel data collection activities that are outside of this common investment framework.
1.2.3 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.	Needs significant strengthening	A document with 316 indicators along with their details (metadata dictionary) has been identified which covers the WHO 100 core indicators, the SDG indicators and programme indicators and which was used to inform progress for the 2017–2020 strategy. Tracking of these indicators needs to be more efficient.
1.3. Governance and coordination mechanisms for monitoring, evaluation and review are clearly defined		
1.3.1 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.	Needs significant strengthening	A coordination mechanism was developed and endorsed in 2016; however, it has never been fully implemented. Most of the coordination currently occurring is bilateral, for example between the civil registrar and the Central Bureau of Statistics. It is also not clear if there an active annual review process that brings together stakeholders in both the production and use of the data.

Component	Score	Comments
1.3.2 Up-to-date legislation and detailed regulations for health information are in place, including all data sources.	Needs some strengthening	Legislation on HIS exists but it needs to be updated to reflect the new realities.
1.4. Data standards, architecture and policies are well defined and agreed by partners and health ministries		
1.4.1 There is a national policy/ strategy for e-Health and information and communications technology development and use, including governance and legal frameworks; enterprise architecture; standardization and interoperability; and research and evaluation on e-Health.	Needs some strengthening	There is a national plan and vision to have an integrated HMIS using the DHIS2 software; however, there is no policy of strategy for e-Health and information and communications technology that describes governance, legal frameworks, architecture, interoperability, etc.
1.4.2 Standard operating procedures have been developed defining roles and responsibilities for collecting, managing and disseminating health data, including confidentiality.	Needs significant strengthening	There are standard operating procedures in place but these need to be updated, especially in light of the key priority for an integrated DHIS2 system for all health programmes. To promote migration over to DHIS2, the roles and responsibilities need to be clearly defined.
1.4.3 There is an overall unifying health data architecture and health data collection standards.	Needs significant strengthening	The Federal Ministry of Health aims to have DHIS2 as the basis of an integrated HMIS with interoperability with other data sources such as electronic logistics management information systems and surveillance. But there is no document that describes the vision of this unifying architecture and all the steps required to achieve it.

Annex 2. Strengthening routine facility reporting for HIV, TB and malaria

HIV in DHIS2

There are an estimated 443 active facilities offering HIV testing services nationally. With an estimated 62% of people who need to know, but do not know, their status, the HIV programme needs to strengthen and expand testing to reach more people. There are only 42 centres across the country that provide antiretroviral treatment services. Of the 38% of people who know their status, only 60% are on treatment. They are lost between the testing centres and the antiretroviral treatment centres. The testing data are aggregated and managed separately from the treatment data.

An attempt was made to introduce an electronic patient management system called Tier.Net in Sudan. Tier.Net is a non-networked electronic patient management system developed by the University of Cape Town. However, only a few antiretroviral treatment centres are using Tier.Net (3–5 centres). It is not clear if the HIV programme wants to continue with/expand Tier.Net. The opinion is that the Tier.Net electronic patient management system is too detailed, and Sudan needs a flexible HIS case surveillance tracking tool that tracks key milestones.

To improve the links between testing and treatment, the HIV programme needs to introduce the use of unique patient identifiers at the time of testing. While there has not been much progress towards the integration in the DHIS2 system, the integration with DHIS2 will benefit the HIV programme. Given that data collection is mostly on paper, much time is spent on collecting and reporting data and less on analysing it. Access to standard dashboards and analytics (based on WHO-standards) will promote greater use at the subnational levels as less time will be used on data entry across the different levels. It will enable better monitoring of the care cascade and the quality of data. Also, the decision to integrate with the aggregate DHIS2 system does not need to interfere with the decision on continuing with Tier.Net or selecting another case surveillance software.

TB in DHIS2

There has been some progress in the integration of TB requirements into DHIS2. The TB reporting forms have been configured in DHIS2. However, there are some challenges in how to align the data flow in the DHIS2 system (from facility to locality to DHIS2) to the data flow currently being followed by the TB reporting system. In DHIS2, the data from the facility are entered at the locality level. In the current TB system, once the data are compiled at the central level, they are revised and updated based on TB information from contact investigations and laboratory activities. To enter and submit TB data into the system at the locality level without final validation from the TB programme is a challenge that will need to be overcome. Roles and responsibilities need to be clearly defined: i.e. who is the custodian of the data, who is administrator of the TB module? If these roles and responsibilities are not clearly specified, the integration of the TB programme with DHIS2 will not be successful. It will also be important to clarify how the TB programme will get data from those localities that do not have DHIS2, including Khartoum state.

Multidrug-resistant TB (MDR-TB) currently has its own separate data collection system. The relevant MDR-TB indicators are not configured in the proposed DHIS2 module. It will be easier for analysis and programme management for the TB programme to have their MDR-TB information in the same system as the drug-

sensitive notification and outcomes reports. There is a metadata package for MDR-TB in DHIS2 based on WHO standards available at: <https://www.dhis2.org/who-package-downloads#tb-tracker>.

Standard operating procedures and roles and responsibilities need to be specified with the HMIS/DHIS2 group. With access to the server, however, the MDR-tracker can be managed by the MDR-TB focal point. If the TB programme is considering only the aggregate TB reporting in DHIS2 and not the DHIS2 tracker for MDR reporting, the annual MDR aggregate report can still be input into DHIS2. This will allow the TB programme to continue to collect MDR-TB in Excel, but to report once a year into the DHIS2 system. Again, for this to be successfully implemented, the standard operating procedures should be clearly defined.

Malaria in DHIS2

The issues facing the malaria programme are the issues that are broadly facing the DHIS2 system as a whole. On the positive side, most of the malaria routine facility indicators are being collected in DHIS2. The routine facility reporting of malaria data are fully part of DHIS2 and the standard operating procedures between the malaria department and the HIS department have been put in place. The malaria programme is not able to access their data as there are some system problems in DHIS2 that are beyond the capacity of the DHIS2 core team to solve.

Malaria reporting is not consistent among the states: there is serious under-reporting from fragile states and those that are hosting refugees (East, North and South Darfur and West Kordofan) and some localities in other states. Khartoum state does not report into the DHIS2 system. It will be especially important for the malaria programme to determine if there is low reporting completeness in areas where the malaria burden is higher. Source documents (registers) are not collecting the specific data elements required to calculate key programme indicators.

Key malaria indicators on routine distribution of long-lasting insecticidal nets are collected through separate parallel systems. Having these data in DHIS2 will support better tracking by the malaria programme. As the malaria programme goes forward to introduce intermittent preventive treatment of malaria during pregnancy after a pause in this intervention for two strategy cycles, it will be important to ascertain these data are

Annex 3. Results from the joint external evaluation on real-time surveillance – tracer metrics of surveillance quality

Number	Attribute	Response/score	Source
1	Completeness and timeliness of weekly reporting of notifiable conditions (weeks 18–21, 2020) (Completeness targets can vary by disease and country. Integrated disease surveillance and response guidelines propose an 80% cut-off).	68.75%	Weekly epidemiological report (weeks 18–21, 2020)
2	Indicator- and event-based surveillance systems in place	3	Joint external evaluation of IHR core capacities, 2016
3	Interoperable, interconnected, electronic real-time reporting system	1	Joint external evaluation of IHR core capacities, 2016
4	Analysis of surveillance data	3	Joint external evaluation of IHR core capacities, 2016
5	Syndromic surveillance system	4	Joint external evaluation of IHR core capacities, 2016
6	System for efficient reporting to WHO, Food and Agriculture Organization of the United Nations and the World Organisation for Animal Health	2	Joint external evaluation of IHR core capacities, 2016
7	Reporting network and protocols in country	3	Joint external evaluation of IHR core capacities, 2016



Annex 4. Regular system to monitor service availability, quality and effectiveness

Key items	Status
Regular independent assessments are carried out on the quality of care in hospitals and health facilities – planned assessments at regular intervals evaluate service availability, readiness and quality of care nationally	Ad hoc monitoring of service availability, readiness and quality is carried out
A system of accreditation of health facilities based on data is in place	Partial system – piloted in some hospitals
There is a system of adverse event reporting following medical interventions	No system

Facility surveys	Year	Topic
Malaria quality of care survey	2019	Malaria
Malaria quality of care survey	2018	Malaria
Sudan facility-based assessment for maternal health commodities and services 2017	2017	Reproductive, maternal, newborn and child health (RMNCH)
Sudan emergency obstetric and newborn care survey	2017	RMNCH
Sudan facility-based assessment for maternal health commodities and services	2015	RMNCH
Sudan facility-based assessment for maternal health commodities and services	2014	RMNCH
Health system performance assessment: Sudan 2013 (based on service availability and readiness methodology)	2013	Overall health sector

Annex 5. Functional national human resources health information system

Number	Key attribute	Level of tracking	Comment
1	Can track number of entrants to the labour market	Needs some strengthening	Sudan Medical Council requires all doctors, dentists and pharmacists to register with them to practise in Sudan. This tracking gives information on labour market entry by doctors, dentists and pharmacists.
2	Can track numbers of active stock on the health labour market	Needs significant strengthening	The last labour market survey was in 2011. Proxy information on active stock can be determined by using some of the other attributes but this area requires considerable strengthening.
3	Can track number of exits from the labour market	Needs some strengthening	The Secretariat of Sudanese Working Abroad has to give permission for Sudanese leaving the country. This partially captures health professionals leaving the domestic market for opportunities abroad, but it does not track Sudanese leaving the market domestically.
4	Can describe demographic distribution of active health workers	Needs some strengthening	According to published statistics, age and sex of the health cadres are not included. There is some evidence that data can be described by sex but not age (at least for health workers in the public sector).
5	Has subnational level data on active health workers	Needs some strengthening	There is robust subnational data for the public sector. It is not clear if the subnational data also include the private sector.
6	Can track number of graduates from education and training institutions	Developed	The Academy of Health Sciences and Ministry of Higher Education track the number of doctors and allied health professionals.
7	Can track information on foreign-born and/or foreign-trained health workers	Needs some strengthening	Any practising doctor, dentist or pharmacist (either foreign-born and/or foreign trained who is practising in Sudan temporarily or is there for the long term has to be registered with the Sudan Medical Council. However, this tracking is only limited to doctors, dentists and pharmacists



Annex 6. Current status of national household surveys from 2014–2019


Survey name	Year	Topic covered															Funded by government					
		Family planning	Delivery/skilled birth attendance	Child immunization	Child weight/ height	Malaria parasite prevalence among children	Child mortality	HIV prevalence	TB prevalence	Tobacco use	Cervical cancer screening	Prevalence of raised blood pressure	Prevalence of raised fasting blood glucose	Health expenditure as a percentage of total household	Water and sanitation	Covers dimensions of inequality (wealth, education, sex, age, urban/rural, subnational)		Aligned with international standards (sample design size, errors, implementation processes, confidentiality, analysis) Reports in public domain	Data available to bona fide users	Main in-country implementer		
MICS	2014	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	CBS/ FMOH	No
GYTS	2014	×	×	×	×	×	×	×	✓	×	×	×	×	×	×	✓	Yes	Yes	✓	NK	FMOH	
MIS	2016	×	×	×	×	×	×	✓	✓	×	×	×	×	×	✓	✓	Yes	Yes	✓	NK	FMOH/ CBS	
STEPS	2016	×	×	×	×	✓	×	×	✓	×	×	×	×	✓	✓	✓	Yes	Yes	✓	✓	FMOH/ CBS	
TB prevalence survey	2014	×	×	×	×	×	×	✓	×	×	×	×	×	×	×	×	Yes	Yes	NK	NK	PHI (FMOH)	
HIV sero-prevalence survey	2014	×	×	×	×	×	×	✓	×	×	×	×	×	×	×	×	NK	NK	NK	NK		No
S3M II	2018	×	×	~	✓	×	×	×	×	×	×	×	×	×	×	×	Yes	Yes	✓	NK	FMOH/ UNICEF	No

MICS = Multiple Indicator Cluster Survey; GYTS = Global Youth Tobacco Survey; MIS = Malaria Indicator Survey; STEPS = STEPwise approach to NCD risk factor surveillance survey; S3M = Simple Spatial Survey method (on health, nutrition, WASH); CBS = Central Bureau of Statistics; FMOH = Federal Ministry of Health; PHI = Public Health Institute; NK = not known; UNICEF = United Nations Children's Fund.

Annex 7. Strong institutional analytical capacity

Component/item	Score	Comments
6.1 There are adequate institutional capacities to analyse and use data at all levels		
6.1.1 Strong analytical institutional capacity for supporting synthesis of data is in place.	Needs significant strengthening	Institutional analytical capacity was identified as a weakness by key informants, especially at the subnational level.
6.1.3 There is a regular (annual) report of progress and performance that covers progress against the objectives and targets, equity and efficiency.	Needs some strengthening	The most recent analytical report, the Joint Annual Review 2017, measured progress against targets.
6.1.4 Synthesis and analysis of national data from all relevant sources is conducted using a collaborative approach involving health ministries, national statistics offices, technical experts and the public and private sectors.	Needs some strengthening	There is some capacity (in programmes and in the planning department) for synthesis and analysis. However, there are still some challenges on collaboration with other stakeholders in this process.
6.1.5 International standards are followed for analysis and presentation of key indicators to ensure comparability of results between populations and over time.	Needs significant strengthening	International standards are not fully followed in the analysis and presentation in the Annual Statistical Reports.
6.1.6 There are effective processes to support analysis and use at the subnational level.	Needs significant strengthening	This area needs a lot of strengthening. The Joint Annual Review identified poor participation in the analytical process by the states.
6.2 Data, methods and analyses are publicly available		
6.2.1 A range of dissemination strategies exist for health information, censuses and vital statistics, including reports, policy briefs and web-based dissemination.	Needs some strengthening	Sudan Health Observatory has been disseminating available information to the broader public since 2014, including Annual Statistical Report guidelines, health policies, etc. Data are also available via the Central Bureau of Statistics website and are accessible to the public but need to be enhanced. Other dissemination strategies are also available but they need advocacy and strengthening.
6.2.2 Health data are transparent and accessible.	Needs some strengthening	Some health data are transparent and accessible. For example, the Sudan Health Observatory provides some analytics as well as publishing reports. However, this is not uniform across all programmes.
6.2.3 National public health and academic institutions, advocacy groups, and the media are engaged by the Ministry of Health and Central Bureau of Statistics to disseminate key health information.	Needs significant strengthening	There is no active engagement by the Ministry of Health and Central Bureau of Statistics or academic institutions, advocacy groups or media to disseminate results. However, the Public Health Institute is involved in publishing some key reports.





This report presents the findings of an assessment of Sudan's health information system undertaken by WHO in 2020 at the request of the Federal Ministry of Health. 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 to enable the Ministry of Health 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.

