

Freedom, Peace, and Justice: A New Paradigm for the Sudanese Health System After Sudan's 2019 Uprising

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FREEDOM, PEACE, AND JUSTICE: A NEW PARADIGM FOR THE SUDANESE HEALTH SYSTEM AFTER SUDAN’S 2019 UPRISING¹

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Abstract

This study demonstrates that health and its system are dynamic and interlinked with social and economic sectors. The paper calls for reading health and its system beyond the standard economic development lens. Optimizing the health system legitimizes the entire state and is an essential pillar for state- and democracy-building in Sudan's transition and path ahead. The paper describes the current health system within the Sudan transition and dives into the historical background of the changes over time. It sheds light on the perpetuated gaps with highlights and analyses of the possible determinant factors and how to reform the health system within and as a component of state-building. It also examines various alternatives for addressing the health system crisis in Sudan in light of the current political instability and the lack of basic health service provision needs. Following a careful analysis, a set of context-specific recommendations with short- and long-term effects are provided. These recommendations are strategic and operational in nature. The strategic recommendations are political and developmental, focusing on developing policies that address the emergency and crisis at a national level with the involvement of all local sectors. The operational recommendations propose how implementation can occur most effectively. These sets of recommendations must operate in harmony and in close communication with the Ministry of Finance and Ministry of Health and other sectors that impact health by their nature, with the aim to generate results that are aligned with Sudan's overall economic and developmental models of reforms to revitalize the health system and restore its functions comprehensively. The unified intellectual thread covering those topics emerges during reading.

Keywords: Health systems, state-building, determinants, Sudan.

JEL Classifications: H1.

ملخص

تظهر الدراسة أن الصحة ونظامها ديناميكي ومترابط مع القطاعات الاجتماعية والاقتصادية. تدعو الورقة إلى صحة القراءة ونظامها بما يتجاوز العدسة القياسية للتنمية الاقتصادية. يؤدي تحسين النظام الصحي إلى إضفاء الشرعية على الدولة بأكملها وهو ركيزة أساسية لبناء الدولة والديمقراطية لانتقال السودان وما بعده. تصف الورقة النظام الصحي الحالي في الفترة الانتقالية للسودان وتعطي الخلفية التاريخية للتغيرات بمرور الوقت والفجوات المستمرة مع إبراز وتحليل للعوامل المحددة المحتملة وكيفية إصلاح النظام الصحي داخل وكعنصر من مكونات بناء الدولة. كما يفحص البدائل المختلفة لمعالجة أزمة النظام الصحي في السودان حول الوضع الحالي لعدم الاستقرار السياسي ونقص الحد الأدنى من الاحتياجات الأساسية لتوفير الخدمات الصحية. بعد تحليل دقيق، يتم تقديم مجموعة من التوصيات الخاصة بالسياق ذات التأثيرات قصيرة وطويلة المدى. هذه التوصيات استراتيجية وتشغيلية بطبيعتها. التوصيات الاستراتيجية سياسية وتنموية، وتركز على تطوير السياسات التي تعالج حالات الطوارئ والأزمات على المستوى الوطني بمشاركة جميع القطاعات المحلية والمتعددة. تقترح التوصيات التشغيلية أكثر طرق التنفيذ فعالية. يجب أن تعمل هذه المجموعات من التوصيات في تناغم وفي اتصال وثيق بين وزارة المالية ووزارة الصحة والقطاعات الأخرى التي تؤثر على الصحة بطبيعتها، بهدف تحقيق نتائج تتماشى مع نماذج السودان الاقتصادية والتنموية الشاملة للإصلاحات. لتنشيط النظام الصحي واستعادته وظائفه بشكل شامل. يظهر الخيط الفكري الموحد الذي يغطي تلك الموضوعات أثناء القراءة.

1. Introduction

It has been more than two years since the fall of the autocratic regime, and the people of Sudan have set certain demands for the new era. The slogan of “freedom, peace, and justice” was the manifesto for the new Sudan. The demands are structure-oriented and intent on radical changes in dominant authoritarianism, kleptocracy, the political and developmental status quo, and power relations. The interlinkages of the revolution’s manifesto should not be neglected, and the state theory of change needs to be centralized around more of a dynamic and stochastic analysis approach that caters to the uniqueness of Sudan’s class, social, geopolitical, and ethnic fabric. Sudan is a country that has been through inherent under-development, with severe geographic disparities, protracted conflicts, and dominantly featuring a post-colonial fragile state (Kandeh, 1992).

Sudan’s political instability and consequently unexamined development and economic reforms have generated institutional fragility and an overall diminished apparatus. Moreover, political domination that can hardly produce equitable and sustainable development has subsequently been reproduced. Health is self-evidently critical to human development and economic advantages. Exploring beyond the classic interlink between health, economy, and development is necessary. Attending to the population’s health needs has a direct impact on the building of legitimacy, democracy, and a “social contract.” The health system and its related institution could play a major “social function” role that transcends the prevention, promotion, curative, restoration, and rehabilitative role (Kruk et al., 2010). Moreover, the health of communities, the level of democracy, and the degree of freedom of a country were reported as positively correlated (Franco et al., 2004). The return of investment on health is incalculable and virtuous, and health interconnects with several aspects such as social cohesion, participation in social and political institutions, and also yonder financial return (Huaman et al., 2015; Ichiro Kawachi and Lisa Berkman, 1979).

This paper considers health as an apparent complex of interactions that builds a social contract, especially in this transition period. Those dynamic interactions lay within and in between the population’s health needs and demands, and the capacity of the health system to meet those expected needs. The resources allocated to capacitate the health system to meet those demands – as well as the governance systems that form the political and legislative platforms – mediate the legitimacy and hence the overall social contract. Furthermore, it explores health as an outcome of other determinants, as an ally to democratic mechanisms and sectors, and also as an input for development.

This paper calls for a reimagining of the health system through a wider scope of thoughts that are context-sensitive, supported by evidence to mediate for state-building and the enhancement of the democratic sphere, which is crucial for this transition period and beyond.³ Discussing the

³ State-building is considered a dynamic and complex concept that implies, for example, an interactive building of institutions, the involvement of political and financial enablers, the provision of capacitated services and facilitating

complexity of health systems as a substance to the anticipated state-building and the alimant of democratic mechanism is of importance. Moreover, the demonstration of this concept necessitates the use of inter and multi-disciplinary lenses (Scott, 2007).

In this paper, state-building is considered a process where development and health are mainstreamed. Health and all its related systems shouldn't be read in isolation as they interact with many concepts, mainly public health, which is a public good that is also shaped by foundational determinants – especially in the COVID-19 era. The building of the health system cognates with state-building explicitly and implicitly through many components. For example, the enhancement of governance and accountability, the utilization of timely quality-assured data, the delivery of health services about community needs, the infrastructure of health delivery points, access to pharmaceutical and technologies, the tackling of corruption, and the amelioration of civil work and financial management systems...etc. (UNDP Report: Tunisia Risk Case Study, 2021). All of these are real challenges in Sudan and assertive steps should be taken to strive for the revolution slogan.

2. Research methods

The methodology's literature included desk and document reviews as well as contributions through personal experiences and observations. It covered the socio-economical determinants and health system building blocks utilizing a macro-level scope yet a context-specific approach. The study is designed around the holistic concept; that building health and its systems legitimizes the state as a whole and that it should be a central pillar in any state-building reforms or policies. This is especially important in view of COVID-19 and its direct and indirect links to health determinants. It puts health reforms as central and reads them within the overall macro-economic paradigms and changes. The study looked at the local health political changes and events after the external economic and market changes as part of the global trends. Global economic and market policy are as impactful to the Sudanese health system as no exception to other low-income countries (LIC) and countries in the global south. This is seen in the changes from hospital services and hygiene-focused public health of the 'colonial period' up to 1960, to the efforts of better coverage and coherent systems of 'the new states' in the 1960s, the capitalism-related new governance of the late 1970s, the verticality of the 1990s, and the new neo-liberal domination in the 2000s. This was then followed by the systemic development of health and the 'new governance' of the 1970s as well as the health systems consensus in the late 1970s. Sudan has followed the global coordination, donor dominance, programmatic fragmentation, and supply-based approaches of the 1980's structural adjustments and has implemented vertical disease programs with the scope of tackling the burden of disease and programmatic efficiency during the 1990s as conditions for development support. Then, in the 2000s and beyond, plenty of new options emerged, all with neoliberal traits and new goals in terms of values, ethics, and priority setting. Some of these included the 'new social and development models of the 21st century' systems thinking and universal healthcare. In

the contractual agreement with the people...etc. Health is considered a main point of interaction between the state and communities.

2015, health was added to the Sustainable Development Goals (SDGs), which set new targets for 2030. Later, the COVID-19 crisis occurred, leading to a substantial impact on economy, growth, and the disadvantaged population.

This has eventuated in several forms of adaptation at governance and health financing, and Sudan was a leader in the adoption of health in all policy approaches as of 2018. Its roadmap was developed based on the Sudan Health policy 2007 and UHC was a central objective.

The paper will later describe the main features and foundations of Sudan's health system and analyze the situation and challenges. The proposed way forward theorizes the change and builds on the already set goals of the health systems which were aligned with the SDGs (UN Universal Health Coverage (UHC) target of 2030, among others) as adopted strategies in guiding human rights, equality, equity, and the provision of services with no financial hardships. The climatic changes, the socio-economic failures, the political construct of hazards, and the interlinked outbreaks and emergencies (specifically the COVID-19 crisis) are also considered structural determinants that call for urgent reforms to reduce gaps of equity and social justice. The analysis is rooted in a health systems-based approach with some elucidation on political economy.

The findings, conclusions, and recommendations focus on enhancing the dialogue and consultation among stakeholders with the Federal Ministry of Finance (FMOF), and under the Federal Ministry of Health's (FMOH) supremacy in tackling the structural inequity as well as planning for and regulating the health system capacity-building during Sudan's transition as central to the state-building and to meeting the revolution manifesto.

3. Sudan context

3.1. Describing Sudan's profile and health system

Sudan, located in North-eastern Africa, has an estimated population of 42 million and is the third-largest country in Africa by land mass (1.886 million km²). The country is sparsely populated with poor infrastructure (roads, water, sanitation, and electricity) and a wide variety of ecological conditions ranging from arid desert to tropical rainforest (About Sudan, UNDP in Sudan, 2022.) Much of its history has been marked by internal armed conflicts, regional inequities, and a fragile state unable to perform functions essential to meeting the basic needs of the population.

Though conflict is protracted in Sudan, with peace and stability seeming to be elusive, the health system has more or less continued to develop. The period between independence in 1956 and the late 1970s was characterized by the steady building of health system capacity. In 1975, the Federal Ministry of Health (FMOH), with assistance from WHO, formulated the National Health Program which focused on the primary healthcare (PHC) model with the recognition and early adaption of a multisectoral approach to health. This was part of a five-year social development plan with the aim of extending health services together with physical infrastructure, water, and basic sanitation to the majority of rural areas of the country. During this time, Sudan was a signatory to the 1978 Alma Ata Declaration, which underlined the importance of primary healthcare.

Sudan's health system is facing many challenges, most of which are imposed from the inherent and perpetuated unexamined and abrupt macro-level developmental and economical approaches (Table 1). The public health sector and systems were not well prioritized, which caused crippled reforms that were not health-sensitive. Hence, the outcomes of the structural adjustments program (SAP) and changes were sub-optimal. Nonetheless, some research suggests that inflation, impoverishment, and inequity are linked to the local policies that shifted resources to destructive sectors and non-productive segments and not merely to the SAP (El Amin K., 2000). As a country in Africa that was under imperial hegemony, Sudan has followed several health system changes following the overall global trends of political prototypes (Loewenson et al., 2021). Those prototypes, as mentioned earlier, ranged from the colonial imposed medical approaches, the human rights/Alma-Ata declaration approach, the liberal PHC selective approach, and the SAP reforms (Wall, 2021).

Table 1. Sudan development and health indicator

Indicator	Value
Gross domestic product (GDP)	USD 40.8 billion
Annual rate of economic growth (%)	-2.3
Adult literacy rate (%)	60
Crude birth rate	33.3
crude death rate	7.5
Total fertility rate (per woman)	4.4
life expectancy at birth (years)	64.4

Notes: *Sudan National Health Account, 2018⁴

Sudan's economic situation has encountered an expansion with an average of six percent growth of the gross domestic product (GDP) on a yearly basis throughout 1999-2010, but it deteriorated, particularly in the last decade, with considerable shrinkage in the GDP and gross national income by a considerable magnitude (International Labour Organization, 2014). Additionally, nearly 24.6 percent of the population is considered impoverished. Only around 68 percent of Sudan's population have access to an improved drinking water supply, and a third of the population do not have access to safe drinking water sources (UNICEF Sudan Water, Sanitation and Hygiene Annual Report, 2020). In addition, unlike its neighbors, Sudan's pariah status made it ineligible for debt relief and access to funding from financial institutions that might have supported development initiatives for improving basic sanitation, access to clean water and increasing food security, which significantly impacted the population's health (MICS, 2014). The fiduciary sanctions had also affected the pharmaceutical market and the South Sudan separation has seized the country's revenues. In general, the Foreign Direct Investment Index (FDI) stood at a very low figure of around USD 825 million in 2019 (mainly agricultural-related and accounting for 28.4 percent of its GDP) (World Bank, 2020; Lambert, Elamin, and Cordoba, 2021). This put the country in excess need of external aid, which was irreversibly affected by sanctions and terrorism listing' related scrutiny, especially with the lack of productivity and its balancing effect on the economy (Gochoero and Boopen, 2020). The trajectory of the health system has followed that of the political economy, which is a system on the brink, with 74 percent of healthcare facilities unable to provide essential

⁴ Based on the National Health Account conducted by Health Economic Department Federal Ministry of Health FMOH 2018

healthcare services, 81 percent of the population with no access to a functional healthcare center within two hours of their place of residence, severe medication shortages, and out-of-pocket (OOP) expenditures overtaking approximately 75 percent of total health expenditures. This percentage exceeds the World Health Organization's upper limit of 40 percent, making the country the most inflated in the Middle East and North Africa, as well as Sub-Saharan Africa (Ali et al., 2012 ; Lucero-Prisno et al., 2020 ; Ali and Abdalla, 2021) .

According to WHO, the life expectancy at birth in Sudan is 63.4 years for males and 66.9 years for females. The country ranks among the lowest-performing countries on several development indicators and is among the last ten countries in the world on the Human Development Index (HDI of 0.510 in 2019) (UNDP, 2020).

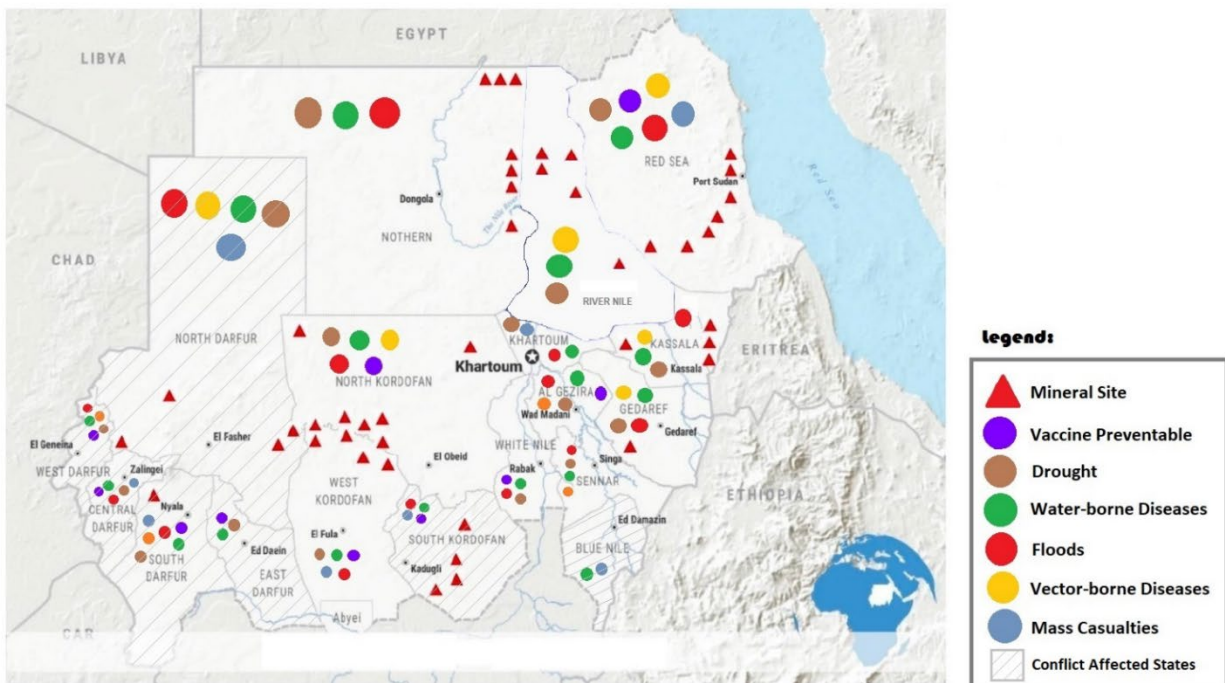
Furthermore, matters have been complicated due to economic crises, conflicts, and floods, in addition to COVID-19 and subsequent lockdowns; as of 20 June 2021, Sudan has reported 36,347 confirmed cases of COVID-19 with 2,737 deaths, and a total of 610,924 vaccine doses have been administered through the COVAX (WHO, 2021). This placed an estimated 13.4 million people in need of humanitarian assistance, representing over a quarter of the population with an M:F ratio of 8:1, with the proportion of children accounting for 55 percent. This is a 44 percent increase from the 4.1 million during 2020, and the health sector bears the highest number of needs (9.2 million), followed by WASH (nine million), and food insecurity (8.2 million). Internally displaced persons (IDPs) account for 2.5 million, with the majority concentrated in Darfur, South Kordofan, and the Blue Nile, while refugees account for 1.1 million, with the majority concentrated in Khartoum and the White Nile States (United Nations Office for the Coordination of Humanitarian Affairs, 2021).

Generally, fulfilling Sudan's health goals is sub-optimal, and the burden of communicable and non-communicable disease (NCD) is prevalent. In 2012, the burden of diseases related to communicable diseases was 52.8 percent, while that of non-communicable diseases and injuries was 33.9 percent and 13.4 percent, respectively. According to the FMOH health statistical report, malaria, pneumonia, diarrheal diseases and gastroenteritis, diseases of the respiratory system, and essential hypertension are among the 10 leading diseases treated in out-patient health facilities as per 1,000 population (Sudan FMOH Statistical Report, 2018). The 2016 Malaria Indicator Survey (MIS) revealed an overall parasite prevalence of 5.9 percent (95 percent CI: 5.7 percent - 6.2 percent). Central Darfur reported the highest prevalence at 21.8 percent, followed by South Kordofan at 14.4 percent and the Blue Nile at 12.1 percent (Sudan Malaria Indicator Survey, 2016). In 2020 and 2021, 2,942,661 and 3,493,622 malaria cases were respectively reported according to the health information system. Other vector-borne diseases like onchocerciasis, leishmaniasis, and many human and zoonotic arboviral diseases are endemic in Sudan (Ahmed et al., 2020). The magnitude of NCDs is escalating and based on the stepwise survey 2016-2017; high blood pressure constituted 31 percent, diabetes around 5.9 percent, and more than a third of the surveyed population had three or more of the cardiovascular system (CVS) risk factors (Pengpid and Peltzer, 2020). Those living in urban settings are more prone to having a complex set of risk factors compared to those living in rural settings. Sudan is prone to emergencies and epidemics due to system or climate-related issues. A hazard analysis done in 2020 has shown that 14 out of 18 states

(78 percent) were reported to be at greater risk of four or more of the hazards of floods, droughts, waterborne diseases, vector-borne diseases, vaccine-preventable diseases, or mass casualties (See Map 1 on multi-hazards in the states of Sudan according to the 2020 FMOH Preparedness Plan).

Sudan’s recurrent outbreaks usually fall under three categories of either water and sanitation-related diseases (e.g. cholera and dysentery), or vector-borne diseases (e.g. malaria, Rift Valley Fever (RVF), Chikungunya Fever, and Dengue Fever), or vaccine-preventable diseases (e.g. whooping cough, measles and diphtheria) (Multi-hazards preparedness plan Sudan 2020). Sudan had faced more than 17 outbreaks of cholera and or acute watery diarrhea between 1966-2019, and it has recently been swamped by hemorrhagic fever outbreaks, namely: Dengue, Yellow, Crimean–Congo, Chikungunya, and Rift Valley fever before and in between 2003-2020. The impact of the recurrent outbreaks and pandemics is devastating on systems, especially the fragile and non-resilient ones, as they can cause significant mortalities as well as long- and short-term shocks at the social and economic level, and they can exacerbate weaknesses and political instabilities (Madhav et al., 2017). Hence, the vulnerability and underlying political construct of events leading to outbreaks or exacerbated by them, including failure of infrastructure, public sector, and state institutions beyond health, cannot be denied (Chigudu, 2020).

Map 1: Multi-hazard in Sudan 2020



Notes: Sudan Multiple Hazard Preparedness and Response Plan, FMOH.

Sudan ranks low in the Sustainable Development Goal Index, especially SDGs three, four, and 10. It has faced many challenges in meeting them, including limited health system resources that are linked to either scarce government resources or the sustained decreased expenditure on health. Several markers reflect this gap, mainly those related to maternal, infant, and child mortality rates

which are proxies for the overall maturity of the health and the development system. The Maternal Mortality Ratio (MMR) per 100,000 live births (LB) – as a sensitive indicator for women’s health – is suboptimal, and despite the declining trend of 2.9 percent per annum it is yet to reach the goal of 6.4 percent per annum as outlined by the SDGs (Table 2). The causes of death are mainly hemorrhage, pregnancy-induced hypertension, obstructed labor, infections, anemia complications, and malaria, which are mainly avoidable (WHO Regional Office Expert Meeting Report, 2013). This puts Sudan amongst the 15 high alert countries as per the Fragile States Index. Mortality in children under the age of five years (U5MMR) is at 58.4 per 1,000 live births in 2019 where pneumonia, birth trauma, sepsis, anomalies, diarrhea, and measles account for the most causes of death (Sudan Demographics, Health and Infant Mortality UNICEF, 2022; WHO EMRO Sudan, 2016). Following the liberalization of health systems, a shock absorption free treatment project was implemented to ensure free treatment for the needs of mothers and children related to MMR and U5MR. Gender disparities, as well as war-related issues, are discernible in Sudan. The systematic violation of women’s rights is apparent in Sudan as women’s subordination is mainstreamed in law and the patriarchal structure. Girls and young women face a wide range of gender-based violence (GBV) and high rates of early marriage and adolescent pregnancy with higher risks of maternal morbidity, disability, and mortality (Table 2) (Al Nagar and Tønnessen, 2020). Gender discrimination, harmful practices such as female genital mutilation (FGM), and complications of pregnancy, including obstetric fistula (as one of the major disabilities), are particularly prevalent in remote rural areas and marginalized and vulnerable populations. Wars and conflicts have fueled women’s subordination and disproportionately impacted women and children. The violation of women’s and children’s rights in the form of rape and sexual slavery had predominated in the Darfur war (Martin, 2007; Bendavid, 2022).

Table 2: Children under five mortality rate and maternal mortality ratio in Sudan during (2000-2019):⁵

Year	U5 Mortality Rate (per 1000 LB)	MMR Maternal Mortality Ratio – MMR (Per 100,000 LB)
2019	58.4	-
2018	60.3	-
2017	62.2	295
2016	64.1	308
2015	65.9	320
2014	67.7	333
2013	69.6	349
2012	71.5	368
2011	73.4	390
2010	75.4	408
2009	77.6	433
2008	79.8	454
2007	82.2	478
2006	84.8	508
2005	87.6	529
2004	90.4	580
2003	93.6	529
2002	96.8	614
2001	100.2	645
2000	103.5	667

⁵ . Data is extracted from <https://data.unicef.org/country/sdn/>

In addition to all these systemic challenges, the COVID-19 pandemic has hit essential services, and the MMR and U5MR, as components of the UHC, have a disproportionate impact on poor and vulnerable populations. COVID-19 is now challenging all the progress towards the SDG's health goals of 2030. It sets back signs of progress in the alleviation of poverty and hunger. In addition, one in six young workers in Sudan lost their jobs, and informal sectors faced the most devastated impact since the beginning of the pandemic.

4. Sudan health determinants and the WHO health system building blocks

This paper delineates the concept that health as a broad element encompasses practically all sectors and that political programs or ideology are drivers of health and all development determinants. The poor structure and governance of the political, economic, and development sectors impact health by causing or leading to a penurious environment, inequity in health determinants, vague frameworks, arid resources, weak partnerships with communities, inferior levels of innovation and accountability, and they disturb many other aspects. Contemplating that almost half of the variance in health status is more or less due to sub-optimal development and one-third is due to environmental factors, and that the impact of COVID-19 is an added layer that should be considered as a determinant, the paper selectively examines the concepts using the lens of health determinants and the WHO framework. It comprises leadership and governance, health services, health information, human resources for health, financing, and access to essential medicines, vaccines, and technologies as the units of analysis, with a focus on challenges and opportunities in line with the aforementioned concept.

4.1. The health determinants

It is pivotal to consider the social environment as the main setting for the political, economic, and cultural elements in tackling health and its system in Sudan. All those elements put a multi-tiered effect on individuals and communities throughout the time of exposure as well as the place of exposure. Poverty and socio-economic status affect health and the health apparatus independently and distinctively. Sudan's post-revolutionary era necessitates a special emphasis on understanding and tackling social class, gender, race, identity, and their intersects as they are in a cyclic relation with the political discourse. Lack of information systems and research dedicated to providing real-time data for informed policy changes and decision-making on gender barriers, along with structural barriers facing the deprived and least developed communities, add an adverse layer to health. All are essential, especially for Sudan's state and nation-building, in light of a diverse, patriarchal system, and a capitalist-driven economy with its potential impact on access, affordability, and availability of health services. Diseases and their associated sequels, like malnutrition, indoor air pollution, lack of safe water and sanitation, and poor access to the health system and related interventions, usually find their way in poverty. Several types of research have documented the interlinked vicious cycle between ill-health and poverty, and how socio-economic and macro/micro determinants affect health dimensions. Every year, around 2.7 million children under the age of five in Sudan suffer from malnutrition, and severe acute forms constitute around 19 percent of the burden (Sudan Demographics, Health and Infant Mortality UNICEF, 2022.) Thus, health determinants were covered through the WHO Conceptual Framework for Action on

the Social Determinants of Health, the Dahlgren-Whitehead model, ecological models, and the multiple life-course influences model, among other frameworks, as important layering to understand the health reality in the country and project the way forward (Shokouh et al., 2017; Chung et al., 2020).

As a deprived country Sudan also facing the striking impact of climate change. The denied interlinkage between climate, health, and environmental policy can lead to overwhelming negative events. Global warming, loss of biodiversity, unplanned urbanization, deforestation, movements for resource mining or extraction all have a direct effect on health. The increase in the levels of carbon dioxide (CO₂) and greenhouse gases, such as methane, is affecting the atmosphere. The planet has warmed by around 0.85° Celsius in the past 130 years, which led to an increment in air pollutants that usually lead to respiratory diseases. The burden of asthma is rising in Khartoum and the prevalence is at 10 percent, whereas the magnitude of chronic obstructive pulmonary disease (COPD) is at 16.5 percent in the urban area of Sudan (Egere et al., 2021). This burden is doubled, especially since the Sudanese system is already repressed by a lack of chronic lung diseases guidelines, lack of trained personnel, lack of bronchodilators and inhaled corticosteroids, and lack of simple lung function diagnostic such as peak flow meters (Egere et al., 2021). Moreover, if not well-tackled through investment in infrastructure, preparedness plans, efficient hazard, and risk-based warning and surveillance systems, the burden will be doubled at multiple layers over an already weak health system. Extreme climate events usually cause injuries and damage and hinder access to healthcare. The Sudan floods of 2020 were the worst in decades, affecting around 900,000 people (OCHA Sudan Situation Report, 2021). It can also hinder major food availability, which can increase malnutrition and undernutrition and cause change in infection patterns via elongation of vector breeding time, causing outbreaks and the endemicity of vector- and snail-borne diseases like schistosomiasis, aedes, and anopheles mosquitos (Ebi, 2021). An outbreak of dengue fever (DF), used as a marker, might also reflect a possibility of a relation to climatic change, and it also highlights the importance of tackling socio-economic macro factors and the population's mobility patterns. Although DF is endemic in the Eastern region, awareness of the disease and preventive measures among communities is low, which determinates the DF burden by hindering appropriate community partnership in the health decisions for DF prevention and control. The housing population density as a poverty predictor is also a detrimental factor in the DF epidemic, which should also be considered in health planning (Soghaier et al., 2015). The re-emergence and resurgence, transmission, and introduction of some diseases like DF to different areas have changed because of mobility patterns and changes related to war, displacement, travel, trade, and resource extraction. Since 1908, the eastern states, mainly Port Sudan and Kassala, are particularized as areas with DF (Soghaier et al., 2015). A study tackling the first outbreak in the western state during 2015-2016 has reported a fatality rate of around 18.2 percent among the suspected 560 cases (Table 3). The molecular conformation among 204 sampled cases reflected a mix of DF, West Nile, and Crimean–Congo hemorrhagic fever (Table 3) (Ahmed et al., 2019).

Table 3: The frequency and distribution of different hemorrhagic fevers among 560 suspected cases in Darfur states (Aug 2015 - Feb 2016)

State	Tested samples	Positive DF	Positive WNV	Positive CCHF	Positivity rate out of samples
Central Darfur	55	5	0	0	9.09
East Darfur	22	0	0	3	13.64
North Darfur	27	1	1	0	7.41
South Darfur	15	2	0	0	13.33
West Darfur	85	24	5	0	34.12
Total	204	32	6	3	20.10

DF: dengue fever Virus; WNV: West Nile virus; CCHFV: Crimean–Congo hemorrhagic fever. F:M = Female to Male ratio.
 Ref: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6473713/>

Reading this with the worst YF outbreak in Darfur in 2012, which has been reported among 26 localities of Darfur with a death rate of 20 percent (171 out of 849 cases), highlights many socio-economic and conflict-related factors as possible attributes to the situation (Ahmed et al., 2019; Markoff, 2013). An entomological survey has shown the prevalence of the “Ae. Aegypti” mosquito (the vector that can spread chikungunya, Zika fever, Mayaro, and yellow fever viruses) among investigated containers in Darfur, constituting around 86 percent of them due to water storage practices related to poor living status in humanitarian settings (Ahmed et al., 2019). The historical analysis of Ae. Aegypti reflected the possibility of its introduction to new settings from western Africa through slave mobility and then to the Mediterranean setting through the Suez canal (Powell et al., 2018). Thus, the Abu Hamad Dam in the Northern State and the upcoming Renaissance Dam necessitates a thorough understanding of the possible environmental, entomological, and habitat changes. The malaria increment in the Northern state (24,827 reported cases in 2021) is also a clear parameter for such occurring vector changes. Post-conflict settings need extra tailored attention in all aspects because the long distress on public services, health system gaps, and interruption of services usually cause more fragility and impact communities. The conflict-related interruption of vaccination is an obtrusive variable that can affect community immunity and conduce an impactful burden on an already oppressed system. An outbreak of measles had been reported in Jebel Mara in 2021 and in 2014-2015, affecting 12 states. The worst impact was in West Darfur, mainly among the gold mining area (Ismail et al., 2014; FMOH Measles Report, 2015). The migration, border movements, or surrounding mobility (whether due to force, seasonal, irregular, or regular factors) is a sensitive health substance that calls for more multi-stakeholder dialogue and strengthening of the health system, alertness and responsiveness, and strict enforcement of the international health regulations (IHR). Research had documented a possibility that Sudan's 2007 RVF outbreak was related to living ruminants forthcoming to Sudan from Kenya or Tanzania during their outbreak span (Chevalier et al., 2010). The 2019 RVF flareup in the River Nile state before the ordinary transmission periods was an odd event and also raised the possible association between the emergence of arbovirus zoonotic outbreaks and the movement of people and animals (Ahmed, Ali et al., 2020). As a border state with Eritrea and Ethiopia, Gedarf had its first emergence of the RVF outbreak in 2019, which can also be related to mobility and socio-economic changes (Ahmed et al., 2021). This also necessitates even more enforcement of the IHR framework components, the provision of cross-border functions and services, and the implementation of one health approach. Such outbreaks have a wide scope of negative impacts on agricultural, livestock sectors, and the economy. On the side of immunization-related diseases, a circulating vaccine-derived poliovirus type 2 (cVDPV2) outbreak was declared in Sudan in August 2021, which was confirmed as genetically linked to the Chad outbreak. Despite the optimum

response to the poliomyelitis outbreak through vaccinating around eight million children and a declaration of no environmental presence, the weak sanitary and sewage infrastructure and the possible low immunity at the level of the non-reached groups in peripheral or conflict settings puts Sudan and other African countries at risk of the occurrence of an outbreak. The naturally occurring nomadic and mass movements in this geographical area are also a layer that presses the need for innovative paradigms of prevention and control. Public health should not consider geopolitical borders as access barriers, and the conduction of joint sensitive social epidemiological studies for community movement and mapping should be a human right obligation that can be insightful in catering for management and control plans. As aforementioned, this also emphasizes the need to enforce IHR and the Center of Disease Control (CDC) concepts with sensitive regional and global collaboration through regional and international political bodies and trade unions (African Union (AU), Non-Allied Movement (NAM)...etc.). The calibration of multilateral efforts toward health stability and health determinants utilizing IHR, one health and other frameworks is essential (Ahmed et al., 2021). The aim should be the tackling of diseases that are security threats, diseases of public health concern, and those related to bioterrorism pathogens like Ebola, RVF, cholera, and poliomyelitis in a systemized and structural way.

Developmental infrastructure, such as the availability of safe water and sanitation places (SDG six), is lagging, which also humiliates the population's dignity and can put women and children at risk of violence while seeking sanitation areas. The public service budget cuts associated with liberalization and SAP have negatively affected the water and agricultural sectors of Sudan. Both are directly linked to the health and endemicity of several water-related and vector-borne diseases. The accumulated overlaid roles, in addition to the unstructured federal governance, have also put a negative impact on the water sector (Mohamed Ali, 2003).

Additionally, and as per models like Dahlgren-Whitehead, behaviors that could be considered as individual or lifestyle factors, such as open defecation or lack of hand washing, exacerbate the probabilities of diseases and outbreaks. Nonetheless, some theories tackle this behavior through the individualism lens with disregard to the development and structural barriers. Despite the progress made in the road map toward a country free of open defecation, the improvement in access to the WASH component as a human right is lagging. Around one-third of the Sudanese population still have no access to safe drinking water (UNICEF, 2020). This can reflect that the overall situation is far from tackling health behaviors from the individualistic perspective and in a way of devolving the state's responsibility to the individual, as there are structural obligations that need to be met by the state or the government before that. This can lead to a rise in preventable infectious diseases which can be protracted by political instability and conflicts. A six-month Hepatitis E outbreak took place in 2004 in alignment with the conflict and the associated poor settings of displacement camps; the attack rate was 3.3 percent and the CFR was 1.7 percent, therefore raising the critical need for clean and reliable water sources (Guthmann et al., 2006). The movement of refugees had also spread the disease to Chad. Orofecal infectious diseases like Hepatitis E have serious implications on pregnant women and this was reported in Port Sudan, where the outbreak led to around 28 percent mortalities, 20 percent bleeding, and 23 percent pre-term delivery among the infected pregnant women (Rayis et al., 2013). Increments in public expenditure to provide

sustainable uncontaminated water resources in rural and urban settings to increase availability and consumption is crucial for health.

Urbanization, city planning, and geographical planning also have an effect on health, and COVID-19 and its mitigation measures have also highlighted the area between health, architecture, and the space. Over crowdedness and an increase in population density can be also linked to unplanned urbanization and resource extraction, like gold mining in the case of Sudan, and it can also result in the emergence and re-emergence of disease transmission (Gayer et al, 2007). The artisanal mining of gold (ASM) in Sudan is usually laborious, poverty- and migratory-related in nature, and associated with a lot of environmental issues (decline in ecosystems, heavy metal intoxication, reduction of water quality) and occupational health issues (mercury exposure-related kidney diseases, silicosis-related pulmonary abnormality, dust-related cough, higher risk of contracting tuberculosis, vector-borne diseases, cancer) (Hussien and Mohamed, 2020; Ayaaba et al., 2017; Nkosi et al., 2015). In 2011, Abu-Hamad hospital received around 107 cases suffering from fever of unknown origin, cyanide- and mercury-associated cancers, and respiratory conditions (El Siddig and El Tohami, 2018).

Power relations within the mining industry can cause conflicts to develop between local communities and gold mining investors, causing a hostile environment and the adoption of violent behaviors. Debates are ongoing regarding putting Sudanese gold in the category of “conflict gold,” which is a new perspective that needs consideration in setting health priorities and reforms (Ille, 2016). Child labor in ASM cannot be denied in Sudan, and women residing near mining proximities or involved in small trades in the area could be victims of non-partner violence (El Siddig and El Tohami, 2018). The literature reflects the need for using context-sensitive approaches and inclusiveness in health interventions. Indoor air pollution related to domestic solid fuel use is a real reflection of the prevalence of the risk factors for chronic respiratory diseases (Nkosi et al., 2015). Leaving no one behind through tackling environmental and occupational health as an SDG marker should be a human rights issue. It is necessary to urgently revive the occupational departments within the FMOH structure, as well as other related ministries, to avoid the fragmentation that is linked to the decentralization of roles between state and locality levels, as well as the unclear cross-cutting roles and responsibilities of having a stand-alone environmental council and the Ministries of Mining and Trade and Industry. Building the capacity of health inspectors at local levels will be of help to the environmental and public health sector. Reviving the departmental and cadre capacity through a thorough analysis of the ongoing FMOH and other multi-sectoral structures in line with the proposed academic structure of early 1965, while taking into consideration the emerging change in the social environment, might be helpful (Khogali, 1966).

Understanding the multiple and distinct dimensions of the whole socio-economic structure beyond the “quantifiable” outcomes and the monetary input should be central to the “state-building” processes. Poverty and catastrophic health payments as a social discourse have their implication for fueling disease incidence. Influencing the health-seeking behavior and the perception of “illness” itself can change the health and disease map in a very abrupt manner. Diseases of poverty like malaria, TB, and HIV are strictly interlinked with structural barriers and modifiable personal

choices that the institution is obliged to work on. The whole structure can affect the “agency” of the person toward attaining health, dealing with illness and diseases, and gaining foremost access to healthy choices and the health care system. The 2016 Malaria Indicator Survey has reflected that those from lower socio-economic classes are at higher risk of malaria, while refugees and the internally displaced have twice the malaria magnitude of those living in rural settings. Age as a contextual determinant correlates with malaria, with children being three times more prone compared to adults (FMOH Sudan Treatment guidelines, 2017). Putting “equity” high on the political agenda and translating the commitment into tangible drives of change at both policy and process levels is needed to eliminate organizational or structural barriers (Blanchet Garneau et al., 2019). This needs multi-sectoral approaches to fairly examine Sudan’s context and the other competing discourses that are related to the liberal, capitalist, stereotypical, efficiency, and mere equality waves or to what has been mainstreamed during the past 30 years (Blanchet Garneau et al., 2019).

The organizational structure of the health system is a cornerstone for imposing equity. However, the decentralization and devolution of responsibilities to lower levels of government has always been an issue, and the health system must mirror the political reforms and decrees only without full planning from a health perspective. The extended reforms have ranged from districts, regions, states, and locality levels. More or less absence of coordination and stewardship in the distribution of resources, regulation, accountability, fairness, implementation, and oversight can easily be captured. The decline in public health expenditure, gutting of public health services in favor of privatization, creating critical medication shortages, and forcing the population to seek care in private, for-profit healthcare facilities were apparent features so far.

Disciplines that investigate complex socio-economic and health fundamentals considering communities as a unit of study rather than individuals, like social anthropology, population health, social epidemiology, health economics, and mathematical modelling are needed in Sudan. When linked to real-time demographic and health surveillance, this will help in understanding population demands, perceived gaps, differentials, and dynamics, hence supporting the informed evidence-based decision. Bridging the gap and integrating evidence generation is very important for the contemporary policy negotiation and for transforming Sudan toward the revolution slogan of equity and leaving no one behind.

Using the WHO health system building blocks and studying the COVID-19 problem as a significant layer that affects both development and the health foundation, each of the elements below reflect the status, analyze, and exhibit difficulties and opportunities. Furthermore, trends in population dynamics and selected health indicators are examined in order to provide policymakers with evidence and forecasts for planning whilst also linking health to the aforementioned Sudan health determinants and fundamentals as much as possible to facilitate health linkage to state-building and the overall wave of transition and change.

4.2 COVID-19 impact

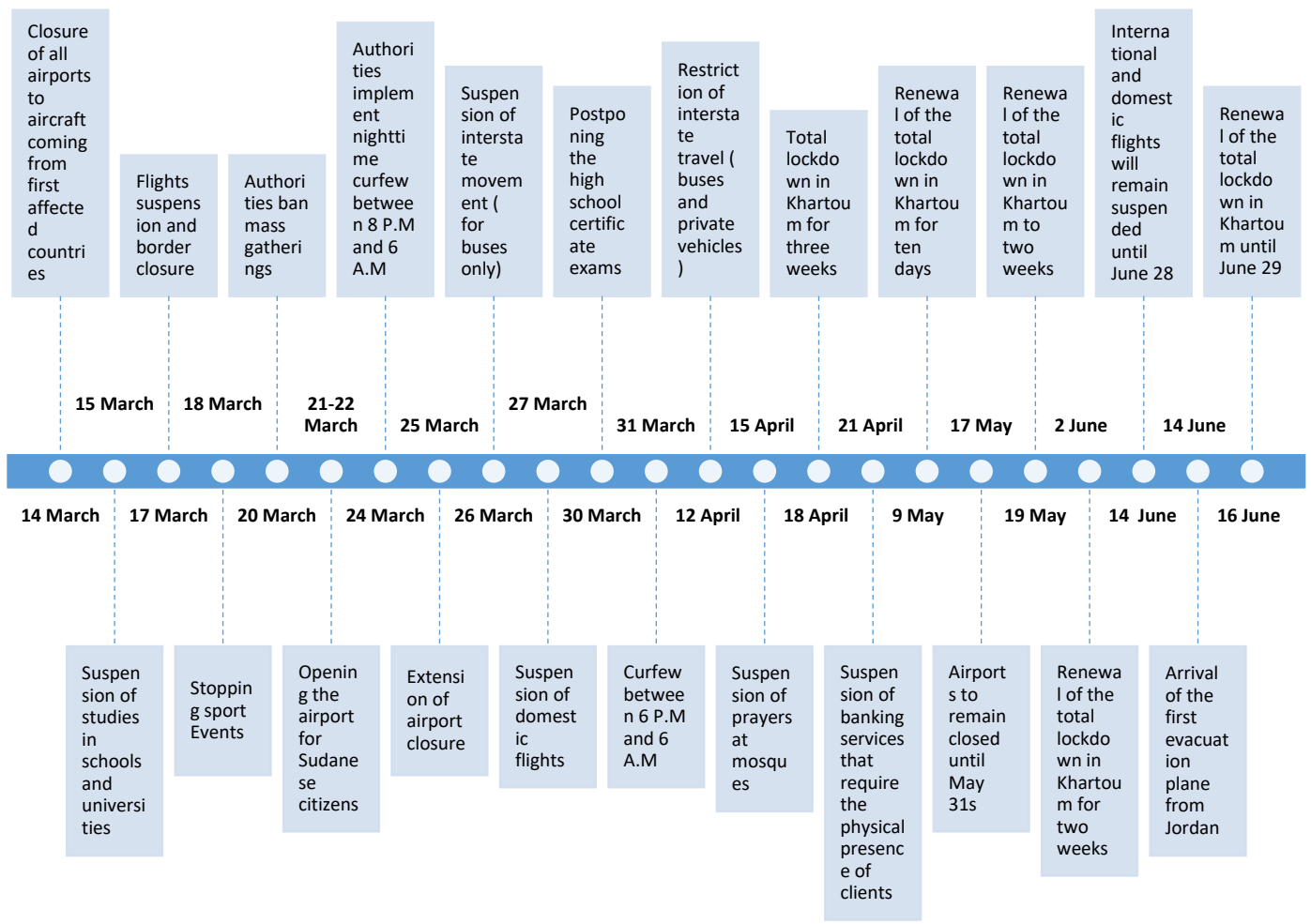
The declaration of COVID-19 as a pandemic was a turning point in health, security, politics, and economics. It is by far an indisputable determinant for health and development that should be predetermined in any planning process. COVID-19 adds a unique layer to health security; the huge exchange of information, finance, operations, goods, supply chain, and human mobility were all affected since December 2019. The pandemic exposed the global inequity at both inter and intra levels. This subsequently brings a major question to state-building and transformation of conflict-affected settings like Sudan. The need for solidarity, multi-sectorial and multidisciplinary acts should now be at the top of the political agenda more than ever.

In deprived health and development settings like Sudan, preventative measures based on keeping physical distance, maintaining hand hygiene, wearing face masks, testing, isolating, and tracing contacts and vaccination are challenging and not easy to reach. Curative measures are impactful and cannot be absorbed by the low capacity of the health system, which has an extreme shortage of medicines and ICU beds.

Sudan started the multi-sectorial preparedness phase early enough, especially at the point of entry, and the FMOH formulated a higher coordination and a technical committee led by the FMOH undersecretary. The committee has adopted, in an advisory term to the cabinet, many decisions related to border movement and travel restrictions to epicenters at the global level to avoid importation of the virus. It then adopted measurements and mobilized resources and the community to slow down the spreading of the virus in coordination with the cabinet affairs. In early March 2020, the response started with the adoption and adaptation of WHO guidelines covering entry points, risk communication, case management, surveillance, WASH, infection prevention and control, and supply management. This was in the integration of the proposed stringent measures of curfew and lockdown (Altayb et al., 2020) (Figure1). A live mitigation and response strategy was developed covering the macro-level strategies, the expansion of isolation centers, risk communication, and a plan for continuity of essential services and PHC. UN agencies and development partners were part of technical committees, especially in the tailoring of RMNCH guidelines and the expansion of grass-root case finding interventions amid the COVID-19 wave. The training of rapid response team and health cadres (1,600 based on localities) on all aspects had taken place together with replication at the state level, headed by emergency operations (EO). Federal and state call centers were upgraded and a private collaboration with telecommunication companies was conducted to guide the response as an entry point to the systems. It also served as a seed for an early warning system where other arms could be integrated. The specificity and geographical setting of states like hosting refugee camps, humanitarian settings, and mining like in South Kordofan, White Nile, and River Nile was considered, and advocacy and partnerships with WHO, UNHCR, IOM, and the Ministry of Power and Mining were reinforced to ensure that multi-sectorial interventions are conducted on the field. A supreme committee was developed under the sovereign council to harmonize and coordinate the sectorial response to the epidemic. The initiation of quarantine and isolation centers (IC) (Burj Aldaman, Khartoum Teaching Hospital, Universal hospital, Elumalim, and Soba Teaching hospital) were implemented in Khartoum as an epidemiological center and went further to all other states (36 IC in Sudan up to June 2020). A

field hospital with a capacity of more than 250 beds was constructed in collaboration with philanthropists, the ICRC, the MSF, and the Ministry of Youth and Sport.

Figure 1: Timelines of public health and social measures for COVID-19 (March up to July 2020)



*WHO Public health and social measures tool data generated by FMOH 2020.⁶

The lockdown was eased on 7 July with movement restrictions from 6:00 PM until 5:00 AM and partial travels were resumed on 12 July. The FMOH, with the MOH, introduced the COVID-19 surveillance arm in integration with the district health information system (DHIS2) to have real-time data to ensure the fulfillment of PCR tests upon arrival and to ease further follow ups. The

⁶ The tool was developed by WHO to capture public health and social measures imposed at the country and the related reproductive number variation. The data was generated by the FMOH emergency and epidemiology team in 2020.

linkage with the National Reference Lab was also enforced. The above was an example of digitalization extending during the COVID-19 crisis.

Some research has shown that the reproduction number has declined from 3.5 up to 0.8, which might be in attribution to the multi-dimensional interventions and the possible growing immunity from May and onwards (Watson et al., 2020). One research in South Kordofan as a humanitarian setting has reported the prevention of community transmission and suppressing the spread to only 50 cases and four deaths up to 28 April as an achievement related to the WHO's early collaborative preparedness training, the strengthening of the surveillance, and the increase in treatment capacity (Ali et al., 2022).

The COVID-19 crisis and the related alleviation course of action are impactful. Mixed method research revealed that 99 percent of the studied households had good knowledge and awareness about COVID-19 methods of prevention, and around 89.50 percent mentioned that they had been practicing handwashing with soap more often than usual in the past seven days. Out of the surveyed households, around 86.4 percent showed satisfaction with the curfew and lockdown as interventions taken by the government to hinder the spread of the virus (Nour S., 2021). Nonetheless, the mentioned impact on households was significant. For example, around 26.6 percent and 23.4 percent mentioned their inability to reach medicine and health facilities, respectively, since mid-March 2020. The main reasons behind the inaccessibility were related to the health system, such as out-of-stock medicine (mentioned by 66.2 percent of respondents) and unavailability of health cadres (mentioned by 58.2 percent of respondents). On the other hand, only 0.5 percent and 4.7 percent mentioned lockdown restrictions and lack of transportation as a reason for inaccessibility, respectively (Nour S., 2021). Nonetheless, the interruption of essential health and development services, especially those that might impact children, would accumulate several future risks. WHO reported that 90 percent of the 105 investigated countries had reported disruption in essential services, with vaccination amongst the services most affected (Causey et al., 2021). The coverage targets of the diphtheria-tetanus-pertussis vaccine (DTP3) and measles-containing vaccine (MCV1) have dropped by more than seven percent worldwide compared to coverage targets before the COVID-19 crisis. This was based on monthly regional reports of administered doses, medical records, and modeling projections extracted from the Global Burden of Diseases covering the period between January 2019 to December 2020. COVID-19 transmission and the challenges caused by its waves are inevitable and interrupted childhood vaccination programs in 90 percent of the 21 countries that were investigated from different regions of the world, which can hinder the eradication of the wild poliovirus and the circulating vaccine-derived polioviruses (Causey et al., 2021). This causes potential risk for future outbreaks and should be considered in planning for polio and the prevention of other vaccine-related diseases. This is especially relevant in Sudan, where the VDP2 outbreak was declared in August 2020. This is a real challenge, especially considering the low levels of immunity amidst the Sudanese political unrest. Moreover, this disruption, together with the livelihood and income effect, can put a significant and long-term impact on system resilience (Causey et al., 2021). For instance, with the high rates of the informal sector in Sudan, the impacts of COVID-19 mitigation on livelihood can be significant. In addition, a World Bank survey in Khartoum, Bahri, and Omdurman targeting the

functioning of 500 enterprises during the COVID-19 mitigation measure highlighted that 29 percent closed permanently (eight percent) or temporarily (21 percent) during the partial lockdown. Around half of the small-scale enterprises (those with five to 19 workers) collapsed during the partial lockdown (World Bank, 2020). The decrease in sales reached around 54 percent, and labors were also affected as there was a reduction in salaries of around six percent and terminations for around five percent of their workforce (World Bank, 2020). These impacts will affect the determinants of health, namely those related to household income, poverty, and security. Around 42.3 percent have reported their worries about not having food due to a shortage of money and resources. Moreover, the negative impact has been recognized by households, and around 32.8 percent were not able to carry their regular income-generating work, such as pasturage, fishing, or agriculture. Gender differentials were also reported in this case, as around 53.3 percent of the females declared their inability to perform their income-generating activities compared to only 31.9 percent of the males (Nour, 2021).

This reflects a double burden on households living in the low economic quintile, because there is a higher possibility of working on farming amongst households of a bigger family, and it is in disproportionate relation to the household educational level. All this triggers the need for a different paradigm of thoughts to tackle the impact of COVID-19 on building systems' resilience and their ability to tackle viral or other climate change-related events, hence meeting the state-building needs.

4.3 WHO health system building blocks

4.3.1 Leadership and governance

Health is determined by a complex interplay of biological, environmental, socio-economic, and behavioral factors. Part and parcel of governance is self-regulation, which is a process of selecting, monitoring, and replacing governments. Governance includes the capacity to formulate and implement policy and govern economic and social interactions between communities and institutions. The restructuring of health is also an embedded function and should not be read aside from the overall political structure, which would underline the degree of partnership with local communities, build accountabilities, define roles and entitlements, and gear local innovation and the use of appropriate technology in order to augment efforts, resources, and yields in a sustainable manner. For over two decades, the Worldwide Governance Indicators (a composite of governance indicators) has been used to measure and make comparisons within a country over time and across countries over time.

In recent years, there has been increased recognition of the important role of governance in the function of health systems and their overall performance (Yuan et al., 2017). Even though there is currently no widely accepted definition or framework for the assessment of leadership and health system governance, it can be described as the set of policies and actions taken by the government to coordinate with other actors in the implementation of health policy to further improve the health of the population (Abimbola et al., 2014). The policies and rules set directives on the provision of public goods and definitions of the right of access to public goods, the utilization of public

revenues and taxes, the provision of human resources for health and service provision points, and their management and utilization. Enabling the coordination of demand and supply and optimizing the efficiency and benefits of invested resources is also a purpose that is usually served through rules (Abimbola et al., 2014; Abimbola, 2020).

Transparency, integrity, law and order, regulation, quality, and corruption control are some of the suggested metrics for measuring health system governance. Others include information/assessment capability, policymaking and planning, societal engagement, and system responsiveness (Yuan et al., 2017). Sudan traditionally has a low score and rank across the six dimensions of governance, indicating overall governance failure.

The health system's stewardship, capacity-building methods, and public health policies and programs are all influenced by population demands, political interests, and budgetary restrictions. In the new paradigm of “freedom, peace, and justice,” health system governance can be thought of as the fulfillment of the social contract between the government and the population to provide equitable access to quality healthcare without financial hardship. WHO framework has outlined improved equity, efficiency, responsiveness, and protection from hardships as central goals for health systems. Resilience is an important parameter that cannot be neglected, especially in the Sudan context and the COVID-19 era. Examining the implemented decentralization as a governance system in Sudan (the purpose, context, and impact on health system governance) is essential for any state-building and in finalizing the ongoing governor system reforms. Sudan's health system has been through perpetuated gaps and inequalities, however, (and as is the case in many countries) decentralization was not initiated from or for mere health sector benefits (Abimbola, 2020; Abimbola et al., 2019). Currently, the Sudan system is a decentralized three-tiered system. The federal government is in charge of planning, policy and strategy development, and standard-setting; the state government is in charge of budget allocation and planning, as well as the operation of tertiary and secondary health service delivery, and the local/peripheral government is in charge of service delivery (El-Sony et al., 2003).

The Sudan health system and the current situation have been influenced by a continuum of many decentralization eras; the local government act of 1951, the law of district act 1961, the regional act of 1981, and the 1991 act and 1998 federalization constitution, and then the 2003 local governance act (Idris, 2011). The several health system reforms were mainly part of the political and overall economic liberalization as early as the 1970s, and later came the devolution, which was implemented in 1994. Health was never prioritized as part of any of those changes and the FMOH has been left to acclimatize and modify accordingly. In 2011, a transfer of services was conducted in Khartoum, where a full shift has taken place from tertiary to peripheral hospitals and centers. Few studies were conducted to assess the implementation of the decentralization, and one study reported that the failure was attributed to poor political management, neglect of the public sector, lack of community engagement, deficient financial resources, and deficient human capital (Noory et al., 2021). A perception of deterioration in access, affordability, availability, and quality of services after the implementation of the 2011 decentralization was reported. A related budget diminish, overall incapacitation of public health system and services, as well as the enforcement of user fees, were also captured through a health study (Noory et al., 2021; Noory et al., 2020).

However, several assessments done by the FMOH and WHO on leadership and health system governance have identified the major gaps and underlined causes of deterioration, including: (a) poor definition of major players' roles and responsibilities; (b) poor coordination and intersectoral collaboration between different ministries and different levels of government; (c) lack of engagement with civil society and barriers to the sharing of information, priority setting, and case management due to the structure of political leadership in communities. Top-level leaders rarely cooperate with low-level leaders, which hinders the flow from need identification and solution development to implementation at the lowest levels. Other major gaps include: (d) lack of an operational health sector strategic development framework; (e) inadequate policy propagation and enforcement; (f) complete lack of constitutional and legal support for some major health policies; (g) lack of current private sector regulatory acts; (h) lack of evidence-based budget and plan management practices; and (i) insufficient health sector funding.

These gaps have contributed to the failure of the health systems to function as expected and have led to the inability of the government and Ministry of Health to manage both supply and demand side factors. Supply factors include the planning and distribution of medicine and other medical products or human capital (healthcare workers) and the financial resources needed to meet the population's health needs. Demand factors are embedded in community trust and the perceptions of services and products, which, in turn, determines the utilization of services. The determinants of failures of the health system that are related to governance are political instability, development shortfalls, poor health services and systems, deficient PHC and universal coverage, corruption, and dearth of community participation (Abimbola et al., 2014). It is apparent that weak governmental contribution and positioning in the provision of health, especially at primary levels, builds a platform for communities and health providers to fill the gap and replace the government in the financing and managing of facilities. Hence, this might further weaken the social contract between communities and the state in general (Abimbola et al., 2014).

It is critical to identify the precise ideology that the country will follow during the transition era. It is a needed benchmark in setting a configuration that defines governance roles (concept center, operations, and expected outcomes), the actors (local communities, resistance committees, civil societies, health providers, the government, and global health partners), and the operations of functions and outcomes (services, equity, efficiency, accountability, monitoring, regulations, policy setting, responsiveness, and risk protection from hardships), which is crucial as it affects all other health system functions and blocks (Abimbola et al., 2014). Overall state and democracy-building need realistic lenses to define the "state-organization agreement with the community." Defining the type of state relation with the community – as a taxpayer, member of a formal or informal sector, civil society member, nomad, youth, member of a vulnerable or marginalized group, or displaced – is essential. It helps demonstrate the laws and constitutional relations as well as the concept of the individual right. Both are very important for health governance, possibly in setting health acts and policies as well as conceptualizing the agency and autonomy of the citizen. Autonomy and agency are very critical components in defining a harmonized health financing policy and other health promotion and demand creation parameters toward enforcing positive public health behavior by the community. Subsequently, mapping the best demarcation of the type

of governance that fits the country – whether fiscal, centralized, dual, cooperative, progressive federalism or even a hybrid – needs formalized testing. Moreover, applying a realistic examination of different states or geographical regions and their characteristics – in terms of local resources, revenue generation, capacity, the under-representation of some local communities/women/youth, and the robustness of its governance and social structure – is unavoidable. Equally, the special characteristics of the health sector should be catered for. For example, crisis and epidemic management usually needs a federal multisectoral command, especially in consideration of state fragility, like the case of Sudan. The possible positive and negative externalities on health that face each state/regional/local level due to certain political or development contexts should be well captured. Financing policy, human resources for health, international health regulation, and access to affordable quality-assured essential medicine should be demonstrated as security-related and national issue within the political debate and in tackling the “state governance system.” The provision of affordable quality services should be revised and setting standards and accounting for them should be dealt with at the federal level. Structural reforms should be based on both qualitative and quantitative data. Nonetheless, the literature have reported variations in meeting the decentralization intentions and concepts, especially on access to equity, efficiency, and resilience. Health and development planning needs to deal with decentralization or any governance structure with “critical realism” that fits in the understanding of its implementation complexity, the context of implementation, its anticipated changes, and the interaction between social elements and the whole apparatus (Abimbola et al., 2019). As part of the “state-building,” decisions on the Sudanese health system’s decentralization or devolution reforms should consider the below facts and aspects (Abimbola et al., 2019) :

- The underdevelopment of many parts of Sudan, especially rural settings, and the disparity between states both affect power relations as well as all access-related components.
- People tend to move from one decentralized level (admin unit, locality, or state) to another seeking to benefit from a better public good, or to another area with better developmental status, such as schooling, diagnosis...etc.
- A clear decision on health as a public good should be demonstrated to determine what the government will be financing and providing and at which level of its vertical level of governance, while bearing in mind that localities have low capacities. This should be done within the whole management and implementation cycle for all health-related sectors and intersects, such as WASH, environmental and preventative health, occupational health inspection, food safety, surveillance, monitoring and evaluation, and the capacity-building of health workers.
- If not well tackled, the weakness of the locality level might cause outbreaks and many shocks on the health system. Moreover, the locality within the ongoing governance system is a point of interaction between the state and the local community. Hence, it needs extra attention for the sake of legitimacy building.
- The decision on health budgeting for federal and decentralized levels should be revised up to the lowest level, and a very sensitive formula should be used to avoid inequity between wealthy and poor states as well as internal inequities within a single state.

- The formula of health allocation, expenditure, and budgeting should be aligned to the overall Sudanese health policy and strategy, which should be harmonized with the overall economic and development policy. The formula must consider the unique characteristics of each decentralized level. (e.g. disease burdens, degree of fragility, state hazards, conflicts, environmental hazards, endemic diseases, revenues, and capacity).
- The effect of a budget cut on public services and health that were aligned to the SAP. Any budget instability or delay in covering any decentralized level can push the state or locality to enforce rough revenue-generating activities, which can also cause financial hardship, dissatisfaction, and inequity.
- The effect of the integration of former disease prevention and control programs, such as TB, HIV, and malaria from 2014 and onwards, as well as the effect of the diagonal versus vertical and full horizontal approaches, especially for immunization, should be reported. In addition, a decision to refrain or continue should be set accordingly. The effect should be studied and come with a clear decision considering whether planning and managing the disease can be vertical in nature. Yet, monitoring and evaluation and service provision can be integrated.
- Lower decentralized units (like localities) usually have weak capacities, especially in poorer states. This can lead to the provision of poor services, especially the environmental and preventative measures, or the outbreak response, which can cause dissatisfaction or non-payment for services that usually affect non-working or poor households.
- Affluent states can increase their health budget whereas poorer states and localities do not have this capacity.
- The federal level will be asked by poorer states to cover the gaps and inabilities, which should be formalized and not based on informal negotiations.
- The financial need might be on the locality level. When the transfer happens, it usually goes to the state level, which can decide to disburse to closer proxies. Hence, the state inequity can be enhanced.
- Any disruption in quality or capacity in service provision might cause a favor toward the private sector (Abimbola et al., 2019; Noory et al., 2020).
- Some studies reflected that communities of the middle order usually seek services in a formal private sector, whereas the lower class might develop health-seeking behavior in informal private sectors or incur poor access and delay in seeking care, hence exacerbating unfavorable outcomes or expanding the infectious pool (Abimbola et al., 2019; Noory et al., 2020, Gebreegziabher et al., 2016).
- As the distribution of health facilities (especially the curative hospitals) is usually within centers or big cities and usual states, it will disburse to closer proximities and therefore neglect the primary and preventative packages and lower decentralized levels. This will also reduce the efficiency of the overall health system and enforce a shift toward a costly curative model and expensive interventions. Not having sufficient and sustainable funds that are aligned to community needs and demand usually is a factor that hinders access and impacts UHC dimensions one way or another.
- Low-skilled health workers are usually retained at local and decentralized levels. The gap in HRH would widen with any reduction or fluctuation in the budget at the decentralized

level. Consequently, health workers would seek work in centers, which might intensify the gap in quality, system responsiveness, and inequity (Abimbola et al., 2019). Sometimes, the federal government would work on bridging the gap by incentivizing high-skilled workers and medical doctors through a Unified Register and certain contractual agreements, which are short-term solutions.

- Defining the lines of accountability at both vertical and horizontal levels is crucial, especially during post-revolution times where there is a demand for change. Local communities and resistance fronts and committees should be aware of the needs and standards to be able to oversee and translate the revolution into change.
- Any variability and unevenness in capacities or information about financial management and standard of services will affect the accountability structure and might cause turbulence among communities regarding money spending. Civil societies and community groups should be aware of their role in supporting accountability and best practices.
- The main intention for decentralization should be the enforcement and implementation of health interventions of quality that work specifically for the poor and local communities. This should be done up to the least decentralized level and in a way that speaks to local priorities and needs and increases coverage for public services, preventative, and promotive measures in order to reduce the need for costly curative services and have access to them whenever needed and without any financial hardship.
- Higher-level supervision and monitoring and evaluation is highly needed to enforce federal/central stewardship. The operationalization of those accountability-related activities should be acclimatized and budgeted for within the overall structural and governance reform.
- Economic measures, especially the economy of scale and the indicators of efficiency in relation to quality and equity, should be examined for each proposed scenario (partially decentralized, non-decentralized, or fully decentralized). Rigorous simulation exercises should be applied to feed in the best possible scenario.

4.3.2 Financing

Like other building blocks of the health system, problems in supply are precipitated by the lack of a clear and assertive political and economic agenda. As mentioned earlier, the decentralization of the health sector, the imposed structural adjustment programs, and the linked financing policy and liberalization did not initiate in the health sector. Moreover, it came as part of the overall economic and development liberalization due to political factors outside the sector, and therefore the health system in the country only had to adjust to the new political and administrative apparatus (Idris A., 2011). Sudan has imposed a full liberalization of the economy since 1992 through the development of the comprehensive National Strategy for Socio-economic Affairs 1992-2002 (CNS). This was aligned with the “Health for All by 2000” concept. It was then followed by a 25-year National Development Strategy 2007-2031, which covered health and the detrimental clusters like water, agriculture, mining and energy, and economic institutions. Nonetheless, primary health care has also been declared as the central mean of the strategy, with a respective load between

PHC, secondary, and tertiary levels of 70 percent, 20 percent, and 10 percent in resource development (Sudan 25-Year National Strategy 2007).

The inequalities within the country and the prevalent poverty are usually superior in making poor health an inherent status that can rarely be defeated by the improvement of GDP alone. Investigating disparities and health among sub-groups of the Sudanese population is a vital step to be followed. The correlated federalization and the ongoing proposal for competitive federalism were not fairly assessed from the lens of health, no empirical data was used, and the factual asymmetries of power and capacities of the states had made disparities even worse. The main feature was the scrutiny and the affiliated cuts in the health budget, which exacerbated the inherited gaps and difficulties, and the FMOH has been financially stressed ever since (Figures 2 and 3).

The analysis of the fiscal space and the exact reason behind the stress should be well tackled. The unplanned implementation of adjustment programs (1978) along with the scrutiny has affected the service delivery and human resource, causing an elusive system. Like many of the African countries, Sudan has been negatively impacted by the 1980s economic recession; at that time, healthcare was free of charge as its financing was tax-based in public facilities. Other financing alternatives, such as cost-sharing and cost recovery, were then introduced in Sudan as part of the overall market liberalization and World Bank regimen.

Figure 2. Sudan’s domestic-general health expenditure from the total health expenditure

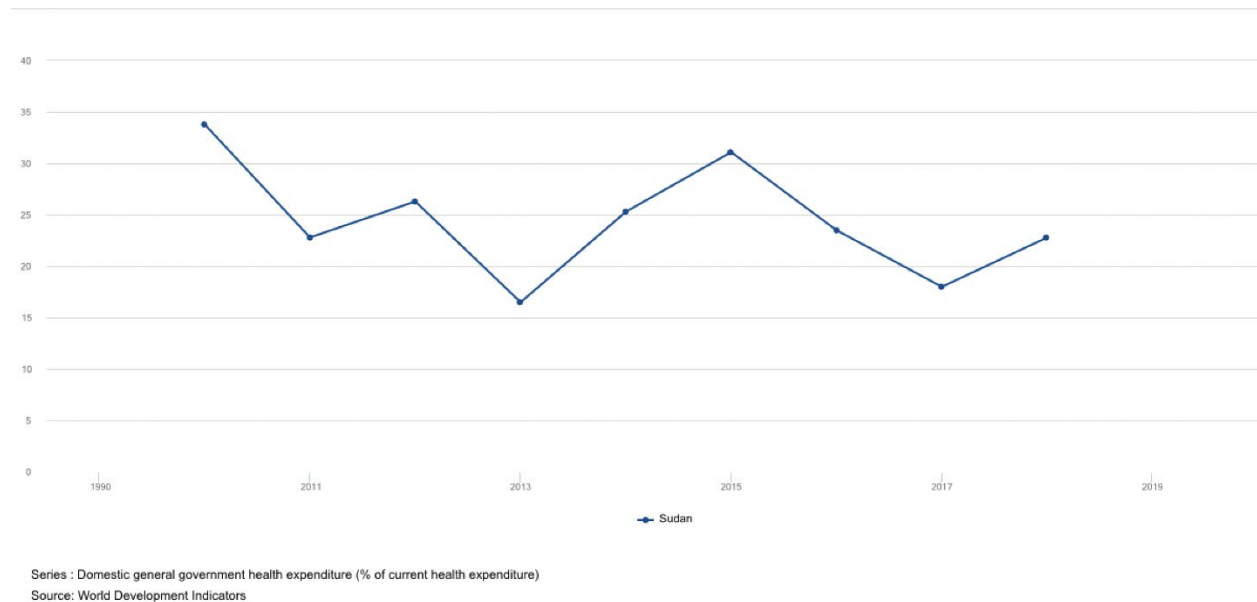
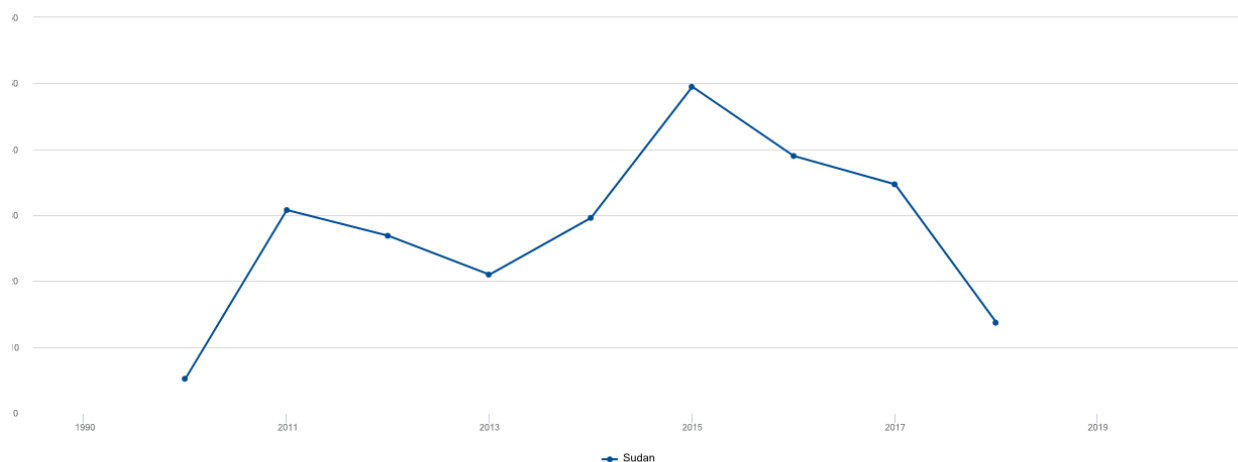


Figure 3. Sudan’s domestic general health expenditure per capital in USD



Series : Domestic general government health expenditure per capita (current US\$)
Source: World Development Indicators

During the *Ingaz* regime, which means ‘salvation’ in Arabic, several health system building schemes were initiated, such as the Supreme National Committee for Health. The committee decided and enforced the separation of hospital budgets as an autonomous part. It also enforced administrative and human resource changes to support health service provision points, put forward the expansion of services in rural areas, decided to have an architectural and project unit for FMOH, and endorsed a new financial alternative known as an economical curative scheme. This scheme was intended to complement the tax-based financing in terms of having revolving drug funds and economic care at primary health centers in Khartoum. Public-private partnership and outsourcing were the main features in the adopted financial schemes, especially in food services, security, and cleaning for health services points. Despite the declared intentions of “improvement of quality of service,” those other health funding schemes – together with the user fee introduced in 1992 – were mainly alternative methods to compensate for and alternate with the public-governmental funding cuts (Suliman, 1999). The research reported a decline in the work environment and in the human resources number (35 percent, ten percent, and four percent decline in physicians, medical assistants, and nurses, respectively) that is associated with funding cuts (Suliman, 1999). The economical financing scheme was devolved to state levels and became adopted as national policy in 1995. A support scheme for poor patients was then adopted and this was deployed through social protection. The inflation and poverty related to the imposed SAP and financing schemes make meeting the needs of the support schemes unrealistic. The reduction in government and social spending impact the poor and low-income class negatively, which has been reported in several countries like Egypt, Pakistan, and Srilanka (social sector expenditure declined by 11 percent between 1977-1983), which in turn affect the buying of goods, the utilization of health services, and the health status (Elbasheer and Bagi, 2000; Suliman, 1999). The National Health Insurance Fund (NHIF) (the law was in place since 1975), was then launched in 1995 to support access to basic health services in a decentralized way at public service delivery points and pharmacies (Wharton, et al., 2020). The free medicine/treatment project covering lifesaving,

cardiac, kidney failure, children under five years of age, and pregnant women was also introduced in 1996 and then ratified in 2005 to complement the low coverage of the NHIF (37.3 percent of the population by 2014) (Wharton et al., 2020). National health financing policy options have been in place since 2016 to determine health purchasing arrangements, especially the NHIF role. It proposes three levels of care: (1) the PHC includes emergency and maternal health, covering the whole community; (2) the secondary covers insured and deprived families; and (3) the tertiary level covers high-cost services. The three-dimension of the UHC are lagging due to low coverage by services and insurance (Mousnad, 2016). Inefficiency at the managerial and economic level is also an issue (the 20 percent least deprived population receives around 13 percent of the public expenditure) (Mousnad, 2016). However, the OOP is high in Sudan, reporting a 40 percent increase in 2016 compared to 2009 (Wharton et al., 2020). This reflects a distorted system that hinders access and augments inequity, disparities, regression, and impoverishment. According to the National Health Services Tracking Survey of 2011, there is no clarity in the federal-state allocation of funds and 27 percent of the funds reach the health facilities. As aforementioned. the whole apparatus is “curative driven” and the revenues generated rarely get back to the health sector for further running or improvement. Meanwhile, supply shortages, scarcity of essential medicines, unaffordability as well as poor hygiene, and sub-optimal services and environmental health support are prevalent. Vertical programs like nutrition and vaccination are usually negatively impacted by the reduction in government spending (Elbasheer and Bagi, 2000). The fragmented programming for nutrition laying in silos under both the humanitarian and development streams of health while sharing the same goals targeted population, and geography might cause a loss of resources. The health system has just been hampered by a variety of problems, including a lack of hard currency, difficulty securing raw materials, production problems, regulatory system issues, and a variety of additional diverting channels within distribution networks. Economic instability is brought about by having no clear economic plans that prioritize health. There are few external investments from outside the country because of the uncertainty and risk, which primarily affect the technology, laboratory, and pharmaceutical system. Because of the country's economic uncertainty, global pharmaceutical corporations consider investing in Sudan a huge risk. While the aforementioned financing schemes have expanded coverage, these insurance plans do not offer universal health coverage, and the efficiency of health financing is impeded by fragmented pools. A fundamental lack of coordination and managerial skills also exists. Healthcare institutions receive funding from a variety of sources, each with its own set of accountability and incentive structures. External funding for vertical programs like tuberculosis, malaria, immunization, and HIV/AIDS is merely overseen by the FMOH. The NHIF, the Ministry of Health, and the Ministry of Welfare and Social Security oversee providers' payment, while the NHIF, the Ministry of Health, and the Ministry of Welfare and Social Security fund curative care. Medical supplies (such as pharmaceuticals) are purchased on a regular basis with a mix of user fees, co-payments, and claims reimbursements. Healthcare facilities generally face challenges in obtaining enough money to operate.

In 2016, the Public Health Institute (PHI) of the Federal Ministry of Health assessed the national health financing system to identify strengths and problems as a preliminary step to formulating national health financing. Weaknesses were found to be: (1) limited government capacity to collect

taxes; (2) poor coordination between agencies involved in tax collection; (3) high OOP costs; (4) inefficient allocation of funds from the Ministry of Finance; (5) a weak decentralized system; and (6) state governments unable to generate local revenue.

Putting no financial hardship on communities has not been attained yet, and the health expenditure (especially the government contribution) is low. Nonetheless, the country has adopted universal health coverage aiming to increase access, reduce inequity, and eliminate financial payments for already poor populations. As SDG 3.8, UHC is perhaps proposed as the single most effective intervention for poverty reduction and is the natural choice for low-middle-income countries (LMIC) committed to sustainable development and economic growth (World Health Organization, 2019). Financial alternatives to support UHC were proposed in Sudan, and health insurance was one of them. Recently, more scholars have studied practical approaches to the funding and implementation of UHC in LMIC with a focus on a stepwise approach. In LMICs, access to clean water, basic sanitation, and maternal and reproductive care were found to be the most important parameters in the UHC Service Coverage Index and thus constitute the successful implementation of UHC (Reid et al., 2020).

Many studies examining large-scale initiatives to expand health insurance coverage in Latin America, Africa, and Asia, particularly in rural, informal, and marginalized populations, have identified factors critical to success, such as federal government ownership and the explicit priority setting of key health policies within the overall national development agenda. This is the foundation for efficient policy formulation and execution on a wide scale. The context specificity and the use of a pro-poor lens are essential in improving health financing in a way that caters to rural, post-conflict settings and women. The country needs to build a dataset that maps the poor and marginalized population to allocate their need and provide sustained protection from hardship and catastrophic payments. Reaching the vulnerable and those living in deprived and underdeveloped settings and conflict-affected settings is pivotal for the Sudan 2020 Juba peace treaty and beyond. Scholars have identified the importance of quantifying the total cost of reaching and covering the unreached (average cost per capita or service point) and, most importantly, the marginal cost for expansion of services. Technologies for determining the total cost in a real setting have been used in countries like Tanzania (Wong and Skead, 2019).

Several countries' scenarios of UHC implementation are progressing either through national health insurance (NHI) like in Indonesia and South Africa, or through the government's sovereignty like in Australia and Canada. Amid COVID-19, Pakistan is now implementing UHC under government authority, covering 100 percent of one of its districts (population of 40 million) and a cost of USD 1,200 for a wide range of services (Wong and Skead, 2019). According to research, countries with strong UHC, such as South Korea and Singapore, have shown superior COVID-19 responses (Hussain and Arif, 2021). Other countries, such as Japan, have augmented the mitigation and retention of vital services by combining COVID-19 response with successful public finance policies and universal health insurance (Hussain and Arif, 2021).

Efforts are ongoing in Sudan; a costing of services has been conducted by an inclusive technical committee. A review of the free treatment project in collaboration with the Ministry of Finance

has taken place, and certain recommendations were set for improvement as well as for the reassessment of the concept of the project and paradigm shift. The European Union-supported project worked from December 2019 to September 2020 and came up with the possible way forward in tracking the Essential Basic Benefit Packages and the Provider Payment Mechanism as means of financing and reaching UHC. Strengthening the health system capacity in terms of building information technologies and capacities and defining roles and responsibilities of the NHIF as a player and F/SMOH as providers were outlined. The suggestion was to have a predetermined apparatus, preferably a hybrid of per-capita payment to meet PHC needs, bundled payment to improve outcomes, and global payment to demonstrate FMOH preferences based on state context and priorities. However, and as aforementioned, any interventions need thorough dialogue and planning as well as realistic analyses of the fragility and local capacities. Points of efficiencies need to be identified by prioritizing access, quality, safety, availability, and utilization and getting them linked with well-identified key performance indicators and tracking and monitoring systems (Mallender, 2021).

All health system pillars should be well catered for, and specific focus should be given to medicine, service provision, human resource payments, hygiene, and environmental as well as risk-based emergency and preparedness. The direction of finance in Sudan is, more or less, curative model-driven, which is the most expensive. In addition, around 70 percent of public financing is directed toward hospitals (28 percent for medicine and 37 percent for salaries) and PHC receives only six percent of the public financing. Health facilities user fee revenues go to MOF, however, there is no clear return of investment on health facilities' maintenance and processing. Financial gaps were also captured all through state hospitals which can lead to diverse financial or more imposed user fees among states. The demoralization of the health cadres due to diminished expenditures on wages and working environment cannot be denied. The transitional government is more focused on population needs, demands, and rights. In the 2020 budget, revenues of 568.3 billion Sudanese pounds were set and an increase in health, education, development, and infrastructure was also reflected. However, and as of now, the financing strategy of Sudan's health sector needs urgent reform; the prescribed user fee, cost-sharing, and decentralization cannot cater for reaching UHC as a WHO-proposed and contemplated mean.

A “step-wise approach” through optimum inclusive commitment toward achieving UHC and utilizing the “revolutionary dynamic” can be the way forward. Out-of-pocket expenditure in itself is an inequitable formality and also a form of inefficiency in health financing that can expose the communities to lack of protection. In Sudan, the unclarity of optimal health goals to be achieved by the whole country and the vague roles and responsibilities between the MOH and the NHIF in purchasing and providing services have caused structural distortion. This raises a need for an urgent high-level review to guide the coming reform in health financing policy and strategy and this should be conducted in close collaboration with the MOF as a provider of around 70 percent of the NHIF's money. Investigating medicine financing and the current models are critically needed. All running sources, whether public financing, revolving cost-sharing models, or all development partners' funding, should be looked at to sustain quality-assured medicine up to the last mile as needed.

Furthermore, the whole state government must have the capacity for policy formulation, planning, implementation, and subsequent information gathering and assessment to facilitate reforms and modification in health financing policies and efficiency points in order to meet the revolution manifesto. Going through a revolution puts the whole apparatus under question, and health structure and functions need to go through a contrasting re-imagining and re-engineering to meet the revolution manifesto. Historically, countries' revolutions (like in Germany, France, Egypt, Turkey, Tunisia, Brazil, and Cuba) were usually followed by radical health sector change, mainly in terms of health financing and governance modality coupled with the economic school or ideology, whether it be a welfare, hegemony, capitalistic, or social protection state, or a hybrid of all, and different health outcomes were observed (Batniji et al., 2014)

In principle, earmarking the exact ideological program and unified policies for the whole country where the health sector is part, defining the intersects of health as a public good, reconceptualizing the common pool of resources, defining inefficiencies, determining enablers and barriers to funding, and improving the fiscal space are urgent exercises that should be conducted. Sudan' ministries of health, finance, social affairs, the NHIF, the parastatal organization, and other public contributors in health financing should lead as main actors in planning, implementing, and overseeing health sector financing.

At the operational level, the strengthening of the overall financial and procurement management systems should be catered for and should also mirror the decentralization nomenclature. Planning and forecasting cash, controlling funds' directions and activities, ensuring compliance with FMOF, and developing partners' rules and regulations should be enforced immediately. Building the capacity of the financial and procurement management system will ensure efficiency, accountability, and transparency, and will support reaching health outcomes.

4.3.3 Health services

Providing high-quality services requires financial support, infrastructure (such as safely constructed buildings, roads, water and sanitation, and electricity), and motivation and capacity-building for health professionals (Delivering Quality Health Services, WHO, 2018). A health system usually also functions at multiple levels (individual, community, national, and subnational) and with the private sector, including civil society organizations (HSS Framework to Action, WHO, 2007). As of 2020, the country has 538 hospitals (rate of 1.3/100,000 of population) with 31,430 beds (rate of 76.4/100,000 of population), 251 blood banks, 171 X-ray units, and 5,852 primary health centers and units.

Accessibility without quality will not lead to improved health outcomes. To build quality into the health system, principles touched upon in governance apply, including transparency, information generation, and analysis. In addition, investment in HRH focuses on building a people- and patient-centric environment in the background of a supportive culture.

Healthcare service delivery in Sudan has been affected by socioeconomic and political instability in the country. Furthermore, after 1977 and under the 30 years of the National Islamic Front (which came to power through a coup in 1989), there was an absence of government stewardship in the distribution of resources, regulation, accountability, fairness, and oversight. Instead, predatory tactics led to state institutions functioning as for-profit schemes. The unfortunate subsiding of government involvement in the delivery of healthcare services resulted in a rise in household health spending. Since the introduction of federalism, the public health system operates through three tiers: (1) FMOH, the federal government responsible for national health policymaking, strategy, and coordination; (2) state ministries, state governments responsible for budget allocation, planning, and implementation at the state level in 18 states; and (3) the local health system and local entities concerned with service delivery on the ground in the 189 localities. The National Health Sector Coordination Council, a multi-sectoral body, is the principal administrative body. This has exacerbated disparities, as states with low revenues are unable to spend as much on health as required. Primary and environmental health as well as the provision of public health services at the local level have been significantly impacted by a lack of strategic budgeting and costing throughout the layers and up to localities. As a result, many hygiene- and poverty-related diseases became endemic, and epidemics occurred.

Before 2011, Sudan's healthcare system consisted of tertiary and secondary level hospitals authorized by the Federal Ministry of Health (FMOH) and district first referral level hospitals that were authorized by state ministries. The first referral units for primary healthcare were primary healthcare units, dispensaries, and health centers (El-Sony et al., 2003). In 2011, a remarkable reform of the health system was performed, resulting in the entire control and authority of the state over secondary and tertiary healthcare facilities (Noory et al., 2021). The PHC model, which emphasizes promotive and preventative services, was largely abandoned in favor of a curative model (70 percent of public financing is directed toward hospitals). The private sector is centered in cities and concentrates on curative care, as indicated by the term "for profit." The provision of quality services requires strong monitoring and sovereignty in the public sector and F/SMOH. A review of local and international evidence was conducted in 2012 with the aim of providing policy options for the improvement of accessibility to PHC services of quality, and it found that although, in some instances, evidence-based planning processes were in place, factors that hindered implementation included lack of legal and financial resources, management, and accountability. The quality assurance system was found to be non-functional with no enforced framework for the accreditation of service providers (Ali et al., 2012).

Poor budgets and not investing hospital revenues back in infrastructure and health, particularly the service provision points, have led to excessive deterioration. Any diminish of quality affects the trust and satisfaction on the community side, which impacts legitimacy. One review that covered around 26 countries has reported a variable yet considerable magnitude of adverse events (AEs) that are related to the health system, either due to surgery, treatment, or an infection from the service point. Most of those AEs were preventable, with a range of 34 percent to 83 percent, some were disabling and not less than seven percent, and between six percent and 30 percent of them were fatal (Schwendimann, et al., 2018). Moreover, several costly negative outcomes might rise

from sub standards at service provision, such as nosocomial infections, occupational infections, and antimicrobial resistance (AMR), which subsequently hinders SDG3. Since 2018, Sudan has been tackling AMR through a multi-sectorial plan with FMOH, the ministries of agriculture and livestock, and WHO through behavioral change, advocacy, and the enforcement of surveillance. Defeating counterfeit medicines through well-functioning regulatory and quality assurance bodies like NMPB also pools in improving the quality of services and minimizing risks. There should be no further neglect of optimization of service delivery and quality aspects after the COVID-19 crisis, namely water and sanitation at the point of care, infection prevention and control, waste management foundation, and the utilization of the associated standardized procedures in all tiers of service provision (Maina et al., 2020). Having a fully functioning structure of service provision at hospitals and service delivery points that utilizes the needed and trained human resource team and outlets (such as drug and therapeutic committees) and other quality hubs (such as infection prevention) is essential in providing patient-centered quality services. Technically, and as per FMOH statistics, Sudan has around 538 hospitals, 31,430 beds, 251 blood banks, 171 X-ray units, and 5,852 primary health centers and basic units. This constitutes bed and hospital rates of 76.4 and 1.3 per 100,000 of population. This all points to the necessity of a comprehensive coverage and mapping survey, which is set to take place in 2019-2020 to represent the reality of coverage and access. In order to get a realistic reflection of the services, a readiness and availability survey is also required. The optimization of the PHC needs an articulated investment to sustain the functionality of the centers and standards. Standards and guidelines as a baseline for capacity and accountability building are critical. Outreach activities or setting a modality to actively reach the community, build more of a link with it, understand the local needs, and imply preventative measures is an optimum way forward. This was conducted in Cuba, where management teams are also utilized while communities are assigned to certain PHC centers. The performance should be assessed through indicators and the FMOH capacity of utilizing the district health teams/locality management teams should be looked at as a source of building evidence on what works for Sudan. These are essential points of contact between the public and the state, and in the legitimacy-building process, as previously stated.

4.3.4 Health information

Public Health information and health information systems (HIS) in general are crucial for the measurement of the health status of individuals, communities, and the population. Information is required for policymaking, resource allocation, and the monitoring and evaluation of interventions. There is an overall deficiency in demographic, health, and surveillance information systems in Sudan. Central survey and consensus-related data are not up to date. The last population consensus was conducted in 2008, and the multiple cluster survey (MICS) and household survey were conducted in 2014 and 2010, respectively. The poverty mapping exercise, as a platform for socio-economic factoring and strategic planning for health, is was done in 2014. The transition government FMOF, FMOH, FMOWASS, and Central Bureau of Statistics (CBS) worked collaboratively with UNICEF to conduct the MICS plus, which was then delayed by the COVID-19 crisis. Sudan has a civil registry act and the transition government is showing political

commitment toward vital statistics and data related to SDGs to ensure harmonization and monitoring and evaluation up to the macro-political levels (Civil Registry Act, 2011).

The birth registration is at around 67 percent of children under the age of five. However, the legal frame is there to issue the certificate. A joint review of the birth registration system and updated notification forms as per WHO standards are currently underway. Death registration is challenged and around 80 percent of deaths happen outside the structured health system and the correct and complete registration of causes of death remains hindered. The enforcement and building of capacities toward the implementation of ICD-11 are also underway. During the first wave of COVID-19, the FMOH led a joint work to enforce death registration at the cemetery to be able to support the estimation of COVID-19 deaths.

In Sudan, individual health centers send reports to the Ministry of Health, and these reports are combined and transmitted to the FMOH as a single report. Activities centered in the community or services provided by the private sector are not included. Because of the development, collection, and reporting of vertical disease-specific programs concurrently, information is more fragmented. Furthermore, the military, police, and other agencies all have information systems that are rarely combined.

Two descriptive studies of the national HIS conducted in 2010 found that the HIS is largely fragmented. Furthermore, the data were not complete, accurate, or timely. Less than one percent of the Ministry of Health's budget is spent on HIS, well below the five percent recommendation for HIS-related activities by the Global Information Forum in Bangkok (Al-Said S., 2010; Amin et al., 2016). Furthermore, most states and localities have few, if any, computers outside of Khartoum, and sustainable Internet is available in 14 out of the 18 states. Yet, around 22.2 percent of hospitals at the state level have Internet installed, and the power supply is generally scarce (Amin et al., 2016). In addition, faxes, printers, and photocopiers are almost rarely available in states other than Khartoum.

An integrated Health Management System has been recommended with efforts to cover all states. However, the lack of laws and coordination, human resources, and funding has proved to be an obstacle to implementation. The global fund, Global Vaccination Alliance, and Italian Cooperation are the main partners supporting the gaps and aiming for a quality-assured, nationwide district information system (DHIS2). However, domestic support for human resources, infrastructure, printing, capacity-building, monitoring, quality audits, and the utilization of data for decision-making at all levels is essential for coverage and sustainability.

Mirroring the medicine and logistics part of the health system needs a cost-effective, fully functioning logistics management information system (LMIS) that supports accurate quantities, and timeliness. An assessment was conducted early in 2013, followed by another phase in 2019, that proposed the most feasible logistics distribution and an associated information system that sustains medicine up to the last mile.

The other arm that also needs urgent interventions and investment is the lab information system (LIS). This is a fragmented area that also needs structural demarcation starting from the National Reference Lab (NRL) until the service delivery point to manage the buildup of an efficient and quality-assured LIS. The LIS needs to support the NRL, state labs, and service delivery points at vertical and horizontal systems. It should also be aligned to serve all IHR and health system aspects and should deal with urgent security matters.

HIS is a key element in a system's ability to recognize, respond, contain, and monitor health events or outbreaks. Effective HIS is identified as a crucial element of health system resilience; i.e., a system's ability to adjust and respond to shock and uncertainty. The necessity of health information during pandemics has been proven by COVID-19. Several countries have already built or leveraged digital platforms to undertake monitoring, prevention, containment, diagnosis, and treatment. This has enhanced greater transparency and accountability by allowing for real-time public information sharing and decreasing the risk of fraud and corruption in COVID-19 payment transfers and other related initiatives (Puaschunder and Beerbaum Dr., 2020).

An integrated surveillance system is functioning in Sudan; however, it functions inequitably. The goal was to detect, prevent, monitor, and respond to emergencies as well as exterminate infections and spread them promptly. A complimentary community-based surveillance system was introduced in around 10 states. COVID-19 has emphasized the utmost urgency of increasing the coverage of quality-assured horizontal surveillance systems. During the first wave, synergy within the information system was identified, the COVID-19 module covering entry points and NRL was integrated through DHIS2, and Khartoum was introduced to the DHIS2 system (due to devolution, Khartoum used to have its autonomous HIS and used to abandon the integration onto DHIS2). The global pandemic accelerated the digitalization of the health system in some countries, including increased use of telemedicine, health applications, and wearable devices that can monitor a wide variety of vitals, including heart rate, blood pressure, temperature, oxygen levels, and even electrocardiograms. In recent years, several countries have adopted digitalization and transformation to improve the efficiency and effectiveness of service delivery and enhance transparency, accountability, accessibility, and citizen participation. This powerful platform has the potential to transform relationships between government institutions and citizens; however, the organization at the technical, programmatic, and customized user level should be well catered for, at stages of digital intervention scaling (Labrique et al., 2018). In Sudan, a Digital Transformation Agency was established in 2020 to improve service delivery efficiency and effectiveness and enhance transparency, accountability, accessibility, and citizen participation. It was led by the Ministry of Finance as a joint body between the ministries and bodies concerned with digitization and the informatics system, including the ministries of labor, social development, interior, justice, health, education, the Central Bank of Sudan, and the Banking Services Company.

The significance of this agency stems from its central role in the development of digital identity, mobile communications, and digital payment systems, which are three basic building blocks in the value chain. This "digital triad" is critical to building an integrated system for digitization to deliver the social program as well as other government programs. Currently, the percentage of the population with digital identity is high, in large part because of the Civil Registry Project in the

Ministry of Interior, where 33 million "distinguished" names with an exclusive digital identity were registered, of which 18.2 million names contain biometric identifiers. Also, according to the data of the main telecommunications companies operating in Sudan, 75 citizens out of every 100 own a mobile phone, and only 31 citizens out of every 100 use the Internet. This data also indicates that 53 percent of all mobile phones (about 33 million phones) can be loaded with data, while the proportion of smartphones is only 27 percent. As a result, there is a compelling need to close this infrastructure digital gap and support it with strong regulation. The participation of health ethicists, legal experts, and civil society is required to avoid any misuse of technology and the potential erosion of rights and civil liberties.

Because of concerns about the misuse of technology and the possible erosion of rights and civil liberties, robust legislation informed by health ethicists, legal experts, and the involvement of civil society is paramount. However, the infrastructure barriers remain in less developed states and information asymmetry is also an obstacle that needs more attention and evidence-based solutions in a decentralized health system. Timely decision-making or policy change and the provision of quality services require the minimization of any gaps and asymmetries within the structure of the political sphere, either in between the vertical governance level or at the horizontal operational level. Any gaps will affect the quality of services provided and the resilience of the system and can cause power asymmetries that need to be avoided in state-building and transition.

Like many other countries from the south of the globe, Sudan's continuum of indigenous innovation and knowledge production systems has been halted. However, the contextualization of innovations is of paramount importance to ensure the appropriateness to the community and sustainability. The use of technology and digitalization should be promoted with evidence-based research, and an indicator that the proposed invention, innovation, or technology is of the best value for money and work, specifically for the poor is highly needed. Supporting the development arm linked to primary healthcare is important, and emergency preparedness and warning systems are essential.

4.3.5 Human resources for health

HRH are recognized as the foundation and driver of health systems, with health worker density (99) being a determinant for UHC in LICs and LMICs (Haakenstad et al., 2022). Furthermore, a responsive health system must be populated by an adequate number of health professionals in the right ratios (nurses to physicians), but a committed multidisciplinary team (nurses, community health workers, midwives, and physicians) must be appropriately deployed and located to meet the demand of the population.

LMICs overtake most of the global HRH projected shortfalls. More health workers are needed in countries with the largest demands, such as those highlighted in the 2006 World Health Report as having a significant shortage. This is not just to attain UHC, but primarily to obtain "modest coverage for key health interventions" (Haakenstad et al., 2022).

Although Sudan has one of the oldest medical education systems in sub-Saharan Africa and the MENA region, it faces a critical shortage of HRH. In 2008, the density of physicians per 10,000 population was 0.31, 0.02 for dentists, 0.04 for pharmacists, 0.47 for nurses, and 0.37 for midwives. In 2019, the density of physicians, nurses and midwives, and other health workers reached 3.6, 14, and 9.1, respectively (Haakenstad et al., 2022). There are currently 145 academic institutions in the country, including 41 medical and dentistry colleges, 12 pharmacy schools, and more than 50 nursing and midwifery schools. The FMOH information systems reported 6,002 medical assistants, 14,684 technicians, 1,233 public health officers, 14,374 nurses, 18,594 midwives, and 714 sanitary officers in 2020 (FMOH Annual Statistical Report, 2019.). In 2006, the FMOH developed an HRH information system in conjunction with WHO and with financial and technical support from the Global Health Workforce Alliance to better inform HRH policy and planning (Badr et al., 2013). The HRH observatory created a comprehensive electronic HRH database and a stakeholder forum with representatives from the FMOH, other ministries, governmental institutions, health worker registration councils, professional associations, non-governmental organizations, and international organizations (Badr et al., 2013).

The HRH information system, as well as the findings of related HRH studies, provided solid evidence of the main issues affecting HRH in Sudan, such as quantifiable scarcities, expertise imbalances, a lack of systems for continuous professional development of health workers, geographical misallocation, and significant emigration of health workers. Data generated from the HRH information system and stakeholder meetings led to the development of a budgeted National Health Strategic Plan for 2012-2016 (Sudan National Health Strategic Plan, 2012-2016).

An assessment of the HRH Labor Market of Sudan conducted in 2013 reported that while the physician-to-nurse ratio improved from 5:1 in 2006 to 0.61:1 in 2011, shortages and maldistribution still exist. Notably, women make up more than 60 percent of healthcare graduates (AubAgla et al., 2013). A common theme was the lack of coordination between the federal and state ministries of health, higher education, labor, and finance to produce and allocate HRH to match the population's health needs (AubAgla, 2013).

Budget constraints, along with an inadequate utilization of available resources and a low absorptive capacity of the public health sector, are largely to blame for the underemployment of skilled health workers. Fresh graduates' aversion to working in rural and remote areas is also a significant influence. Low pay, poor working conditions, and difficulty recruiting and retaining HRH, especially in rural areas, are all factors contributing to the problem. Only 20 percent of the Sudanese population live in the capital city of Khartoum, which is served by 70 percent of the country's total healthcare providers. In addition, physician migration has resulted in the loss of over 70 percent of the physician workforce (Badr et al., 2013). On the other hand, due to limited job-shifting choices, the shortage of nurses and midwives in neglected rural areas is worsening, adding to an already overburdened healthcare system. Statistics on maternal mortality, infant mortality, and child health are regarded as valid indices of development (Table 2). In general, under-five mortality reflects the quality of health services, and maternal mortality in Sudan is unacceptably high. In 2017, around 295,000 women died while giving birth, and the majority of cases might have been avoided (Table 2). Producing additional physicians in Sudan and other

LMICs with HRH deficits, particularly in countries with large rural populations, may not be cost-effective or deliver the optimum results. Instead, LMICs with low HDI and high maternal and infant mortality should consider investing in and training midwives who meet international standards and work in multidisciplinary teams within health systems. In LMICs, skilled birth attendance has been demonstrated to reduce maternal mortality and morbidity. A review of some studies has reflected a significant reduction of 23 percent in stillbirths in relation to skilled attendance (Yakoob et al., 2011). Women make up most midwives, and they work with women and their newborn babies. Midwives working in rural settings in most LMICs are drawn from the communities they serve, which is critical in fragile settings where the under-utilization of health services may be due to a lack of trust in state institutions (Adatara et al., 2021). In the early 1990s, prospective research in Sudan documented the significant abilities of village midwives in the identification of risky groups, which contributed to a reduction of around 25 percent in neonatal mortalities and stillbirths (Ibrahim et al., 1992).

Midwives and community health workers in rural communities can be taught to provide basic health treatments for malaria, diarrhea, headaches, family planning, immunization, and health promotion and education, as well as refer severe or advanced cases to the next level of care. Midwives could get two years of additional training in midwifery, according to WHO criteria, and be qualified to provide maternal health services, including skilled delivery. Ghana has demonstrated that when integrated into health systems, midwives can extend basic healthcare in rural settings, but collaboration with district hospitals and health centers can facilitate a strong referral, monitoring, and evaluation system (Sakeah et al., 2014).

However, poor infrastructure – such as a lack of delivery and resting rooms for pregnant women and nursing mothers, lack of toilet facilities, electricity, water, and medical supplies – hinders the provision of skilled delivery services in rural communities. Insufficient transport and lack of physical infrastructure such as roads contribute to poor outcomes, including maternal and neonatal death.

HRH shortages and deficiencies necessitate diverse policies customized to the country's specific position context and economy, and effective HRH management and policy necessitate improved data. However, data, leadership, and health governance are not the only elements required for policy implementation. HRH is a key parameter for political stability in Sudan. The SAP-related reduction in health expenditure pushed human resources to work in the private sector, migrate to other countries, and (together with the diminished working environment) doctors have been demoralized, which led to several strikes all through the last 10 years. Similarities were reported among other African countries such as Zambia and Mozambique (R. Loewenson, 1993). In addition to the HRH assessment and market force analysis findings, there are certain challenges that need urgent short-term solutions, such as opting out of the “zero contracting policy” and moving toward the centralization and budgeting of HRH jobs, specifically physicians. The jobs should be projected in line with the real nationwide gap and should be aligned to the civil service rules and the career pathway. The contractual agreements implemented as part of the health reform, the structural adjustment, and the budget cuts have led to decreased liability and diminished the sense of accountability between the FMOH and health cadres. It also nurtured the dual practices

and (to a certain level) neglected public hospitals, which also negatively impacted capacity building, the ethical accountability to the hierarchical concepts, training, and the system in general. Other structural barriers related to the governance system need to be considered. The ongoing decentralized system with its vague vertical and horizontal roles and responsibilities and the imbalanced budget allocations and asymmetrical capacities have augmented a skewed distribution of health cadres and retained low-skilled health cadres at the peripheries. The recruiting and retention of highly-skilled cadres is easier at the central level, which is correlated to the centralization of power and resources. This skewed HRH retention that mirrors the skewed development and urban-rural disparity will keep the apparatus of having a lower-skilled human resource at lower peripheries and for PHC or public good provision with a continuous intention to exit for the higher payment in higher levels of curative services and higher remunerations in cities or centers. This internal exodus might be a contributing factor to an imbalanced “need-demand-supply.” Licensing bodies and specialization boards should be pooled in a way to support the relicensing and code of ethics and practice in a vital way that ensures safety and quality.

On the other hand, lacking inadequate continuous development and training of health cadres on real community needs and prevalent diseases is also an issue that requires special attention. The FMOH and other partners in the education sector should align capacity-building to overall health indicators and treatment guidelines. Studies have documented poor knowledge of severe malaria standard case management and the control of its complications among consultants and house officers (Elnour, Alagib, Bansal, Farag, and Malik, 2019). This entails the possibility of poor quality services and might attribute irrational prescription and avoidable morbidity and mortalities. In another study, around 60 percent of surveyed PHC doctors showed fair knowledge about diabetes management, and attendance of training was the main factor that determines the level of knowledge (Saleh et al., 2021). This raises the question of how far the educational and training systems in Sudan are fit for purpose and well acclimatized to the need of communities. Certain countries designate a whole year of medical education for primary care and family physicians as part of the fit for purpose modality.

The failure of health systems reflected in points of interaction between doctors and communities is a barrier to political stability. This challenged interaction and the unethical practices as a subsequent of the overall systems’ gap, including the HRH component, can be easily read in the attacks against doctors in service delivery settings. In April, the Sudanese doctors’ committee has documented around 14 attacks (usually violations of law), and attacks on health cadres are reported during times of political instability and turmoil where health is neglected (Doctors under Siege in Sudan, The Mail and Guardian, 2020).

Serving equity, resilience and efficiency need a thorough realism and social constructivism lens to commit to and understand the causation of the HRH gaps. Tackling the need of the local community in terms of qualitative and quantitative needs rather than just the market force is essential for pooling the HRH supply with appropriate projections of skills, capacities, and proportions.

4.3.6 Access to medicines and technologies

The availability and affordability of quality-assured medicines are essential for reaching UHC and SDGs. It is also one of the interaction points between the community needs and demand for health service provision. Subsequently, this makes it a political priority that legitimizes and builds social contracting and state-building. The pharmaceutical sector of Sudan was governed by a medicine and poison act since 1939, which was then amended more than three times until the inclusion of medical devices and cosmetics into the national medicine and poisons Act of 2009 (Abdeen Mustafa, 2018).

The FMOH is financially stressed due to the scarcity of allocated resources for health, which can either be attributed to the lack of country resources or just poor allocation. The medicine bill usually constitutes around one-third of the annual health budget. The cost for all deprived countries is commonly high due to a number of factors, including the pharmaceutical sector's oligopolistic character and trade policies that limit the ability to produce medicines (Turshen, 2001). It is also due to cuts in health expenditures as part of structural adjustment, currency depreciation, a lack of foreign exchange, and the FMOH's inability to acquire pharmaceuticals at competitive costs on an international level (Turshen, 2001). The cuts in the health budget led to delays and defers in payments, hence minimizing the trust toward the country, and the oligopolistic power of international companies minimizes third world countries like Sudan in negotiating for lower unit medicine prices. Research in 2012 reported the challenges faced by central medical stores (CMS, then referred to as NMSF) and the low stock levels of life savings due to insufficient foreign exchange, which can push some hospitals to purchase on their own from the private sector. The prices of medicine were reported among the highest in the MENA region (Gamal K. M. Ali and Yahia, 2012).

Like many developing countries, Sudan's health system reforms – which were aligned to the overall economic liberalization and structural adjustments – have led to radical changes in pharmaceutical sector financing and structure, such as imposing user fees, cost-sharing and recovery, devolution of supply, privatization, and pluralism of responsibilities. Medicine is classified into essential and non-essential medicine, and the availability of medicine in the Sudan health era (especially after the 1978 reforms) are lying between two theories. The first is the “rational use/technically based” theory which assumes that “rational management of medicines” is the determinant factor for availability. This means that science-based forecasting and quantification, a well-managed supply chain, and a health worker who is rational and relies on standard guidelines will then ensure medicine availability. The second is the “market-based/commodification/user demand” theory where availability is mainly determined by the satisfaction of the patient as a consumer on the quality of service being paid for. The intersection of those two approaches is always conflicting and many efforts are slipped without tackling the reality of the situation in Sudan. Medicine availability is central to the community perception around the quality of care, therefore it also feeds into state- and social contract-building (Haddad, et al., 1998).

After 1978, the pharmaceutical sector witnessed a lot of transformations correlated with a decrease in public health expenditure and the enforcement of privatization through SAP. The idea of increasing the utilization of PHC and reducing the possible impact of referral systems through the implementation of a revolving drug fund (RDF) was proposed as early as 1987, targeting child health programs with sustained low-cost essential medicines (Gamal Khalafalla Mohamed Ali, 2009). Cost-sharing as alternative financing was then imposed after 1989 through the RDF project to sustain an equitable medicine supply, especially at the peripheral first referral level of care. This was part of the “Sudan economical curative-treatment scheme” which was imposed with political will in the 1990s, and a provision of seed fund/capital from “Save the Children International.” Then, in 1992, a major economic liberalization took place, which included the imposition of fees for medicine and health services. Central Medical Supplies, which was responsible for the free distribution of medicine to public health care facilities, was replaced with a self-governing Central Medical Supplies Public Corporation (CMS) that is also responsible for distribution, but on a cash-and-carry basis. Subsequently, and as the liberalization process progressed, the 25-year health strategic plan of 2003 underlined the importance of the private sector as a fundamental pillar.

However, those steps of privatization enforcement were not a product of or followed any utilization of empirical data or any structured research, which makes the capture-recapture evaluation almost impossible. Further, alternative financing and the empowerment of the private market with weakening the state/government dominance were promoted through proposing a privatization alternative on the possession of the CMS share and by advocating for a “state responsibility” that is sole regulatory, which is, more or less, aligned to the neo-liberal apparatus towards state sovereignty. The debate was based on the government’s previous experience in privatizing parts of health-related services, such as food supplies, points of care, and telecommunication services (Gamal K. M. Ali and Omer, 2011). The argument was aimed at improving efficiency, equity, and supporting government revenue generation through the taxation of private shareholders and from profit-making during the whole process (Gamal K. M. Ali and Omer, 2011).

Nonetheless, and at the level of states, the need to protect vulnerable people was demonstrated and the financing model was changed and the RDF was initiated, thereby expanding its list and coverage. It eventually expanded to PHC and entered the second level of care. This model succeeded in Khartoum because of the semi-cost recovery and drug sourcing through an international tender from non-profit organizations and long-term agreements (LTA), through bulk purchasing (Gamal K. M. Ali, 2000). According to a few pieces of research, the RDF was considered a public non-profit body that acclimatized the mode of drug costing and pricing in Sudan’s economic and health sphere. RDF-Khartoum has used the variable costing method given its feasibility and ease of operationalization (Gamal K. M. Ali, 2000). Usually, the costing is revised two to three times a year, however, the differentiation of mark-up had been adjusted to replenish the capital, which was depleted after the liberalization policies enforced in the 1990s. One researcher documented that RDF medicines were 50 to 60 percent cheaper compared to the private sector, even with the settled markup (Gamal K. M. Ali, 2000). Nonetheless, there is a lot of complexity in the model since it is also market-driven; for example, the coverage is based on the target for the availability of the RDF’s list. To sustain the capital and expand, the RDF has

further included non-essential medicine aiming to cross-subsidize or cover essential medicine at PHC and inside hospitals. In 2015, a parliamentary act changed the CMS into the NMSF, which is a change into an integrated supply system. It expanded the RDF modality/cost recovery into a nationalized fund, where the (then called) NMSF contract included already existing RDF at state levels. The role of the NMSF is to conduct centralized bulk procurement (national and international tenders), expanding the list from the limited essential list to a more advanced list of medicines and medical devices, and expanding the target geographically and the strata beyond the people pharmacies. Around 78 percent of the procured medicine is from EML, and 16 percent is from local manufacturing (National Supply Chain for Pharmaceuticals and Health Products, 2017).

Additionally, the NMSF is responsible for the public supply and logistic chain up to the last mile. Human resources were paid through cost recovery and 15 percent were set to strengthen the state. NMSF is a self-financing body and the first seed fund was directed from the MOF to recover costs through markups and margins on medicines that will be delivered up to the last mile (National Supply Chain for Pharmaceuticals and Health Products, 2017). “Free of charge” was also maintained for life-saving medicines and specific national/vertical programs. Decentralization and its Federal-State act have hindered the transformation speed as states with high revenue-making capacity and the biggest volume of RDF projects, such as Khartoum, Gezira, Port-Sudan, and Gedarif, refused to sign the entry under the NMSF umbrella. Through advocacy and supreme level enforcement and between 2019 and 2020, almost all states signed except the Khartoum. However, the evolution of the NMSF at the central level was tangible; an integrated supply chain strategy 2017-2021 was put in place with the support of international partners to strengthen automation and serve the whole function of the supply chain, logistics, and inventory management system (National Supply Chain for Pharmaceuticals and Health Products, 2017). This NMSF-RDF model can work on a high scale and the agreement also covered the provision of the NHIF needed essential list. The medical sector has also been influenced on the regulatory side by the decentralization of the health systems and structural adjustments. Quality and regulatory restructuring has also occurred, mirroring the overall adjustments and decentralization, with a national medicine poison board being established and taking over the responsibilities and all quality assurance aspects that were previously under the Directorate General of Pharmacy (DGoP) of the FMOH. The DGoP's fundamental role is ensuring conformity through policies, standardizing the medicine list, and enforcing the rational usage of medicines. A coordinating multi-sectorial supreme federal body for pharmacy and poisons has also existed since 2001, utilizing the DGoP as an entity for executing adherence to policies up to the last mile.

Some studies have analyzed the value and the expenditure on medicines through the Always, Better, and Control (ABC) analysis and the Vital, Essential, and Nonessential (VEN) system. They investigated whether the money was spent on procuring the appropriate medicine categories that cover the prevalent diseases. The distribution of categories among different medicines imported for the private sector, central hospitals, and within NHIF was studied. In NHIF, few items constituted a huge amount of its supply, where non-essentials constituted around 50 percent of the products which is translated into quarters of the total NHIF budgeted amount (Kheder et al, 2020).

Some researchers, and all through the evolution and restructuring of the Sudan medicine procurement and supply management, have declared authentic challenges in medicine availability and affordability, which constitute a barrier to access and equity. Amongst a selected list of medicines in 2013, the availability of originators was 3.7 percent and 4.5 percent, and around 68.1 percent and 55.4 percent for generic medicines in NHIF and RDF on average, respectively (Musa M., 2013). A patient gets the lowest price of generic medicines at 2.98 times more than international reference prices in the public sector and 2.7 higher in RDF-covered outlets. NHIF markups are high, which is also a contributing factor to the high prices of medicines. Patients utilizing private outlets usually pay 4.24 and 2.9 times the worldwide reference prices for originators and lowest-cost drugs, respectively (Musa M., 2013). Differences in wholesale mark-up charges were discovered, ranging from 15 percent in the private sector to 125 percent in CMS and 240 percent in RDF. The retail markups were found at 11 percent, 50 percent, and 20 percent for CMS, RDF, and the private sector, respectively, which reflect the high margin of possible profit made in the public sector. Any disturbance in the availability of medicines in the public sector exposes the population in need to excessive out-of-pocket payments from the private sector. This cannot be neglected, particularly for chronic conditions like diabetes or hypertension, where in comparison to the lowest-paid wage, one can pay 2.5 days and nine days for a 30-day regimen of Glibenclamide and Amlodipine in private pharmacies (Kheder S., A., 2007). The cost of a combined asthma inhaler surpasses the lowest monthly government wage by 25 percent and inhaled corticosteroids as an asthma preventative are inaccessible (Global Asthma Report, 2014). Any inflated cost of medicine should flag an alert on both the economic and health side, and the scale of actions and efficiency of the procurement planning and used approaches should be assessed. The pluralism of medicine supply markets and outlets in Sudan (having drug stores in rural settings, private community pharmacies, people's pharmacies, private, public hospitals, private clinics, RDF, NMSF, private importer companies, local industries, agents) calls for a rigorous imposition and enforcement of regulation from the registration, licensing, costing and tracing and pharmacovigilance. The 2019 FMOH statistical reported a total pharmaceutical market of USD 650 million. The public sector constituted USD 155 million (24 percent), while the private sector constituted USD 495 million (74 percent) of the total amount. The medicines' source in the private sector is either through local manufacturing or through international importation and local agents (FMOH Annual Pharmaceutical Statistical Report, 2019). In 2016, more than 4,000 pharmaceutical commodities were registered, with most of the importation coming from Jordan (18 percent), India (13 percent), Pakistan (nine percent), Egypt (eight percent), European countries (seven percent), China (seven percent), Japan (seven percent), Saudi Arabia (six percent), and the United Arab Emirates (four percent) (Khder S. et al., 2020).

The self-sufficiency policy was set to be achieved through local manufacturing and around 25 licensed factories are functioning in Sudan as of 2019. However, there is a huge gap where it constitutes only around 17 percent of locally registered pharmaceutical products in the NMPB (FMOH Annual Health Statistical Report, 2016). In 2015, the country decided to stop the importation of medicines that are locally produced for the local manufacturing to expand. This was formally supported by a presidential decree in July 2017. Furthermore, the NMPB endorsed a list of 104 self-sufficiency medicines restricted to local production only (FMOH Annual Health Statistical Report, 2016). Research that looked into the impact after the enforcement of the decree

found that the availability through local production is still below the WHO target of 80 percent. Nonetheless, locally manufactured medicines (LMM) are still more available than imported medicine (IM) in the public sector (LMM at 47.2 percent and IM at 14.0 percent) and the private sector (LMM at 63.9 percent and IM at 23.5 percent) with variations among groups of medicines and between state. IMs are most available in Khartoum at 29.6 percent and 40 percent in both public and private sectors, respectively. LMM's highest availability was in S. Kordofan among the public (62.4 percent) and private sector (79.5 percent) (Khder S. et al., 2020).

Supporting local production can augment having sustained essential medicine, and the association with local regulatory authorities and laboratories can be easily maintained in comparison to importation. This might improve the safety and quality of medicines, but only if the capacity and technologies utilized in local production are maximized and optimized. The challenging operating environment in governance, economics, and operations is real and has been documented in several sub-Saharan countries. Economic simulation exercises would be needed to support the country projection of decision with regard to production

The implication of Sudan's regulatory blueprints and structure are overlooked despite the importance of controlling quality, ensuring safety, efficacy, cost control, and reaching optimum health outcomes. Having laws as a backbone is needed to support the regulations. The investment in the public sector is mainly directed toward the central structure of the supply chain. The decentralized governance and the transformed structure have many points of conflict and unresolved intersects of roles and responsibilities at state and locality levels. This is outstanding in the fragmented execution of the regulatory authorization between DGoP and NMPB at the state level and in the free medicine programs.

The National Drug Quality Control Lab (NDQCL) is the reference arm for ensuring the quality, safety, and efficacy of all medicines, pharmaceutical products, and medical devices. Any obstacle at this stage might hinder access to essential medicines, hence affecting the quality-of-service provision. The national quality-controlled laboratory started in 1903 as part of the investments of Wellcome Tropical Research Laboratories. As part of the FMOH restructuring in alignment with the overall reforms, the NDQCL was transferred to the DGoP of FMOH. Then it was referred to as NMPB in 2007 as a semi-autonomous arm of the NMPB that covers the surveillance, inspection, licensing, and control of imports and export (Ndomondo-Sigonda et al., 2017). Several investments (through the Global Fund and WHO) had been directed in 2012 to strengthen the then called National Medicines Quality Control and Research Laboratory (NMQCRL) to execute quality control in a very effective manner. This covered the rehabilitation of the laboratory and the provision of needed equipment. Moreover, and to reach the standards of WHO, prequalified and ISO 17025 certificate technical assistance on quality management system was provided in 2017 and 2018. Several recommendations were set and a phase of peer audit by the WHO team and the inspection by WHO was planned to happen in the third quarter of 2019.

An unpublished explorative survey conducted in 2019 by the DGoP to explore factors behind the shortage of Medicine in Sudan has revealed a perception that NQCL capacity is a challenge that hinders the expansion of medicine registration and strong post-marketing surveillance. This is no

exception from other laboratories and regulatory authorities in certain regions of Africa, which may lack needed human resources and financial capacity. This eventually might affect the overall public health sphere; minimizing safety and quality, prevailing sub-standard and counterfeit medicine, and minimizing access to essential medicines, which is already an issue in a country like Sudan. This is in line with an article that highlights the need of synchronizing all efforts between WHO and stakeholders even at the regional level to reduce barriers and ensure the efficiency of regulatory processes and steps. The inclusion of a research-based pharmaceutical industry in the strengthening process of testing and registration is also suggested (Goñi, 2016). Nonetheless, having a legal backbone is crucial to support the regulatory system in general. Enacting the role all through the cascade from registration and up to post-marketing surveillance, research, inspection, and pharmacovigilance needs a solid governance system and an intact vertical and horizontal liaison, which is a real challenge in Sudan's decentralized health system, sustained funds, and sustained human resources and technical capacity.

Looking into the peripheral level of the hierarchy and utilizing the lens of sustained availability of medicine up to the last mile, an assessment was conducted between 2011-2013. It revealed the need of building and redesigning the NMSF supply chain system in many aspects and many areas like the inventory management system, logistic management information system (LMIS) and electronic LMIS, warehousing, distribution chain, forecasting and quantification, procurement, and human resource capacity-building all through the supply chain demands. Jointly with development partners like Global fund and UNDP, a huge effort and money were invested in this project. Spot checks and regular performance monitoring revealed some essential out-of-stock medicines like Malaria treatment over the past three months in assessed hospitals, which is an alarming indicator that could be attributed to weaknesses in the supply system from the central level to point of service delivery (Elnour et al., 2019). As a monitoring arm for the FMOH, the DGoP conducts a regular survey for the availability and affordability of essential medicines in both the public and private sectors while adopting the WHO methodology. The average availability of originators was at 3.2 to 3.7 percent and at 53.7 to 69.3 percent for generic medicines in the public and private sectors. The DGoP monitoring survey has been revealing this severe gap in essential medicine availability consecutively from 2017 to 2020, where the reported availability was 67.2 percent, 70.8 percent, 59 percent, and 58.5 percent. There was a huge gap among IV fluids, central nervous system (CNS), ear nose throat (ENT), and ophthalmic preparations (FMOH EM Survey, 2017).

The overall governor structure needs revisiting, and the medicine supply should be one of the central components in the "Transitional Government Conference on Governance and administration." The dissatisfaction with the locality level has always been reported as being a weak layer that affects the chain of command and therefore supply availability. The poor investment in the supply chain after the level of state was obvious, which also mirrors the overall perpetuated centralized development and investments. The 2019 Axios Assessment was tailored around ways to optimize the public supply chain network, improving, and redesigning the distribution model, and developing a prioritized implementation plan for the improvement of the LMIS. A consensus workshop was conducted and agreed on certain costed models to be used to

optimize distribution and LMIS. Both models rely on direct distribution from NMSF to central state stores than to either sub-stores or state stores that are closer to the community. However, both models neglect the locality layer and enhance a more direct chain of command and responsibilities on distribution, collection, the aggregation of consumption data, and need.

Pharmacists within the HRH pool represent a challenged stratum, which also causes obstacles in the provision of quality, human-centric health services. The demand for a skilled pharmacist is prevailing at all points of the procurement and supply management chain. According to the FMOH 2019 Pharmaceutical Statistical Report, there are 21,020 registered pharmacists in the Sudanese Medical Council (SMC). However, the overall imbalanced labor market of pharmacists brings a varied sub-optimal ratio of 0.05 pharmacist per 10,000 population in West Darfur to 5.5 in Khartoum. The non-generation and low enumeration of jobs in hot points of the public sector medicine chain and points of service have augmented the rift to the private sector (26 percent of pharmacists work in the public sector) (Mandour and Salih, 2009). The capacity-building of the technical part is facing some challenges where the assistant pharmacist was declared a three-year training in university, yet the rules and blueprints have not captured this workforce in an optimal way that boosts the overall capacity of the pharmaceutical sector. The pharmacist's role in the provision of a continuum of pharmaceutical care (ex. detecting and managing any prescription error and providing health promotion) is limited. The barriers were many, and all were centered around the mismatch between education and practice, the lack of standardized capacity-building and preparedness, and the misconception about the pharmacist's role in the provision of care (Ibrahim and Scott, 2013). Moreover, the practical knowledge about inventory tools was reported as sub-optimal by research on ABC-VEN analysis among graduates and some practitioners (Abdelmonim et al., 2019).

The availability of well-functioned laboratory medicine (diagnostic and medical devices that are of the best value and work specifically with the context) is also a challenging area. The challenges are: lack of infrastructure as per the burden and needs, weak supply chain management and information systems, poor coordination and asset management, and the lack of standardized and calibrated operating procedures. This could hinder the whole surveillance, prevention, and control cycle which can put both financial and health burdens in a limited resource setting like Sudan.

The complexity, fragmentation, and pluralism of the pharmaceutical sector all hinder equity, quality, prevention of financial hardships related to health, and the responsiveness as main objectives of the health system. At the whole state level, any lack of sustained quality-assured affordable medicines in the last mile of care disrupts the interaction and social contraction. The situation calls for an urgent need to read the pharmaceutical sector in alignment with the overall health system and state apparatus. Tackling the organization and governance structure of the pharmaceutical sector is pivotal. There is an immediate need to regulate and bring the theory of rational medicine use as close as possible to the market force and commodification-based theory. Demonstrating Sudan's population needs and stratification is essential, and this could be achieved through state regulation, context-specific drug policies, the enforcement of state dominancy, and a strong leadership structure. With the scarcity in resources and allocations for the health systems and the huge uncertainty and COVID-19, certain concepts should be introduced, such as the best

value for money. The pharmaceutical sector should mirror the population's needs and demands that are based on real-time health and logistics information data. National forecasting and quantification should be conducted for the essential and vital medicine list that is integrated with standard treatment guidelines and formularies. A legal backbone to support EML and the medical and diagnostic blueprint plan is needed. The fragmentation of having three different lists of EML NHIF and NMSF should be continuously prohibited and should be unified. The unified interim list that was declared at the end of 2019 can be a benchmark for further improvement. The know-how of TB/HIV/malaria forecasting and quantification that was developed in 2013 and formally revived in the fourth quarter of 2019 should be advanced and expanded under a supreme FMOH leadership. Such direction necessitates the enforcement of strategies to ensure strategies of "best value" rather than cost.

The enforcement of medicine regulation has been defined by WHO as steps taken to control the supply and demand side, namely: standards of manufacturing, quality, efficacy, safety, information, distribution as well as prices at the consumption level. Hence, the authorization of the market with bioequivalent, safe, and effective generic medicine according to research and regulating their use through well-defined policies that tackle the health authorities, prescribers, and patients, can save a bulk of 70 percent consumed on brands. The least-cost generic in the private sector usually cost 2.6 times less than brands. Swapping to generic medicine is of value even in the public sector; one research reported savings of approximately 65 percent on patients (Cameron et al., 2012). However, the economy of scale is also an area of intersection that should be considered because the price is disproportionately related to competition. Applying Pharmacoeconomic (PE) field theories is especially useful in limited resources as it helps assess the costs and consequences of using alternative remedies to intensify therapeutic outcomes. Sudan must move in regulating prices and expenditures further than the pooled public procurement and the costing tools of price comparison that are applied by NMPB towards imported medicines. Effective regimen comparisons through PE and enforced "value for money" registration is important in any steps of dossier review or registration. PE should also augment the inclusive selection of EML, which in turn also increases access to medicine. Effective coordination with development partners in developing a networked and strategic laboratory and diagnostic structure is of utmost importance. It is necessary to invest in strengthening the structure with more emphasis after the state level and augment efforts toward improving the logistics and supply chain system and information.

5. Conclusions

Literature from many countries have revealed that sociopolitical movements and revolutions often lead to reforms and changes towards certain models and ideologies. This paper relied on comprehensive thinking while using the determinants and the WHO framework to structure the analysis and engage the cross-sectional foundations. The fact that there are several challenges at the cross-cutting foundations and among the health system building blocks indicates that the existing political direction and models are not effective or at least not serving the community.

There is an obvious need for a coordinated radical multi-sectoral transformation from the perpetuated failure to a more context-sensitive organization that mirrors the community's needs and works in full partnership with the community. The transition is challenged with political turmoil, the health sector is financially stressed, and the governance system is politically influenced by an apparent frangible decentralized structure with indistinct roles and responsibilities at the vertical and horizontal levels. There are described shortcomings and deficiencies facing the health system on the sustainability of quality-assured affordable medicines, the surveillance and information systems, and the provision of quality-assured accessible services and human resources. Health as a public good and the intersects of the common goods for health, where a significant load of the "prevention" lies, is hugely affected by the followed liberalized structuring. This calls for reconstructing and resetting financing in a vivid "whole of state" way that integrates social, economic, environmental, climatic, and other determinants. The public crisis preparedness and emergency readiness system of Sudan is an area of significance given the climatic changes and fundamental gaps. The repercussions of the COVID- 19 crisis on essential services, human behaviors, the economy, and its possible hindrance to reaching SDGs by 2030 (the UHC and PHC pillars are already far from being optimally enforced) cannot be denied. The paper is aware of the globally proposed paradigm and benchmarks like SDGs and the UHC component; nonetheless, the paper promotes for a more radical way of thinking, using the revolution as a motivation and change driver to look beyond this proposal. This paper promotes an extensive dialogue and utilization of the realism and social approaches as part of the country's economic and political shift with a sense of transforming health and coming up with a "Sudan-specific" paradigm. Community health needs to be high on the political agenda as a central element for "legitimacy and state-building" and for the realization of the revolution's slogan. Hence, a multi-sectoral and context-sensitive approach in equal partnership with the communities is needed to ensure "equity," as the political changes in the development and health sectors cannot be read in isolation from economic and financial debates. Certain disciplines and concepts that can make the shift from a pure "market and curative-driven system" to a rational "community demand and prevention-driven system" should be well catered for within the dialogue. It is essential to congregate the no financial hardship, equity, resilience, and responsiveness concepts using the lens of certain disciplines like public policy development, health economics, Pharmacoeconomics, applied economics, mathematical modeling, social epidemiology, and social anthropology. This paper promotes an analytical way of thinking that questions the performance and the anticipated result so that we can come up with unified answers that are "Sudanese" and be able to put measurable "Sudanese indicators" for the resilience of the country's health system. Moreover, certain characteristics should be well articulated in the systematic way of thinking, in reconstructing a development program for Sudan as a post-colonial state and in our actions toward the building of the state, such as:

- Health is a political construct that is central to state-building and legitimacy. Hence, utmost political commitment should be shown.
- Planning for development and health cannot be done in silos. Therefore, a multi-sectoral, multi-level approach is needed.

- Investing in health determinants and leveraging for the common good for health and aspects of health as a public good are crucial to ensure enforcing “health for all and by all” and improve the health status concerning economic, climate and environmental-related diseases, vector-borne diseases, and geography- and urbanization-related aspects.
- It is necessary to understand the needs of communities at the lowest level of decentralization to mirror the proposed interventions.
- Policy analysis should consider defining the whole Sudan structure and context with its health determinants, considering and investigating alternatives, and projecting and evaluating outcomes and impacts. It is important to outline the value of discernment on vulnerability and risk and the overall followed ideology.
- It is also necessary to come up with “value-based” alternatives that tackle the roots of poor health and the deprived health sector with a total partnership of communities as benefactors of health.
- The integrated SDGs are a benchmark for moving forward, particularly in planning, budgeting, and defining the points of intersects and synergies between the FMOH, the FMOF, and other line ministries. This will also ease the process of defining information parameters for internal and external tracking and monitoring. Yet, the paper suggests moves beyond this to consider “Sudan specificity” to find a solution specifically for the Sudan context. Crisis and pandemic preparedness should be a live diagonal investment.
- Certain paradigms should be mainstreamed within the whole system, and the planning structure to apply the long-term recommendations could include, for example:
 - a. Advocacy and participatory collaborative views and inquiries: It is important to ensure political commitment toward health and the empowerment of gender issues, youth agenda, conflict-affected settings, and marginalized populations. In this situation, the units of change are policy and processes.
 - b. Sociological analysis: This will help in the in-depth understanding of Sudan’s context and social construct, and it will ensure that fundamentals and socio-economic determinants are well tackled, particularly in regards to endemicity, vector mapping, poverty-related diseases, epizootics, outbreaks, and preparedness. It also helps tackle community groups’ needs and possible frameworks for representation and, most importantly, it helps integrate the “why” question all through the system.
 - c. Positivism and pragmatism views are also needed in building answers for inquiries related to resource allocations, decentralization, governor structure, and the implementation at the field and local level. Testing questions around best practices and possible interventions is needed, especially since analysis has shown serious challenges due to the structural adjustment consequences of budget cuts and decentralization on access, affordability, and availability of services. It might also help in centralizing health in the “state and institution building and restructuring.”
 - d. The realism to identify what can be done now as a “quick win,” what should come first, and what can be imposed as a long-term strategy. It is also important to question the overall perpetuated health structure and come up with solutions that mirror the community’s needs and priorities.

- e. Research and evidence generation is essential as it also helps strengthen the health information system and data quality, and certain questions should always be there:
- What are the effects and outcomes of the proposed change and intervention on Sudan settings?
 - What is the operational feasibility and cost-effectiveness of proposed interventions within the overall economic and development setting?
 - What are the comparative advantages/disadvantages of the proposed intervention within the universality and equity discourse as means to increase access to quality-assured public intervention with no financial hardships?
 - What are the lessons learned and the operational recommendations from the field and available Sudan-specific evidence?
 - What are the parameters, indicators, tools, and standards to be utilized in alignment with the introduction of any of these proposed interventions? This is needed to ensure a proper capture-recapture or effect analysis.

6. Recommendations

6.1 Macro-level themes

Stressing on that the call is for a radical change and the system building call for staging to avoid any disruption. Immediate and short-term ratifications and long-term solutions should be set in direct linkage with economic and state-building. The Ministry of Health should carefully develop a comprehensive national health strategy comprising short- and long-term impact; where the short term is for effectively addressing the crisis where responsibilities and accountability need to be much better defined (Table 4). It is also important to ensure the availability of adequate funding that covers the necessary and life-saving materials and medicines and establish coordination platforms with closer monitoring, evaluation, and a learning system to help the Ministry of Health address the urgent and necessary issues identified in the analysis.

A parallel path should go for a long-term radical reform/building of the health system in a way that avoids perpetuating inequalities and health gaps. The main feature of the proposed change is to ensure governmental and state dominance as well as strong governance models that tackle the disruption of the current financial and governor structure. Given the challenges, there should be a multi-sectorial answer on which governor structure the country should adopt. The government should be very assertive in the overall state model that will be adopted. A plan of no less than 10 years should be demonstrated based on local community needs and preferences and cover even the social determinants, security issues, and global warming-related risks. Applying it through a stepwise approach – starting with a community unit or a locality unit (depending on the agreed decentralization model) and expanding vertically and horizontally accordingly and with integrated evaluation and research – is crucial. Partnership models with communities and/or the private sector should be portrayed, considering the utmost need of strengthening the governmental sector capacity and its supervisory role. Nonetheless, adopting abrupt or non-acclimatized public-private partnership models might add extra layers of weakened systems and poor outcomes. Stressing on reading health with the overall political, development, and economic paradigm and applying

agonistic interventions revolving around preventative and need-driven healthcare linked to other development sectors is the main output of this paper. On the other hand, the system should be critical in questioning the global regimens, including the PHC, through research and community participatory approaches that reflect the specific community needs as an element for peacebuilding and justice. This generated evidence can lead the move toward a stepwise “Sudan-specific model” where PHC might be central or can be even shifted to primary care that is patient-centered in nature yet linked to the public health program. However, all should be based on local environmental and social needs.

Enforcing a live risk matrix and a risk analysis approach is also essential in bridging the noticeable lack of effective long-term policies and sustained health systems and relationships between the central and peripheral levels. The main strategic and operational conclusions relevant to health are directed to the Ministry of Health as well as other ministries of the government of Sudan (Table 4), including the Ministry of Finance, the Ministry of Higher Education, and the Ministry of Social Protection, among others, and they are parallel in nature. The following points and detailed table provide glimpses on areas to be tackled:

1. Prioritizing and working immediately on a comprehensive in-depth analysis of population health needs using a multi-disciplinary lens involving economic, development, and sociology disciplines. This is an important point to align the health sector to the overall state reforms through context-specific essential needs and models for cost-effective approaches.
2. The MOF should work on increasing the fiscal space (emphasis on government revenue generation and expenditure on health) and define the financial alternatives that harmonize and put forward the allocation efficiently for the SDG in the short-term and the radical change that will be selected.
 - The main spending should be governmental to ensure sustainability, and not less than 14 percent of the GDP per year until 2030 should be allocated to meeting SDG targets after the COVID-19 impact.
 - The OOP expenditure should not be a source of financing as it is not sustainable and precipitates inequity and poverty.
 - Strengthening the taxation strategy to increase compliance and rates, setting progressive taxation, and improving the sovereignty on country resources, such as mining, and related revenues and taxes.
 - All revenue generated from health sectors should be directed to the health sector.
 - The pooled generated revenues should be earmarked to the health sector; for example, population-based interventions such as improving WASH, integrated vector management, and environmental and hygiene-related public services. These will halt an ample magnitude of disease and ease the burden on the health system.
 - Setting targeted policies for women, poor, and conflict-affected settings as these are needed in conflict-affected countries. This will have a direct impact on morbidity and mortality indicators and halt imbalanced development in the long run.

3. Close and routine systematic communication and coordination between the Ministry of Finance and the Ministry of Health so as to answer the question of whether the issue of “the funding gap facing the health sector” is a matter of scarcity of resources or poor allocation and lack of planning abilities. This will also help in advocating for prioritizing health within the overall state-building and within any economic and development reform.
4. Enforcing policies that increase the revenue and have a spill-over on a healthy lifestyle, maternal and child health, and reductions of NCD burdens, such as:
 - The taxation of tobacco, beverages, high sugar and salt, and ultra-processed food (one percent increase in price due to taxation might lead to a decrease of 0.3 to 0.8 percent in smoking rates).
 - Earmarking percentages of corporate revenues, especially those working on increasing NCDs, in urbanization or in increasing pollution risk factors, to health system strengthening efforts and public promotive interventions.
5. All ministries, academic partners, and indigenous knowledge groups should develop an updated mapping of the climatic, entomological, and epidemiological risk factors for Sudan.
6. Given the COVID-19 crisis as well as the aforementioned and continuous emergencies and outbreaks, and the projected climatic crisis in Sudan and the associated effect, there should be an immediate comprehensive inter-ministerial multiple-hazard plan so that the country can analyze and integrate the emergency preparedness and response within the horizontal health system strengthening efforts towards UHC. The diversion should be toward a multi-sectoral and proactive multiple risk approach.
7. The Ministry of Health should build on the 2020 Wave 1 continuity plans and exercises and have an immediate costed plan to contain the effect on the disruption of the essential services due to COVID-19, especially those on vaccination and diseases with long-term treatment like NCDs and some of the CDs (ex. TB/HIV). The system should define the horizontal, vertical, and diagonal approaches. Secondary and primary data analysis could direct this exercise with its money allocation from FMOF and other development partners.
8. The apparently weak decentralized system and its negative impact on access to health calls for utilizing a wider frame of governance to define vertical and horizontal roles, the budget allocations up to the last mile, defining the operations of all the health system’s building blocks and functions, and the projected outcomes up to locality and admin unit levels. This should be done realistically by understanding the overall structure, the weakness of localities, and the financial stress in underdeveloped states, and being able to tailor and build in as needed.
9. Swift action and investment in the overall information system are essential to reach 100 percent and utmost data quality and usage. There should be a linkage between the civil registry and the district health information system while ensuring ethical and confidentiality aspects all through. These necessities sustained public spending on HR, the operations of systems at the last mile, the printing of health information books and registers, and the ratification of digital systems that are aligned to the FMOH-Ministry of Interior budgeted plan.

10. Enforcing a country-wide surveillance system to ensure detection, prevention, control, and monitoring of disease.
11. Strengthening the viability of multi-sectorial and multiple-point early warning systems.
12. The F-SMOH and the FMOH should develop HRH jobs at the central level in a unified register and pathway to drive the system into a more resilient manner and balance the turbulence caused by the ongoing contractual mode, gaps, and maldistribution within all health system levels.
13. Conduction of an urgent human resource forum to work on aligning human resource shortage and maldistribution through operational and short-term solutions.
14. Health-related syndicates can manage “diaspora in country serving” to organize certain shifts for serving in Sudan with the MSB and the FMOH to fit the gaps of the transition state and mainly in under-developed states and localities.
15. A more radical change in HR policy aligned with the overall country’s economic reform and financial policy (Table 4). The centralization of national posts during the transition period could be a way of sustaining financial coverage and equitable availability at state levels.
16. Supporting HR-HIS/observatory is highly needed to work on harmonizing the supply of higher education with FMOH needs and to build involvement, deployment, and retention policy that deals with state needs and gaps (WHO HR code-Push and Pull factors HR market force analysis).
17. Strengthening AHS in a way that is aligned with the agreed-upon decentralization-federal chamber reforms). Implementation of the skill mix and sharing, task shifting, community health workers and volunteer workers in a context-analyzed and institutionalized manner.
18. Implementation of planned “one health” approaches, especially in states with agricultural and livestock schemes. This should be linked with well-supported IHR regulations and in alignment with the nationwide surveillance system.
19. A thorough review should be accomplished to the pharmaceutical sector to answer how appropriate and consistent Sudan’s pharmaceutical and medical policies are. This is to ensure that all elements of supply and demand theories are well catered for and to ensure alignment with the FMOF economic and developmental policy and financial strategy.
20. Enforcing EML and national forecasting and quantification through an inclusive committee of multidisciplinary experts.
21. Immediate support for a costed supply and logistics management information systems plan as part of the HIS strengthening plan.
22. Ensure single player, explore efficiency points, and avoid fragmented points of medicine financing (social protection, health, Zakat, taxes, health insurance). This should be aligned with the overall health financing policy as part of the country’s fiscal policy). Pharmacoeconomics and health economists’ work should include picking the EML, life savings, and the exact country’s needs and selection.
23. For now, the country should finance the free medicine project through improving and tackling the supply chain gaps and strengthening the governance and administrative structure to avoid fragmentation between the NMSF and the DGoP to absorb expected/ongoing economic shocks.
24. Mobilizing immediate resources to complement external funds, especially since the GAVI and GF transition is underway to sustain all investments.

25. Establishment of a board of hospitals that controls everything related to hospitals. The board’s approach should feed in the economic and mathematical modeling. The board should know the exact expenditure and medical and non-medical costing and support hospital management and cost budgeting planning. This board should also work in alignment with agreed upon FMOF financial alternatives and policies. Certain answers are strictly needed regarding the provider payment, consultation fees, sources of drug cost-sharing...etc.
26. We need to demonstrate the exact load of sectors within the health system (public, private, mix) and in between primary, first referral, and tertiary levels. It is also needed for the forecasting and quantification, the selection of the type of medicines as per EML, and drug availability and quality of services evaluation
27. Setting UHC-NHIF benefit packages and the evidence-based costing of packages and needs as part of the short-term phases that move in parallel with the radical reform arrangements.
28. The Ministry of Finance should support the on-costing exercise to ensure health intervention coverage rates and the expansion of marginal cost in comparison to average cost to reach the unreached population in rural and conflict-affected settings.

6.2. Micro-level recommendations at the level of the health system building blocks and stakeholders

The following table puts a more detailed micro level and some operational recommendations and the major players. As stated, the reform might need realistic two parallel arms to phase out to a more resilient system aligned to the unified state program.

Table 4. The recommended actions within the health system building blocks by health stakeholders

Recommendation	Players
Leadership and governance:	
1. Putting health in the center of the “decentralization and governance dialogue” to ensure that weaknesses, realistic challenges on prevention and hygiene as well as PHC (with all its function or a primary care linked to public prevention intervention) service provision are well tackled and that there is no skew toward the strong centers with high revenue-generating capacities. The recommended approach should investigate all Sudan scholars on the effect of weak structure and vague roles and responsibilities on minimizing the capacity of public services, affordability, and access.	Ministry of Federal Government, F/SMOH, F/SMOF, academics, syndicates, and local communities.
Health financing:	
<ul style="list-style-type: none"> ▪ Conduction of multi-sectoral dialogue and development of the transformative Sudan health sector financing plan and strategy as part of the whole of state economic policy that should be aligned with SDG indicators (the arm of the short-term effect before coming out with the evident long-term prototype that works specifically for Sudan). The policy and strategy should cover: ▪ Identification of the ideology and the structural model that leads the expenditure and health financing apparatus. ▪ The FMOF plan of expanding the sustained fiscal space as well as setting alternative financing approaches, roles of all stakeholders, and the financing contributions. ▪ The FMOF and FMOH should utilize a realism lens and avoid abrupt engagement in assumptions that are merely theoretical such as those related to the potential release of public funds which can be used for primary care and pro-poor investments, thereby ensuring equity in case of increasing coverage of private health insurance. ▪ Quantifying the private sector’s contribution and weaknesses to plan for better sovereignty and FMOH stewardship approaches to oversee and control quality and impact on patients. ▪ Demonstrating specific contributions for the poorer groups and the post-conflict settings’ needs. The Gini co-efficient should also be considered for disparities and the distribution of financing alternatives and approaches. ▪ Setting “multi-sectoral medicine and technology financing with a well-defined pricing policy and strategy” that demonstrates the reliance, load, and role of each sector; the NMSF, local manufacturing, and private 	Led by FMOF, FMOH, Ministry of Social Services (MOSS), states, Ministry of Justice, academics (Pharmacoeconomists, health economists, policy advisors, economists, and modelling experts), and other line ministries.

sector. Key performance indicators should be integrated to avoid market gaps and failures and ensure that “technical-rational theory” speaks to “market-based theory” and put a detailed risk mitigation to ensure the availability of affordable, quality-assured medicine that meets the needs and demands of the Sudanese community. All should be aligned to a unified and updated forecasted and quantified essential medicine list and a well-developed vital medicine list.

- Determining the government’s contributions in strengthening the health information systems and the supply chain in term of inventory management, storage, distribution, and logistics management systems. Without fully cascading domestic contribution, there will be no state ownership or sovereignty toward ensuring the availability of free or affordable quality-assured medicines up to the last mile in the least developed states.
- Set a plan on how FMOF and NHIF will raise additional resources through earmarked progressive taxes and premiums through context sensitive models that cater for the formal and informal sector. The above recommendations on financing policy and the short versus long term solutions that work specifically for Sudan should be considered.
- Digital mapping of average costs and marginal costs of expansion to the unreached, for health interventions and programs as per the National Health Policy and Strategy 2021 to ensure having a realistic budget and covering the health priorities at the vertical and horizontal levels.
- Setting feasibility studies on options for investing funds available and building on points of efficiencies within NHIF and FMOH resources.
- Immediate provision of capacity-building for updated and automated financial management systems to ensure compliance with the FMOF and the development partner’s financial and procurement rules and regulations and avoid high transaction costs. This will mainstream accountability, efficiency, and meeting of health outcomes.
- Capacity-building of internal and external auditing that is aligned to “risk-based management” and “preventative auditing.”
- Setting a well-defined financing and budgeting formula that reflects the “Federal-State-Locality-Admin Unit” level in a realistic way that is based on context specificity; fragility, disease map, human resources, revenue generation, and administrative capacity.

Human resource for health:

1. Provision and centralization of budgeted HRH jobs through a unified scheme based on a specific projection exercise for at least the coming five years. This is an immediate step to improve the service provision and therefore improve the legitimacy and contract with the society.
2. Ensure equitable HRH distribution among the decentralized vertical level as well as the horizontal level of tertiary, secondary, and PHC levels. This will help in the transformation from “zero contractual agreements” to a more sustained stream with supported ethical liabilities and hierarchical knowledge transfer, hence providing a better quality of services.
3. Retention modalities should be enforced.
4. Provision of centralized jobs needed for serving interventions related to health as a public good, such as vector management, hygiene inspection, and other preventative measures that are conducted at the peripheral level.
5. Partnerships through syndicates, the Sudan Medical Specialization Board (SMSB), the Sudan Medical Council (SMC), the Paramedic Council, the Academy of Health Science (AHS), and the Sudanese Intellectuals Initiative in Diaspora to ensure supporting sustainable capacity-building and transferring know how in reported case gaps.
6. The fit-for-purpose exercise is important, as when the dialogue agrees on PHC investments as central to UHC and the comprehensive packages that will be covered afterward, partners should modify the medical/paramedical education (adding one extra year with a curriculum that produces probable family or general physicians) that are fit for the exact need.
7. Also, in alignment with the fit-for-purpose concept, the FMOH (along with its partners) should assess the in-service training (ex. the in-service family physician training project that was initiated in Gezira in 2010 among other initiatives related to coverage increase). In Kassala, midwives were deployed and teachers were trained and used as midwives in North Kordofan, and both projects should be assessed for demonstration and expansion.

The FMOH, the FMOF, WHO, the Federal Ministry of Higher Education FMOHE, and the NHIF.

Health services and quality:

1. Having an autonomous board of hospitals to fully coordinate and manage hospitals in Sudan is needed. This will complement the stewardship and standard setting role of FMOH. The main features of the board would be the following:
 - Have a structure for hospitals that read the agreed upon decentralization in a clear and efficient way.
 - Set clear roles, responsibilities, and chain of command on the vertical and horizontal level.
 - Project and set budgets for each hospital.
 - Align the financial and administrative roles with the agreed upon health financing policy to sustain the provision of quality services.
 - Project skills and HR needs all through in linkage with the centralized unified register funded by FMOFE.
 - Set the needs assessment for training and orientation practices, especially hospital management aspects.
 - Manage the budget in coordination with MOFE.
 - Enforce accreditation and quality of services aspects.
 - Ensure quality and confidentiality medical records and information systems as per FMOH standards.
 - Ensure thorough utilization of monitoring and evaluation in line with hospital performance indicators, patient satisfaction indicators, and workload indicators (WASIN).

- Serve the other common public goods in coordination with relative sectors, such as waste management, WASH, and quality aspects – especially those related to the rational use of medicines, AMR-one health approaches, surveillance systems, and pharmacovigilance.
- 2. The autonomous board of hospitals should enforce TORs for each type of HR/cadre (medical and non-medical) along with the FMOH-HR, the Federal Ministry of Higher Education (FMOHE), the Sudan Medical and Para-medical Councils (SMC), and the Sudan Medical Specialization Board (SMSB).
- 3. Ensure that the hospital management staff and medical director have extensive hospital management training.
- 4. Have regular joint structured supervision on the hospitals with the FMOH and the SMOH and ensure alignment with structured and quantified Monitoring Evaluation Research and Learning (MERL) tools and reporting to the FMOH.
- 5. FMOH to work extensively on ratifying the referral systems and ensuring that this element is well supervised.
- 6. Private hospitals to earmark no less than five percent of their capacity to be able to respond to and manage outbreaks and emergencies in close collaboration with the FMOH and the SMOH.
- 7. The FMOH to lead and sustain the standardization of all diseases and this should be applied in public as well as private care settings (applying concepts of rational theories and combating AMR).
- 8. Implementation of integrated community case management (ICCM) in the institutionalization of the pool of already trained community health workers and midwives. Acclimatization of guidelines and recording and reporting tools and referral with primary entry and first referral levels in alignment with RMNCH and comprehensive maternal childhood approaches as well as implementing the project as implementation research.
- 9. Finalizing the PHC coverage survey and mapping as a benchmark for investments (sustained HR, medicine, and diagnostics) according to potential (grade A and B/highest and medium potential) as well as the geographical distribution to reduce the non-medical cost on population. The investment should be linked to the short term investment on PHC centers to ensure a sustained function that increases access and pool into UHC. The long-term investment will be based on what will be agreed upon reform on the best model of health or care Sudan will follow (i.e. comprehensive PHC with community centricism and positive outreach/community centered PHC linked to ICCM that focus on diseases related to RMNCH only/patient-focused primary care and an aligned primary health intervention...etc.).

Procurement and supply chain management:

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| <ol style="list-style-type: none"> 1. Initiation of a national inclusive forecasting and quantification committee for essential and lifesaving/vital medicines based on approved lists. Technical assistance can be catered to building capacity and adopting the appropriate tools and technologies to be used. 2. Having an international restricted tender bulk procurement for essential and lifesaving/vital medicines to regulate the cost and cover at least two years' needs of medicine. 3. Set a plan to sustain the fund pool not to get devaluated and (together with the FMOF) work on having a monetary system that sustains the value. Any revenues generated from the NMPB should be allocated strictly to sustaining quality-assured medicine up to the last mile. 4. Implement the optimization of distribution exercise' recommendation and dissolve the locality as a layer to strengthen the command and ensure the timely and cost-effective provision of medicines up to the last mile. Research to study the outcome should be run in parallel to the intervention. This should also be read in the decentralization agreed structure dialogue. 5. Assess the ongoing outsourcing and public private partnership (PPP) used in the pharmaceutical sector for distribution and other aspects through a "value for money" lens and ensure that the replication of PPP is aligned with implementation and operation research. 6. Strengthen local manufacturing through a stepwise expansion plan that is aligned with overall National financing policy. | <p>Ministry of Federal Government, F/SMOH-RDF, F/SMOF, Pharmacoeconomists, health economists, Pharmacoepidemiologists, PSM specialists, Academicians, NHIF, Parastatal bodies.</p> |
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Health information system:

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| <ol style="list-style-type: none"> 1. Immediate outsourcing of a mentorship implementation program for civil registration (birth certificate, death certificate, and disease classification), IHMIS and ELMIS to ensure 100 percent coverage of information systems in Sudan in line with strategic directions and in linkage to SDGs. This should cover up to the data quality audit and usage. This will feed in the forecasting and quantification routine exercises and reporting against coverage and outcome indicators. 2. Generate the critical mass of researchers from FMOH and the FMOHE 3. Development of FMOH research priorities and the advocacy plan for the priorities among the FMOHE and all universities and academic institution to be conducted by affiliates. The outcome should be a publication in a high- impact, peer reviewed journal. 4. Building an operational research partnership (ex. Structured Operational Research and Training Initiative (SORT IT) UNION-TDR to bridge the gap between FMOH programmatic data information and decision-making). 5. Reviving implementation research in collaboration with well reputed platforms like Research and Training in Tropical Disease (TDR-MOOC) to test certain evidence-based informed public health and health system strengthening packages, such as integrated community case management (ICCM) for childhood illnesses and maternal health support and other neglected tropical diseases, as well as testing models of financing alternatives to support UHC and other models to support access. 6. Mainstreaming of Monitoring Evaluation Research and Learning (MERL) all through the FMOH strategic direction of the National Policy and the operations. | <p>The FMOH, the Ministry of Federal Government, the F/SMOH, the Civil Register, the F/SMOF, academics, and the FMOHE partners.</p> |
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Common good for health and pool resources:

The Ministry of Federal

1. The FMOH should earmark “common goods for health” that would complement the whole health intervention cascades to ensure comprehensive public funding and align it with the advocacy and communication strategy to highlight its importance, externalities, and the area of collective actions and solidarity among communities. This is highly needed, especially for:
 - Supply chain elements.
 - Governance laws and regulations related to improving common pool resources like those related to environmental, occupational, WASH, and NCDs as per the stepwise survey findings.
 - Vector control interventions at state and locality levels.
 - Immunization, especially since GAVI is phasing out.
 - Strengthening regulation and safety through pooling the funding of cross-ministries and governmental bodies that are involved (Metrology, FMOH, NDQCL-NMPB, MO Livestock...etc.). In the long term, dealing with this through the FDA approach is crucial.
 - Whole of state biosafety and biosecurity systems involving all sectors of health, animals, and agriculture.
 - Proactive whole of state-multisectoral systems that tackle integrated multi-hazards and risks utilizing coordination platforms, such as one-health and IHR components. Considering Center of Disease Control (CDC) and intelligence approaches in a cross-agency manner might be a helpful and more cost-effective medium-term solution.

Government, the F/SMOH, the F/SMOF, academics, the Ministry of Justice, and the Metrology Cooperation.

Emergency and epidemic preparedness and control:

1. A joint review of a possible point of synergy between FMO livestock, FMO agriculture, and FMOH-NR lab to ensure having a viral lab that caters to a one health approach and as a mean of readiness to all endemic and emerging viral diseases that might happen due to climate changes and COVID-19 disruption (vector-borne, vaccine-related, among others).
 2. Urgent mobilization of domestic resources to implement a costed one health plan.
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Federal and state ministries, WHO, OIE, and FAO.

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