

The COVID-19 pandemic and healthcare systems in Africa: a scoping review of preparedness, impact and response

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ABSTRACT

Background The COVID-19 pandemic has overwhelmed health systems in both developed and developing nations alike. Africa has one of the weakest health systems globally, but there is limited evidence on how the region is prepared for, impacted by and responded to the pandemic.

Methods We conducted a scoping review of PubMed, Scopus, CINAHL to search peer-reviewed articles and Google, Google Scholar and preprint sites for grey literature. The scoping review captured studies on either preparedness or impacts or responses associated with COVID-19 or covering one or more of the three topics and guided by Arksey and O'Malley's methodological framework. The extracted information was documented following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension checklist for scoping reviews. Finally, the resulting data were thematically analysed.

Results Twenty-two eligible studies, of which 6 reported on health system preparedness, 19 described the impacts of COVID-19 on access to general and essential health services and 7 focused on responses taken by the healthcare systems were included. The main setbacks in health system preparation included lack of available health services needed for the pandemic, inadequate resources and equipment, and limited testing ability and surge capacity for COVID-19. Reduced flow of patients and missing scheduled appointments were among the most common impacts of the COVID-19 pandemic. Health system responses identified in this review included the availability of telephone consultations, re-purposing of available services and establishment of isolation centres, and provisions of COVID-19 guidelines in some settings.

Conclusions The health systems in Africa were inadequately prepared for the pandemic, and its impact was substantial. Responses were slow and did not match the magnitude of the problem. Interventions that will

Key questions

What is already known?

- COVID-19 affects people of all ages, however, older people, and those with underlying medical conditions are at greater risk of infection and mortality from the disease.
- Despite the slow progress of the COVID-19 pandemic in Africa, there is increasing concern about the impact as nearly all countries in the region have weak healthcare systems.

What are the new findings?

- Africa's health systems were not well prepared for the pandemic.
- The response was generally slow and disproportionate to the magnitude of the problem.
- The pandemic had sizeable adverse effects on access to and utilisation of essential services.

What do the new findings imply?

- Efforts should be directed toward building health system resilience through local, national and global engagement and improving healthcare financing.
- African countries should focus on a coordinated approach to build capacity for vaccine development, transport and roll-out of vaccination for healthcare professionals and high-risk individuals, including rural areas.
- High-quality time-trend analyses are needed to understand better the extent and nature of ongoing changes and responses of the African health systems to the pandemic.

improve and strengthen health system resilience and financing through local, national and global engagement should be prioritised.



INTRODUCTION

COVID-19, caused by a novel SARS-CoV-2, continues to create havoc across the globe.^{1 2} COVID-19 affects people of all ages; however, older people; and those with underlying medical conditions are at greater risk of infection and mortality from the disease.² As of 26 October 2021, over 244 million people were infected by the virus, and the COVID-19 pandemic caused 4.95 million deaths globally. Africa alone registered an estimated 8.5 million COVID-19 infections and over 217 000 deaths.³ Despite the late start and slow progress of the COVID-19 pandemic in Africa, there is increasing concern about the impact of the pandemic as nearly all countries in the region have weak healthcare systems.⁴

Africa has limited health infrastructure and workforce, including a shortage of professionals trained in critical care and inadequate tertiary care facilities (specialised hospitals) equipped with intensive care units (ICUs).⁵ In urban areas of Africa, health facilities are overcrowded with patients due to staff shortages, while in rural areas, unreliable transport and poor roads infrastructure remain key bottlenecks for access to medical care.⁴

The World Health Organization (WHO) recommends regular hand washing, face masks, social distancing and covering the mouth and nose while coughing or sneezing to prevent transmission of the virus.^{6 7} However, these measures mainly depend on how individuals respond to advice.⁸ Furthermore, resource scarcity could further hamper compliance in regions like Africa, even when people are willing to abide by these rules. For the same reasons, African countries might also be unable to implement WHO's recommended quarantine strategies at airports and hospitals for suspected contact tracing of confirmed cases.⁹ The possibility of an outbreak of other infectious causes, including an Ebola outbreak, on top of COVID-19, may add further complexity to the already complex public health systems in the region.¹⁰

Cognisant of the multifaceted effects of the pandemic and the need for better preparation, the Africa Centres for Disease Control and Prevention has established a task force in six main work streams: laboratory diagnosis; surveillance, including screening at points of entry and cross-border activities; infection prevention and controlling healthcare facilities; clinical treatment of people with severe COVID-19; risk communication; and supply chain management and stockpiles.^{11 12} Public health and social measures have also been implemented across Africa which included, but not limited to, shutting borders, introducing self-isolation of exposed persons and establishing of quarantine centres.⁵ However, adherence to prevention measures varied remarkably.^{13–15}

The few available studies showed that while there was limited surge capacity to provide COVID-19 treatment, the pandemic also affected the general public's access to essential health services.^{16 17} While there were two scoping reviews to date, one investigated the impact of COVID-19 on maternal and perinatal health,¹⁸ and the other focused on access to sexual and reproductive health,¹⁹

both reviews were based on experience from western countries. It is worth reviewing the available evidence on the level of health system preparedness, impacts of and responses for COVID-19 in Africa, which is the aim of this scoping review.

METHODS

Study design

We conducted a scoping review since it allows us to capture the broad nature of the research question and range of health system preparedness measures, impacts of and responses implemented across Africa in different settings. We followed the methodological framework suggested by Arksey and O'Malley²⁰ and further refined by Levac *et al*²¹ which comprised of the following five steps: (a) identifying research questions, (b) identifying relevant studies, (c) selection of studies, (d) extraction and charting of data and (e) summarising and reporting results.

Identifying research questions

The following questions guided the scoping review: (1) How well prepared were the existing health systems in responding to adverse impacts of COVID-19 infection? (2) What were the implications or consequences associated with COVID-19 on the healthcare system in Africa? (3) How did the health system respond in maintaining pre-pandemic health service needs, including providing essential healthcare services?

To effectively answer these questions, we adopted the population, concept and context framework developed by the Joanna Briggs Institute,²² as described in table 1.

Identifying relevant studies

GAT developed a comprehensive searching strategy and discussed with the research team, presented in online supplemental file 1. We searched peer-reviewed papers on PubMed, Scopus and CINAHL bibliographic databases for peer-reviewed articles. Since grey literature such as unpublished work, preprint articles and relevant government reports on COVID-19 have grown in number and significance, we also searched Google and Google Scholar and MedRxiv and Research Square websites. We considered studies that employed quantitative or qualitative methods and reported health systems more broadly or any essential health services. These studies reported the impact of COVID-19 on maternal and child health services, services for infectious diseases such as tuberculosis, malaria, HIV and antiretroviral treatment services, chronic care, cancer care, hypertension care and treatment, and mental health services. We included studies conducted between 1 December 2019 and 21 March 2021, at which time the comprehensive literature search was performed.

Study selection

We included any published, preprint or grey literature in English that explored a combination of the following

Table 1 Population concept context (PCC) framework for defining the eligibility of the studies for the primary research question

Criteria	Element(s)	Descriptions
P—Population	All people	All individuals accessing healthcare services.
	Health workforce	Healthcare workers such as physicians, nurses, midwives and paramedics working as frontline contact in the healthcare system.
C—Concept	Preparedness	The ability and readiness of the health system to avail material and human resources to provide general and essential services during the pandemic.
	Impact	The effects that COVID-19 has on the provision of uptake and access to health services.
	Response	The capacity of the health systems to mobilise the required resources and act quickly to address the adverse consequences of COVID-19 pandemic; deliver all the necessary health services to those in need and support the healthcare workers during the pandemic.
C—Context	General health services	Any health service sought by patients at any level—community health posts, health centres, hospitals—or provider—public or private—settings.
	Essential health services	Healthcare services comprising any of the following services: maternal and child health services such as antenatal care, facility delivery, postnatal care and immunisation services; infectious diseases such as malaria, HIV and chronic care including cancer treatment.
	African countries	Any country in continental Africa that reported on preparedness, impacts and responses of COVID-19 on general or essential health services and its health workforce.

three terms: ‘health system preparedness’, ‘the impact of’ and ‘responses for COVID-19 pandemic by the healthcare system’. Two investigators (GAT and FHT) searched and screened the studies by titles and abstracts and then reviewed the full texts of potential studies. Records were managed by EndNote X9.0 software. The reference lists of the included studies were screened for relevant studies. Any questions around study eligibility were resolved through consensus between the two investigators (GAT and FHT). However, we excluded articles that mainly focused on the clinical and biological conditions of the diseases without any contextual linkage into the health system or those investigating the perceived/anticipated health system impact of the COVID-19 pandemic. Editorials, commentaries and letters to the editor that did not involve primary data were also excluded.

Data charting process

Two reviewers (GAT and FHT) initially developed a pre-determined electronic data-charting form that the research team later discussed and agreed on. Five reviewers (GAT, BAD, AGT, KG, DE) extracted data from included studies. The data extraction form had the year of publication, country name, article title, journal, study design, study setting and population. It also captured the key findings reported in the three core areas of health systems (ie, preparedness, impact and response) and limitations acknowledged in each study.

Summarising and reporting the results

We used a thematic content analysis using narrative descriptions of the extracted data, and organised the results under three main domains: preparedness, impacts and responses. We reported the review following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines Extension for Scoping Review reporting standards (online supplemental file 2).²³

Patient and public involvement

The study did not involve patients or the general public. Their input was not sought in the systematic review design, interpretation of results, or drafting or editing this document.

Ethics statement

This study was a systematic review of publicly available literature, and ethical approval was not required.

RESULTS

Description of studies

We retrieved 804 records from databases and an additional 37 documents from grey literature sources. After removing duplicates, 747 records remained for titles and abstracts screening, of which 83 articles were retrieved for full-text screening. We conducted the final review on 22 studies,^{16 24–44} of which 19 (86.4%) were quantitative (figure 1, table 2). A total of 61 papers were excluded for the following reasons: studies assessed clinical and biomedical aspects of COVID-19 (n=28); covered expert opinions or commentary that did not involve primary data (n=12); assessed perceived or anticipated impacts (n=13); were not focused on Africa (n=8).

Characteristics of the included studies

Table 2 summarises the key characteristics of the studies included in our review. Of the included studies, about three-quarters (72.7%) were published in 2020. Except for four studies^{24 31 38 42} that were multicountry, 18 came from 10 different countries: four were from Ethiopia,^{16 32 33 36} three each from Kenya,^{27 34 43} and Uganda.^{28 30 41} While 18 (81.8%) were original studies^{16 24 26–30 32–35 37 38 40 42–44} published either in peer-reviewed journals or available in preprint repositories, the remaining four studies^{25 31 36 39} were published as letters to editors or commentaries but

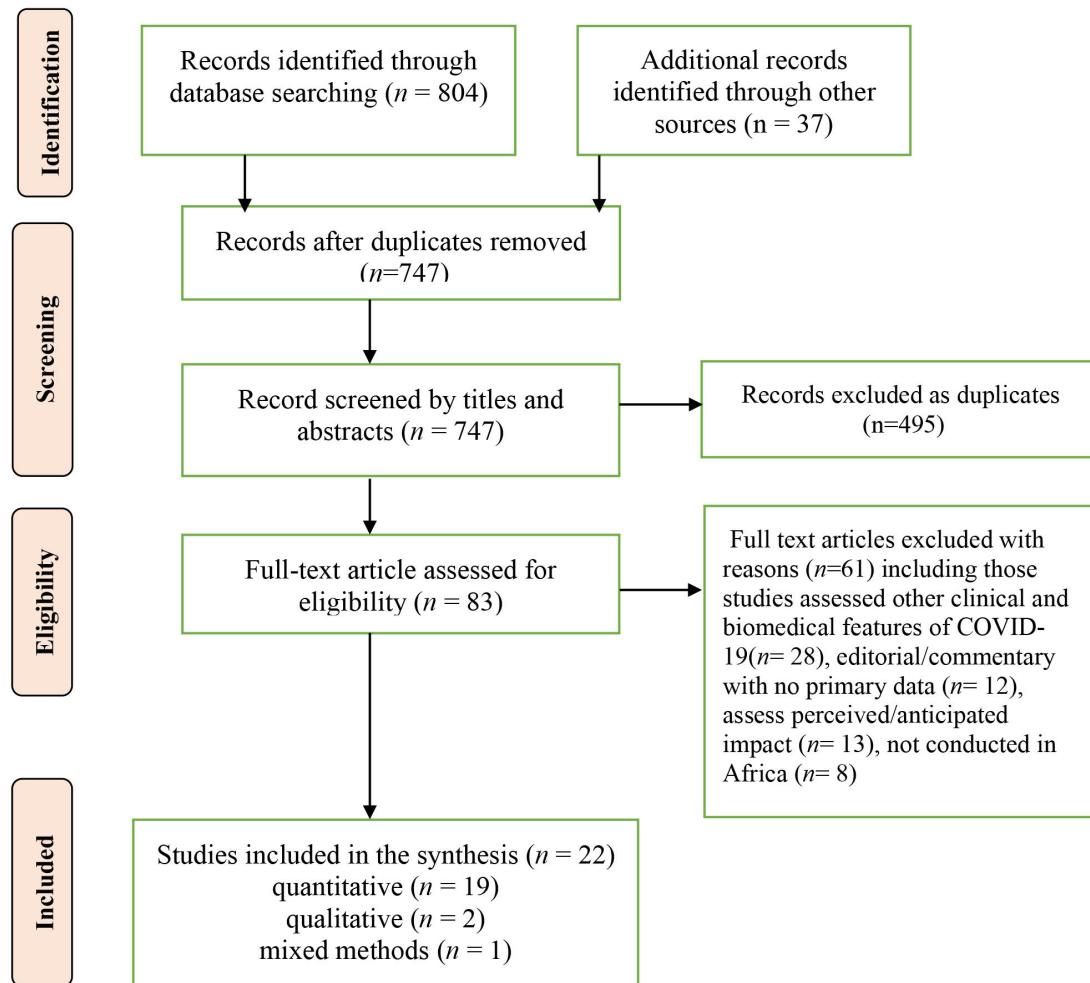


Figure 1 PRISMA-ScR flow diagram.

backed up by primary data. Of the included studies, 19 studies^{16 24 25 28-32 34-41 43-45} described the impacts of COVID-19 on accessing healthcare services, 7 studies^{24-28 33 38} reported health system responses to mitigate COVID-19 and 6 studies^{24 26 27 32 33 38} provided information on health system preparedness. Six studies^{24 26-28 34 38} focused on the general healthcare system. At the same time, four studies investigated specific health services components such as essential healthcare services, including specific healthcare delivery for maternal, child and sexual and reproductive health services.^{29 30 35 43} Additionally, three studies focused on infectious diseases such as tuberculosis^{36 37} and HIV.³⁹ Another three studies reported on healthcare services for cancer care,²⁵ mental health services⁴⁰ and integrated care for hypertension and HIV.⁴¹ Moreover, four studies^{31-33 42} assessed health workforce preparedness and workers' experiences during the pandemic. Details of the study characteristics are provided in online supplemental file 3.

Main themes from the included study

Health system preparedness

Six studies^{26 27 32 33 38 42} included under this theme demonstrated a low level of preparedness of Africa's health system to prevent, diagnose and manage the COVID-19

pandemic in the region (table 3, online supplemental file 4).

Resources to manage and guide COVID-19 were limited or not available

Three studies^{26 33 42} reported insufficient resources, including personal protective equipment (PPE) and clinical guidelines for healthcare providers during the pandemic. A Tanzanian study²⁶ showed low health facility readiness for COVID-19 prevention measures, with only two-thirds (64%) of urban and one-third of rural (32.9%) health facilities having functioning communication systems. A study from Ethiopia showed that half (50%) of the healthcare providers were not satisfied with the available medical equipment for COVID-19 treatment in their hospitals.³³ A global study that included African countries also reported that over half (53%) of healthcare workers working in maternal and neonatal health service provisions in low/middle-income countries did not receive updated guidelines for the management of COVID-19.⁴²

Healthcare workers preparedness

Two studies^{33 42} assessed the knowledge of healthcare workers on different aspects of COVID-19 and showed

Table 2 Summary of studies by study context and main focus in the healthcare system

Characteristics	Number (%)	Evidence
Publication year		
2020	16 (72.3)	Abdela et al, ¹⁶ Ahmed et al, ²⁴ Ammor et al, ²⁵ Bajaria et al, ²⁶ Barasa et al, ²⁷ Bell et al, ²⁸ Buonsenso et al, ²⁹ Gichuna et al, ³⁴ Mohammed et al, ³⁶ Odume et al, ³⁷ Sagaon-Teyssie et al, ⁴⁰ Jensen et al, ³⁵ Pierre et al, ³⁹ Semaan et al, ⁴² Shikuku et al, ⁴³ Siedner et al, ⁴⁴
2021		
	6 (27.3)	Burt et al, ³⁰ Deressa et al, ³² Desalegn et al, ³³ Otitoloju et al, ³⁸ Schwartz et al, ⁴¹ Debes et al, ³¹
Country of study		
Ethiopia	4 (18.2)	Abdela et al, ¹⁶ Deressa et al, ³² Desalegn et al, ³³ Mohammed et al, ³⁶
Kenya	3 (13.6)	Barasa et al, ²⁷ Gichuna et al, ³⁴ Shikuku et al, ⁴³
Nigeria	1 (4.5)	Odume et al, ³⁷
Uganda	3 (13.6)	Bell et al, ²⁸ Burt et al, ³⁰ Schwartz et al, ⁴¹
Rwanda	1 (4.5)	Pierre et al, ³⁹
Tanzania	1 (4.5)	Bajaria and Abdul, ²⁶
Mali	1 (4.5)	Sagaon-Teyssie et al, ⁴⁰
Morocco	1 (4.5)	Ammor et al, ²⁵
Sierra Leone	1 (4.5)	Buonsenso et al, ²⁹
South Africa	2 (9.1)	Jensen and McKerrow, ³⁵ Siedner et al, ⁴⁴
Multicountry*	4 (18.2)	Ahmed et al, ²⁴ Debes et al, ³¹ Otitoloju et al, ³⁸ Semaan et al, ⁴²
Types of articles		
Original articles	18 (81.8)	Abdela et al, ¹⁶ Ahmed et al, ²⁴ Bajaria et al, ²⁶ Barasa et al, ²⁷ Bell et al, ²⁸ Buonsenso et al, ²⁹ Burt et al, ³⁰ Deressa et al, ³² Desalegn et al, ³³ Gichuna et al, ³⁴ Jensen et al, ³⁵ Odume et al, ³⁷ Otitoloju et al, ³⁸ Sagaon-Teyssie et al, ⁴⁰ Schwartz et al, ⁴¹ Semaan et al, ⁴² Shikuku et al, ⁴³ Siedner et al, ⁴⁴
Commentary/letter to editor†	4 (18.2)	Pierre et al, ³⁹ Mohammed et al, ³⁶ Debes et al, ³¹ Ammor et al, ²⁵
Study designs		
Quantitative	19 (86.4)	Abdela et al, ¹⁶ Ammor et al, ²⁵ Bajaria et al, ²⁶ Barasa et al, ²⁷ Bell et al, ²⁸ Buonsenso et al, ²⁹ Burt et al, ³⁰ Debes et al, ³¹ Deressa et al, ³² Desalegn et al, ³³ Jensen and McKerrow, ³⁵ Mohammed et al, ³⁶ Odume et al, ³⁷ Otitoloju et al, ³⁸ Pierre et al, ³⁹ Sagaon-Teyssie et al, ⁴⁰ Schwartz et al, ⁴¹ Shikuku et al, ⁴³ Siedner et al, ⁴⁴
Qualitative	2 (9.1)	Ammor et al, ²⁴ Gichuna et al, ³⁴
Mixed methods research	1 (4.5)	Semaan et al, ⁴²
Health services context		
General health services/health system	6 (27.3)	Ahmed et al, ²⁴ Gichuna et al, ³⁴ Abdul, ²⁶ Barasa et al, ²⁷ Bell et al, ²⁸ Otitoloju et al, ³⁸
Essential healthcare service delivery	2 (9.1)	Abdela et al, ¹⁶ Siedner et al, ⁴⁴
Maternal, child, sexual and reproductive health services	4 (18.2)	Burt et al, ³⁰ Jensen and McKerrow, ³⁵ Shikuku et al, ⁴³ Buonsenso et al, ²⁹
Infectious diseases‡	3 (13.6)	Mohammed et al, ³⁶ Odume et al, ³⁷ Pierre et al, ³⁹
Chronic care§	3 (13.6)	Ammor et al, ²⁵ Sagaon-Teyssie et al, ⁴⁰ Schwartz et al, ⁴¹
Health workforce	4 (18.2)	Debes et al, ³¹ Desalegn et al, ³³ Semaan et al, ⁴² Deressa et al, ³²
Main focus¶		
Preparedness	6 (22.7)	Ahmed et al, ²⁴ Bajaria and Abdul, ²⁶ Barasa et al, ²⁷ Desalegn et al, ³³ Deressa et al, ³² Otitoloju et al, ³⁸
Impact	19 (86.4)	Abdela et al, ¹⁶ Ahmed et al, ²⁴ Ammor et al, ²⁵ Bell et al, ²⁸ Buonsenso et al, ²⁹ Burt et al, ³⁰ Debes et al, ³¹ Deressa et al, ³² Desalegn et al, ³⁴ Gichuna et al, ³⁴ Jensen and McKerrow, ³⁵ Mohammed et al, ³⁶ Odume et al, ³⁷ Otitoloju, et al, ³⁸ Pierre et al, ³⁹ Sagaon-Teyssie et al, ⁴⁰ Schwartz et al, ⁴¹ Shikuku et al, ⁴³ Siedner et al, ⁴⁴ Semaan et al, ⁴²
Response	7 (31.8)	Ahmed, et al, ²⁴ Ammor et al, ²⁵ Barasa et al, ²⁷ Bell et al, ²⁸ Otitoloju, et al, ³⁸ Semaan et al, ⁴²

*Studies involving one or more African counties as part of a global study.

†Included letters to editor's papers that was conducted based on a primary study.

‡Tuberculosis and HIV care services.

§Cancer, mental health, integrated care for hypertension and HIV.

¶More than one aspect was involved.

**Table 3** Summary of key findings on preparedness, impact and response of healthcare system in included studies

Health system context	Evidence	Examples
Preparedness		
Resources to prevent COVID-19 were limited or not available	Bajaria and Abdul ²⁶ Semaan et al ⁴² Desalegn et al ³³	<ul style="list-style-type: none"> ▶ Limited availability of some COVID-19 precaution products, such as medical masks, disinfectants, alcohol-based hand rub and access to running water, especially at publicly managed facilities and facilities in rural areas. ▶ Less than half (47%) of respondents in LMICs received updated guidelines for care provision. ▶ Half (50%) of the healthcare workers were not satisfied with the medical equipment available for COVID-19 treatment in their hospitals. ▶ Most of the healthcare workers were not optimally prepared to prevent the COVID-19 outbreak.
Knowledge gaps by healthcare workers	Desalegn et al ³³ Semaan et al ⁴²	<ul style="list-style-type: none"> ▶ Moderate knowledge about signs and symptoms, identification of persons at risk of developing the disease, case definition of COVID-19, appropriate tests offered to suspected cases and high-risk patients and preventive measures that help to minimise the risk of transmission. ▶ Only 15% of healthcare workers reported that they clearly identified how to provide care for women with COVID-19.
Lack of training opportunities and resources	Semaan et al ⁴²	<ul style="list-style-type: none"> ▶ One-third of respondents received training. ▶ Half of the respondents in LMICs received updated guidelines for care provision. ▶ Shortage of qualified staff, either because of symptoms, self-isolation after potential exposure or inability to reach their workplace, as a midwife in Uganda described: '(t) ransport to work is a big challenge due to lockdown; many staff live far away from the hospital. Staff who manage to come to work hurry to leave early to observe the curfew time of 7.00 p.m.'
Limited surge capacity and low testing ability	Barasa et al ²⁷ Otitoloju et al ³⁸	<ul style="list-style-type: none"> ▶ Limited ICU bed surge capacity. ▶ When equipment were available, they were not functioning properly. ▶ While Kenya has 537 ICU beds, it only has 256 ventilators. ▶ The testing capacity in African countries was very low. Most of the countries on the very low capacity need to scale up rapidly.
Limited or no available health services needed during the pandemic	Ahmed, et al ²⁴	<ul style="list-style-type: none"> ▶ Mental health services and those addressing gender-based violence were perceived to be limited or unavailable.
Impact		
Reduced patient flow or limited access to health services	Abdela et al ¹⁶ Ahmed et al ²⁴ Ammor et al ²⁵ Bell et al ²⁸ Burt et al ³⁰ Buonsenso et al ²⁹ Gichuna et al ³⁴ Jensen and McKerrow ³⁵	<ul style="list-style-type: none"> ▶ Reduced patient flow for accessing essential health services (maternal and child health and tuberculosis). ▶ Stakeholders perceive a reduction in access to all healthcare services in slums during COVID-19 lockdowns with services uptake was affected by an increased cost of healthcare, reduced household income, increased challenges in physically reaching healthcare facilities and exacerbated reluctance of residents to seek healthcare due to fear of infection and stigmatisation. ▶ A significant decrease in patients' admissions during the lockdown period at the different units of oncologic centre. ▶ Reduction in the rate of detection of HIV and malaria and reduction of the provision of prophylaxis for tuberculosis prevention for patients with HIV. ▶ Reduction in facility deliveries is March 2020. ▶ Reduced attendance for antenatal care services, neonatal admission and prevention of mother to child transmission of HIV remarkably. ▶ The under-five vaccination rate dropped by 50%–80% in 2020 compared with the previous year ($p<0.0005$). ▶ Limited access to receive sexual and reproductive healthcare services by female sex workers. ▶ Limited access to some reproductive health commodities. 'One of the main commodities we lack is family planning. During this time if we are not careful we will deliver a lot of 'corona babies'. There is a problem with Norplant and the family planning injectables are also not available for continuing women. This is not good for us. (Sex Worker, 40 years, Kasarani)' ▶ Significant declines for clinic attendance (36%; $p=0.001$) and hospital admissions (50%; $p=0.005$) of children aged <5 years and a 47% increase in neonatal facility deaths were reported.

Continued

Table 3 Continued

Health system context	Evidence	Examples
	Mohammed et al ³⁶	► The pandemic has reduced TB care significantly including diagnosis, care and treatment.
	Odume et al ³⁷	► TB clinic attendance, presumptive TB identification, TB cases detection and treatment initiation significantly decreased since the onset of the COVID-19 ($p<0.001$).
	Siedner et al ⁴⁴	► There was a >50% reduction in child healthcare visits at the start of the level five lockdown from 11.9 to 4.7 visits/day (7.1 visits/clinic/day, 95% CI=8.9 to 5.3), both for children aged <1 year and 1–5 years.
Missed appointment for chronic care services	Pierre et al ³⁹	► Less than half (48%) patients with HIV attended scheduled antiretroviral treatment collection clinic appointments.
	Gichuna et al ³⁴	► Female sex worker reported a missed appointment due to COVID-19 restrictions to travel: 'I have missed my appointments to the clinic at BHESP (Bar Hostess Empowerment and Support Program). I was supposed to go collect my ARVs but now with the lockdown, how will I go to collect them? I cannot visit the public health facility because of stigma and discrimination. (Sex worker, 21 years, Jogoo Road)'
	Schwartz et al ⁴¹	► Compared with the pre-lockdown period (0.4%–5.2%), the percentage of missed appointments during lockdown for HIV and hypertension care ranged from 16.2% to 21.5%.
Re-orientation of services deter essential services provision	Mohammed et al ³⁶	► Human and material resources for tuberculosis have been shifted to COVID-19. ► Some health facilities that have been providing tuberculosis care and treatment services have been committed as COVID-19 isolation and treatment centres.
	Gichuna et al ³⁴	► It was observed disruption of supply for reproductive health commodities due to the focus on COVID-19 had led to a neglect of routine reproductive healthcare services especially in the public health centres. 'For now, when you visit the public health facility, we cannot be given contraception, priority has been given to responding and attending to emergency cases. (Sex workers, 20 years, Jogoo Road)'
Not all services were affected	Abdela et al ¹⁶	► Attendance for health facility delivery services was stable during the pandemic.
	Siedner et al ⁴⁴	► There was no drop-in clinic visitation in adults at the start of the Level 5 lockdown, or related to HIV care.
	Schwartz et al ⁴¹	► During the lockdown, 49%–66% of those who missed appointments for HIV care sought care at other health facilities but not for hypertension due to its limited integration.
	Shikuku et al ⁴³	► No differences in monthly mean ($\pm SD$) attendance between March and June 2019 vs 2020 for antenatal care, hospital births, family planning attendance, post-abortion care and pentavalent 1 immunisation.
	Burt et al ³⁰	► Immediate postnatal care, and contraceptive provision remained stable during the pandemic.
Impact on healthcare providers		
Perceived stigma	Debes et al ³¹	► Over half (56%) of health professionals reported safety concerns related to stigma from being healthcare workers.
Experienced mental health illness	Sagaon-Teyssie et al ⁴⁰	► 72%, 73% and 77% of participants (community healthcare providers) reported depression, anxiety and insomnia symptoms, respectively.
	Semaan et al ⁴²	► Healthcare workers providing essential services to women and newborns during this pandemic experience increased stress and anxiety levels. An obstetrician from Mozambique described, 'My stress level is immeasurable. Every time a pregnant woman with flu-like symptoms (visits the health facility), I feel almost completely lost. I need to be equally protected and I don't feel any protection from whoever (is responsible for protecting me)'.
	Deressa et al ³²	► About 38% of respondents were perceived as somewhat worried and a half (50%) were apprehensive due to the potential risk of becoming infected with COVID-19 by their clinical role in the hospital setting. ► About two-thirds (65%) were extremely worried about the potential risk of infection to their family and loved ones.
Response		
Provision of guidelines	Otitoloju et al ³⁸	► Countries adopted the WHO protocols, personal hygiene, economic palliatives and social distancing measures.
	Semaan et al ⁴²	► Lack of national guidelines to facilitate the provision of health services for pregnant women. An obstetrician/gynaecologist from Uganda expressed: 'I am worried that no national guidelines (are) rolled out yet regarding care for pregnant women and newborns.'

Continued

**Table 3** Continued

Health system context	Evidence	Examples
Tailored healthcare services and consultation	Ahmed et al ²⁴	<ul style="list-style-type: none"> ► Mobile consultation using phones at the time of pandemic lockdowns. A Kenyan health manager expressed: 'We have given out telephone numbers for the rapid response team to help with COVID-related cases. We also have a health facility telephone numbers for patients to call and talk to a health worker for non-communicable conditions that need monitoring. That way we can continue providing other services besides COVID-19 and ensure continuity of services.' ► Increased patronage of locally available services.
Re-purposing available health services	Ammor et al ²⁵	<ul style="list-style-type: none"> ► Allocating a special clinical unit to manage suspected COVID-19 cases. ► Adapted schedules to suit healthcare workers and treatment administration.
Implementing COVID-19 prevention methods to avoid COVID-19 transmission inside the facility	Ammor et al ²⁵	<ul style="list-style-type: none"> ► Surgical masks were provided for non-suspected patients. ► Suspected patients with COVID-19 were isolated in a dedicated area, and later referred to COVID-19 facilities for further examinations.

ARV, antiretroviral drugs; CI, confidence interval; HIV, human immunodeficiency virus; ICU, intensive care unit; LMICs, low and middle-income countries; WHO, World Health Organization.

mixed findings. The study from Ethiopia showed that healthcare workers generally had moderate knowledge on detection and management of COVID-19.³³ Another study showed limited understanding of case definition, identification of high-risk patients, tests appropriate to identify suspected cases and lack of adequate preventive measures to minimise transmission.⁴² In this study, only 15% of the participants perceived that they had complete knowledge to provide maternity care to patients with COVID-19.⁴² The same study also reported on the lack of training opportunities for staff and shortage of qualified staff as some experienced staff were not on their role partly due to self-isolation because of contact with patients with COVID-19 infection.⁴²

Limited surge capacity and low testing ability

A study in Kenya²⁷ showed that health facilities had limited surge capacity due to a lack of ICU beds and ventilators. Even when these equipment were available, there were also concerns about the lack of accompanying equipment or managing the equipment properly. Studies also noted resource gaps, particularly the incompatibility between infection rates and the infrastructure available to provide COVID-19 testing, given the size of the population in the region. For example, Otitoloju *et al*³⁸ reported that while few countries such as Mauritius, Ghana, South Africa, Botswana, Tunisia and Cape Verde had a medium to higher ability to carry out COVID-19 testing, the capacity in most African countries was low compared with their population size.

Lack of essential services needed during the pandemic

Despite the anticipated increase in demand for some health services, such as mental health, following a pandemic, including COVID-19, the review identified no concomitant expansion in health services to address mental health issues or gender-based violence in some countries.²⁴

Impact of COVID-19 on health services utilisation

The included studies reported a range of impacts associated with the emergence of the COVID-19 pandemic in one or more African countries (table 3, online supplemental file 4).

Reduced patient flow or limited access to health services

Over half of the studies^{16 24 25 28–30 34–37 44} showed significant reductions in inpatient hospital admissions and access to essential and general health services. The COVID-19-related lockdown restrictions has impacted all healthcare services,²⁴ including HIV care, treatment for malaria and tuberculosis, and maternal and child health services.^{25 35} A study from Ethiopia reported a decline in service utilisation as high as 98% for family planning services and up to 50% for antenatal care attendance compared with pre-pandemic trends.¹⁶ In addition, three studies^{16 36 37} have observed substantial declines in diagnosis and management of tuberculosis services. As a study from Ethiopia revealed, part of the decline was attributed to the re-orientation of health services as some healthcare facilities have been re-purposed to serve for COVID-19 care services.³⁶ Similarly, in Kenya, routine reproductive healthcare services were neglected due to priorities accorded to COVID-19-related services, especially in the public health centres.³⁴ A female sex worker expressed her concern as: 'For now, when you visit the public health facility, we cannot be given contraception; priority has been given to responding and attending to emergency cases. (Sex workers, 20 years, Jogoo Road)' (p. 1436)³⁴ In South Africa, there was a 36%–50% reduction in the rate of child healthcare visits^{35 44} and a 50% decline in hospitalisations for child health services.³⁵ Other essential health services with a reduced patient flow included prevention of mother to child transmission of HIV,³⁰ malaria diagnosis and treatment services,²⁸ sexual and reproductive healthcare services for some segments of the population such as female sex workers,³⁴ and patient admissions for

oncologic services.²⁵ Moreover, under-five vaccination rates in the region have declined significantly, by up to 50%–80%, in the post-pandemic period as compared with the year immediately before the pandemic.²⁹

Missed appointments for chronic care services

Three studies reported that COVID-19 impacted certain health services in chronic care follow-up clinics as patients could not attend routine appointments for follow-up and refilling drugs.^{34 39 41} A study in Rwanda showed that over half of patients with HIV with scheduled appointments were not visiting antiretroviral treatment collection clinics during COVID-19 lockdown, with patients from outside Kigali and patients with advanced HIV status (WHO stages 3 and 4) were impacted more than their counterparts.³⁹ Similarly, a Kenyan study showed that female sex workers could not attend their appointments due to the pandemic, as expressed by a female sex worker: ‘I have missed my appointments to the clinic at BHESP [Bar Hostess Empowerment and Support Program]. I was supposed to go and collect my ARVs, but now, how will I collect them with the lockdown? I cannot visit the public health facility because of stigma and discrimination. (Sex worker, 21 years, Jogoo Road)’ (p.1434).³⁴

Access to some health services in some settings was stable

Five studies^{16 30 41 43 44} reported that COVID-19 did not hamper health services provisions or affect the number of patients attending health services during the pandemic. For example, a Kenyan study comparing the monthly rate of antenatal care, hospital skilled births, family planning, post-abortion care and immunisation services during the 4 months before (March–June 2019) and after the COVID-19 pandemic (July–September 2019) showed no difference. Similarly, a study conducted in Uganda showed that, unlike other essential health services, immediate postnatal care and contraceptive provision remained stable during the pandemic.³⁰ A study in Ethiopia showed that while family planning services were severely affected by the pandemic, the effects were minimal for institutional delivery services.¹⁶ Similarly, a study from Uganda showed that despite COVID-19-related national lockdown, HIV services were still available in the country during the early phase of the pandemic, though this was not the case for hypertension services, reflecting the lag in integrated service delivery for chronic conditions.⁴¹

Impact of COVID-19 on healthcare workers

Four studies^{31 32 40 42} showed that healthcare workers had experienced mental health issues due to stressful working conditions and perceived fear of acquiring COVID-19 infection. For example, a study conducted in Mali involving community healthcare workers showed that about three-quarters (72%–77%) of the participants reported having at least one of the three symptoms of mental illness, including depression, anxiety and insomnia.⁴⁰ Similarly, an obstetrician from Mozambique who participated in a global study described their

circumstances as follows: ‘My stress level is immeasurable. Every time a pregnant woman with flu-like symptoms (visits the health facility), I feel almost completely lost. I need to be equally protected, and I don’t feel any protection from whoever (is responsible for protecting me)’ (p. 6).⁴² While about 38%–50% of healthcare workers reported somewhat to extremely worried for themselves being at risk of COVID-19 infections. Nearly two-thirds (65%) were extremely worried that they could potentially risk their families and loved ones for COVID-19 as they continued to be in hospital settings for clinical duty.³² Similarly, a survey of healthcare providers from 13 African countries demonstrated an increase in daily depression for stigmatisation in their community.³¹

Health system responses

Three studies^{24 25 38} reported on responses taken by the healthcare system to prevent the negative consequences of the COVID-19 pandemic and maintain existing health services provision. Table 3 summarises the findings from these studies, while the details are provided in online supplemental file 4.

Provision of guidelines

The results related to guidelines provisions and adoptions are mixed. A preliminary evaluation of COVID-19 outcomes throughout African countries showed that almost all countries adopted the WHO protocol and guidance. Most countries established compulsory isolation and treatment centres for treating COVID-19 positive patients, mainly with hydroxychloroquine, chloroquine and chloroquine–azithromycin combination.³⁸ However, interviews with healthcare workers from Uganda demonstrated a lack of national guidelines to facilitate the provision of health services for pregnant women. ‘I am worried that no national guidelines (are) rolled out yet regarding care for pregnant women and newborns’, an obstetrician/gynaecologist had remarked. (p. 4)⁴²

Establish a channel for consultation

A multicountry study that examined response mechanisms during the early phase of the pandemic²⁴ had demonstrated the use of telephone consultation to mitigate the challenges of physically accessing health facilities by patients. A healthcare worker in Kenya attested that: ‘We have given out telephone numbers for the rapid response team to help with COVID-related cases. We also have a health facility telephone number for patients to call and talk to a health worker for non-communicable conditions that need monitoring. That way, we can continue providing other services besides COVID-19 and ensure continuity of services’ (p. 13).²⁴

Re-purposing of available services and establishing a dedicated isolation centre

One study reported that existing health services had been re-arranged to suit healthcare workers capability and treatment administration. The re-purposing of existing services involved, among others, providing health services



for COVID-19 suspected cases through dedicated clinical units, establishing isolation centres and providing protective masks.²⁵

DISCUSSION

Our scoping review provided comprehensive information on Africa's health system preparedness, impact and responses to the pandemic. While Africa's weak healthcare system is already well recognised, our findings identified three core preparedness-related bottlenecks. These included the lack of resources and equipment, limited testing ability and inadequate surge capacity to deal with COVID-19. Our results identified several impacts attributed to the pandemic, including reduced service utilisation rates and missing scheduled appointments by chronic care patients. Despite the negative consequences, some response measures such as availing telephone consultations, re-purposing of services and facilities and establishing isolation centres and provisions of guidelines were in place as response mechanisms. However, in some settings, some services remained unaffected.

COVID-19 pandemic has challenged local, national, regional and global capacities to prepare and respond.⁴⁶ Recent pandemics, such as COVID-19 and others like the HIV epidemic of the early 1990s and the Ebola outbreak in the mid-2010s, have presented significant challenges to the African health systems.^{47 48} Several countries have learnt valuable lessons from these crises and developed coping mechanisms to combat these diseases.⁴⁹ Various experts have speculated the potential impact of the COVID-19 pandemic in the African health systems early in the pandemic and alerted resource-limited countries to make the utmost preparation to lessen the impact of the pandemic.^{50–52} Also, lessons from outside the region were essential for controlling the spread of COVID-19. For example, during the early phase of the outbreak, some countries such as China quickly deployed human resources and expanded infrastructure, including constructing two new hospitals and re-designated wards in existing hospitals to isolate and treat patients immediately,⁵³ although the applicability of such aggressive measures remains a moot point in resource-limited countries. These being the case, the late introduction of COVID-19 into the African continent has offered an opportunity for the region to develop testing and treatment capabilities strategies.⁵⁴ This was evident from the number of countries that could undertake laboratory tests increased from only 2 (South Africa and Senegal) in January 2020 to 33 in a few months following the advent of the pandemic in the region.⁵⁵ Some countries achieved this by re-purposing existing research laboratories, diagnostic tools and reagents previously used for other infectious diseases.^{56 57} However, disruption in the supply chain of highly needed resources such as PPE and increased global demand^{58 59} meant vast shortages of such equipment in many countries globally, including African countries.⁶⁰ It was not surprising that

our review showed the lack of resources and equipment and limited know-how and surge capacity for COVID-19 in these countries. Several countries reported inadequate supply of PPE equipment and essential medicines.⁶¹ Moreover, the challenges became even more apparent when some African countries such as Kenya embarked on mass testing,⁶² despite shortages of test kits.⁶³ In part, this problem was exacerbated by travel restrictions⁵⁹ that hindered international trade, particularly the ability to purchase new equipment or transport donated materials.

Our review showed that the pandemic impacted essential and general health services, leading to reduced flow of patients, missed scheduled appointments and lower hospital admission rates. These findings were consistent with a recent time-series study in China that reported a significant decline in inpatient and outpatient visits.⁶⁴ Apart from essential healthcare services, healthcare services dedicated to non-communicable diseases were also impacted, partly due to priorities accorded to acute cases and to the COVID-19 pandemic. This was observed in a study from Morocco that reported a significant decline in cancer patients admission in the early phases of the lockdown.²⁵ The study result was consistent with a report from the WHO indicating a considerable degree of healthcare services disruption for non-communicable diseases in the early phases of the pandemic in more than three-quarters of countries globally.⁶⁵ Similarly, although not directly comparable as most studies in the reviews came from high-income settings, two reviews showed adverse effects of COVID-19 on hospital visits, hospitalisations, diagnostics, and maternal and child health services.^{19 66} Furthermore, the current study showed that the pandemic had also affected the mental health status of healthcare workers due to fear of infection and work-related stress. The findings from Africa were consistent with those from Thailand, which revealed that the COVID-19 pandemic led to uncertainty, anxiety, fear and stigmatisation among healthcare workers.⁶⁷ However, our review noted that not all health services were affected as demonstrated from studies conducted from Ethiopia and Uganda.^{16 30} While this could partly be explained due to that some of the studies included in our review conducted in earlier phases of the pandemic, it may also reflect the attention provided to preserve the provision of essential health services in some settings, which needs further research.

Our study has also indicated some variations on the impact of COVID-19 between geographic locations, vulnerable populations and countries. For example, our findings from a Tanzanian study²⁶ indicated that there were disparities in the level of health facility readiness for COVID-19 prevention measures as urban facilities were two times better than their rural counterparts in terms of available functioning communication systems.

Implication for policy and future research

The African health systems will continue to be confronted by emerging global and local events, including conflict, a

potential new infectious disease, climate change and the increasing burden of non-communicable diseases. On another side, countries with a fragile health system are likely to be overwhelmed by the complexity of case identification, the need to establish and maintain communication strategies, and the challenges of safely caring for a surge of critically ill patients.⁶⁸ Ultimately, the focus in the region should be on creating a resilient health system, a system that responds for all health challenges, times and people.⁶⁹ Well-established and resilient health system allows countries to prepare and respond appropriately to health system shocks and disturbances following unprecedented community health risks, including pandemics.⁴⁶ However, establishing a resilient health system will not be without challenges, partly due to limited resources, including insufficient health financing and shortage of skilled health workforce. While COVID-19 remains a biomedical challenge, an approach focused on disease control alone will be insufficient to contain the pandemic.⁷⁰ Lesson from past epidemics and major health challenges in the region remind us of the need to protect, support and empower the frontline healthcare workers, particularly the community health workforce, which remains the backbone of Africa's health system.⁷¹

With the advent of COVID-19 vaccines, vaccination roll-out can serve as one pillar of the health systems response globally and in Africa.⁷² Just in less than a year, we observed several success stories in vaccination coverage, mainly in high-income countries, including a coverage rate of over 85% in Portugal and the UAE.⁷³ In countries like Portugal, such success led to getting away with lockdowns or wearing masks outdoors.⁷⁴ Unfortunately, many countries in Africa are still at the bottom lane of the queue for vaccination access except Seychelles, which achieved a vaccination roll-out of over 75% of its population.⁷³ The COVAX initiative, a multilateral coalition led by GAVI, the Vaccine Alliance, the Coalition for Epidemic Preparedness Innovations, and the WHO, was established to facilitate life-saving COVID-19 vaccines to low-income countries.⁷⁵ However, despite the pledges to allocate sufficient doses for 47 countries in Africa to vaccinate at least 20% of their population, the progress remains limited.⁷⁶ Thus far, in Africa, only 5% of its population has received access to COVID-19 vaccines, which poorly compares with over 55% vaccination coverages in Australia and Europe,⁷³ reflecting the continued disparities in equitable access to healthcare.

Unless vaccination access to the African countries is accelerated, the adverse impacts of COVID-19 identified in this review are likely to be further exacerbated as waves of existing and newly emerging variants of the COVID-19 hit the region.^{77 78} Therefore, African countries should focus on a coordinated approach to build capacity for vaccine development, transport and roll-out of vaccination for healthcare professionals and high-risk individuals, including rural areas. Even if these challenges are addressed through inter-African initiatives and cooperation with development partners, administering

Box 1 Implications for policy and research

Implications for health system policy

- Preparedness: Strengthen testing capacity and health emergency information system to ensure timely detection and response to new variants of COVID-19 and—as the pandemic matures and vaccine uptake increases—further integrate COVID-19 cases as part of a common notifiable disease.
- Impact: Moving toward a resilient health system responsive to emerging health threats and incorporating home care as part of the future pandemic impact response strategy.
- Response: Building human and infrastructure capacity and health financing mechanisms to ensure a sustainable supply and delivery of vaccines to eligible persons.

Implications for future research

- Systematic analysis of the impact of COVID-19 on:
- Specific health services (eg, surgical services).
- The role of the private health sector in ensuring public health security and emergency response.
- Health workers performance, with the latter being supported by qualitative studies.

the new vaccines in each country could likely pose enormous logistical challenges for the region. For example, assuming a vaccination rate of 80% to achieve herd immunity for COVID-19, Africa will need to administer about a billion doses, which at the very least means doubling the region's vaccination capacity from its current level. Therefore, each African country will also have to develop the human resource need and infrastructural capabilities to vaccinate its population when the vaccines become available as desired. As the task is horrendous, countries must also intensify public awareness creation through active community engagement to reduce the burden of infection, debunk misinformation toward COVID-19 vaccination and improve Africa's health system ability to respond well with its limited capacity. Countries in the region also need to take the current challenge as an opportunity to develop a more resilient health system capacity through multilevel governance arrangements that coordinate local, national, regional and global actions.⁷⁹ A well-established and resilient health system allows countries to prepare and respond appropriately to health system shocks and disturbances following unprecedented community health risks, including pandemics.⁴⁶ Eventually, this will enable the health systems to minimise current COVID-19-related morbidity and mortality, maintain essential healthcare services, provide support for healthcare workers and effectively respond to subsequent waves of COVID-19 pandemic (see summary for implications for policy and research in **box 1**).

Strengths and limitations

Although two systematic reviews were conducted before the current study, the studies were mainly from high-income countries.^{18 19} Ours is the first study to provide an Africa focused comprehensive assessment of preparedness, impacts and responses to COVID-19 in the region.



The integration of quantitative and qualitative studies is another strength of this review, which allowed to improve the volume of evidence and get multiple dimensions of the effects of the pandemic on Africa's health systems. However, the findings should not necessarily be taken as reflective of the views and perspectives in the African health systems in their entirety as we have only included two mixed-method studies and one qualitative study. Given that scoping reviews, by their nature, are focused on mapping rather than on appraising the quality of the available evidence,⁸⁰ we have not performed quality appraisal in this review. In addition, we may have missed out on relevant studies published in other languages as the reviews in our paper were limited to those written in English. Despite the rigorous searching strategies that have been implemented in three broader bibliographic databases, our study might still have potentially missed out studies that could have been identified through other databases. Most of the included studies were based on data in the early stages of the pandemic. They may not be fully generalisable to or reflective of the ever-changing situation in terms of the newly emerging variants of COVID-19 on a one side and the development of COVID-19 infection on the other side. We have not also explored the private health sector, particularly how it is affected by and its responses and role in fighting the pandemic. This remains a limitation as the private sector has a significant role in service delivery and can be a powerful partner if mobilised and provided the necessary government support.

CONCLUSIONS

The health systems in Africa were inadequately prepared for the pandemic, and its impact on other health services was substantial. The response to the pandemic was generally slow and did not correspond to the magnitude of the problem. Interventions that will improve and strengthen health system resilience through local, national and global engagement and improving healthcare financing should be given priority. High-quality time-trend analyses are needed to understand better the extent and nature of ongoing changes and responses of the African health systems to the pandemic.

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Supplementary file 1. Search strategy

Source of literature	Covid-19 terms	Health system/response terms	Africa terms
PubMed	COVID-19 [MH] OR COVID-19 [Title/Abstract] OR Coronavirus [Title/Abstract] OR Corona virus[Title/Abstract] OR 2019-nCoV [Title/Abstract] OR SARS-CoV[Title/Abstract] OR MERS-CoV[Title/Abstract] OR Severe Acute Respiratory Syndrome [Title/Abstract] OR SARS-CoV-2[Title/Abstract] OR Corona[Title/Abstract]	'health system*' [tiab] OR 'healthcare system*' [tiab] OR 'health care system*' [tiab] OR 'healthcare sector*' [tiab] OR 'healthcare industr*' [tiab] OR 'health industr*' [tiab] OR 'health facilit*' [tiab] OR 'hospital*' [tiab] OR 'healthcare' [tiab] OR 'health care' [tiab] OR 'health service*' [tiab] OR 'healthcare service*' [tiab] OR 'health cent*' [tiab] OR 'care, health' [tiab] OR 'system, health care' [tiab] OR 'systems, health care' [tiab] OR 'system, healthcare' [tiab] OR "maternal health" [tiab] OR "family planning" [tiab] OR "contraceptive services" [tiab] OR "antenatal*" [tiab] OR "prenatal" [tiab] OR "delivery service*" [tiab] OR "postnatal" [tiab] OR "childbirth*" [tiab] OR "child birth" [tiab] OR Pediatric" [tiab] OR "paediatric*" [tiab] OR "sexual health" [tiab] OR "reproductive health" [tiab] OR "abortion" [tiab] OR "immunization" [tiab] OR "immunisation" [tiab] OR "vaccination" [tiab] OR "child health" [tiab] OR "under-five services" [tiab] OR "under five service*" [tiab] OR "mental health" [tiab] OR "psychiatr*" [tiab] OR "chronic illness" [tiab] OR "chronic care" [tiab] OR hypertension" [tiab] OR "diabetes mellitus" [tiab] OR "diabetic*" [tiab] OR "cancer" [tiab] OR "hypertensive diseases" [tiab] OR malaria [tiab] OR HIV [tiab] OR "HIV/AIDS" [tiab] OR "human immunodeficiency" [tiab] OR "acquired immunodeficiency syndrome" [tiab] OR "tuberculosis" [tiab]	Africa[mh] OR Africa*[tiab] OR Algeria*[tiab] OR Angola*[tiab] OR Benin*[tiab] OR Botswana*[tiab] OR Burkina Faso [tiab] OR Burundi*[tiab] OR Cape Verde*[tiab] OR Cabo Verde [tiab] OR Cameron*[tiab] OR Cameroon*[tiab] OR Chad*[tiab] OR Comoros*[tiab] OR Congo*[tiab] OR Cote d'Ivoire[tiab] OR Ivory coast [tiab] OR Djibouti*[tiab] OR Egypt*[tiab] OR Eritrea*[tiab] OR Ethiopia*[tiab] OR Gabon*[tiab] OR Gambia*[tiab] OR Ghana*[tiab] OR Guinea*[tiab] OR Kenya*[tiab] OR Lesotho*[tiab] OR Liberia*[tiab] OR Libya*[tiab] OR Madagascar*[tiab] OR Malawi*[tiab] OR Mali*[tiab] OR Maurit*[tiab] OR Morocco*[tiab] OR Mozambiqu*[tiab] OR Namibia*[tiab] OR Niger*[tiab] OR Rwanda*[tiab] OR Senegal*[tiab] OR Seychelles[tiab] OR Sierra Leone*[tiab] OR Somalia*[tiab] OR Sudan*[tiab] OR Swaziland*[tiab] OR Tanzania*[tiab] OR Togo*[tiab] OR Tunisia*[tiab] OR Uganda*[tiab] OR Zambia*[tiab] OR Zimbabwe*[tiab]
CINHAL	MH COVID-19 OR TI COVID-19 OR AB COVID-19 OR TI Coronavirus OR AB Coronavirus OR TI Corona virus OR AB Corona virus OR TI 2019-nCoV OR AB 2019-nCoV OR TI	TI' health system*' OR AB' health system*' OR TI' healthcare system*' OR AB' healthcare system*' OR TI' health care system*' OR AB' health care system*', OR TI' healthcare sector*' OR AB' healthcare sector*', OR TI' health facilit*' OR AB' health facilit*' OR TI 'hospital*' OR AB 'hospital*' OR TI' healthcare' OR	MH Africa OR TI Africa* OR AB Africa* OR TI Algeria* OR AB Algeria* OR TI Angola*OR AB Angola* OR TI Benin*OR AB Benin* OR TI Botswana* OR AB Botswana OR TI "Burkina Faso**" OR AB "Burkina Faso**" OR TI Burundi* OR AB

SARS-CoV OR AB SARS-CoV OR TI ‘Severe Acute Respiratory Syndrome’ OR AB “Severe Acute Respiratory Syndrome” OR TI SARS-CoV-2 OR AB SARS-CoV-2 OR TI Corona OR AB Corona	AB’ healthcare’ OR TI ‘health care’ OR AB ‘health care’ OR TI’ health service*’ OR AB’ health service*, OR TI’ healthcare service*’ OR AB’ healthcare service*, OR TI’ health cent*’ OR AB’ health cent*, OR TI’ care, health’ OR AB’ care, health’ OR TI ’system, health care’ OR AB ’system, health care’ OR TI ‘systems, health care’ OR AB ‘systems, health care’ OR TI ‘system, healthcare’ OR TI ‘system, healthcare’ OR TI “maternal health” OR AB “maternal health” OR TI “family planning” OR AB “family planning” OR TI “contraceptive services” OR AB “contraceptive services” OR TI “antenatal*” OR AB “antenatal*” OR TI “prenatal” OR AB “prenatal” OR TI “delivery service*” OR AB “delivery service*” OR TI “postnatal” OR AB “postnatal” OR TI “childbirth*” OR AB “childbirth*” OR TI “child birth” OR AB “child birth” OR TI *Pediatric*” OR AB “Pediatric*” OR TI “paediatric*” AB “paediatric*” OR TI “sexual health” AB “sexual health” OR TI “reproductive health” OR AB “reproductive health” OR TI “abortion” OR AB “abortion” OR TI “immune?ation” OR AB “immune?ation” OR TI “vaccination” OR AB “vaccination” OR TI “child health” OR AB “child health” OR TI “mental health” OR AB “mental health” OR TI “psychiatr*” OR AB “psychiatr*” OR TI “chronic illness” OR AB “chronic illness” OR TI “chronic care” OR AB “chronic care” OR TI “hypertension” OR AB “hypertension” OR TI “hypertensive disease*” PR AB “hypertensive disease*” OR TI “diabetes mellitus” OR AB “diabetes mellitus” OR TI “diabetic*” OR AB “diabetic*” OR TI “cancer” OR AB “cancer” OR TI malaria OR AB malaria OR TI HIV OR AB HIV OR TI “HIV/AIDS” OR AB “HIV/AIDS” OR TI “human immunodeficiency” OR AB “human immunodeficiency” OR TI “acquired immunodeficiency syndrome” OR AB “acquired	Burundi* OR TI “Cape Verde*” OR AB “Cape Verde*” OR TI Cameron* OR AB Cameron*OR TI Cameroon*OR AB Cameroon* OR TI Chad* OR AB chad* OR TI Comoros* OR AB Comoros* OR TI Congo* OR AB Congo* OR TI “Cote d’Ivoire” OR AB “Cote d’Ivoire” OR TI “Ivory coast” OR AB “Ivory coast” OR TI Djibouti* OR AB Djibouti* OR TI Egypt* OR AB Egypt* OR TI Eritrea* OR AB Eritrea* OR TI Ethiopia* OR AB Ethiopia* OR TI Gabon* OR AB Gabon* OR TI Gambia*OR AB Gambia* OR TI Ghana* OR AB Ghana OR TI Guinea* OR AB Guinea* OR TI Kenya* OR AB Kenya* OR TI Lesotho* OR Lesotho* OR TI Liberia* OR AB Liberia OR TI Libya* AB Libya* OR TI Madagascar* OR AB Madagascar* OR TI Malawi* OR AB Malawi* OR TI Mali* OR AB Mali* OR TI Maurit* OR AB Maurit* OR TI Morocc* OR AB Morocc* OR TI Mozambiqu* OR AB Mozambiqu* OR TI Namibia* OR AB Namibia* OR TI Niger* OR AB Niger* OR TI Rwanda* OR AB Rwanda* OR TI Senegal* OR AB Senegal* OR TI Seychelles* OR TI Seychelles* OR TI “Sierra Leone*” OR AB “Sierra Leone*” OR TI Somalia* OR AB Somalia* OR TI Sudan* OR AB Sudan* OR TI Swaziland* OR AB Swaziland* OR TI Tanzania* OR AB Tanzania* OR TI Togo* OR AB Togo* OR TI Tunisia* OR AB Tunisia OR TI Uganda* OR AB Uganda* OR TI Zambia* OR TI Zambia* OR TI Zimbabwe* OR AB Zimbabwe*
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		immunodeficiency syndrome" OR TI "tuberculosis" OR AB "tuberculosis"	
Scopus	TITLE-ABS-KEY (COVID-19 OR Coronavirus OR Corona virus OR 2019-nCoV OR SARS-CoV OR MERS-CoV OR Severe Acute Respiratory Syndrome OR SARS-CoV-2 OR Corona)	'health system*' OR 'healthcare system*' [tiab] OR 'health care system*' OR 'healthcare sector*' OR 'healthcare industr*' OR 'health industr*' OR 'health facilit*' OR 'hospital*' OR 'healthcare' OR 'health care' OR 'health service*' OR 'healthcare service*' OR 'health cent*' OR 'care, health' OR 'system, health care' OR 'systems, health care' OR 'system, healthcare' OR "maternal health" OR "family planning" OR "contraceptive services" OR "antenatal**" OR "prenatal" OR "delivery service**" OR "postnatal" OR "childbirth**" OR "child birth" OR Pediatric" OR "paediatric**" OR "sexual health" OR "reproductive health" OR "abortion" OR "immunisation" OR "immunisation" OR" vaccination" OR "child health" OR "under-five services" OR "under five service*" OR "mental health" OR "psychiatr**" OR "chronic illness" OR "chronic care" OR hypertension" OR "diabetes mellitus" OR "diabetic**" OR "cancer" OR "hypertensive diseases" OR malaria OR HIV OR "HIV/AIDS" OR "human immunodeficiency" OR "acquired immunodeficiency syndrome" OR "tuberculosis"	TITLE-ABS-KEY (Africa OR Algeria* OR Angola* OR Benin* OR Botswana*OR "Burkina Faso" OR Burundi* OR "Cape Verde**" OR "Cabo Verde" OR Cameroun*OR Cameroon* OR Chad* OR Comoros* OR Congo* OR "Cote d'Ivoire" OR "Ivory coast" OR Djibou* OR Egypt* OR Eritrea* OR Ethiopia* OR Gabon* OR Gambia* OR Ghana* OR Guinea* OR Kenya* OR Lesotho* OR Liberia* OR Libya* OR Madagascar* OR Malawi* OR Mali* OR Maurit* OR Morocc* OR Mozambiqu* OR Namibia*OR Niger*OR Rwanda* OR Senegal* OR Seychelles OR Sierra Leone* OR Somalia* OR Sudan* OR Swaziland* OR Tanzania* OR Togo* OR Tunisia* OR Uganda* OR Zambia* OR Zimbabwe*)
MedRxiv	COVID-19 OR 2019 novel coronavirus disease OR 'COVID-19 virus disease' OR COVID19 OR 'COVID- 19 pandemic OR 'SARS-CoV- 2 infection'	Health system Or Health services	Africa
Research square	COVID-19 OR 2019 novel coronavirus disease OR 'COVID-19 virus disease' OR COVID19 OR 'COVID- 19 pandemic OR 'SARS-CoV- 2 infection'	Health system OR Health services	Africa

Google (100 hit)	COVID-19 OR 2019 novel coronavirus disease OR 'COVID-19 virus disease' OR COVID19 OR 'COVID- 19 pandemic OR 'SARS-CoV- 2 infection'	Health system OR Health services	Africa
Google scholar (150 hit)	COVID-19 OR 2019 novel coronavirus disease OR 'COVID-19 virus disease' OR COVID19 OR 'COVID- 19 pandemic OR 'SARS-CoV- 2 infection'	Health system OR Health services	Africa

Supplementary file 2. Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	3
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	5-6
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	6
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	N/A
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	6
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	6-7
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Supplementary Table 1
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	7, Fig 1
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	7
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	Page 6, Table 1
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	N/A
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	7

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	8, Fig 1
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	9, Table 2, Supplementary Table 3
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	N/A
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	8-12
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	8-12
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	12
Limitations	20	Discuss the limitations of the scoping review process.	14-15
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	15
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	15

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

‡ The frameworks by Arksey and O’Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of “risk of bias” (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O’Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. Ann Intern Med. 2018;169:467–473. doi: 10.7326/M18-0850

Supplementary file 3. Study characteristics

First author (year) Country	Study title	Type of article	Study design and population	Sample size	Study focus (preparedness, impact, response)	Health services context
Abdela ¹ (2020) Ethiopia	Essential Healthcare Services in the Face of COVID-19 Prevention: Experiences from a Referral Hospital in Ethiopia	Journal article (Original research article)	Design: Institution based cross-sectional study (comparative) Population: Patients attending essential healthcare services	NA	Impact	Essential healthcare service delivery
Ahmed ² (2020) Bangladesh, Kenya, Nigeria and Pakistan	Impact of the societal response to COVID-19 on access to healthcare for non-COVID-19 health issues in slum communities of Bangladesh, Kenya, Nigeria and Pakistan: results of pre-COVID and COVID-19 lockdown stakeholder engagements	Journal article (Original research article)	Design: Qualitative pre-post survey (pre-COVID-19 and during COVID-19 lockdowns.) Population: Stakeholders (community leaders, residents, health workers and local authority representatives)	860	Impact of societal response to COVID-19 Stakeholder response for mitigation	access to healthcare for non-COVID-19 health issues
Ammor ³ (2020) Morocco	Managing cancer patients during COVID-19 pandemic: a North African oncological centre experience	Supplement article (original research)	Design: Cross-sectional study (document review) Population: All cancer patients treated between March 2,2020 and April 20, 2020.	N/A	Impact and response	Cancer care and services
Bajaria ⁴ (2020) Tanzania	Preparedness of health facilities providing HIV services during COVID-19 pandemic and assessment of their compliance to COVID-	Journal article (Original research article)	Design: Survey Population: HIV services users and providers	1188 health facilities and 6866 health care providers	Preparedness	Health service preparedness for provision of HHLI related services

	19 prevention measures: findings from the Tanzania Service Provision Assessment (SPA) survey					
Barasa ⁵ (2020) Kenya	Assessing the hospital surge capacity of the Kenyan health system in the face of the COVID-19 pandemic	Journal article (Original research article)	Design: Modelling/prediction Population: Health facilities providing health services	NA	Preparedness	Health systems surge capacity (general hospital and ICU) of the COVID-19 pandemic.
Bell ⁶ (2020) Uganda	Predicting the Impact of COVID-19 and the Potential Impact of the Public Health Response on Disease Burden in Uganda	Journal article (Original research article)	Design- Cross sectional study (document review) Population: Patients accessing healthcare services	n/a	Impact	General health services
Buonsenso ⁷ (2020) Sub-Sierra Leone	Child Healthcare and Immunizations in Sub-Saharan Africa During the COVID-19 Pandemic	Journal article (Original research article)	Design: Cross-sectional (comparative) Population: Under-five children vaccinated for the most common diseases in 2020 and 2019	NA	Impact	Basic health services (Child health care and vaccinations)
Burt ⁸ (2021) Uganda	Indirect Effects of COVID-19 on Maternal, Neonatal, Child, Sexual and Reproductive Health Services in Kampala, Uganda	Pre-print article (original research article)	Design: Cross-sectional study (document review) Population: Patients accessing healthcare services during pre-COVID (July 2019 – February 2020) and post-COVID (March–December 2020)	14,401 pregnant women seeking antenatal care, 33,499 deliveries, 111,658 attendances for childhood services and 57,174 SRH service attendances	Impact	Basic health services (Maternal, Neonatal, Child, Sexual and Reproductive Health Services)

Debes ⁹ (2021) 13 African countries	Risk of Healthcare Worker Burnout in Africa during the COVID-19 Pandemic	Letters to the editor*(primary data)	Design: Cross-sectional Population: Healthcare workers	489	Impact	Health workforce
Deressa ¹⁰ (2021) Ethiopia	Risk perceptions and preventive practices of COVID-19 among healthcare professionals in public hospitals in Addis Ababa, Ethiopia	Original article	Design: Cross-sectional study Population: Healthcare workers	1,200 healthcare providers from six public hospitals	Preparedness and impact	Health workforce
Desalegn ¹¹ (2021) Ethiopia	Evaluation of COVID-19 related knowledge and preparedness in health professionals at selected health facilities in a resource-limited setting in Addis Ababa, Ethiopia	Journal article (Original research article)	Design: Cross-sectional Population: Healthcare workers	1334 health professionals in 10 hospitals (six government and 4 private)	Preparedness and impact	Health workers and their facilities
Gichuna ¹² (2020) Kenya	Access to healthcare in a time of COVID-19: Sex Workers in Crisis in Nairobi, Kenya	Journal article (Original research article)	Design: Qualitative (in-depth interviews) Population: Female sex workers and Healthcare workers	117 female sex workers and 15 health care providers	Impact	Healthcare access (HIV prevention, care and treatment and sexual and reproductive healthcare)
Jensen ¹³ (2020) South Africa	Child health services during a COVID-19 outbreak in KwaZulu-Natal Province, South Africa	Journal article (Original research article)	Design: Cross-sectional survey (review of District Health Information System (DHIS) data Population: Under-five children	681 health facilities (589 PHCs, 22 CHCs, and 70 hospitals)	Impact	Routine child health services (Service access and utilisation, service delivery and child wellbeing)
Mohammed ¹⁴ (2020) Ethiopia	Containment of COVID-19 in Ethiopia and implications for	Commentary*	Design: Commentary Population: General health system with a particular focus on tuberculosis care	NA	Impact	Provision tuberculosis care

	tuberculosis care and research					
Odume ¹⁵ (2020) Nigeria	Impact of COVID-19 on TB active case finding in Nigeria	Journal article (Original research article)	Design: Cross-sectional Population: Outpatient department attendees	190,734	Impact	Chronic Health care services (TB active case detection and treatment)
Otitoloju ¹⁶ (2020) African countries	Preliminary evaluation of COVID-19 disease outcomes, test capacities and management approaches among African countries	Pre-print (Original research article)	Design: Cluster analysis and cross-country comparison Population: COVID-19 infected cases	NA	Response and Impact	Health systems capacity to deal with COVID-19. And impact on global resilient indices
Pierre ¹⁷ (2020) Rwanda	Attendance to HIV Antiretroviral Collection Clinic Appointments During COVID-19 Lockdown. A Single Center Study in Kigali, Rwanda	Letters to the editor* (Original research article)	Design: Cross sectional study design (document review) Population: HIV patients	382	Impact	HIV services
Sagaon-Teyssie ¹⁸ (2020) Mali	Assessment of mental health outcomes and associated factors among workers in community-based HIV care centers in the early stage of the COVID-19 outbreak in Mali	Journal article (Original research article)	Design: Cross-sectional Population: Healthcare workers	135 (Health care workers) in 18 community-based HIV care centres.	Impact	Mental Health Services
Schwartz ¹⁹ (2021) Uganda	Impact of a COVID-19 National Lockdown on Integrated Care for Hypertension and HIV	Journal article (Original research article)	Design: Health facility survey (review) Population: HIV/hypertension patients	1,133 participants	Impact	Chronic Health care services (HIV and hypertension)

Semaan ²⁰ (2020) Global survey	Voices from the frontline: findings from a thematic analysis of a rapid online global survey of maternal and newborn health professionals facing the COVID-19 pandemic	Journal article (Original research article)	Design: cross-sectional study - mixed methods research Population: Healthcare workers	714 providers	Response	Health work force (health workers COVID related knowledge assessment)
Shikuku ²¹ (2020) Kenya	Early indirect impact of COVID-19 pandemic on utilisation and outcomes of reproductive, maternal, newborn, child and adolescent health services in Kenya	Journal article (Original research article)	Design: retrospective data analysis Population: Patients attending healthcare services	NA	Impact	Reproductive, maternal, newborn, child and adolescent health
Siedner ²² (2020) South Africa	Access to primary healthcare during lockdown measures for COVID-19 in rural South Africa: an interrupted time series analysis	Journal article (Original research article)	Design: Time series analysis Population: People who made clinic visits during the observation period.	46 523	Impact	Access to primary healthcare

*Letters to the editors/commentary article included as the articles were backed up with primary data. PHC - Primary healthcare clinics, CHC- Community health centres.

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Supplementary file 4. Key findings from studies included in the review

First author (year)	Key findings	Authors acknowledged limitations (if any)
Abdela ¹ (2020)	<p>Impact</p> <ul style="list-style-type: none"> Patient flow has decreased substantially in all elements of essential healthcare service i.e. maternal and child health, medical and surgical chronic illness follow-ups, oncology, HIV/AIDS clinic, tuberculosis diagnosis, and medical and surgical emergencies. The decline was dramatic for family planning visits (98%), emergency surgery (77%), follow-up of chronic surgical conditions (70%), neonatal admission and other childhood emergency visits (70%) and number of ANC attendees (50%). Almost all components of maternal and child health services suffered from a low case flow. The exception was the delivery service, which was relatively stable. The number of tests for the diagnosis of tuberculosis also decreased substantially 	<ul style="list-style-type: none"> The study was conducted in a single hospital (lack of representativeness) and was not able to collect information on the reasons behind the decrease in patient flow. Second, we were not able to collect information on the reasons behind the decrease in patient flow, and whether patients attended other healthcare facilities
Ahmed ² (2020)	<p>Preparedness</p> <ul style="list-style-type: none"> Mental health services and those addressing gender-based violence were perceived to be limited or unavailable. <p>Impact</p> <ul style="list-style-type: none"> Pre-COVID-19, diagnostic and treatment services were available for slum dwellers, preventive services were well used. Stakeholders perceive a reduction in access to all healthcare services in slums during COVID-19 lockdowns, with inconsistent and inadequate attention given to ameliorating this. Access barriers include increased cost of healthcare, reduced household income, increased challenges in physically reaching healthcare facilities and exacerbated reluctance of residents to seek healthcare due to fear of infection and stigmatisation. Few health facilities were operating on reduced or minimal services where opening hours were limited, stocks of medicines and other supplies were compromised and staff numbers low (or sometimes none) as staff could not get to work due to the lockdown: "<i>Outpatient services are reduced because not all members of staff are able to come to work. Our ambulance goes round to pick staff who live close by (Nigeria Site 3/Nurse/ Female)</i>" 	<ul style="list-style-type: none"> The report is the perspective of stakeholders who may not, for example, realise an apparently closed health facility is functioning by providing remote consulting or that what they experienced was transient as health services adapted to the lockdown. The authors reached (i) those self-identifying as disabled and (ii) belonging to formally constituted youth groups in two research sites and are likely to have missed engaging with people from other vulnerable groups. It is likely stakeholders were influenced by social desirability, their expectations of the research and researcher positionality. The shift from face-to-face interactions to telephone calls reduced non-verbal cues which can be important in deepening the conversation

	<ul style="list-style-type: none"> • In Kenya, routine growth monitoring and health promotion for children under 5 years was suspended. • In all sites, services delivered by community health workers in households were stopped due to movement restrictions. • In Kenya, a nurse explained that her primary care centre had diverted its emergency resources to COVID-19 preparedness: “<i>Health facility has been forced to spend its emergency kitty on COVID preparedness. All money has been diverted to COVID. (Kenya Site 2/Nurse/Female)</i>” • With COVID-19, stakeholders reported that the lockdown had reduced the ability of people to move around, even for emergencies. Due to reduction in local healthcare provision, people had to travel further for their care, but this too was difficult. Exacerbated reluctance of residents to seek healthcare due to fear and stigma. • Health workers thought fear of infection was one reason for a reduction in the number of residents seeking healthcare from facilities that were open. • Fear of being diagnosed with COVID-19 discouraged healthcare seeking. • Alleviators included provision of healthcare by phone, pharmacists/drug vendors extending credit and residents receiving philanthropic or government support; these were inconsistent and inadequate. <p>Response</p> <ul style="list-style-type: none"> • Mobile consultation using phones for COVID-19 symptoms. A <i>Kenyan health manager expressed: ‘We have given out telephone numbers for the rapid response team to help with COVID- related cases. We also have a health facility telephone numbers for patients to call and talk to a health worker for non- communicable conditions that need monitoring. That way we can continue providing other services besides COVID-19 and ensure continuity of services.’</i> 	
Ammor ³ (2020)	<p>Impact</p> <ul style="list-style-type: none"> • A significant decrease in patients' admissions during the lockdown period at the different units of our centre. • No healthcare professional was infected and only 8 patients showed symptoms of fever and cough, and all of them had a negative test for COVID-19 (RT-PCR) in the early stage of the pandemic. <p>Response</p> <ul style="list-style-type: none"> • Strong infection control measures were implemented all over the oncology and Hematology Centre (OHC) such as including a new sorting area dedicated to patient screening 	<ul style="list-style-type: none"> • Not provided

	<ul style="list-style-type: none"> • Allocating a special clinical unit to manage suspected COVID-19 cases • Adapted schedules for healthcare workers and treatment administration. • Screening/sorting zone • A strict and safe triaging procedure was performed • Suspected COVID-19 patients were isolated in a dedicated area, and later referred to COVID-19 facilities for further examinations. • Surgical masks were provided for non-suspected patients • Primary hygiene measures applied 	
Bajaria ⁴ (2020)	<p>Preparedness</p> <ul style="list-style-type: none"> • Low health facility preparedness to comply with COVID-19 prevention measures in HIV services is low. • Limited availability of some COVID-19 precaution products, such as medical masks, disinfectants, alcohol-based hand rub and access to running water, especially at publicly managed facilities and facilities in rural areas. • Availability of medical masks at facilities in general was considerably low, especially at publicly managed facilities and facilities in rural areas. • 64% of urban and 32.9% of rural health facilities had functioning communication systems. 	<ul style="list-style-type: none"> • The data were collected five years ago and might not reflect the most current situation in some areas • The study did not take into consideration the facility level or size, availability or readiness of some items
Barasa ⁵ (2020)	<p>Preparedness</p> <ul style="list-style-type: none"> • There is a significant gap in Kenya's health system to accommodate a potential surge in caseload due to COVID-19. • While Kenya has 64,181 hospital beds across all sectors (public, faith based/NGO, private for profit), only 37,216 (58%) of these beds are in hospitals that have oxygen supply. • While Kenya has 537 intensive care unit (ICU) beds, it only has 256 ventilators. Therefore, when ventilators are considered, 281 of existing ICU beds do not have the accompanying equipment to provide care for COVID-19 critically ill patients. The findings reveal that if the pandemic is concentrated over 6 months, Kenya will on average need 1,511 additional ICU beds to absorb COVID-19 cases, and an additional 1,609 ventilators. 	<ul style="list-style-type: none"> • The study was unable to obtain adequate number of health workforce available at each facility.

Bell ⁶ (2020)	Impact <ul style="list-style-type: none"> HIV/AIDS: New HIV case declined by 75% in the first 2 weeks of April, with a similar 75% reduction in the initiation of isoniazid-preventive therapy to prevent secondary tuberculosis. Malaria: Malaria showed a reduction in case detection in the first quarter of 2020. Admissions and inpatient deaths declined by similar proportions Maternal mortality: A 29% (28,939) reduction in facility deliveries is recorded in the Ministry of Health Uganda data in March 2020 	<ul style="list-style-type: none"> Understanding the extent of spread in the community through better testing will be important to understand whether the relatively low COVID-19 numbers recorded in African countries to date are due to late introduction, are an artifact of low testing, or are due to the low rate of severe presentations predicted here.
Buonsenso ⁷ (2020)	Impact <ul style="list-style-type: none"> The vaccination rate dropped by 50–80% in 2020 compared to the previous year ($p < 0.0005$). The number of children diagnosed with common childhood conditions (malaria, pneumonia, and diarrhoea), decreased but no increases in deaths were reported. 	<ul style="list-style-type: none"> The study was a retrospective with a limited time period and collected absolute numbers only No comprehensive epidemiological data (such as birth rates) were available
Burt ⁸ (2021)	Impact <ul style="list-style-type: none"> Antenatal care attendances decreased by 96% in April 2020 and remain below pre-COVID levels. Rise in adverse pregnancy outcomes for Caesarean sections (5%), haemorrhages related to pregnancy (51%), stillbirths (31%) and low birth weight (162%) and premature infant births (400%). Drop in neonatal unit admissions by 25%, immunisation clinic attendance and delivery of all vaccinations except measles. Drop in clinic attendance for prevention of mother to child transmission of HIV An increase in childhood malnutrition clinic attendance (348%). Maternal and neonatal deaths, immediate post-natal care and contraceptive provision remained within normal limits. 	<ul style="list-style-type: none"> Data collected retrospectively Use of data from electronic medical records as opposed to direct patient records could have resulted in under-representation of the true values of each indicator.
Debes ⁹ (2021)	Health workforce <ul style="list-style-type: none"> 56% of health professionals reported safety concerns related to stigma from being HCWs. Reported fears due to risk of infection for different reasons: lack of resources (33%), community transmission (23%), economic insecurity (11%), and social stigma (11%). 	<ul style="list-style-type: none"> Not provided
Deressa ¹⁰ (2021)	Health workforce <ul style="list-style-type: none"> Only one third (33.6%) reported that they were prepared to provide direct clinical care to COVID-19 patients. 	<ul style="list-style-type: none"> A possibility of selection bias and eligible participants might be excluded. Limited generalizability of the results and findings to other public and private hospitals.

	<ul style="list-style-type: none"> • 93% wearing facemask (93%), 92.7% washed hands for at least 20 seconds (92.7%), 90.9% covering mouth and nose when coughing or sneezing, 90.5% avoiding touching eyes, nose, and mouth with unwashed hands. • About 30% and 43% of the participants somewhat or strongly worried, respectively, that their personal health was at risk during the COVID-19 pandemic. • About 38% and 50% of all respondents perceived that they were somewhat worried or extremely worried about themselves, respectively, due to the potential risk of becoming infected with coronavirus by their clinical role in the hospital setting. • About 65% were extremely worried about the potential risk of infection to their family and loved ones. • Average worry scores for the COVID-19 crisis were high, with a mean ($\pm SD$) of 28.4 (± 5.9), ranging from 12 to 36. 	<ul style="list-style-type: none"> • The study focused on more general populations of HCPs like other studies who might have direct contact with COVID-19 patients. • The results of this study might be affected by information bias since it was based on self-reported data using self-administered questionnaire, • The respondents might overestimate or underestimate the responses in a way that they believe is socially acceptable rather than reporting actual or genuine answers.
Desalegn ¹¹ (2021)	Preparedness <ul style="list-style-type: none"> • Half (50%) of the healthcare providers were not satisfied with the medical equipment available for COVID-19 treatment in their hospitals. • Most of the health care workers were not optimally prepared to prevent the Covid-19 outbreak. • The overall knowledge of the participating HCWs regarding signs and symptoms, identification of persons at risk of developing the disease, case definition of COVID-19, appropriate tests offered to suspected cases, and high-risk patients and preventive measures that help to minimise the risk of transmission was moderate. 	<ul style="list-style-type: none"> • The study was a cross-sectional design, did not show cause and effect relationship • The study was conducted in Addis Ababa, the capital city of Ethiopia, where people had good access to health-related information.
Gichuna ¹² (2020)	Impact <ul style="list-style-type: none"> • Various restrictions imposed by the government to help curb the spread of COVID-19 spared significantly impacted female sex workers to access sexual and reproductive health care services. • Female sex workers felt stranded as there is no Bar Hostess Empowerment and Support Program clinic or a sex worker friendly facility within the Eastleigh area. One sex worker expressed her concern because she had been forced to go without pre-exposure prophylaxis while another could not get a refill of her ARVs: "<i>I live in Eastleigh, and take my PrEP supplies from Jogoo Road clinic, with the lockdown, I have been forced to stop taking pre-exposure prophylaxis. (Sex worker, 26 years, Jogoo Rd)</i>" • Female sex worker reported a missed appointment "<i>I have missed my appointments to the clinic at Bar Hostess Empowerment and Support Program. I was supposed to go collect my ARVs but now with the lockdown, how will I go to collect them? I</i> 	<ul style="list-style-type: none"> • Generalisability (the study included sex workers covered by Bar Hostess Empowerment and Support Program (BHESP) services only

	<p><i>cannot visit the public health facility because of stigma and discrimination. (Sex worker, 21 years, Jogoo Road)</i></p> <ul style="list-style-type: none"> • A nurse at Bar Hostess Empowerment and Support Program observed that due to the increased waiting time, some of the clients grow impatient and leave before they get the services while others feel they are being avoided or rejected: “<i>We are wary of the dangers of contracting COVID-19 so we now allow only 5 clients at a time in the clinic. This has its downside because some when told to wait they get impatient and leave without the service. Some may feel like we do not want to attend to them and they go away complaining. (Nurse, BHESP)</i>” • Limited access to some reproductive health commodities. “<i>One of the main commodities we lack is family planning. During this time if we are not careful we will deliver a lot of ‘corona babies’. There is a problem with Norplant and the family planning injectables are also not available for continuing women. This is not good for us. (Sex Worker, 40 years, Kasarani)</i>” • It was also observed in the disruption of supply for reproductive health commodities due to the focus on COVID-19 had led to a neglect of routine reproductive healthcare services especially in the public health centres. “<i>For now, when you visit the public health facility, we cannot be given contraception, priority has been given to responding and attending to emergency cases. (Sex workers, 20 years, Jogoo Road)</i>” 	
Jensen ¹³ (2020)	<p>Impact</p> <ul style="list-style-type: none"> • Following the start of the COVID-19 outbreak, significant declines were seen for clinic attendance (36%; $p=0.001$) and hospital admissions (50%; $p = 0.005$) of children aged <5 years and a 47% increase in neonatal facility deaths were reported. Overall, a significant disruption pattern was seen across multiple indicators for service access, service delivery and the wellbeing of children. 	<ul style="list-style-type: none"> • There might be potential inaccuracies in the District Health Information System (DHIS) data set • The DHIS data only provide information about children presenting to healthcare facilities (i.e. some children in need of healthcare may have remained at home because of the COVID-19 outbreak)
Mohammed ¹⁴ (2020)	<p>Impact</p> <ul style="list-style-type: none"> • Tuberculosis cases detection rate has reduced considerably, and Directly Observed Therapy visits have been interrupted. • Human and material resources for TB have been shifted to COVID19 • Some health facilities that have been providing TB care and treatment services have been committed as COVID-19 isolation and treatment centres. 	<ul style="list-style-type: none"> • Not provided

Odume ¹⁵ (2020)	<p>Impact</p> <ul style="list-style-type: none"> The COVID-19 epidemic has adversely impacted TB services in Nigeria. TB clinic attendance, presumptive TB identification, TB cases detection and treatment initiation significantly decreased since the onset of the COVID-19 ($P < 0.001$). 	<ul style="list-style-type: none"> The study focused only on the trend in the TB cascade and did not explore other confounders to the declining trend through qualitative means. Some errors and omissions could occur during the data collection and transcription process
Otitoloju ¹⁶ (2020)	<p>Preparedness</p> <ul style="list-style-type: none"> While few countries such as Mauritius, Ghana, South Africa, Botswana, Tunisia and Cabo Verde had medium to higher ability to carry out COVID-19 testing, most African countries were low comparing their population. The testing capacity in African countries was very low. Most of the countries on the very low capacity to scale up rapidly When the number of tests carried out were related to population number of the countries, small number of countries Djibouti, Mauritius, Ghana and South Africa are found to be the leading countries. <p>Response</p> <ul style="list-style-type: none"> All the countries adopted the WHO protocols, personal hygiene, economic palliatives and social distancing measures. Most of the countries are providing prompt treatment of the patients with a range of drugs especially Hydroxychloroquine, Chloroquine and Chloroquine-Azithromycin combination. 	<ul style="list-style-type: none"> Analysis was based on available data over a 75-day period of observation only. The patterns and trends are still evolving and by the time the paper is published, significant changes could have occurred. The wide variation in the number of COVID-19 testing being carried out by the different countries will also have a major impact on the actual number of reported confirmed cases of infection. The overall impact of COVID-19 on African resilient indicators will require many years of assessment to finalise its true impacts.
Pierre ¹⁷ (2020)	<p>Impact</p> <ul style="list-style-type: none"> Less than half (48%) HIV patients attended scheduled ART collection clinic appointments. Compared to patients living outside Kigali, patients staying within Kigali attended scheduled ART collection clinic appointments during the lockdown period compared to those living outside Kigali (p-value 0.040). Patients with WHO period compared patients in WHO clinical stage 3 and 4 (p-value 0.019). Clinical stage 1 attended scheduled ART collection clinic appointments during the lockdown 	<ul style="list-style-type: none"> As studies conducted in a single centre, findings may not be generalized to map the national context. Secondly, the factors reported in this study do not show causality as there are prone to a number of confounders.
Sagaon-Teyssie ¹⁸ (2020)	<p>Health workforce</p> <ul style="list-style-type: none"> Following the Covid-19 outbreak, 72, 73, and 77% of participants reported depression, anxiety and insomnia symptoms, respectively. A lack of personal protection equipment and a shortage of health care professionals (especially nurses) were associated with a high risk of common mental health disorders among participants. 	<ul style="list-style-type: none"> The sample size was small The sample was not representative of the population of Malian HCW The study did not collect detailed information about participants' working and living conditions

Schwartz ¹⁹ (2021)	<p>Impact</p> <ul style="list-style-type: none"> COVID-19 national lockdown adversely affects hypertension but not HIV services. This is due to the underdevelopment of integrated service delivery for other chronic conditions. Compared to the pre-lockdown period (0.4–5.2%), the percentage of missed appointments during lockdown for HIV and hypertension care ranged from 16.2%–21.5%. During lockdown, 49–66% of those who missed appointments sought care at other health facilities of which most sought services for HIV, not for hypertension. 	<ul style="list-style-type: none"> Not provided
Semaan ²⁰ (2020)	<p>Impact</p> <ul style="list-style-type: none"> In all settings and across the continuum of care, participants saw fewer patients at facilities, due to transportation restrictions or fear of nosocomial transmission. A nurse- midwife from Kenya wrote, '<i>[a]ccessing inpatient antenatal care [is] minimal. Women fear [getting] infected with COVID-19 if [they are] in hospitals. Most of them keep off from hospital even when they are sick</i>' Participants in LMICs acknowledged that women's inadequate access to communication infrastructure prevents equitable healthcare provision. <p>Health workforce</p> <ul style="list-style-type: none"> Only 15% of health providers reported that they clearly identified how to provide care for women with COVID-19 1/3 of respondents received training on COVID-19 from their health facility & nearly all searched for information themselves Less than half (47%) of healthcare providers in low-and middle-income countries received updated guidelines for care provision, which compared with 82% in high-income countries. Less than half (47%) of participants in low-and middle-income countries, and 69% in high-income countries felt mostly or completely knowledgeable in how to care for COVID-19 maternity patients Healthcare workers providing essential services to women and newborns during this pandemic experience increased levels of stress and anxiety. An obstetrician from Mozambique described, '<i>My stress level is immeasurable. Every time a pregnant woman with flu- like symptoms [visits the health facility], I feel almost completely lost. I need to be equally protected and I don't feel any protection from whoever [is responsible of protecting me]</i>'. 	<ul style="list-style-type: none"> Not provided

	<ul style="list-style-type: none"> Shortage of qualified staff, either because of symptoms, self-isolation after potential exposure, or inability to reach their workplace, as a midwife in Uganda described: '<i>[t]ransport to work is a big challenge due to lockdown; many staff live far away from the hospital. Staff who manage to come to work hurry to leave early to observe the curfew time of 7.00 p.m.</i>'. Certain healthcare facilities relied on locum workers and students to fill staffing shortages. Some respondents requested more support from management as exhaustion increased. A department head in Uganda reported, '<i>[t]here are no more clear work schedules as I get to attend many unscheduled/emergency meetings. Staff are very anxious and panicky and need talking to all the time, which is exhausting</i>'. <p>Response</p> <ul style="list-style-type: none"> Variability in the facility-level response to COVID-19 between high-income countries and low-and middle-income countries (in terms of guidelines, setting-up signage and patient/visitor screening, testing availability, and dedicating isolation rooms for maternity patients with confirmed or suspected COVID-19). One third (32%) of health providers from LMICs reported that the availability of all three types of personal protection equipment items such as gloves, masks, and aprons, with reported availability ranges from 32% (aprons) to 70% (gloves). Lack of national guidelines to facilitate the provision of health services for pregnant women. An obstetrician/gynaecologist from Uganda expressed: '<i>I am worried that no national guidelines [are] rolled out yet regarding care for pregnant women and newborns</i>'. 	
Shikuku ²¹ (2020)	<p>Impact</p> <ul style="list-style-type: none"> There were no differences in monthly mean (\pmstandard deviation) attendance between March-June 2019 vs 2020 for antenatal care, hospital births, family planning attendance, post-abortion care and pentavalent 1 immunisation. Reduction in the proportion of adolescents presenting with pregnancy among 10 – 14 years and 15 – 19 years from 0.4% to 0.3% ($p < 0.0001$) and 8.4% to 7.0% ($p < 0.0001$) respectively from the pre-COVID-19 to the peri-COVID-19 period Reduction trends were observed for revisiting clients for antenatal care services (69.8% to 67.9%, $p < 0.0001$) Reduction completing four antenatal care visits at the health facilities (18.6% to 17.0%, $p < 0.0001$). 	<ul style="list-style-type: none"> The use of DHIS2 data poses key data quality challenges including inaccurate and incomplete reporting that are prevalent in low and middle-income countries. The short period reviewed during the peri-COVID-19 pandemic represents the period when the burden of the pandemic was not at the peak in the country compared to the transmission trends as experienced in other European and American countries. Further evaluations at 6 and 12 months may be required to validate the outcomes.

	<ul style="list-style-type: none"> • Increase in the new clients seeking antenatal care services at the health facilities during similar periods (30.2% to 32.1%, $p < 0.0001$) but also a significant decrease in ANC revisits (69.8% to 67.9%, $p < 0.001$). • Mean monthly skilled birth attendance rate and caesarean section rates increased significantly from 68.5% (standard deviation ± 2.0) to 79.7% ($SD \pm 1.2$) from the 4-month pre-COVID-19 to peri-COVID-19 period ($p < 0.0001$). • There was a significant increase in the proportion of clients revisiting the hospitals for family planning services from 53.0% to 56.6% ($p < 0.0001$) from the pre-COVID-19 to the peri-COVID-19 period. • a significant reduction was reported in the new clients seeking family planning services from 47.0% to 43.3% ($p < 0.0001$). 	
Siedner ²² (2020)	<p>Impact</p> <ul style="list-style-type: none"> • There was a significant, although temporary, reduction in child healthcare visitation but general resilience of adult ambulatory care provision during the first 4 months of the lockdown. • There was no change in total clinic visits/clinic/ day at the time of implementation of the level 5 lockdown, or at the transitions to less stringent level 4 and 3 lockdown levels. • There was a >50% reduction in child healthcare visits at the start of the level 5 lockdown from 11.9 to 4.7 visits/day (-7.1 visits/clinic/day, 95%CI -8.9 to 5.3), both for children aged <1 year and 1–5 years. • There was no drop-in clinic visitation in adults at the start of the level five lockdown, or related to HIV care. 	<ul style="list-style-type: none"> • The exposure of interest (i.e., the lockdown measures) were not randomly allocated, so there is a risk, however small, that a simultaneous exogenous shock could be responsible for the changes in clinic visitation seen. • The dataset is purely quantitative and focused on clinic visitation events, which prevents deeper exploration of the root causes of trends noted. • Another key potential limitation is that it is predicated on the assumption that there were no other external factors that would have caused interruptions to the healthcare system on or after 27 March 2020 (e.g., power outage, inclement weather).

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