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1	**RAPID POLICY BRIEF NUMBER: 011-02**
2	**RESEARCH DOMAIN:** COVID-19 Response Capacity with the Health Systems
3	**TITLE:** COVID-19 Response Capacity with the Health Systems – Health Information Systems
4	**DATE OF PUBLICATION: 02/03/2021**
5	**BACKGROUND** Information systems have played a pivotal role in responding to the outbreak of COVID-19 as they serve as platforms for effective and efficient communication. Public health and health systems responses to this pandemic have heavily relied on health information reporting, projection of incidence, morbidity and mortality, visualization of data, planning for and responding to it [1]. Prompt and timely use of data and information to plan health systems capacity in alignment with decisive public health responses results in low community transmission and death rates [2]. COVID-19 has further highlighted that health information is prominent and required to manoeuver through the pandemic, reinforcing the need for robust health information systems, data capture analysis, and reports to support clinical care and efficient health management systems [3]. The application of emerging health technologies and digital practice in health care such as mobile health, big data, telehealth or telemedicine, artificial intelligence, and the internet of things have been identified as powerful strategies to fight against this pandemic and provide strong support in pandemic control and prevention.
6	**SEARCH STRATEGY / RESEARCH METHODS** A systematic search of the following databases was conducted to obtain peer review literature published between December 01, 2019, and January 15, 2021, **PUBMED, WHO COVID-19, and Index Medicus.** Using a combination of search terms - (COVID-19 or SARS-CoV-2) and (health information). Also, we searched the reference list of potentially eligible studies and related reviews obtained from the three databases. We included studies of any design and scoped Africa-related evidence published in English. Studies that reported health information integrating health technologies and practices such as artificial intelligence (AI), machine learning (ML), big data, Internet of Things (IoT), mobile health applications, geospatial technology, and information technology were included. The search yielded 1,329 studies in PUBMED, 971 in the WHO COVID-19 databases, and 28 from Index Medicus. After screening and removal of duplicates, 23 studies met the inclusion criteria. Due to the results' heterogeneity, we present a descriptive analysis of the findings from different studies.
7	**SUMMARY OF GLOBALLY PUBLISHED LITERATURE RELATED TO THE SUBJECT** Two studies were identified as reviews in low and middle-income countries (LMIC), big data technology, eight on mobile health applications, five on geographic information and technology, three on information technology, and one each on short message service laboratory information system. We summarize these below in various categories. The first category of studies contains the review literature, while the second is a summary of all the various health technologies. This study reveals mobile phone communication's usefulness in disease management for varying purposes in LMICs, such as information sharing between health care professionals, disease surveillance, and communication with patients and communities [4]. Four themes were identified from the scoping review carried out on exploring AI and ML in combating COVID-19 and

opportunities for LMICs; these are COVID-19 pandemic and the need for AI (AI can reduce the burden on health systems and improve disease surveillance systems in resource-limited storage, can be used to boost data mining), the utility of AI in COVID-19 screening, diagnosis and contact tracing (mobile-based survey can be used to identify and control COVID-19 in a population under quarantine), use of AI in COVID-19 patient monitoring and drug development (can be used to automate patient supervision using data from different sensors and hospital monitors), AI beyond COVID-19 and opportunities for LMICs (AIs superior ability to extract information can make clinical decisions for disease diagnosis, tracking and prognosis [5]

In addition, the application of big data analytics has been used for COVID-19 prevention, control, and contact tracing [6, 7]. This was used in China and Taiwan, as this technology displayed potential in containing, suppressing, and controlling COVID-19 [6, 7]. Information from major medical institutions, telecommunication operators, government departments, the internet, and commercial companies, through its analysis, revealed that big data technology played critical roles in the global pandemic. These roles include; early warning and epidemic surveillance, tracing of virus sources and personal tracking, monitoring drug screening, medical treatment, planning public health interventions, strengthening regional and community responses to epidemics, and guiding economic and social recovery in the post epidemic period [6]. Big data analytics with effective contact tracing, automated alert messaging for self-quarantine, and follow-up of the outcome related to COVID-19 showed it could decrease the resources required for epidemiological surveillance of new virus infection [7].

A common approach across countries (as many as 25 countries) to combat the spread of the coronavirus is the use of digital technology, a new infrastructure that involves the usage of Bluetooth and application program interfaces (APIs) provided by Google and Apple to enable interaction between mobile devices to close [8]. One of such apps in Japan uses personal health records (PHRs)-based COVID-19 symptom-tracking app. This was used as part of an active epidemiological investigation executed at a public health center [9]. A conceptual framework in the development of an app should possess the following core functionality target users, operating systems, products, functionality, application scenarios, and navigation/use of the tool; also, preservation of user's privacy should be prioritized [10, 11]. The Bluetooth-based mobile contact confirming app, COVID-19 contact confirming application (COCOA), which is in use in Japan, protects users' privacy from potential attackers, other users, and public authority [11]. Although the digital form of contact tracing is more effective and does not face similar challenges of slow response due to human resources that the manual contact tracing face, it is, however, dependent on the effectiveness of any contact tracing system depends on the level of public support [12].

Due to the number of apps that are currently in use and evaluation of the contents and features in order to guide users in choosing an appropriate mobile app and to help developers enhance the designs of their existing or future mobile apps in order to further improve quality [13]. The evaluation was done to assess the knowledge, purpose, tracing or mapping of COVID-19 cases, usability, online consultation with a health professional, home monitoring surveillance, official apps run by health authorities, information accuracy, privacy, organizational reputation/attributes, transparency, and user control/self-determination [13, 14].

More so, an overview of the COVID-19 apps in India revealed that about 70% of the target users are the general population, while the international patient summary in Taiwan (IPS; an eHealth

	record that contains essential care information about a patient) was designed for physicians treating patients with COVID-19 [15, 16]. Also, the use of a short message service was explored to monitor patients who risk clinical deterioration at home. It was useful for an early warning system to refer patients with worsening clinical status to hospital-based care or additional clinician advice [17]. Also, the use of information technology showed the need to establish a hospital incident command structure that works in synergy with other systems, and this makes the response to public health emergencies quicker [18]. This was further demonstrated in China that portrayed IT play a pivotal role in responding to the COVID-19 pandemic [19]. In the emergency management of COVID-19, IT has been used for different aims such as accurate diagnosis, forecasting, statistical reporting, and monitoring and controlling disease [20]. Also, IT use to alleviate laboratory personnel from repetitive and administrative tasks through digitalization and automation using developed laboratory information systems (LIS) functionality and reporting tools significantly streamlines sample processing and reduces turnaround time [21]. There has been increasing relevance of geospatial technologies such as geographic information systems (GIS) in the public health domain. Themes were cited, and case studies were carried out on COVID-19 to demonstrate its richness and establishing the link between diseases and their environment [22]. Incorporating GIS into COVID-19 pandemic surveillance, responses, and modeling enhances understanding and control of the disease [23]. There are currently some online/mobile GIS dashboards that provide real or near-real-time mapping and tracking of the coronavirus epidemic. These include the John Hopkins University Center for Systems Science and Engineering dashboards, the World Health Organization dashboard, HealthMap, Close contact detector geosocial app, and Guangzhou underground covid-19 tracking [24]. The integration of GIS-based surveillance methods provides greater flexibility and efficiency to prevent any outbreak and track the cases in a near-time manner [25]. GIS has played a pivotal in many aspects, including the rapid aggregation of multi-source big data, spatial tracking of confirmed cases, rapid visualization of epidemic information, prediction of transmission, balancing and management of the demand and supply of material resources, and spatial segmentation of the epidemic risk and prevention level [26]
8	**SUMMARY OF AFRICA-SPECIFIC LITERATURE ON THE SUBJECT** No study was specific to Africa.
9	**POLICY FINDINGS** When disease travels quickly, information needs to move even faster; this is where the health information system becomes critical [4]. Application of health information systems (HIS) is an inevitable issue in any disaster situation, such as the COVID-19 outbreak. • There is a current need to develop self-testing and quarantine monitoring apps, as most apps focus on contact tracing. • Also, developing comprehensive health solutions for rapid response teams, frontline healthcare workers, and public health authorities is crucial. • The government and policymakers need to ensure a least intrusive measure for disease surveillance.

	• In other to strengthen information technology's capacity to support pandemic prevention and control, taking advantage of health technologies in aiding the investigation and judgment will innovate diagnosis, treatment and improve service delivery. • Targeted strategic planning will enhance public health response to outbreaks, mitigate losses and save lives.
10	**ONGOING RESEARCH IN THE AFRICAN REGION** None was identified
11	**AFRO RECOMMENDATIONS FOR FURTHER RESEARCH** There is enormous evidence of paucity in the region, which includes but not limited to • Applications and evaluations of these technologies, health delivery services, and practices should be explored in the African context. • There is a need to map out new and expedited ways of approaching IT support to clinical needs in Africa • Improving technologies for predicting infectious disease outbreaks should be investigated as they play a crucial role in enhancing the government's capabilities to cope with epidemics. • There is a need to sensitize the communities to utilize the advantage of IT to support emergency management.
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