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Commentary

Prevention and Control of Infectious Diseases: Lessons from COVID-19 Pandemic Response in Zimbabwe

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Abstract: The coronavirus disease (COVID-19) has exposed the unpreparedness of governments in their capacities to prevent, detect, and respond to emerging infectious diseases. Many healthcare systems have been overburdened and the coordinated efforts in different countries have focused on containment and mitigation, with varying degrees of success. A delay in the detection of and response to infectious diseases can lead to the overburdening of already challenged health systems. Containment strategies, such as social distancing, contact tracing, quarantining of exposed individuals and lockdowns, can help control the spread of the infection in communities. Still, long-term solutions should be sought to counter future outbreaks. In this paper, we focus on Zimbabwe to identify and discuss public health strategies that can result in an effective response to future infectious disease outbreaks. We consider potential solutions to facilitate early detection, control, and mitigation of any similar emerging infectious disease. We argue that sustained financial support in public health infrastructure, both locally and nationally, integrated surveillance response systems, and improved communication and research within and across public and private sectors can be instrumental in limiting the damage caused by future outbreaks.

Keywords: COVID-19; infectious diseases; public health response; coronavirus disease

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1. Introduction

When the World Health Organization (WHO) declared the COVID-19 outbreak a global pandemic in March 2020, the Zimbabwe Government stepped up its preparedness efforts to fight the disease through the Ministry of Health and Child Care (MoHCC). Measures implemented included screening passengers arriving from regional and international destinations, creating testing and isolation centers, and providing training on infection control to health personnel in collaboration with non-governmental organizations (NGOs). Additionally, the MoHCC started giving daily updates to the public about COVID-19 through its official website and other media, such as Twitter and Facebook. Zimbabwe recorded its first confirmed case of COVID-19 on 21 March 2020. By 27 March 2020, a total of seven cases had been reported in the country, with four of those having travelled abroad. By the end of March 2020, several additional measures had been instituted, including a

declaration of COVID-19 as a national disaster and the National COVID-19 Preparedness and Response Plan launch.

Before the pandemic, some longer-term problems affecting the Zimbabwe health system have included frequent drug stock-outs, shortage of health workers, dilapidated facilities, and poor procurement practices. Additionally, corruption in the public sector has existed alongside significant politicization, with political views influencing the policies and actions of the Government. An example of such problems was given by the Zimbabwe Minister of Defense and Chairperson of the ruling party, who, during a political rally in March 2020, claimed that COVID-19 was God's punishment against countries that had imposed economic sanctions on Zimbabwe [1]. Such manipulation from a government official had detrimental effects on efforts to contain the crisis at a time when trust in the Government to give accurate information about the disease and the potential control strategies is needed. At such times, public health experts or designated officials should be at the forefront, sharing relevant and accurate messages promoting the adoption of adequate preventive health behaviors and helping instill confidence in communities.

Zimbabwe has the highest informal sector in sub-Saharan Africa, with at least 61% of its gross domestic product resulting from the informal economy [2]. With such a staggering figure, COVID-19 containment measures, such as lockdowns, are likely to have severe and prolonged effects on the citizenry, who rely on informal business activities and generally have no health insurance or savings. The COVID-19 pandemic has resulted in a significant loss of human life worldwide and severe economic and social devastation [3,4]. As a result, there is a need to implement prudent and reasoned measures that aid early detection and management, reducing the spread of this and any similar diseases, and considering the local context.

Before COVID-19, Zimbabwe had experienced other infectious disease outbreaks. The 2008 cholera outbreak resulted in at least 98,000 reported cases and more than 4000 deaths [5]. The 2011 typhoid outbreaks resulted in more than 4000 cases of typhoid fever reported [6]. Besides the lack of suitable public health interventions, financial resources, and poor disease surveillance, the country's inability to mobilize resources led to unsystematic responses to those outbreaks. In the aftermath of crises of such proportion, it would be expected that policies aimed at improving disaster management, response, and infrastructure would have already been upgraded to rise to those challenges before the advent of COVID-19. However, as of 31 October 2021, Zimbabwe had a cumulative number of 132,977 confirmed COVID-19 cases and 4678 COVID-19-related deaths.

2. Conceptual Background

The COVID-19 outbreak highlighted significant gaps in most countries' healthcare systems and their unpreparedness to handle disease outbreaks. For example, in most countries, intensive care unit (ICU) resources were overwhelmed and clinicians were forced to reallocate ICU resources based on patient prognosis. Additionally, some countries may have underreported COVID-19 deaths, as they only reported deaths occurring in hospitals and, in some cases, not all COVID-19 cases were laboratory-confirmed due to limited resources [7,8]. In this paper, we share our perspective, focusing on Zimbabwe, by outlining opportunities to improve how information and data should be used to improve preparedness, capacity, and ultimately, a response to crises. We also discuss what could have been done differently to inform timely actions better to reduce the spread of the virus. Lessons learned help strengthen preparedness and reduce further loss of lives in other waves and similar future threats. This information is also applicable to other developing countries with similar characteristics to Zimbabwe.

Evidence-based decision-making should be at the center of handling public health responses, with a growing need to utilize relevant and time-sensitive information increasingly challenging. Decision-making during the COVID-19 pandemic and other previous epidemics in Zimbabwe was hampered when the timely collection of appropriate, reliable data was not possible due to technological challenges and organizational barriers. While in

some cases, data can be used to understand the problem at hand, prioritize the response to disease outbreaks, and identify and monitor optimal interventions or combinations of interventions, it can also be crucial, used retrospectively, to assess the effectiveness of some interventions.

Thus, we document, below, some potential data-driven future directions and opportunities for managing infectious diseases in Zimbabwe, and maybe in many other developing countries.

2.1. Documentation and Timely Sharing of Information

There is a growing need to utilize data to inform decision-making and evaluate performance, transforming data into insights to build infrastructure and capacity. As a first step toward producing evidence, collecting data is a process that requires adjustments to organizational culture. In this way, it is not simply a technological challenge. The handling of future public health emergencies is dependent on our ability to harness data by creating an enabling environment where they can be sourced and fed into valuable insights. For this purpose, governments need to invest in centralized repositories or data warehouses that can effectively store and manage data sets to be accessed and used to prioritize health issues, develop policies and programs, monitor impact, and communicate with stakeholders. The benefits of data warehouses include offering immediate information delivery and enabling consolidation of healthcare data sources, thereby contributing to better health outcomes and improved management of healthcare resources. While this discussion is centered on healthcare, the same data warehouse model can be used in other government sectors.

2.2. Health System Capacity and Adequate Functional Healthcare Infrastructure

The response to a health emergency should involve access to a fully functional health system that can safely handle the provision of needed essential services [9]. The Organization for Economic Cooperation and Development (OECD) argued that response to infectious disease outbreaks, such as COVID-19, must be pursued "in parallel with health system strengthening, as part of a mutually reinforcing approach to developing resilient health systems" [9]. Health centers in Zimbabwe frequently face logistical issues, including a lack of continuous power supply, a dearth of medical equipment and supplies, eroded infrastructure, and a shortage of skilled healthcare professionals and healthcare staff. The strengthening of health system capabilities would, at a minimum, involve upgrading the design of hospitals to handle infection control, increasing laboratory testing capacity, provision of adequate personal protective equipment, and above all, specialized training to keep the healthcare workforce in sync with new infection control practices and technologies.

2.3. Surveillance and Health Information Systems

Zimbabwe has a Notifiable Disease Surveillance System (NDSS), created by the Zimbabwe Public Health Act (15:09) [10]. The process must be followed when a notifiable disease is diagnosed and is elaborately articulated. Considering the responsibilities of the relevant officers, from the clinic to the district, provincial and national offices are clearly defined within this system, alongside appropriate timelines. However, an antiquated infrastructure hinders effective disease surveillance. Some of the barriers to health information system adoption include a lack of healthcare personnel with the necessary information and communication technology skills to support electronic health record systems throughout their operational lifespan, as well as resistance from healthcare personnel who believe that these systems will complicate work processes or even lead to job losses [11]. Now is the best time to modernize the NDSS by improving its mechanism of gathering input by developing electronic system functionalities that directly feed into data warehouses or central repositories. If implemented, the rapidly evolving electronic infrastructure presents an opportunity to use health information technology to improve health outcomes while

supporting health research. Moreover, recent technological advancements in digital health, digital medicine, and artificial intelligence allow the integration of social, behavioral, and medical data to support health promotion efforts, including coordination of health services. For the early detection of infectious diseases, routine monitoring and reporting supported by a health management information system should be prioritized. Besides identifying outbreaks and monitoring trends of new pathogens, surveillance also characterizes the burden and epidemiology of diseases [12]. Those data are critical to inform the response. During the early days of the COVID-19 outbreak, efforts to control the spread of the disease through testing and contact tracing were hampered by a lack of data, resulting from limited testing capacity and other resources. It remains true that an effective information system should facilitate prompt notification of positive results to keep policymakers abreast of the evolving facts and statistics. Therefore, leveraging health information technologies designed to provide access, manage, and share comprehensive, timely, and higher-quality information, at all healthcare system levels, is key to improving population health.

2.4. Promoting Health through Partnerships of Multiple Stakeholders

While it is the Government's responsibility to promote health by availing financial and human resources, the practical reality is that too many competing needs and limited fiscal wiggle room constrain the capacity to respond to disease outbreaks. An effective public health system necessitates continuous engagement and collaborative efforts with the private sector, civil society, communities, and researchers. The alignment of policy and practice of public health agencies at the national level and the development of public–private partnerships (PPP) can make healthcare delivery services significantly more effective and efficient [13]. PPPs can support institutional frameworks to be more efficient, improve quality and efficiency and add human resources. For example, a healthcare collaboration between the Lesotho Government and a private consortium resulted in the construction of a new health facility and refurbishment and management of at least three community-based clinics. Compared to similar government-run networks, research evaluating the performance of the public–private partnership found that the PPP-managed network treated more patients, provided higher-quality services, and produced better clinical outcomes [14]. The private sector has more significant potential to bring healthcare innovation and can help build the internal capacity of public health programs and projects. It can also help by expanding access to specialized services, adding value to supply chain and logistics, laboratories, and diagnostics, and advancing research and development of new technologies.

2.5. Public Health Communication Strategies

While communication strategies differ depending on the message and audience, they should take advantage of science and facts about the identified health problem(s). Public health communication is defined as "the scientific development, strategic dissemination, and critical evaluation of relevant, accurate, accessible, and understandable health information communicated to and from intended audiences to advance the health of the public" [15]. Health communication strategies are even more critical during a crisis, such as COVID-19, where everything is happening in real time. In Zimbabwe, the COVID-19 response included a strategic thrust, given the sobriquet Risk Communication and Community Engagement (RCCE)—a tool developed by the World Health Organization (WHO) as a guiding action plan for COVID-19 preparedness and response [16]. The primary focus of the RCCE activities is to promote people-centered and community-led approaches through radio, television, posters, pamphlets, and interpersonal communication channels, such as drama and community dialogues. Moreover, data collection should be broadened to include sentiment analysis of opinions expressed on both mainstream and social media. Such sentiment analysis can assist policymakers in identifying the lacunas in their strategy and alert them to emerging challenges, such as information overload and behavioral fatigue.

2.6. Modeling Disease Spread

Modeling a pandemic in real time and simulating different scenarios provides policymakers with unique tools to gather essential insights on scales and trajectories, which cannot be obtained in any other way. There was little to no modeling of disease spread in Zimbabwe in the early days of the COVID-19 pandemic. The lack of synchronicity meant the disease spread to and within different continents, regions, and countries was also evident at the local level, as 60 days after the first case was reported in Zimbabwe, six of the ten provinces had not recorded a single case. Given that COVID-19 was likely to arrive in Zimbabwe through international travel, modeling that considers virus transmission could have highlighted the differential spread trajectories, followed by the provinces in the initial stages of the disease spread. Consequently, provincially tailored containment measures could have been instituted, thereby avoiding a national lockdown. However, good data and reasonable modeling assumptions best serve such a fine-grained approach. This underscores the need for Zimbabwe to invest in developing and strengthening its disease modeling capacity.

2.7. Health Systems Research

Using scientific research to develop initiatives that improve human health is the cornerstone of public health in every nation. This is why data repositories and data warehouses are so important. Research also helps build the required evidence for enhanced decision-making. In addition, it enables us to determine the mechanisms of disease and its transmission, which, in the case of an emerging disease, such as COVID-19, cannot be overemphasized. Countries similar to Zimbabwe need to direct more resources towards identifying knowledge gaps by supporting their research capacity and avoiding overreliance on international support. It is high time that the country sets up a National Institute of Public Health to assist the government in decision-making by providing expert knowledge with a scientific basis.

2.8. Building Data Science Human Resource Capacity

All of the strategies above should be implemented in tandem with a deliberate effort to increase health data science capacity. In general, human resource constraints are the bane of developing-world healthcare systems. Many developing countries, including Zimbabwe, have training programs designed to churn out healthcare professionals continually, such as doctors and nurses. However, training programs for data scientists with expertise in health data science approaches and procedures are in short supply. Expertise in pattern recognition methodology and tools, for example, can help identify groups at higher risk. In contrast, experts in spatial-temporal data science approaches can help discover emergent "hotspots" and disease trajectories.

Several initiatives can be implemented to expedite the capacity building of health data science human resources. Four such initiatives are proposed here. First, short training courses are offered in collaboration with universities. Health departments can draw into existing expertise in university departments, such as computer science and statistics, to design training programs geared at improving current employee abilities. Second, universities should be encouraged to develop graduate-level programs focused on health data science. Third, and related to the second, is faculty development. If universities are to play a critical role in the development of health data science as a profession, faculty development exercises must be undertaken to guarantee that faculties are abreast of cutting-edge methodologies and technology. Finally, engagement with stakeholders in the private sector is essential. Many private sector companies consume data created by the health sector. Life insurance providers and health insurance companies are examples of such customers. Governments should use their partnerships with these groups to fund human resource capacity building and align training programs with local needs.

3. Conclusions

COVID-19 poses a severe public health threat to the current and potentially future generations. It came as a wake-up call to all, particularly developing countries, to strengthen their health systems by setting up public health infrastructures capable of handling infectious disease outbreaks. Zimbabwe swiftly and effectively implemented social distancing, a national lockdown and other measures that limited gatherings in response to this threat. Since most of these measures were reactive, the country needs to build a data-driven health infrastructure that can actively prevent, detect, and respond to emergencies. While most developing countries have experienced severe infectious disease outbreaks, such as EBOLA and cholera, there have not been continued efforts to create sustainable solutions to potential disasters. Research plays a pivotal role in the response to new and emerging diseases. However, governments should be at the forefront in providing sufficient and continuous funding for the harnessing and processing of data, which is critical in implementing science-based decision-making and informing effective policies. Most developing countries, including Zimbabwe, constantly face logistical challenges in gathering public health data and have limited disease surveillance [9]. Until this is addressed, the response cannot be maximized, to the detriment of the effectiveness of interventions.

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