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Prospective Study

Perspective: COVID-19 Outbreak and Information Tools

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Abstract

In April 2020, a novel coronavirus (COVID-19) outbreak originating in Wuhan, China, began spreading worldwide. There are currently more than two million cases. The World Health Organization has declared the viral spread to be a pandemic. The virus is transmitted between humans via droplets in the air and contaminated surfaces. After 2–14 days of incubation time, mild to severe symptoms occur, sometimes resulting in death. Key strategies for managing the pandemic are early detection, quarantine, and treatment. Many drugs or drug combinations like Hydroxychloroquine/Azithromycin or antiviruses like Remdesivir, which were originally designed to treat the Ebola virus, have been screened clinically to treat COVID-19 patients. Vaccines are likewise being developed by biotechnology companies and universities. We report in this paper how technology, and geographic information tools, can be used to control the pandemic in African settings. Different thematic such as flights tracking, electronic surveillance using web mass tools, temperature detectors, and telemedicine but also issues are developed.

Situation

On January 30, 2020, World Health Organization (WHO) Director-General Dr. Tedros Adhanom Ghebreyesus declared the Chinese outbreak of COVID-19 to be a public health emergency of international concern, posing a high risk to countries with vulnerable health systems. The emergency committee stated that the spread of COVID-19 may be interrupted by early detection, isolation, prompt treatment, and the implementation of a robust system to trace contacts [1]. Respiratory illness caused by the virus was first identified in Wuhan, a city in the Hubei province of China, on December 8, 2019 [2]. Evidence indicates that the patients were suffering from the infection of a novel betacoronavirus that was spreading worldwide at alarming rates despite drastic containment measures such as transportation restrictions, the cancellation of mass gatherings, social distancing, and lockdowns. The current situation resembles several other outbreaks of the last decade, including those of the 2009–2010 swine flu (H1N1), the 2014 West African Ebola virus (EVD), the 2018–2020 Democratic Republic of Congo (DRC) EVD, and the 2015–2016 Zika virus in Latin America [3]. COVID-19 is a new disease, and peoples's awareness and knowledge are gradually

increasing based on ongoing research findings and clinical practice experience [4].

Information technologies to monitor and control the pandemic

The correlation coefficient of travellers and case detection data indicates that COVID-19 will remain a significant threat. The data are impacted by the airborne movement of people and are therefore affected by the closure of flights and borders [5]. Data extracted from FLIRT (an online air travel dataset that uses information from 800 airlines to show direct flights and passengers' end destinations) for the month of January 2020 indicates that the African countries of Ethiopia, South Africa, Egypt, and Mauritius are at higher risk of transmission [5]. Electronic surveillance using web-based tools has proven to be of substantial value in reporting outbreaks of infectious disease. In response to this ongoing public health emergency, online interactive dashboards such as the ones provided by WHO, the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University, and HealthMap at Boston Children's Hospital, all of which visualize reported cases of the coronavirus in real time (Figure 1), are available [6–9].



Considering the WHO dashboard, accessed on April 24th, 2020, 210 countries and regions have been affected by the disease, with more than 2.6 million confirmed cases and 181 thousand dead. The virus reached Africa later than other parts of the world, but it is anticipated that the emergency will impact African health and society durably. There is an urgent need for governments in low-income countries, including those in sub-Saharan Africa, to invest in improving their fragile health systems and for donors to support their preparedness efforts [3].

The first case was registered in Egypt on February 14, 2020, and countries including Algeria, Senegal, South Africa, Cameroon, Nigeria, and Togo have been subsequently affected [3,6]. Clinical features of COVID-19 include dry cough, fever, diarrhea, vomiting, and myalgia. Individuals with multiple comorbidities are prone to severe infection [10]. The clinical diagnostic method used for COVID-19 is nucleic acid detection through nasal or throat swab sampling or other respiratory tract samplings using real-time polymerase chain reaction (PCR). The results of the swab sampling are confirmed using next-generation sequencing [11]. It is critical to detect coronavirus early to prevent its spread within communities. Spreading would trigger a number of cases that could overwhelm communities' treatment capacity, said Michel Yao, WHO Africa program manager for emergency operations [6]. Early detection, diagnostic testing, and isolation are three critical features of a successful response to the pandemic that would reduce its societal impact [12]. COVID-19 patients are stigmatized, and hospitals deserted for other pathologies due to fear for contaminations. As consequences numbers of death will not be declared and recorded in pandemic indicators data. Technology can play a critical role in underdeveloped countries through the development of geographic information

system tools. Recording instances of fever during the COVID-19 pandemic would allow for geographic information progression (trajectories, travel), including real or near-real-time mapping, visualization, and prediction to detect hot spots. The use of data and simulations to track and combat contagion has been considered by health professionals. Area detectors or miniaturized "smart," "micro," and inexpensive family-, individual-, community-, and patient-thermometers, that are linked to the internet or paired to smartphone applications can warn individuals of local outbreaks better than other government tools [12]. The U.S. Health Weather Map, for example, is a visualization of seasonal illness linked to fever; namely, influenza-like illness. The aggregate, anonymized data visualized via the Health Weather Map is a product of Kinsa's network of smart thermometers and accompanying applied health geography mobile applications. Thus, this method could also be used to prevent second waves of diseases and to control endemic infectious diseases in low-income countries [13]. During infectious disease outbreaks and epidemics, social media play an important role in communicating verified facts and proven prevention tips to the masses, but they also carry the risk of 'virally' spreading misinformation, confusion, and fear among the general public [14]. False positives (as coming from other infectious diseases) or asymptomatic patients will distort results of the fever distribution and visualization. In the case for example of fever induced malaria due to the liberation of merozoites in the blood and where vectors are mosquitoes, much progress is made and the comparison with breeding site study, and entomologic survey of vectors could help correct the data. We can postulate that the inter-population progression in the case of a pandemic is different with an endemic progression as in the case of malaria. In the case of asymptomatic COVID-19, Henegan et al., (2020) from The Centre for Evidence-Based Medicine (CEBM) proportions between 5-80% from various

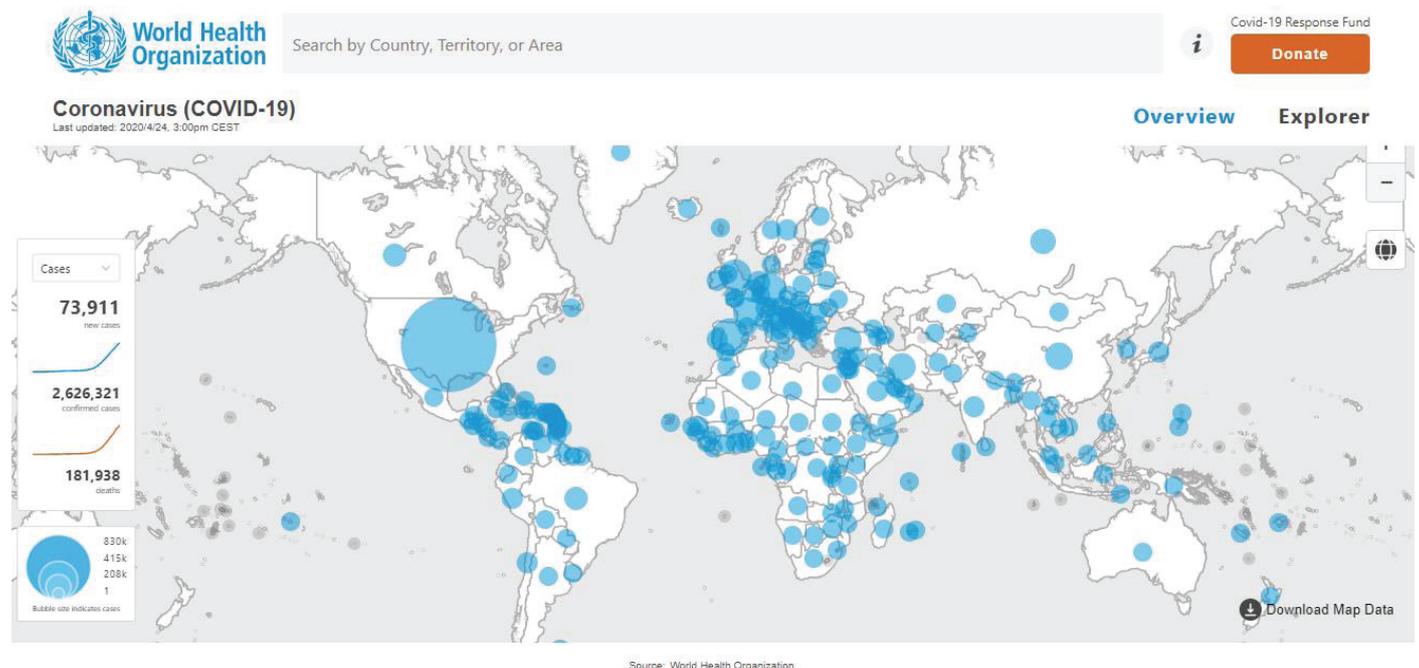


Figure 1: April 24, 2020, WHO pandemic dashboard.



sources are observed highlighting that children and young adults are asymptomatic [15]. These later patients must not be included in fever visualizations studies and symptoms-based studies will miss cases but are a good indication of the outbreak progress. These indications must be followed by targeted cheap rapid testing.

China has developed the Close Contact Detector app/platform, which uses big data collected from public authorities about the movement of people (public transport data covering flights and train travel, as well as disease case records) to determine whether a given user has had any close contact with a person confirmed or suspected to have been infected in the recent past [16]. Based on advanced information technology and telemedicine and telehealth services, the "Medical Internet of Things" has experienced four major evolutions, including the development of wireless sensing technology, use of internet technology in clinical medicine, use of radio frequency identification, and artificial intelligence applications, in realizing the Internet of Things medical model [17]. Low-income countries will certainly lack structures for social distancing and isolation; thus, telemedicine and telehealth services that rely on the popularity of smartphones are necessary to encourage most people to quarantine themselves in their homes. The goals of the technological methods are to identify areas where illness levels are unusually high and investigate them, as well as to gauge whether the measures being taken are working to slow the spread. Other structural problems will arise, as most businesspeople in African cities consist of small, weak, disconnected units. Structural issues will be combined with fear and patient stigmatization. Determining how to support and organize the most vulnerable populations in order to improve social distancing is a challenge. In the context of a public health pandemic like this one, patient tracking via phone triangulation or cameras may be considered the most acute loss of privacy using technology. During a health crisis, governments must communicate crisis information effectively and efficiently to members of the public. Failure to do so will inevitably lead citizens to become fearful, uncertain, and anxious about the prevailing conditions [18]. It will also increase the spread of misinformation and conjecture to the public. Trying to maintain a semblance of normality during this pandemic has required individuals to learn how to work remotely and hold meetings virtually [19]. The ability to use information technology will allow schools and universities as well as organizations and administrations to continue their activities while maintaining social distancing. The digital health hub conclusions of the Transform Africa Summit Yield in Rwanda (2018) has presented a landscape and countries' roadmap of 80.8 % for mobile phone- and 25.1 % for internet-penetration in the continent [20]. Inside 26 countries over 47 in the African Region of WHO (AFRO) have developed eHealth strategies back 2016 [21]. In a context of COVID-19 outbreak public-private partnerships may be expended to alleviate issues such as the lack of interoperability of Digital Health solutions, poor power, high cost of the internet infrastructure or inadequate sustainable financing [22]. Personal data confidentiality issues are correlated to internet applications over the world. The question is how privacy must be preserved in a

context of quick progressing crisis outbreak where for example airlines and offices are screening mass populations for fever. Confidentiality will remain of actuality and will found different solutions respectively to the type of government.

Conclusion

At the end of 2019, a deadly new virus appeared in the Wuhan region in China. Drugs and vaccines to stop the virus progression are undergoing clinical trials. To date, 210 countries and territories around the world have reported outbreaks of the virus. Reemergence in following years isn't to exclude. Information tools are being used to help to monitor and control the spread of COVID-19. Low-income countries such as those in sub-Saharan Africa will benefit from mastering geographic information tools and other technological services such as telehealth and telemedicine to gain control over the disease.

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