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The Past and the Present: The Nigerian Ebola experience and the Covid-19 Pandemic

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Abstract
The 2013—16 Ebola virus disease (EVD) outbreak is by far the most geographically dispersed and deadliest Ebola outbreak recorded. Whilst most fatalities associated with the outbreak were mostly concentrated in three West African countries (Guinea, Liberia, and Sierra Leone), Nigeria contained the virus within 92 days. Whereas this earned Nigeria a global applaud, the world is in another epidemic barely years after the 2013—16 EVD epidemic. Conventional thinking would be that Nigeria can easily contain the Covid-19 within its border by mimicking its erstwhile country-wide response in the fight against EVD. However, available statistics neither show Nigeria a victor over the Covid-19 pandemic nor suggest the country a potential victor over it. Instead, the number of Covid-19 confirmed and death-related cases has been on the rise since the index case. Against this backdrop, in this paper we attempt to identify factors responsible for Nigeria's victory over EVD, through a comparative analysis. We also evaluate Nigeria's country-wide response to Covid-19, while drawing inference from its past success on EVD to underpin factors that may have impeded the country's from mimicking its successful erstwhile country-wide response in the fight against EVD. We complement this analysis with recent surveys for Nigeria to assess the spatial disparities in terms of vulnerability and shocks to Covid-19 and explore the spatial distribution of government and non-government assistance across the different regions.
Keywords: Covid-19; Coronavirus; Ebola virus; Wes Africa; Nigeria
JEL: H51; H53; I15; I18

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Abbreviations

African Development Bank	AfDB
African Union	AU
Bundibugyo Ebola virus	BEBOV
Center for Disease Control	CDC
Central Bank of Nigeria	CBN
Coalition against Covid-19	CACOVID
Covid-19 National Longitudinal Phone Survey	Covid-19 NLPS
Ebola treatment centers	ETCs
Ebola virus disease	EVD
Emergency Operations Centre	EOC
European Union	EU
Federal Capital Territory	FCT
Global Health Security	GHS
Government of Nigeria	GON
Internally Displaced People	IDP
International Health Regulations	IHR
International Monetary Fund	IMF
Joint External Evaluation	JEE
Lagos University Teaching hospital	LUTH
Mobile Strengthening Epidemic Response System	mSers
Nigeria Afrobarometer survey	NAS
National Bureau of Statistics	NBS
National Incident Coordination Centre	ICC
Nigeria Center for Disease Control	NCDC
Nigeria Covid-19 National Longitudinal Phone Survey	COVID-19 NLPS
Nigeria Field Epidemiology and Laboratory Training Program	NFELTP
Médecins Sans Frontieres	MSF
Middle East Respiratory Syndrome Coronavirus	MERS-CoV
Personal Protective Equipment	PPE
Presidential Task Force	PTF
Reston Ebola virus	REBOV
Severe Acute Respiratory Syndrome Coronavirus 2	SARS-COV-2
Sudan Ebola virus	SEBOV
Surveillance and Outbreak Response Management System	SORMAS
Taï Forest Ebola virus	TEBOV
United Kingdom	UK
United States of America	US
United States Agency for International Development	USAID
United Nations Children's Fund	UNICEF
Viral hemorrhagic fever	VHF
World Health Organization	WHO
Zaire Ebola virus	ZEBOV

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1. Introduction

2013 ushered yet another global epidemic, the Ebola virus disease (EVD) outbreak. Nigeria recorded its index case for this virus on 20 July 2014, when a Liberian-American man infected with the virus arrived in Lagos. The index case, which died in the hospital five days later, set off a transmission chain that infected a total of 19 people, of whom seven died (World Health Organization, [WHO] 2014a). The EVD outbreak in Nigeria, and in particular Lagos, attracted a lot of global concern. There is no better way to buttress this than how the then United States of America [US] Consul General in Nigeria, Jeffery Hawkins, phrased it: "The last thing anyone wants to hear is the two words, 'Ebola' and 'Lagos' in the same sentence", noting that that single juxtaposition conjured up images of an apocalyptic urban outbreak (WHO, 2014a).

Global concerns regarding the EVD outbreak in Lagos draw from two systemic issues. First, Nigeria is notorious for its dilapidated and poor healthcare infrastructure and system. Second, Lagos is a densely populated city with many of its inhabitants dwelling in slums, and lacks a database on residents, making it difficult for any effective contact tracing. It suffices to mention that the city through its airport and land road network engenders intra—and inter Africa mobility. It also receives a large number of people on a daily basis from across the globe who enters the country for business or financial refuge. The culmination of these makes the city a conduit for an easy spread of the virus globally. Against all odds and to the astonishment of many, however, Nigeria was declared EVD free by WHO nearly 92 days after the index case was announced (WHO, 2014a). In contrast to other West African countries vis-à-vis Guinea, Liberia, and Sierra Leone that were plagued by the same virus, Nigeria has been applauded globally on how it contained the outbreak within a short period.

Fast-forward to 2020, the world is in another pandemic called Covid-19. Unlike the 2013 EVD outbreak that started in West Africa and had its most fatalities recorded in that region, Covid-19 was first discovered in December 2019 at the Wuhan province in China (WHO, 2014a; Yan *et al.,* 2020; Wang & Su, 2020) and has since spread across all continents and countries therein. As of 1 January 2021, the global recorded Covid-19 confirmed cases are about 84 million, while the death-related cases are about 1.83 million (Worldometer, 2021), making it the worst pandemic of the modern age since the Spanish Flu of 1918. Anecdotal evidence from Europe and the US that have

the most recent epicenter of the outbreak underscores the importance of a robust healthcare infrastructure and system, and a strong political will in containing the virus. In response to the health challenges the virus poses, countries across the globe have adopted different measures such as border shutdowns, travel restrictions and quarantine, social distancing, and in some cases, lockdown measures in a bid to "flatten the curve" and not to overwhelm the healthcare system.

Basic hygiene habits such as regular washing of hands and wearing face masks have also been adopted, while aggressive testing, screening, and isolation have been recommended as pathways to break the transmission chain and contain the virus. While these approaches were initially adopted largely due to a lack of any clinically approved drug/vaccine for the cure or prevention of the virus as at the outset of the outbreak, recently clinically approved vaccines for emergency usage has not eased most of these restrictions and government recommendations for at least three reasons. First, many countries are still in the distribution plans that prioritize those at highest risk of complications such as the elderly and those at high risk of exposure and transmission such as healthcare workers. Second, there is a limited supply of the available vaccines, meaning that easing the restrictions will expose those who are yet to be vaccinated. Third, there is a dearth of clinical data to ascertain whether those vaccinated are still potential carriers and transmitters of the virus.

Nigeria is among the most Covid-19 affected countries in Africa, with its first confirmed case dated 27 February 2020 (Nigeria Center for Disease Control [NCDC], 2020a)[1]. Since then, the number of confirmed cases has been on the rise. Like most developing countries, Nigeria is characterized by a dilapidated and poor healthcare infrastructure and system, which would make it difficult for Covid-19 patients to receive the requisite medical care. In addition, the economy is dominated by a large informal sector, which exposes many workers at vulnerability risk under the lockdown policies that slow down economic activities. Yet, Nigeria's victory over EVD, despite the country's epileptic healthcare system and infrastructure is suggestive of bling of hope since the country can mimic its erstwhile country-wide response in the fight against EVD. Anecdotal evidence, however, does not support any evidence of learning from the past as the number of

[1] NCDC is the government agency responsible for leading "the prevention, detection, investigation, monitoring, and control of communicable diseases".

Covid-19 confirmed and death-related cases have been on the rise since the country announced its index case. More still, different rhetoric currently abounds in the media and policy space on the approach of the current Nigerian government [GoN] not being optimal in containing the virus.

Against this backdrop, the overarching objectives of this paper are threefold. First, we seek to conduct a comparative study on the Ebola outbreak in Nigeria and other West African countries vis-à-vis Sierra Leone, Liberia, and Guinea, identifying the approaches undertaken by Nigeria and these other West African countries in the fight against the EVD. We then compare how these approaches differ and that could have explained Nigeria's success in containing EVD despite its epileptic healthcare sector. Second, we assess Nigeria's country-wide response to Covid-19, drawing inference from its past success on EVD. We also highlight structural and systemic challenges undermining the country's fight against Covid-19. We complement this analysis with recent surveys for Nigeria to assess the spatial disparities in terms of vulnerability and shocks to Covid-19 and explore the spatial distribution of government and non-government assistance across the different regions.

The rest of this paper is structured as follows. The next section conducts a comparative analysis on the 2013-2014 EVD outbreak in West Africa. Sections 3 and 4 discuss Nigeria's experience with Covid-19, highlighting the country's challenges as it battles to contain Covid-19 outbreak in the country. Section 5 evaluates factors that have limited a country-wide Covid-19 response similar to that of EVD, while Section 6 uses secondary data to assess the spatial distribution of Covid-19 vulnerabilities and shocks and extent to which assistance targeted the most vulnerable people. Section 7 concludes and summarizes the key policy recommendations.

2. A Comparative Perspective on Ebola outbreak in West Africa and the success of Nigeria

2.1. 2013—16 Ebola outbreak: Guinea, Liberia, and Sierra Leone

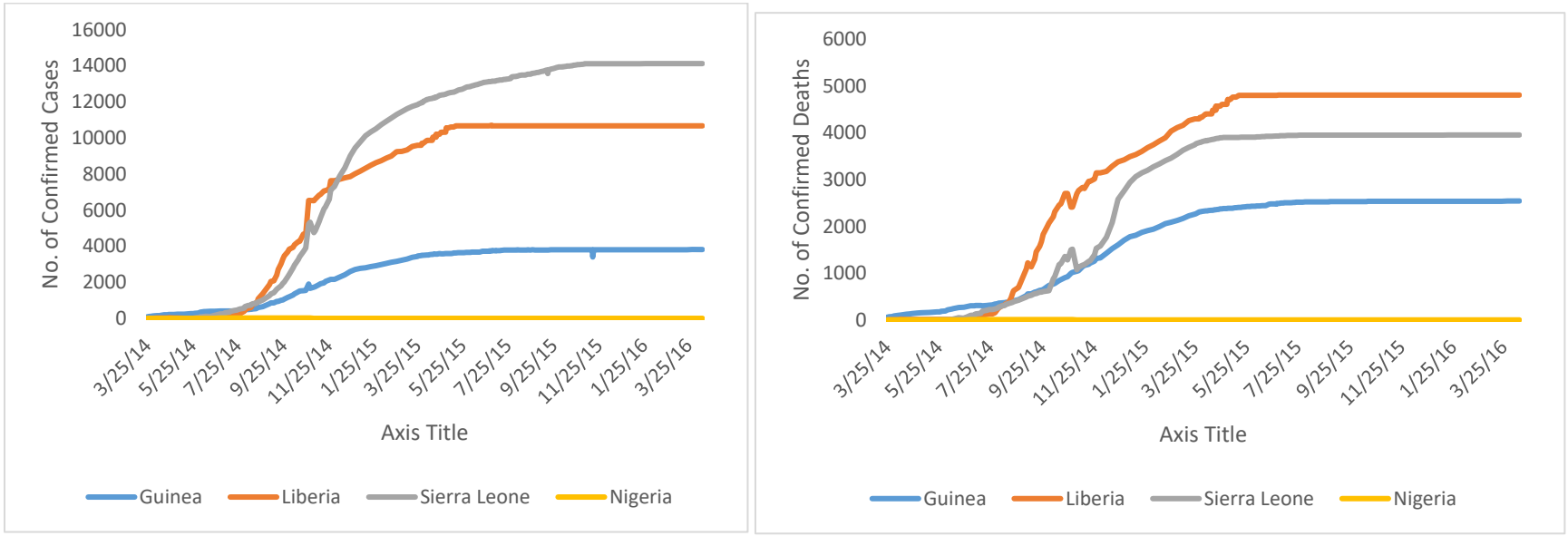
The EVD outbreak in 2013 remains one of the deadliest of Ebola outbreaks (Cenciarelli *et al.,* 2015; Omilabu *et al.,* 2016). In West Africa, Guinea, Sierra Leone, and Liberia alone recorded about 28,630 infections with 11,310 fatalities (Shuaib *et al.,* 2014; Bell *et al.,* 2016; Dahl *et al.,*

2016; Coltart *et al.,* 2017)[2]. Figure 1 shows the trend of the outbreak in these three West African countries. The strain of the EVD that ravaged West Africa was the Zaire strain that is the most lethal of the 5 strains of the Ebola Virus (Zawinlinska & Kosz-Vnenchak, 2014)[3]. Several studies show poor health surveillance and increase human interaction in the context of urbanization in West African countries as some of the reasons for the persistence of this wave of EVD in West Africa (Woolhouse *et al.,* 2015; Houlihan *et al.,* 2017). According to WHO (2015a), the index cases in Guinea and Sierra Leon occurred in December 2013 but were undetected or unconfirmed as Ebola until March and May 2014, respectively. By this time, although the total number of laboratory confirmed deaths was 70 for Guinea and 6 for Sierra Leon (CDC, 2020), the disease has spread to greater parts of the country and thereby overwhelmed the limit of the existing healthcare infrastructure in these West African states (Gatherer, 2014). In August 2014, WHO declared the situation a public health emergency of international concern when it became clear that poor handling of the situation, poor healthcare infrastructure, urbanization, and migration patterns could amplify the spread, posing a greater threat to the rest of the world (WHO, 2015a).

[2] Different reports stated varying figures depending on the time of collection.

[3] There are five identified strains of EVD according to their geographical occurrence: Sudan Ebola virus (SEBOV), Zaire Ebola virus (ZEBOV), Taï Forest Ebola virus (TEBOV), Bundibugyo Ebola virus (BEBOV), and Reston Ebola virus (REBOV). These viruses have varying pathology and virulence in humans and non-humans (Weyer *et al.,* 2015).

Figure 1: EVD trend from March 2014 to March 2016



Source: US Center for Disease Control[4] and Humanitarian Data Exchange (2020)[5,6]

[4] https://www.cdc.gov/vhf/ebola/history/2014-2016-outbreak/case-counts.html
[5] https://data.humdata.org/dataset/ebola-cases-2014
[6] Data for Nigeria is extracted particularly from HDX database.

The EVD being the first of its kind in the region, accentuated the poor health infrastructure and weak preparedness for such epidemics (Omilabu *et al.,* 2016; Vetter, 2016; Rico *et al.,* 2016). Frontline health workers were most at risk because as the disease spread across borders to other countries, no one suspected a severe viral disease upon handling the national index case[7]. According to WHO (2015b) report, it was estimated that over 881 healthcare workers were infected and more than 513 died in Guinea, Liberia, and Sierra Leone. The low safety level across hospitals and laboratories also explains the exposure healthcare workers faced at the onset. The impact on healthcare workers was highest in Liberia and Sierra Leone were 8.1% and 6.9% of the healthcare worker in the respective countries lost their lives due to EVD. The figures are lower in Guinea with 1.5% of doctors, nurses, and midwives who died due to EVD (Evans *et al.,* 2015; Coltart *et al.,* 2017). The overall implication of the loss of lives of healthcare workers already in critically short supply is that it withdraws resources from other areas of needs and emergency such as maternal and infant mortality, HIV, malaria, tuberculosis, and Lassa fever (Piot *et al.,* 2014; Evans *et al.,* 2015; CDC, 2019).

The EVD outbreak did not spare children: 20% of all confirmed cases were children under the age of 15 and an estimated 30,000 children lost both parents (Evans *et al.,* 2015; CDC, 2016c; Davies, 2020). Children without any of their parents have bleak chances of completing their education (CDC 2016c). EVD is deadlier in children and they tend to suffer more because the placating they require in times of distress is practically impossible due to the no-contact nature of the disease. They may, therefore, be left to endure through it by themselves, without their parents. Strasser (2003) considered the effect of inequality in the distribution of healthcare resources in the spread of the virus: rural areas usually have worse infrastructure than their metropolitan counterparts in most parts of sub-Saharan Africa. Given that in all three countries, the index cases were in the villages from where it spread to towns and cities; it was, therefore, difficult to control due to existing shortages in healthcare facilities in these areas.

[7] It suffices to note here that the transmission of EVD is only possible when symptoms begin to show (CDC, 2019; WHO, 2020a), making it easier to identify and isolate these patients. Hence, the people more vulnerable to contract the disease are those who have very close contact taking care of the bedridden victims—whether they are in the home or the hospital. This also goes to explain why frontline workers were the ones mostly at risk.

Other factors that stymied the efforts to contain the spread of EVD within the respective countries included cultural practices and beliefs, and lag in government response. Government across these West African states failed to swiftly respond to the pandemic before it hit the cities. The response of the national governments to declare a national emergency lagged several months—only following the WHO declaration of Public Health emergency in August—after the disease was identified as Ebola in March 2014. As resources were diverted towards treating patient diseases, the government in Liberia, Sierra Leon, and especially Guinea did not swiftly respond by deploying law enforcement agencies to ensure restricted border movements, contact tracing, quarantine measures, and compliance to social distancing (Coltart *et al.,* 2017).

Notwithstanding, inter-agency collaboration, and community engagement were effective in managing the epidemic. The CDC, WHO, African Union [AU], Médecins Sans Frontieres (MSF) as well as other humanitarian organizations worked collaboratively with the national government and Ministry of Health in the affected countries to put the situation under control (CDC, 2016a; Coltart *et al.,* 2017). Foreign governments were also involved in the management of the situation as France, the US, and the United Kingdom [UK] played an active role in Guinea, Liberia, and Sierra Leone, respectively (Vetter, 2016). The governments of the US, UK, and Germany donated more than USD3.61 billion towards the international response to the Ebola crisis (United States Agency for International Development [USAID], 2015). The U.S. government particularly allocated USD2.37 billion and deployed troops to West Africa for the development of Ebola treatment centers (ETCs), to enhance the laboratory capacity and technical expertise, and increase the stock of medical supplies and protective gear (CDC, 2016a; Coltart *et al.,* 2017). In all, over 2000 foreign health workers from 58 medical teams and 40 organizations provided support to 66 Ebola Treatment centers and over 800 hospitals and centers, and more than 4000 indigenous health workers were trained, and 1.5 million personal protective equipment (PPE) sets were distributed to hospitals and treatment centers in the affected nation (Vetter, 2016). And by 2015, 176 organizations were actively working towards mitigating the spread of the virus as well as providing care for the infected (Simpson, 2015).

2.2. 2014 Ebola Outbreak: the Nigerian Experience

The first confirmed case of EVD in Nigeria was on 20 July 2014 three days after a Liberian already symptomatic of the virus arrived in Lagos state[8]. The index patient was placed on malaria treatment even though Ebola was suspected (Shuaib *et al.,* 2015). Upon his death on 25 July 2014, 20 people had been tested positive for Ebola including frontline healthcare workers, of which a total of 8 people died (Althaus *et al.,* 2015; NCDC, 2017). By this time, there were suspected cases in another state in Nigeria, Rivers state (Otu *et al.,* 2017). The government declared a state of emergency and began massive contact tracing almost immediately. In all, about 19, 000 contact tracing was carried out and 890 contacts were established (Oleribe *et al.,* 2015).

Nigeria's first hold on the situation was restraining the index patient—until the status was confirmed, swift monitoring, tracking, and isolation of patients and secondary contacts (Althaus *et al.,* 2015; NCDC, 2017). NCDC and the government of Lagos state worked collaboratively with the Federal government and international organizations like MSF, WHO, United Nations Children's Fund [UNICEF], and the US CDC to create an Ebola management center for tracking and monitoring the spread of the virus (Shuaib *et al.,* 2014; Oleribe *et al.,* 2015). The center was created as a subsidiary of the Emergency Operations Centre (EOC), which was already experienced in the management of other outbreaks in the country (see Otu *et al.,* 2018). The EOC had experts who had managed Lassa fever, Influenza, and Polio in the past. Their expertise in handling other infectious diseases came in handy in managing the spread of the EVD (Oleribe, 2015).

The Ebola Management Centre was first set up in Lagos and subsequently in Port Harcourt (Shuaib *et al.,* 2014)[9]. The government allocated 200 million naira as funding for the operation of the centers and laboratories (Althaus *et al.,* 2015). The prompt release of these funds was immediately directed to procuring the needed materials in the fight against the virus (Otu *et al.,* 2017). Besides, the government enacted restrictive measures on movements, suspended festivities, and made a pronouncement on funeral rites (Otu *et al.,* 2017). There were no major lockdown orders as the

[8] Lagos is Nigeria's commercial capital with over 17 million actively mobile and congested populations. This has implications for the risk of spreading the virus to other states and beyond.

[9] Other state governments were at alert for potential outbreaks. They had an Ebola incident coordination center in readiness for any case. Also, all 56 tertiary hospitals in the country created an emergency isolation ward for potential cases.

situation was generally under control. However, intensive health surveillance was mounted to monitor the spread of the virus and alert the government and health policymakers in case of a need to restrict the general movement of people.

On 20 October 2014, after a 42-day window without new cases, Nigeria was declared Ebola-free. Nigeria was applauded globally for its swift response to the Ebola virus outbreak and how the situation was brought under control within a relatively short period and with fewer casualties. The question yet remains how Nigeria was able to manage the epidemic effectively relative to other West African countries. In the next section, we address this question by highlighting Nigeria's country-wide response that somewhat differs from those of other West African countries, where the virus ravished.

2.3. A Synthesis on West Africa's 2013—16 Ebola Outbreak

The feat attained by Nigeria in halting the outbreak promptly and with fewer fatalities has been applauded globally, with WHO declaring the scenario a "piece of world-class epidemiological detective work" (WHO, 2014b), begs the question: ***"how was Nigeria able to manage the epidemic effectively relative to other West African countries that were ravaged by the virus?"*** Although a country's ability to respond decisively to a fatal outbreak depends largely on the robust healthcare infrastructure and system it managed to build before the outbreak, Nigeria, like most other West African countries plagued by the virus is still battling with poor health care and inadequate supply of medical facilities and personnel (WHO, 2015a & b; Shoman *et al.,* 2017; McPake et al., 2019). It is, therefore, difficult to cite the adequacy of developed healthcare infrastructure as a determinant in the management of the epidemic.

What factors were then responsible for the success and what good practices can we draw from Nigeria's experience in handling outbreaks, especially in States characterized by the poor healthcare system and infrastructure? It is instructive to understand that EVD was already ravaging these other West African countries for about 6 months before spreading into Nigeria. This scenario allowed the government and all stakeholders in the healthcare sector including the organized private sector the window to observe, learn, and prepare for any likelihood of spread into Nigeria. The news of EVD and its dangers had spread around the country before the index

case in Nigeria was recorded. Hence, Nigerians also had the chance to appreciate the deadly nature of the virus and called for immediate government's preventive action. This had a significant effect on both Nigerian residents and government that helped in the fight against EVD in Nigeria. Particularly, given that the outbreak had occurred in similar African countries, its imminent doom in the country was obvious. This induced an unprecedented amount of cooperation among citizens and government in the fight against the virus on the one hand, while communities were receptive to healthcare workers and provided them with the information they needed, on the other hand. In fact, as Coltart et al. (2017) rightly noted, the level of community cooperation was better than in the other countries, perhaps due to the death toll the residents saw had happened in other countries the residents were uncooperative with the health workers[10]. On the other hand, the lessons from the social and economic devastation in Liberia, Guinea, and Sierra Leon, fed into Nigeria's health response strategy and alacrity. In essence, government and healthcare workers already knew how to respond in the event of an EVD outbreak, and they did so in an astonishing manner (WHO, 2014a&b)

The health response of the country that led to its success includes tracking of all potential cases, ongoing monitoring of those cases, rapid isolation, supportive care, and increased surveillance (Fasina *et al.,* 2014; Ibrahim, 2020). As one of the last countries to still be polio-endemic at that time, the country also benefited from the strong polio surveillance system backed by an emergency command center established in 2012 by the Bill & Melinda Gates Foundation. Unlike in the cases of other EVD ravaged West African countries, health workers were adequately equipped, while a treatment center was provided in less than the 21-days incubation period (WHO, 2015d). However, it suffices to mention that the effectiveness of these responses was facilitated largely by the entry state of and the early identification and isolation of the country's index case. Particularly, whilst EVD outbreak in EVD ravaged West African countries occurred in rural communities from where it spread to other cities and towns, the index case in Nigeria was recorded in the metropolitan city of Lagos where healthcare assets are well equipped relative to other states in the country and these other West African nations. It is particularly argued that the existence of First Consultant

[10] For instance, a study by WHO (2015c) reported that community resistance has been a major barrier to control in all three countries but took on extreme dimensions in Guinea. Resistance in some communities even led to violence including, vandalizing vehicles of health workers, destruction of treatment facilities, and murder of health workers. Also, see Wilkinson & Fairhead (2017) and Richards *et al.* (2019).

Hospital— a privately owned hospital where the index case was admitted —and a virology Laboratory at the Lagos University Teaching hospital (LUTH) made the identification of the index case faster as it provided the requisite health infrastructure to restraint the index case until a laboratory confirmation was possible (Adogho *et al.,* 2019). It is arguable that if the index case occurred in some rural areas in the country, the effect might have been worse than what was experienced—despite the preparedness[11].

Regarding the early identification and isolation of the index case in the country, it mitigated a potential widespread of the virus as it enabled a timely tracing, isolation, and monitoring of all contacts the index case had, which is quintessential to break the transmission chain and prevent community transmission that is more difficult to contain. Along this line, while the index case arrived in the country on 20 July 2014, as of 24 September 2014, a total of 894 contacts were identified, and approximately 19,000 face-to-face visits were conducted by contact tracers to assess Ebola symptom development (Shuaib *et al.,* 2014; Bell *et al.,* 2016; Dahl *et al.,* 2016). Identified contacts were either isolated or monitored closely. Upon release, the patients who had been suspected cases started a new 21-day follow-up because of the possibility that they were exposed in the ward. This intense contact tracing has been applauded globally to be thorough and rigorous as it led nearly 100% of all EVD cases linked to the index case, thereby undermining any possibility of community transmission (Shuaib *et al.,* 2014; WHO, 2014b). In contrast, the initial outbreak in Guinea remained undetected for several weeks, leading to community transmission in the country and a consequent transnational spread of the virus to Sierra Leone and Liberia (Fasina *et al.,* 2014). The difficulties and at times inability to track and contain infectious individuals compounded the situation and resulted in an uncontrolled epidemic in these countries.

Generally, these factors worked with the readiness of the GoN and the commitment of development institutions (e.g., WHO, MSF, UNICEF, etc.) and the governments of developed countries (e.g., US, France, etc.) towards nipping the virus before it becomes widespread and difficult to curtail. It is also relevant to highlight the role of the organized private sector by their

[11] As a caveat, it is worth noting that the index case is only the first case identified, implying that there could have been other unrecorded case before that. However, we believe the latter do not apply to the country since all known cases of the virus until the country was declared EVD free were linked to the index.

financial supports and supports with protective equipment and materials necessary for managing the spread of the virus (Otu *et al.,* 2017).

3. Nigeria and Covid-19 Outbreak

3.1. A Synopsis on Covid-19 outbreak in Nigeria

The first confirmed Covid-19 case in Nigeria was reported on 27 February 2020, nearly three months after the first case was reported in the Wuhan Province in China. It also happens to be the third laboratory reported case in Africa[12]. The country's Covid-19 index case is reported to be a 44-year old Italian man who had gained entry into the country via the Murtala Muhammed International Airport in Lagos (NCDC, 2020a), the financial capital city of the country and one of the most densely populated cities in Africa. The patient had subsequently traveled from Lagos to Ogun State (one of the western regions in Nigeria) where he became ill and was promptly isolated (NCDC, 2020a). By 9 March 2020, 27 people out of 216 contacts linked to the index case were screened for Covid-19 in four states (Edo, Lagos, Ogun, and Kano) and the Federal Capital Territory [FCT]. 25 suspects tested negative, while two were confirmed positive (NCDC, 2020a).

Before the index case in Nigeria, WHO had already identified Nigeria and thirteen other countries as high-risks for Covid-19 importation due to their direct link or high travel volume to and from China (WHO, 2020d). Hence, before the reported index case, GoN through its disease outbreak response agency, the NCDC, put in place some measures aimed at containing the outbreak in the country. Among others, this included issuing technical guidelines and response plans, training health workers, and supporting laboratories for Covid-19 testing and campaign to educate Nigerians on how to protect themselves from the disease and setting-up three isolation centers (Avenyo & Ndubuisi, 2020; NCDC, 2020b; Ihekweazu, 2020). Some other important measures included increased surveillance at ports of entry through temperature checks, travel history documentation, and collection of contact details of passengers arriving from Covid-19 hotspots; activation of the National Incident Coordination Centre [ICC] for coordination of preparedness/response efforts and the development of the surveillance and outbreak response

[12] The first laboratory Covid-19 confirmed case in Africa is in Egypt dated 14 February 2020, while the second case is in Algeria dated 25 February 2020.

management system (SORMAS) and the mobile strengthening epidemic response system [mSers] (Adesanya, 2020).

Figure 2: COVID-19 Cases and deaths in Nigeria

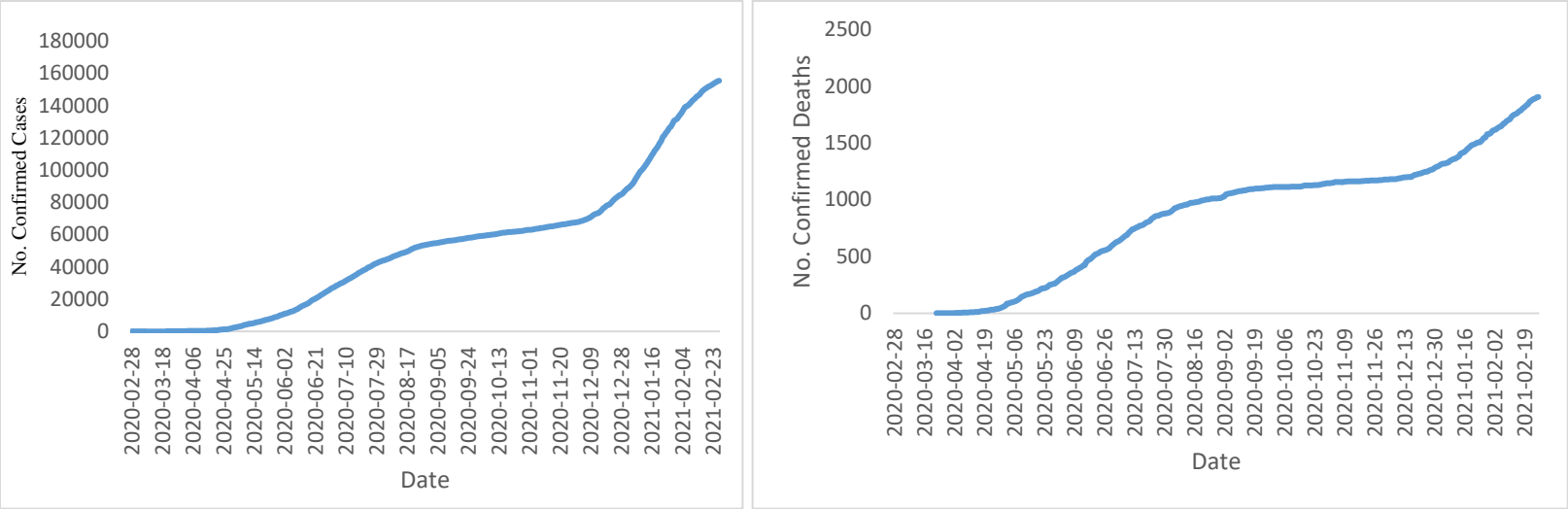


Figure 2 shows the total COVID-19 confirmed and death related cases in Nigeria.
Data Source: Our World in Data[13]

[13] https://ourworldindata.org/covid-cases?country=IND~USA~GBR~CAN~DEU~FRA

Despite these measures, the number of Covid-19 confirmed and death-related cases in the country have been increasing (see Figures 2) since the first recorded case. As of 3 January 2021, the number of officially laboratory Covid-19 confirmed cases in the country is 90,147, with 1,311 death-related cases (NCDC, 2020b). The 36 states in the country, including the FCT, have all recorded at least one laboratory-confirmed case and death-related case. Figure 3 shows that Lagos has the highest number of confirmed cases (31,321) and death-related cases (247). This is followed by the FCT with about 12,083 confirmed cases and 104 death–related cases, while Kogi has the lowest number of confirmed cases (5) with two recorded death-related cases (NCDC, 2020b). While the majority of the initial Covid-19 cases in the country were imported, most of the new cases have no travel history or contact with such people, suggesting an ongoing community transmission. Importantly, given that people infected by the virus can be asymptomatic, it has also been argued that the number of Covid-19 cases in the country may be underreported (Olusola *et al.,* 2020; Adegboye *et al.,* 2020).

Figure 3: COVID-19 Cases across States in Nigeria (27 Feb. 2020-1 Jan. 2021)

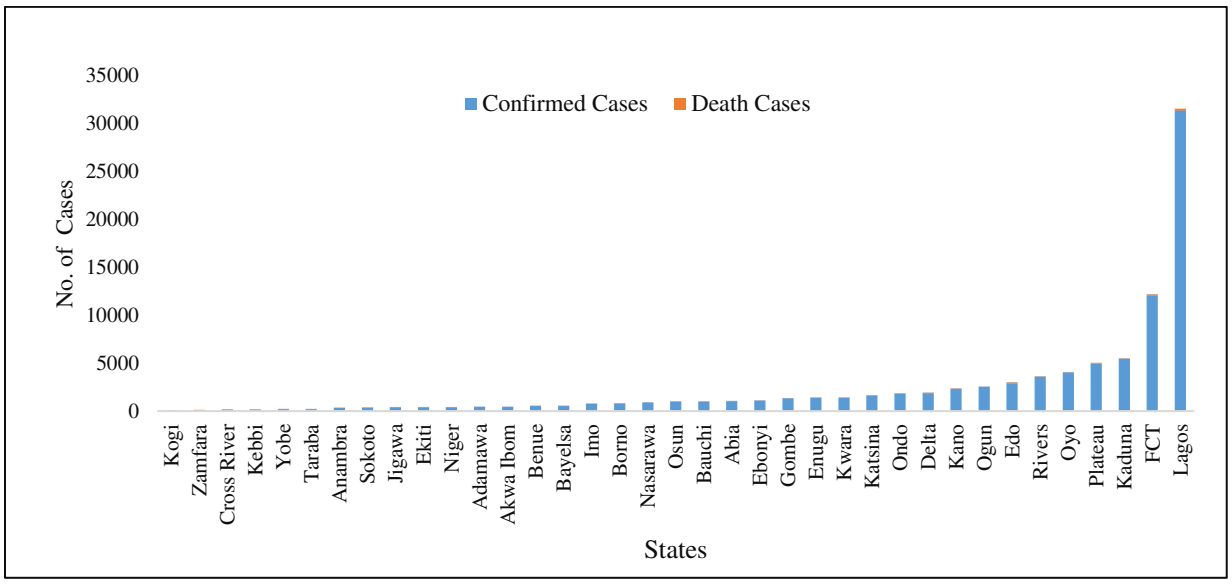


Figure 3 shows the distribution of COVID-19 confirmed and death-related cases across states in Nigeria.
Data Source: NCDC (2020)

Two factors tend to support the view that Covid-19 cases in the country may be underreported. First, the rate of testing in Nigeria, like in most other developing countries, is very low. Part of this

is due to limited testing kits, facilities, over-stretched health and medical workers, and unavailability of specific demographic data needed for contact tracing. Second, a large number of the country's population live in slums and remote areas, making it difficult to do proper contact tracing and identify death-related cases. The latter is further enhanced by religious beliefs and practices, which tend to make families hide the demise of their loved ones from the government even when the course of death may be Covid-19 related. It suffices to mention that Nigeria has a much younger population, a cohort studies suggest often asymptomatic to the virus (Kronbichler *et al.,* 2020; Gao *et al.,* 2020). Hence, the low reported case may also be attributed to this factor.

3.2. Nigeria and Covid-19: Assessing Nigeria's response

Before the reported Covid-19 index case in Nigeria, GoN had what can be best described as a mild approach to the prevention and control of the virus. This is particularly obvious in Figure 4 that shows the level of GoN Covid-19 stringency measures. However, the arrival of the index case on 27 February 2020 (as seen in Figure 4) triggered extreme measures to prevent, mitigate, and contain the spread of Covid-19 across the country. These include lockdowns, movement restrictions, social and physical distancing measures, as well as public health measures. As earlier shown in Figure 3, the distribution of Covid-19 cases is uneven across the states in the country. Whereas this has resulted in a diversified response from the federal and state governments, in this section, we focus mostly on the policy initiatives at the Federal level.

Figure 4: COVID-19: Government Stringency Index

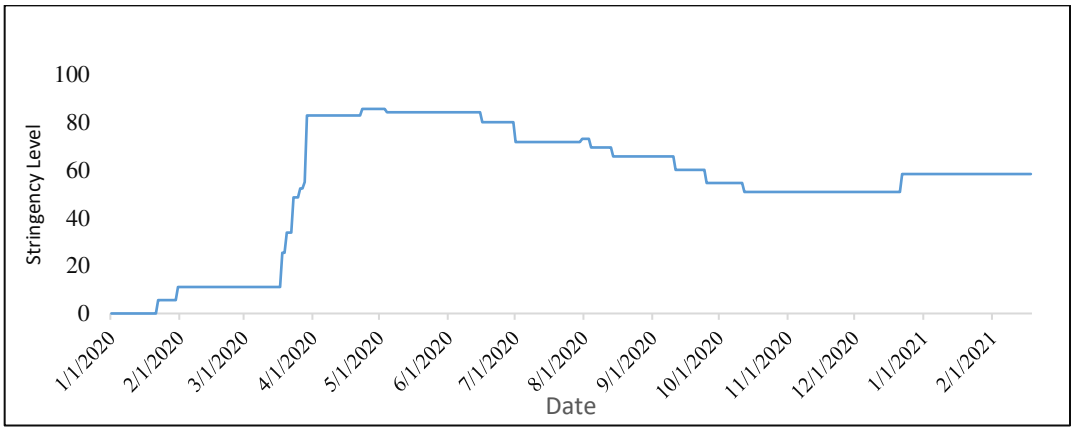


Figure 4 shows Government COVID-19 Stringency Index. The index is a composite measure based on nine response indicators including school closures, workplace closures, and travel bans, rescaled to a value from 0 to 100 (100 = strictest). ***Data Source:*** Our World in Data[14]

The first response of GoN in this regard was the immediate activation of a national multisectoral EOC at level 3, the highest level of response in the country intended for public health emergencies requiring national coordination and use of all available resources for the response (Amzat *et al.*, 2020; Adesanya, 2020). EOC is led by the Federal Ministry of Health, in conjunction with NCDC and the Nigeria Field Epidemiology and Laboratory Training Program (NFELTP). Together, they are responsible for the coordination, surveillance, case management, risk communication, logistics, and research on COVID-19 related matters. At the national level, a COVID-19 Presidential Task Force (PTF) was formed on 9 March 2020. The mandate of the PTF was to coordinate and oversee the country's multi-sectoral and intergovernmental efforts to contain the outbreak, mitigate the impact of the Covid-19 pandemic in Nigeria, and enlighten Nigerians on evolving evidence and issues about the virus and the government's response strategies (Amzat *et al.*, 2020; Adesanya, 2020).

Following the inauguration of EOC, GoN through the management team of EOC engaged in aggressive sensitization of the masses on Covid-19 through a different media outlet, including the radio, television, print, and social media. NCDC also released a set of recommendations and proceeded with the acquisition of medical equipment to identify and test Covid-19 patients. However, due to limited capacity and resources, testing was mostly reserved for travelers arriving with Covid-19 symptoms, especially people with high fevers at airports. Others exposed to the virus but had no symptoms were requested to self-quarantine, whiles NCDC observed them for Covid-19 symptoms (Amzat *et al.,* 2020)[15]. This may have been responsible for the early community transmission that was witnessed in the country. This is because many travelers returning to the country, albeit may have been exposed to the virus but was not showing symptoms, provided wrong information about themselves, making it difficult for NCDC to trace them and those they had contact with (Amzat *et al.,* 2020). To date moreover, testing capacities in the country compared to other Africa countries remain extremely poor (see Figure 5). Other adapted

[14] https://ourworldindata.org/grapher/covid-stringency-index

[15] As of the time of writing, this arrangement has changed as providing a negative Covid-19 test result that is not less than 4 days is now a condition to enter the country.

policy responses from GoN include encouraging citizens to maintain social distancing, regular hand washing and use of sanitizers, use of face masks in public, and good reparatory hygiene.

Figure 5: Daily COVID-19 Tests per thousand people

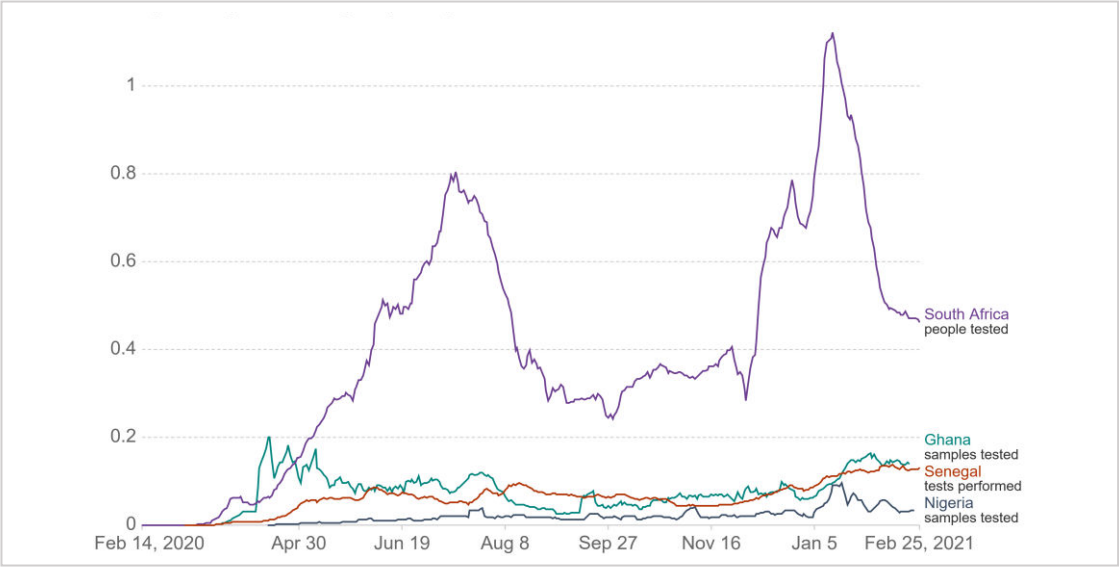


Figure 5 shows number of people tested in a day for COVID-19 per 1000 people.
Source: Our World in Data[16]

As the number of confirmed cases accelerated, a travel ban against 13 countries that each had a Covid-19 case above 1000 was implemented on 18 March 2020. On 20 March 2020, Sweden and Austria were added to the list, while on 21 March 2020 total closure of local and international airports was initiated by GoN. Whilst the ban of international flight followed global practice, GoN has been largely criticized as the decision to close the country's border came rather too late. Ideally, given the country's poor health sector, an optimal approach would have been a closure of the borders before the arrival of patient zero. On 30 March 2020, an initial 2-week lockdown was implemented in Lagos, Ogun, and FCT. The lockdown was implemented in Lagos and FCT as they were the epicenter of the virus, while it was implemented in Ogun due to its proximity to Lagos. From 2 April 2020, more states such as Bauchi also went into lockdown. On 13 April 2020, the lockdown in Lagos, Ogun, and FCT was extended for another week (Ibrahim *et al.,* 2020).

[16] https://ourworldindata.org/grapher/covid-stringency-index

During the lockdowns, only essential workers were allowed free movement. Importantly, states across the country also engaged in different forms and degrees of lockdown such as curfew, closure of schools and offices, bans on religious and social gatherings, and restrictions on businesses except those involving essential products such as foods, drugs, fuel, and gas, etc. Some states in the country also closed their land borders, to prevent interstate movement while allowing intrastate transportation. To ensure complete compliance with the directives on lockdown and other government-initiated policies, different state governments constituted taskforces to ensure that people in their respective states do not default. However, the lockdown was characterized by massive civil disobedience largely due to citizen's distrust in the government and because of the largely informal structure of the economy wherein people depend on daily income and interaction with people. For instance, in Lagos over 1400 people were arrested due to defiance of government orders (Ezeibe *et al.,* 2020). The consistent civil disobedience to the Covid-19 guidelines also led to loss of life during the early days of the outbreak from security forces implementing the Covid-19 lockdown (BBC, 2020). On 30 June 2020, GoN lifted the bans on lockdown and inter-state travel ban. This was the last phase of gradual phasing off following the guidelines stipulated by WHO for every country seeking partial or full reopening of the economy. However, a study by Ibrahim *et al.* (2020) showed that every day of the easing phase of the lockdown witnessed an increasing number of cases, suggesting that people neither kept to the Covid-19 guideline during nor after the lockdown.

To cushion the adverse economic effect of the Covid-19 outbreak on business and households, different social and economic measures has been passed at the Federal and State level. Famous among these was the Emergency Economic Stimulus Bill that was passed by the House of Representation (second tier) to provide formal businesses with 50 percent tax rebates so they would not need to lay off some of their workers. The government also announced that it will transfer ₦20,000 (~$52) to poor households in the national register. While there were about 2.6 million households in the national register at the onset of the outbreak, the government planned to increase the number 3.6 million households during the outbreak (Dixit *et al.,* 2020). Whilst this initiative is applaudable, it is worth noting that Nigeria is currently the “poverty capital” of the world accounting for 15% of the world’s poor with an estimated 102 million people in extreme poverty. Even more worrisome is that extreme poverty in the country is estimated to be growing

by 6 people every minute and the country is projected to account for 30% of the world's poor by 2030 (Ejiogu *et al.,* 2020). Hence, the additional 1 million households the GoN intended adding to the national register for the poor do not reflect the country's reality.

The Central Bank of Nigeria (CBN), the country's apex bank, cut down the interest rate at which it lends to commercial banks from 13.5% to 12.5%, had all interest rates on all the Banks interventions revised downwards from 9 to 5 percent, while a one-year moratorium on the Banks intervention facilities was introduced, effective from 1 March 2020 (PWC, 2020; Dixit *et al.,* 2020; KPMG, 2020). Among others, CBN devalued the naira because of the collapse in crude prices and also established a targeted credit facility for households and Small and Medium Enterprises [SMEs] that have been particularly hit hard by Covid-19. These include hoteliers, airline service providers, and health care, merchants, among others. While this was done in good faith, about 80% of the working population are employed in the informal sector. This suggests that the government policies only catered for the selected few in the formal sector, whilst the many in the informal sector were left to wallow. To further reach those at the bottom of the pyramid, the CBN committed to conditional cash transfer to poor families impacted by Covid-19, while GoN through the Federal Ministry of Humanitarian Affairs Disaster Management and Social Development announced that it will provide food rations to vulnerable households across the Federating States. Whilst the latter was done, the process was marred with corruption as many were left complaining of either not getting any palliative from the Government or those that got complained about the palliative being paltry (Eranga, 2020). Anecdotal evidence also shows that citizens broke into a different warehouse where the supposed palliatives were hoarded across the Federating States and catered away with them (Dabang & Ukomadu, 2020). Finally, to cope with the fiscal burden caused by the pandemic, GoN also amended its 2020 national budget to ensure that funds are directed to important areas where it can provide a "modest" stimulus to the economy. Among others, this revision includes a fiscal stimulus of ₦500 billion (~$1.3 billion) designated as a Covid-19 Intervention Fund aimed at upgrading healthcare facilities, supporting subnational government interventions, financing public works projects, and funding social interventions (Ejiogu *et al.,* 2020).

3.3. Revenue Mobilization for Covid-19 Response and Corporate Social Responsibility

GoN annual expenditure is largely dependent on revenues from the oil and gas sector. As Covid-19 hit the global economy and oil prices plummeted, GoN sourced financial aid both locally and globally to meet-up its Covid-19 response commitment. Notable among these are $3.4 billion it borrowed from the International Monetary Fund (IMF), $288.5 million from the African Development Bank (AfDB), and $114 million from the World Bank. A basket fund was also set up by the United Nations system in Nigeria in collaboration with the federal government to mobilize resources and strengthen the Covid-19 response. The Basket Fund is to serve as the single Covid-19 financing and investment platform for international donors to channel their financial support to Nigeria to ensure that their support is used efficiently, effectively, and impactful (UNSAIDS, 2020). As of 20 June 2020, the United Nations (UN) had mobilized US$61.3 million, including 50 million Euros from the European Union (EU). Besides this, GoN also solicited and received cash and in-kind transfer from private citizens and business entities in the country through the so-called Coalition against Covid-19 (CACOVID) that was launched on 26 March 2020. As of the end of June 2020, CACOVID has raised over $72 million (Ejiogu *et al.,* 2020).[17] In-kind transfer among others includes the donation of 425 hospitals to the government as isolation centers by the Catholic Church in Nigeria (Ejiogu *et al.,* 2020). Living Faith Church Worldwide, donated ambulances, test kits, PPE to the Lagos and Ogun State governments, while the Redeem Christian Church (RCCG) donated medical supplies to the Lagos State Government. The Latter Rain Ministries offered also two of their facilities to the Lagos State government and a private residence in Abeokuta to the Ogun State government as isolation centers.

4. Challenges to a Robust Covid-19 response in Nigeria

The identification of the COVID-19 index case in Nigeria spurred GoN at the Federal and State level to embark on measures targeted at preventing, mitigating, and containing the spread of the disease. Despite these measures, the number of cases has been on the rise, indicating that the execution of the prevention and control measures in the country met some challenges. What are these challenges and how did they counteract the measures initiated by the GoN to prevent, mitigate, and contain the spread of the disease? While copious factors can be mentioned in this regard, through scoping literature review and anecdotal evidence, we discuss 8 factors upon which

[17] https://www.cacovid.org/pdf/list_of_contributors_to_the_cacovid_relief_fund_as_at_30_June_2020.pdf

other factors may rest. Whiles we discuss these factors focusing on Covid-19, it is worth noting that some of them underscores structural problems in Nigeria and cases could also be made for their prominence in EVD despite the attained success thereof. Our objective in this section is not to show how their various effects differ in the context of EVD and Covid-19, but how they incapacitated the country in successfully containing the Covid-19 irrespective of their prominence during of EVD. The insights generated in the section are then used in the subsequent section to draw a comparative analysis on plausible factors that explain the differences in feat attained by the country as regards to the two outbreaks under study.

4.1. Lack of Preparedness

Two important metrics used in assessing a country's readiness to deal with a pandemic are the WHO's Joint External Evaluation [JEE] of the International Health Regulations [IHR] core capacities and the Global Health Security [GHS] index. JEE is an independent, collaborative multi-sectoral effort to assess a country's capacity to prevent, detect, and respond to public health risks. Each component of this measure i.e., prevents, detects, and responds, receives a score of 1 to 5, where 1 is no capacity and 5 is sustainable capacity. The GHS index, on the other hand, is the first comprehensive assessment of global health security capabilities in 195 countries that make up the States Parties to the IHR. The index benchmarks health security and related capacities across 6 subcomponents[18]. Each of the components is on a scale of 1 to 100, with 100 indicating better outcomes.

[18] The six-component include Prevention (prevention of the emergence or release of pathogens), Detection (early detection and reporting for epidemics of potential international concern), Response (rapid response to and mitigation of the spread of an epidemic), Health System (sufficient and robust health system to treat the sick and protect health workers), Norm (commitments to improving national capacity, financing plans to address gaps, and adhering to global norms), and Risk (overall risk environment and country vulnerability to biological threats.

Figure 6: 2017 Joint External Evaluation

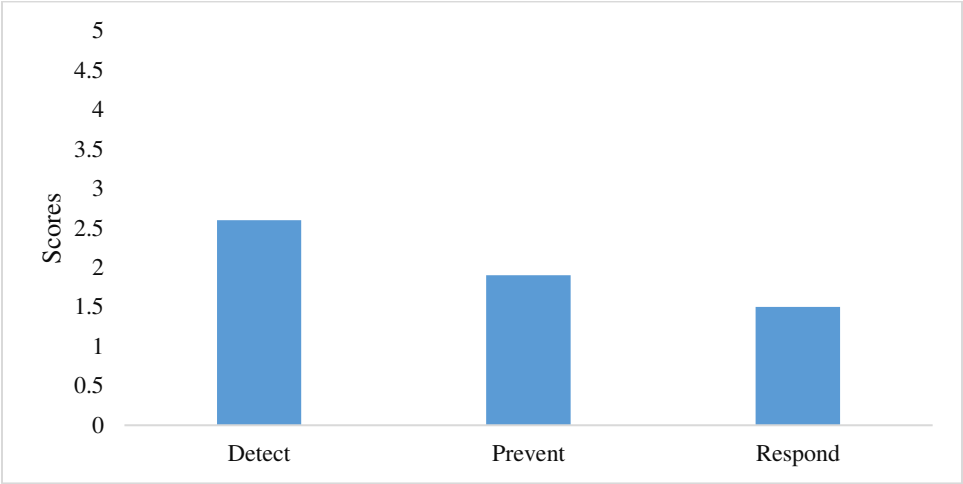


Figure 6 shows the scores of Nigeria for the 2017 JEE of the IHR core capacities. Each core capacities is on a scale of 1 to 5, where 1 is no capacity and 5 is sustainable capacity. Data Source: WHO (2017).

Figure 6 summarizes the findings of the 2017 JEE for Nigeria. Nigeria performed poorly both in prevention and response with respective average scores of 1.9 and 1.5, while it was relatively better prepared in the detection category, with an average score of 2.6 (WHO, 2017). Figure 7 reports the GHS index scores of Nigeria for the year 2019 for which the country ranked 96th in the world. As the figure shows, Nigeria had an overall score of 37.8%, hence putting Nigeria in less than a "moderate" preparedness category. As can be seen in the graph, besides Norm where Nigeria scored a little above 50%, it scores below 50% in all the other subcomponents with the worst scores being under its capacities to prevent a pandemic and for its health system to treat the sick and protect health workers in a pandemic such as Covid-19. More importantly, the graph also shows that Nigeria is very susceptible to environmental and biological threats, a finding that is consistent with an earlier study by WHO (2020d) and Gilbert *et al.* (2020) ranking the country as one of those most vulnerable to the outbreak. Insights from a study by Sambala *et al.* (2018) evaluating the quality of the influenza preparedness plans in the WHO African region also show Nigeria's abysmal underperformance in different thematic areas in which a country must focus while preparing for an influenza pandemic.

Figure 7: 2019 Global Health Insecurity Index

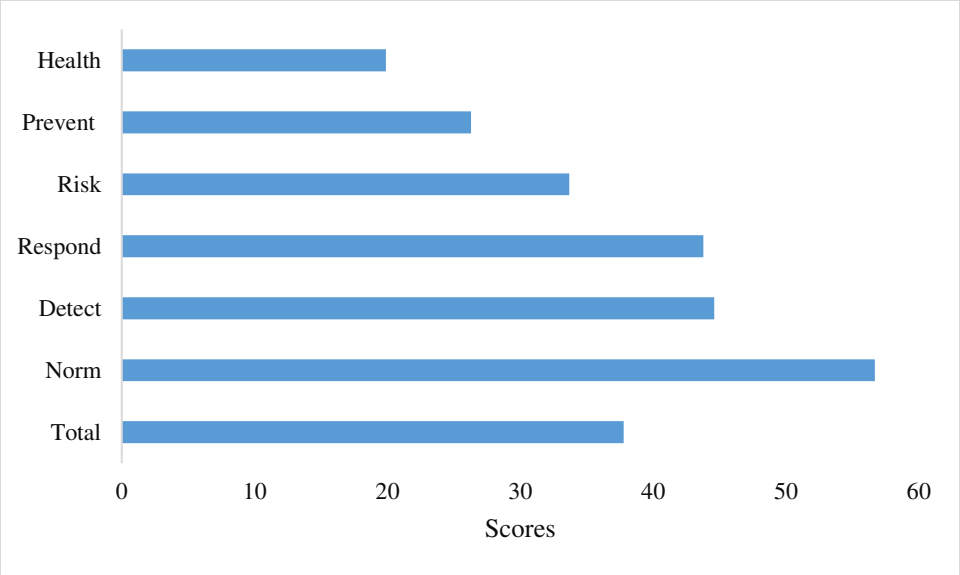


Figure 7 shows how health insecure Nigeria is before the Covid-19 outbreak using the Global Health Insecurity Index. Each sub-component is on a scale of 1-100 with 100 indicating that the country is secure along that sub-component. Total is the average score of the six sub-component. Data Source: Global Health Security[19]

Overall, while it cannot be taking for granted that Nigeria has developed some capacities due to many viral disease outbreaks it had experienced in the past, the country still has significant gaps in its capacity to prevent, detect, and respond to pandemics like the Covid-19. It is, therefore, safe to argue that the unpreparedness of the country before the outbreak may have exacerbated the inability of the country to contain the outbreak since it recorded its index case.

4.2. Weak healthcare sector

Closely related to section 5.1 is the country's weak health care system and infrastructure. The fight against any virus requires the application of vast technical expertise and effective public health interventions (Gilbert *et al.,* 2020). Hence, a country's ability to respond decisively to a fatal outbreak depends on, among other things, the robustness of its healthcare system. This is even more important for an outbreak like Covid-19 which is novel, and the first response is mostly intensive care. One of the major challenges in containing the Covid-19 outbreak in the country is the poor state of the country's health infrastructure and access to healthcare services. The poor nature of the sector has led to huge annual medical tourism abroad, with available evidence suggesting that at least 5,000 patients a month travel abroad for healthcare (Holt *et al.,* 2017).

[19] https://www.ghsindex.org/

According to a report by Price Waterhouse Coopers in 2016, Nigerians spend nearly $1 billion annually on medical tourism, an amount that is almost equivalent to 20% of the GoN budgetary allocation to the health sector for that year (PWC, 2016).

Figure 8. Health Sector Annual Budgetary Allocation

Figure 8. Shows the annual budgetary allocation to the health sector.
Data Source. Central Bank of Nigeria.

The poor state health sector is driven largely by mismanagement and underfunding. While studies have ranked the sector as one of the most corrupt in the world (Onwujekwe *et al.,* 2020; Ezeibe *et al.,* 2020), Figure 8 shows the health sector budgetary allocation between 2000 and 2019. It reiterates the obvious: budgetary allocation to the sector has consistently fallen below the annual 15% threshold required by the Abuja declaration. Furthermore, there has also been a notable decline in budgetary allocation to the sector, with the years 2015 and 2016 being the worst. Unfortunately, this decline coincides with the post-Ebola period, although one would expect to see an increase in the health sector budgetary allocation during this period. The inadequate budgetary allocation to the sector significantly influences recurrent and capital health expenditure. Figure 9 shows government expenditure per capita. The graph suggests that over the period 2000-2018, GoN spend less than $35 per person in the country, lagging behind the world average and other countries in Sub-Saharan African countries.

Figure 9: Government health expenditure per capita

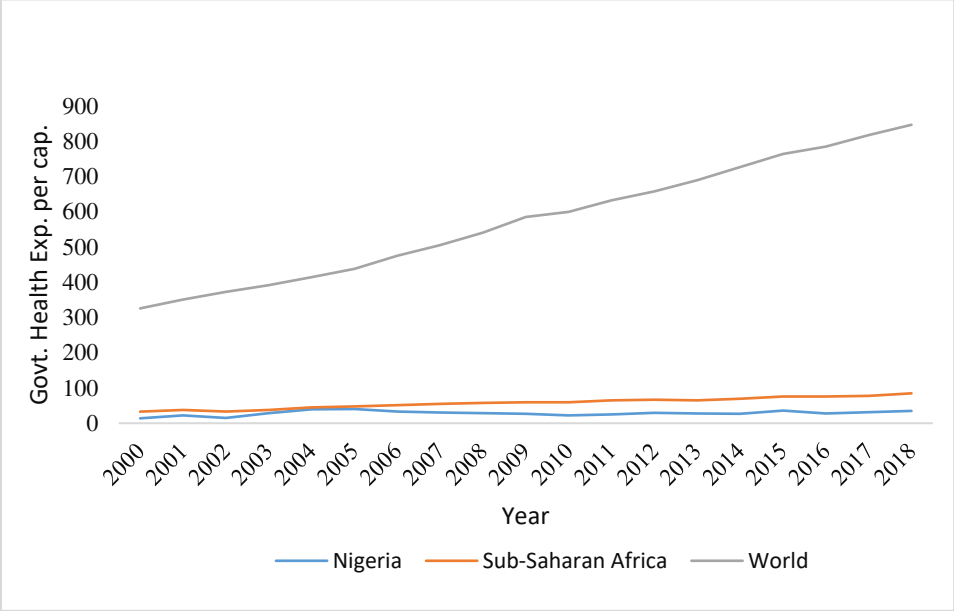


Figure 9 shows total government health expenditure per capita PPP (current international $)
Data Source: WDI

Figure 10: Government health expenditure (% of current health expenditure)

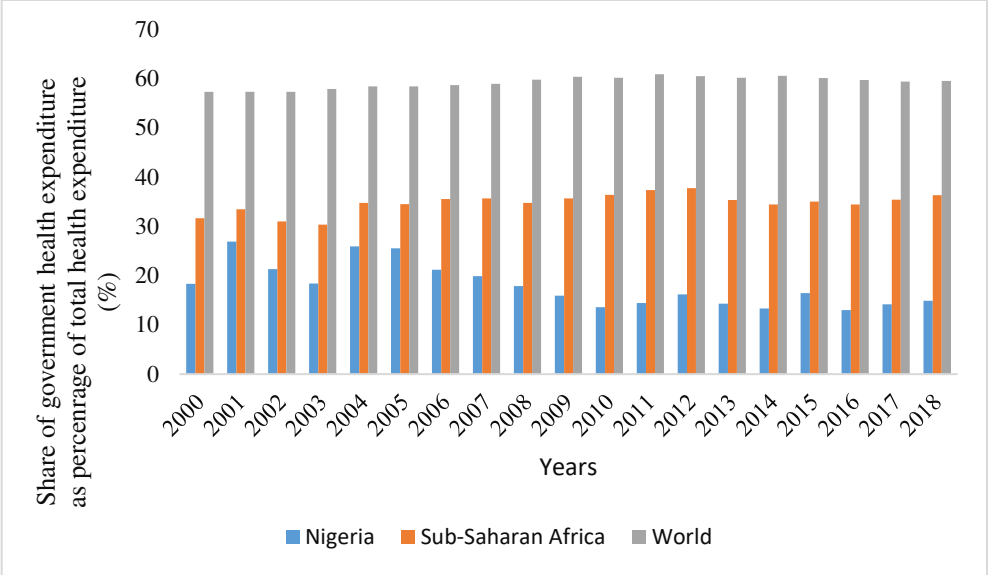


Figure 10 shows the share of government expenditure in total health expenditure as percentage of total health expenditure.
Data Source: WDI

Figure 10 further reveals that GoN's contribution to total health expenditure in the country is abysmally poor, compared to the world average and those other SSA. The health financing deficit is largely compensated by an out-of-pocket expenditure that currently accounts for approximately 70-77% of total health expenditure in the country (See Figure 11). This suggests that most Nigerians lack health insurance of any kind and by implication, limited access to basic and quality health care. Hence, it is unsurprising that the country's health care quality and health outcomes are ranked among the poorest in the world (GBD, 2018; Ejiogu *et al.,* 2020). It also suffices to say that the country's inadequate health sector financing has adversely affected its healthcare infrastructure, thereby impairing the country's ability to respond effectively to outbreaks such as the novel coronavirus (Ezeibe *et al.,* 2020; Onwujekwe *et al.,* 2020; Adebisi *et al.,* 2020).

Figure 11: Out-of-pocket expenditure (% of current health expenditure)

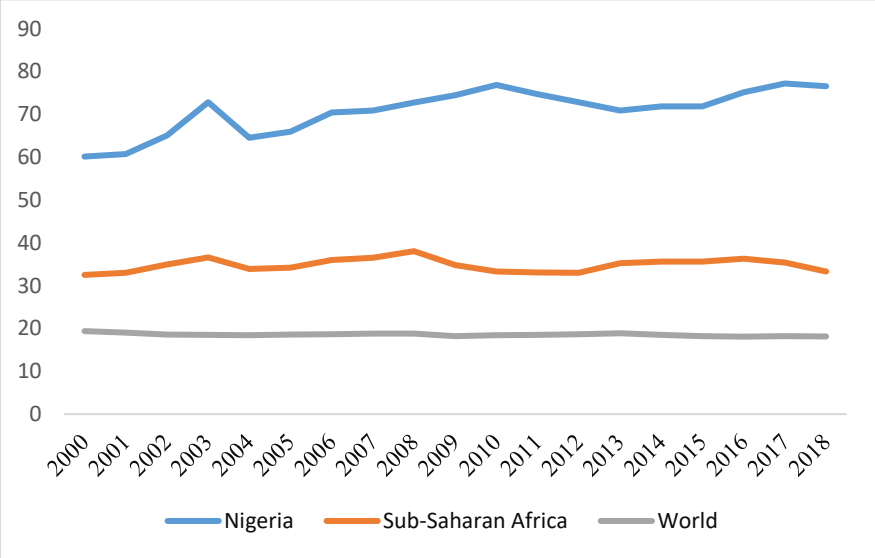


Figure 11 shows the Share of out-of-pocket payments of total current health expenditures. Out-of-pocket payments are spending on health directly out-of-pocket by households.

According to a WHO report in 2019, Nigeria is the second country with the highest number of newborn deaths which is estimated at 270 deaths per thousand (WHO, 2020e), and is responsible for 20% of all maternal mortality globally (WHO, 2019). It is also responsible for the highest amount of under-five child deaths (WHO, 2020f), with preventable or treatable infectious diseases such as malaria, pneumonia, diarrhea, measles, and HIV/AIDS accounting for more than 70% of the estimated one million under-five deaths in the country. Regarding the health care infrastructure, the country can only boast of 23,640 hospitals catering to its over 200 million citizens. The ratio of doctors per patient is about 1:5100[20]. Before the outbreak, also, the country can only boast of 350 ventilators (Dixit *et al.,* 2020), 0.9 hospital beds per 1,000 people which is less than the global average of 2.3, while its Intensive Care Unit (ICU) beds for emergencies is estimated at 0.07 per 100,000 people (Holt *et al.,* 2017). Evidence also suggests that at the onset of the outbreak, the country only had a molecular RT-PCR laboratory network of 6 laboratories in 3 states (out of 36) and the FCT to cater for the Covid-19 testing need of the country with over 200 million population (Adesanya, 2020).

[20] https://techcabal.com/reports/the-state-of-health-tech-in-nigeria/

Overall, the continuous weak health sector that plagues the country has contributed in accentuating the country's inability of containing the virus. For instance, to meet its health care infrastructure deficit, GoN is setting up ad-hoc isolation centers across the states. However, these premises often lack required health facilities. Also, the poor state of the sector and the consequent lack of trust in the sector by many Nigerians leads to less disclosure from those who may have been exposed to Covid-19.

4.3. The predominance of the informal sector

Arguably, the informal sector is the largest employer of labor and serves as a source of livelihood for many in Nigeria, creating even a safety net for those that are underpaid in the formal sector. The informal economy in the country accounts for about 65% of the country's annual total GDP. Reports from the International Labor Organization [ILO] in 2018 estimates that about 93% of all employment in Nigeria is informal, with 95% of women working in the informal sector as compared to 90% of men (ILO, 2018). Among others, informal workers in the economy are employed across all sectors of the economy and consist of street vendors, casual wage employment, home-based worker or service providers, street vending, and petty traders (Etim & Daramola, 2020) who either work for themselves or small and medium enterprises. In whichever, a predominant characteristic of most informal workers in the country is interaction with people and reliance on daily income for survival. As this represents the reality of an average citizen in the country, restrictions on movement imply deprivation of the ability of these groups to generate income. On the other hand, it also means less could be done by these citizens in observing physical and social distancing. Hence, social distancing and obeying the lockdown order was difficult to adhere to, while severe civil disobedience took precedence in the country.

4.4. Population density and the rural-urban poor

Although population density does not cause infectious disease outbreaks, it is an important determinant in the spread of infectious diseases (Tarwater & Martin, 2001; Iaccarino, 2019). Densely populated areas are overcrowded, which could spur challenges in sanitation and declined quality of living conditions and potentially serves as a breeding venue for infectious agents and rapid transmission (Amoo, *et al.,* 2020). In the case of Covid-19 where physical and social

distancing are encouraged as a way of breaking the transmission chain, it is difficult achieving this objective in a densely populated environment. Consistent with this view, different studies have shown that population density enhances the spread of Covid-19 (Rocklöv & Sjödin 2020; Schuchat *et al.,* 2020; Jahangiri *et al.,* 2020). Nigeria is the largest and most densely populated country in Africa and the 7th largest population in the world, with approximately 200 million people. It is, therefore, not surprising that some studies have also shown a significant relationship between population density and Covid-19 in the country (Olusola *et al.,* 2020; Osayomi *et al.* 2020). However, the population density has not acted alone in posing a challenge to contain the spread of the virus. According to the National Bureau of Statistics (NBS) report in 2019, 40 percent of the total population, or almost 83 million people, live below the country's poverty line of $381.75 per year (World Bank, 2020a). Furthermore, approximately more than 60% of Nigerians are urban dwellers, with more than a half of these urban dwellers living in slums and informal settlements which are overcrowded and characterized by poor housing and living conditions (Amoo *et al.,* 2020; Osayomi *et al.* 2020). This makes it difficult to respect social and physical distancing, or strictly follow hygiene practices such as the washing of hands that aid the spread of highly contagious diseases like Covid-19.

4.5. Crisis and settlement

The poor living conditions of internally displaced people (IDP) and the vulnerability of displaced people are well documented in the literature (Milcher, 2006; Thalayasingam, 2009; Davies & Jacobsen, 2010; Ibanez & Moya, 2010). Along this line, another factor that has posed a challenge in containing the spread of the virus is terrorist attacks especially in the northeast of Nigeria. This has left almost 5 million people internally displaced as of September 2020 (WHO, 2020g). While most of these internally displaced people (IDP) now reside in the so-called IDP camps, these terrorist attacks also damaged health and sanitation infrastructure, making them highly susceptible to disease. Also, most of the IDP camps are often congested and lack basic facilities. Hence, people are both unable to observe the basic hygiene of regular hand washing or social and physical distancing. For instance, in 2018 over 600,000 IDPs (one-third of the total internally displaced population in northeast Nigeria) were living in congested informal IDP settlements, with 5m2 per person (ACAPS, 2020).

4.6. Political distrust

Political trust is associated with voluntary compliance to rules and regulations (Murphy, 2004; Marien & Hooghe, 2011), including those related to public health guidelines (Blair *et al.,* 2017). Along this line, the importance of citizens' trust in its government during all stages – i.e., containment, mitigation, and recovery – of a pandemic such as the novel coronavirus cannot be overemphasized. Empirical and anecdotal evidence from the 2018-2019 EVD outbreak in Democratic Republic of Congo shows how an environment of political distrust makes it difficult to combat the spread of the disease despite the availability of vaccines and significant international and local efforts. Particularly, studies have shown that political distrust undermined public health responses such as compliance with social and behavioral recommendations, refusal to seek medical care, and acceptance of vaccines during the outbreak (Vinck *et al.,* 2019; Richardson *et al.,* 2019; UN, 2020). In the context of Covid-19, there is now a plethora of empirical evidence suggesting a positive association between citizen's trust in the political institution and high compliance levels to the remedial measures proposed/initiated by the government (Almutairi *et al.,* 2020; Goldstein & Wiedemann, 2020; Clark *et al.,* 2020; Lalot *et al.,* 2020; Nivette *et al.,* 2020). Political distrust in Nigeria before and during the Covid-19 is a widespread phenomenon. According to the World Economic Forum [WEF] (2018) report, Nigeria is ranked among the top seven countries with the highest level of citizen distrust of government officials.

Consistent with the view that political distrust undermines public cooperation and promotes the rapid spread of viral diseases, it is unequivocal that this has also played a vital role and continues to pose a challenge in the case of Nigeria. A study by Ezeibe *et al.* (2020) showed that a cumulative of 86% indicated that distrust of government initiatives to mitigate the spread of Covid-19 in Nigeria is either high or very high, only a collective of 11% indicated that political distrust is either low or very low. Political distrust in Nigeria is largely driven by large-scale institutionalized corruption that has plagued the country for many years. Hence, the arrival of patient zero and the entire Covid-19 outbreak was welcomed by many in the country as disbelief and a channel the political elite wish to use to perpetuate corruption by siphoning money that would be allocated for the fight against the virus. This has caused civil disobedience to health emergency guidelines in the country as it patterns to the Covid-19 outbreak, leading to a further spread of the virus.

4.7. Transmission dynamics

How the virus is contracted poses an additional challenge to GoN. Since the Spanish flu of 1918, many other viral infectious diseases have threatened the world. While each of these viral infectious diseases is unique in terms of its origin, symptoms, transmission mechanism, and fatality rates, the conventional view is that each outbreak creates an opportunity for the government to build institutional capacity, while the public health officials accumulate experiences that enable them to prepare and fight the next outbreak. While Nigeria may have gained experience from the past outbreak, the novelty of the coronavirus and the way the virus spreads has also limited the ability of GoN to curb the menace. Consider for instance, while EVD causes extreme severe symptoms, including fever, vomiting, diarrhea, bleeding, and death by organ failure. This implies that people infected with the virus are often bedridden and therefore, less likely to spread it. The incubation period of the virus is between 2 to 21 days and transmission occurs only through bodily fluid (CDC, 2019; WHO, 2020a). Importantly, the transmission is only possible when symptoms begin to show, which makes it easier to identify and isolate these patients. Hence, the people more vulnerable to contract the disease are those who have very close contact taking care of the bedridden victims—whether they are in the home or the hospital. In contrast to Ebola, the novel coronavirus spreads primarily through close contacts with droplets of saliva or discharge from the nose when an infected person coughs or sneezes which can be suspended on the air for hours (Huang *et al.,* 2019; Harapan *et al.,* 2020; WHO, 2020c). Unlike Ebola, most Covid-19 patients show mild symptoms or are asymptomatic[21], making it difficult to identify and isolate infected people. However, they can transmit the virus even when they are not showing symptoms. This implies that massive testing and isolation remain the pathway to break the chain of transmission. However, given the limited resources the country has not been able to engage in massive testing, leading to the further spread of the virus.

4.8. Belated response

[21] A recent study by Day (2020b) suggested that 78% of people with COVID-19 have no symptoms. The findings are in line with research from an Italian village showing that 50%-75% were asymptomatic but represented "a formidable source" of contagion (Day, 2020a). A report by the WHO (2020h) also suggest that 80% of the novel coronavirus infections are either mild or asymptomatic, 15% are severe infection, requiring oxygen and 5% are critical infections, requiring ventilation.

Another factor that has impacted GoN's ability to contain the virus is its belated public-health response. As shown in Figure 4, before the index case, there were hardly any obvious stringent policies initiated by GoN to prevent the spread of the virus. While WHO declared Covid-19 a Public Health Emergency of International Concern on 30 January 2020, both the EOC and PTF were only instituted after the index case. The closure of land and air borders was delayed and the initial approach of the government to only test travelers with symptoms may have contributed to early community transmission that was experienced from April, two months after the index case. The earlier approach of GoN to focus mostly on Lagos, Ogun, and the FCT may have also facilitated community transmission in other states that were not the focus, hence leading to a sporadic spread and the consequent inability of the government to track the cases

5. Lessons from EVD and Covid-19 in Nigeria

Moving from one pandemic to another raises the question: ***What can be learned from the previous pandemic to deal decisively with the current pandemic?*** More specifically, ***can the lessons learned from a previous pandemic inform the country-wide response to the next pandemic?*** Discussions in section 2, among others, showed that conventional control tools[22] along with cooperation among citizens and government, and cooperation among community and health workers were paramount in containing the EVD. These factors denominated by strong political will were responsible for Nigeria's timely victory over the EVD outbreak. 5 years after this colossal victory, Nigeria, like other countries across the globe is besieged by another pandemic. However, available statistics do not show any evidence that Nigeria is successfully containing the further spread of the COVID-19 virus. Instead, available statistics (see Figure 3) show that the number of Covid-19 confirmed and death-related cases have been on the rise since the index case was identified on 27 February 2020. Importantly, studies also suggest that community transmission started as early as April (Ezeibe *et al.,* 2020), barely 2 months after the index case was reported in the country.

Considering Nigeria's colossal victory over EVD, an eminent question demanding a constructive discussion is: ***why has Nigeria been unsuccessful in mimicking its erstwhile EVD country-wide***

[22] These include early detection, contact tracing, isolation and monitoring of those exposed, adequate supplies of PPE for health workers, and strict procedures for infection prevention and control (WHO, 2014a&b).

policy to contain the Covid-19 outbreak in the country? Effective country-wide response to a pandemic involves health responses and strategies from the government on the one hand, and citizens' adherence to health emergency guidelines on the other hand. In which case, an understanding of factors responsible for the (un)successful transfer of lessons gained from dealing with previous pandemics must account for these dimensions as well as the conditions in which erstwhile success or failure was attained, and the similarities between the previous and current pandemic. Applying this principle to the two outbreak scenarios rules out the weak nature of the healthcare system as the state of the system are synonymous in both scenarios. However, we found that the successful transfer of knowledge gained from the previous pandemic has been limited in the country due to the transmission dynamics of Covid-19 that is utterly different from that of EVD. For instance, unlike EVD, Covid-19 is transmitted through bodily fluids that can be suspended surfaces for hours. More importantly, most Covid-19 patients show either mild symptoms or are asymptomatic, although they can also transmit the virus when they show no sign. Among others, this makes the spread of Covid-19 far more easily than EVD and difficult to contain.

Whilst this dissimilarity restrains the ability of GoN to successfully use the knowledge gained from EVD to fight Covid-19, GoN may have exacerbated this effect given its belated policy response as discussed in section 5.7, untimely closure of the country's border. Also, the earlier approach adopted by the government wherein Covid-19 checks at the border was limited to only travelers showing symptoms, an approach that is markedly different from the health response during the EVD, contributed in exacerbating the effect. Whereas the country may have benefited from some health infrastructures and/or institutional capacities it built during the EVD outbreak, accrued benefits from such innovations are still far-fetch as the number of confirmed and death-related cases in the country continue to rise exponentially. In fact, while the response of GoN during EVD was robust and aggressive, it is difficult to make such a claim in its effort to contain the current pandemic. Political will and leadership in the country's effort to fight Covid-19 has at best been limited, in contrast to EVD. Figure 4 showed that before the index case, the country hardly adopted any stringent measures that would have prevented the virus from making it into the country. Studies also suggest that surveillance mounted at the border was weak (Amozat *et al.,* 2020), which annihilated the possibility of early detection of the index case that could have

facilitated a timely contact tracing, isolation, and monitoring of Covid-19 contact cases along with the index case.

Regarding the response of the citizens towards the outbreak, especially as it concerns health guidelines, we found that it may have also played a role in downsizing the successful transfer of lessons from the EVD to the Covid-19 outbreak in the country at least in three important ways. First, whereas it is a good thing that the EVD outbreak in the country did not spread across the country, this success may have cost the populace the experience that would have helped her in adapting during the current crisis. Indeed, in a recent explorative study by Morisho *et al.* (2020), the authors illuminate how the experience of living through the EVD epidemic in two Eastern Congolese cities Goma and Beni is positively shaping the responses of individuals and communities to the novel coronavirus. Particularly, the study suggests that there is high compliance to Covid-19 health guidelines in these cities. In most cases, communities are even taking a lead in prevention measures against the Covid-19, as opposed to waiting for the government. The authors, for instance, note that Headteachers in Goma decided to close their schools even before the government officially declared that all public spaces should be closed down.

Figure 12: Perceived reasons for immunity against Covid-19

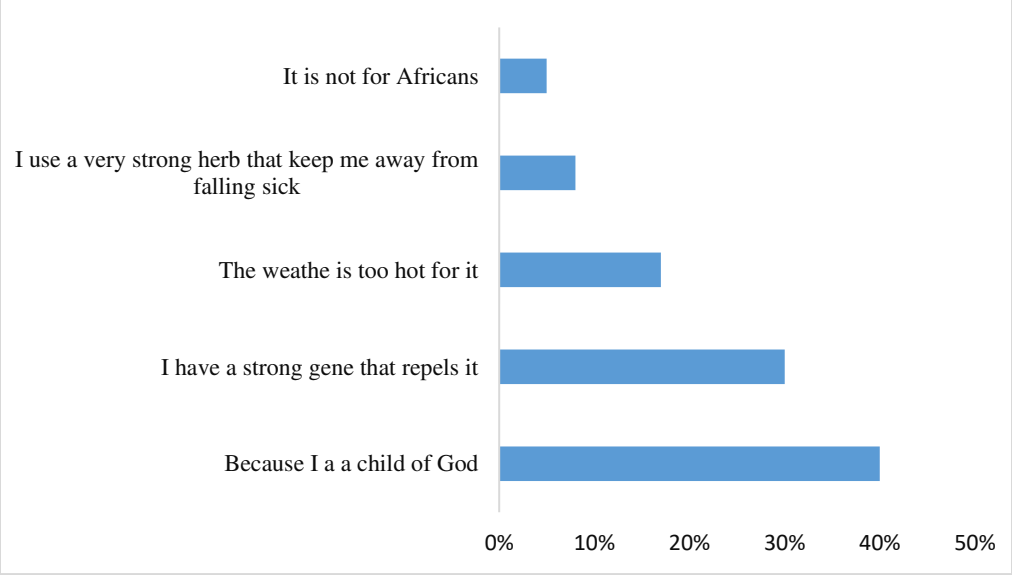


Figure 12 shows the share of Nigerian with different perception about being immune to Covid-19. Data Source: NOIPolls[23]

Second, the fact that unlike EVD, Covid-19 started in the global North also beclouded the judgment of many citizens in the country.Many Nigerian have disavowed the existence of Covid-19 in the country or had diverse conspiracy theories that undermine the far-reaching fatalities associated with the virus. Such theories held by many include the believe that the virus is an elite disease or the problem of the Global North or Nigerians being genetically immune to the virus (Onapajo & Adebiyi, 2020; Anthonia Obi-Ani *et al.*, 2020; Onyemelukwe, 2020). For instance, a "nationally representative" survey by NOIPolls during the early months when Nigeria had only 2 confirmed cases of Covid-19 cases, indicated that about 26 percent of Nigerians believed they are immune to the virus. Figure 12 shows the premise of such perception. Unfortunately, 40% believe they are immune because they are children of God, while 30% believe so because they have a strong gene that can repel the virus. 17%, on the other hand, stated that the weather is too hot for the virus to thrive in amongst other reasons mentioned. It suffices to mention that these doubts, as well as conspiracy theories, have further fueled citizens' distrust in the government, thereby discouraging cooperation among citizens-to-government and communities-to-healthcare that were underscored in sections 3.3 as an essential ingredient that helped the country emerge a victor in the fight against Covid-19. Finally, unlike in the case of EVD, the informal economy, which is where a large chunk of the country's population relies on for daily income receives by far the negative shocks induced by health measures needed to contain the spread of Covid-19 such as lockdown, and/or physical and social distancing. The culmination of these has impacted how the citizens can adapt during the Covid-19 outbreak, and by implication snared the chances of learning from the EVD success story.

6. Covid-19 and the Nigeria's most Vulnerable

One of the essential aspects of preparing for an outbreak or preventing the high fatality rate associated with the outbreak is safeguarding the most vulnerable (Kidd, 2020). The most vulnerable to the Covid-19 outbreak are the old, health workers, people with underlying health complications, and the poor. In this section, we focus on the latter, for two reasons: data availability

[23] https://noi-polls.com/covid-19-poll-result-release/

and because different reports from multilateral organizations such as the World Bank suggesting that Covid-19 would increase extreme poverty (World Bank, 2020b). Given that Nigeria is currently the "poverty capital" of the world accounting for 15% of the world's poor with an estimated 102 million people in extreme poverty (Ejiogu *et al.,* 2020), it suffices noting that Covid-19 outbreak would only exacerbate this.[24] Guarding the nation against what is to come requires social assistance to the Covid-19 most vulnerable as well as a long-term policy initiative that engenders production factors allocated into new business and sectors. While the former is more short-term, the latter is a long-term for the post-Covi-19 recovery.

Sections 3.2 and 3.3 underscore different social assistance undertaken by both GoN and private sectors to cushion the adverse effects of Covid-19. In line with the foregoing discussion, a question that begs an answer is: ***To what extent have these government and non-government Covid-19 social protection programs targeted the most Covid-19 vulnerable populations in Nigeria?*** Answering this question requiring identifying the most Covid-19 vulnerable and mapping these social assistance program to it. To this end, we employ two sources of datasets: the most recent Nigeria Afrobarometer survey (NAS)[25] and the Nigeria COVID-19 National Longitudinal Phone Survey (Covid-19 NLPS)[26] conducted by the World Bank Group. The NAS covers the pre-covid-19 period [2017-2018], and it helps track the COVID-19 vulnerable populations before the pandemic. We employ the multidimensional vulnerability to Covid-19 approach proposed by OPHI to identify the regional disparities in terms of (very) high risk of covid-19 vulnerability. The OPHI approach uses deprivation in three essential areas, access to nutrition, drinking water and cooking fuel, to measure vulnerability to Covid. An individual is defined as being at risk to Covid-19 vulnerability if she/he is deprived of at least one of these three items, and she/he is considered to be at high risk if she/he suffers from all three Covid-19 risk vulnerability.[27] Once we map the

[24] In our scoping literature, we did not find any evidence to suggest any GoN Covid-19 targeted policies for the poor or those with underlying health conditions that may be more vulnerable to the virus. However, there evidence of limited PPE for health workers (IIesanmi *et al.,* 2021)

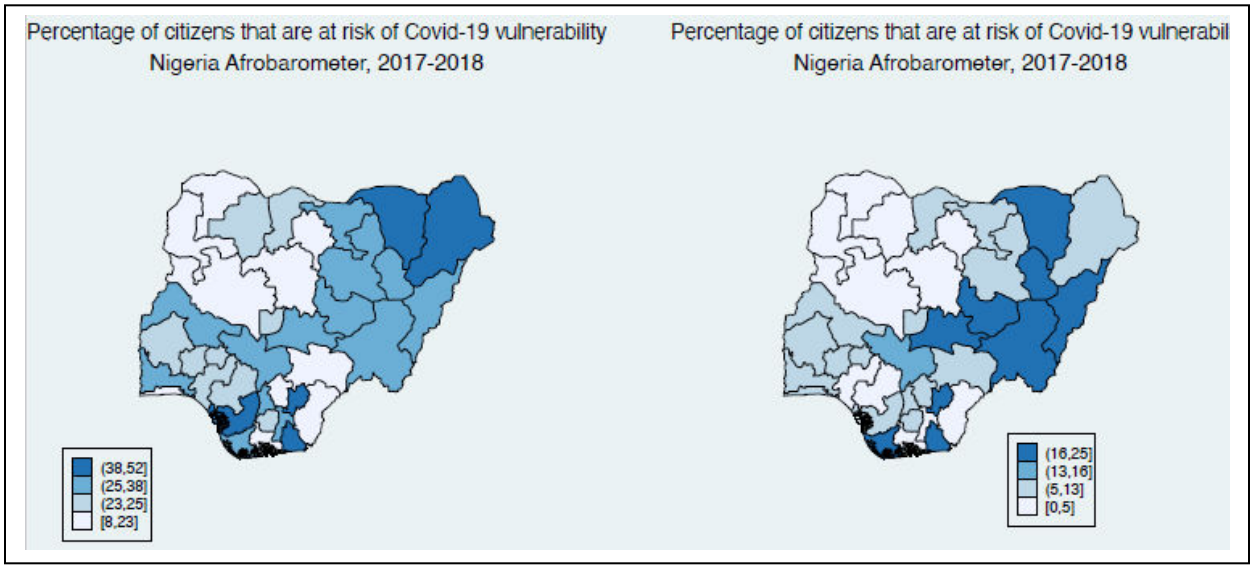
[25] https://afrobarometer.org

[26] https://microdata.worldbank.org/index.php/catalog/3712

[27] While this is a condition that may not change in response to the Covid-19 outbreak, our assumption is that this group of individuals are more vulnerable to Covid-19. At the onset of the outbreak, basic hygiene such as constant washing of hands was recommended. Lockdown policies was also initiated in different states, as could also be observed across different countries. Along this line and consistent with our definition, people who had no access to water are more likely not to regularly wash their hands meaning that they are more likely to contract the virus. Similarly, people who

locations of the vulnerable populations, we then use the Covid-19 NLPS conducted between mid-March 2020 and end July 2020 to investigate if the regions with the highest concentration of Covid-19 vulnerable populations pre-pandemic are also the regions that have the highest concentration of households that experienced shocks between mid-March 2020 and end July 2020. The different types of income shocks through which households have lost income are the following illness, injury, or death of income earning member of household; job loss; nonfarm business closure; theft/looting of cash and other property; disruption of farming, livestock, fishing activities; increase in price of farming/business inputs; fall in the price of farming/business output; and increase in price of major food items consumed. Furthermore, the Covid-19 NLPS also provides information on whether the households have received assistance from government or non-government assistance or remittances from relative and friends. With such information, we can see whether regions with the highest proportion of households that received assistance are or not the regions with the highest proportion of households that have experienced shocks. Unfortunately, we cannot assess the individual components of the assistance received by the households because of data limitations.

Figure 13: Spatial distribution of risk to Covid-19 vulnerability

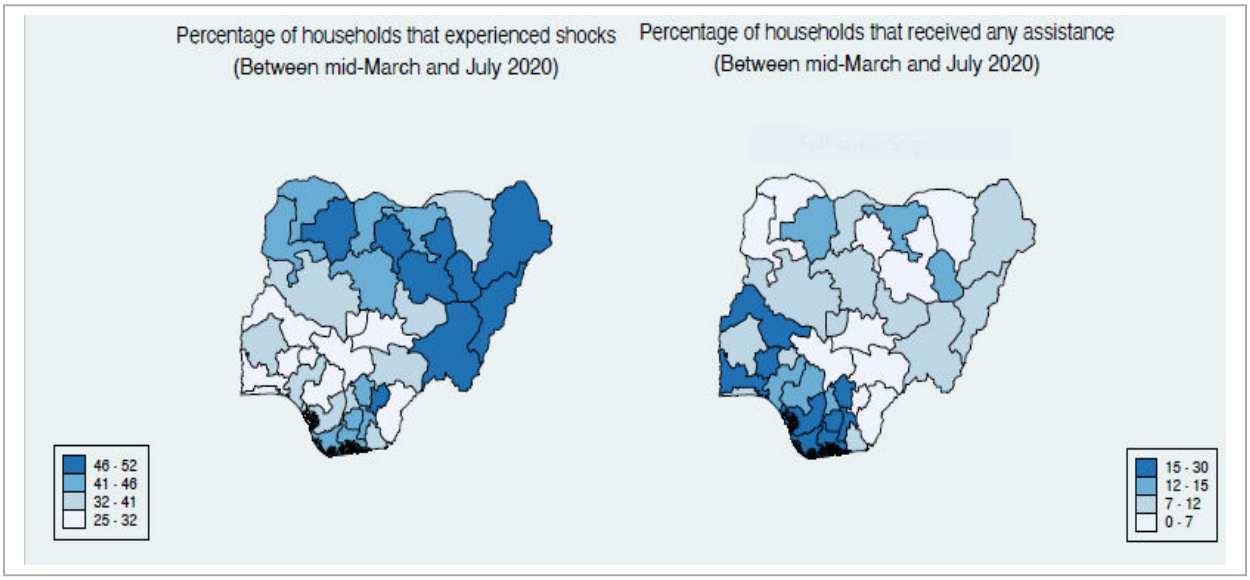


Source: Authors' own calculation using the most recent Nigeria Afrobarometer Survey (2017-2018). Recall that an individual is defined as being at risk to Covid-19 vulnerability if she/he is deprived of access of at least of the following: nutrition, drinking water or

do not have access to cooking gas are more likely to go out in search of firewood in the forest. This increases community interaction, making the individuals more exposed to the virus.

cooking. An individual is considered to be at high risk of Covid-19 vulnerability if she/he suffers from all three Covid-19 risk vulnerability

Figure 14: Spatial distribution of COVID-19 related shocks and assistance



Source: Authors' own calculation using the Nigeria COVID-19 National Longitudinal Phone Survey from the World Bank

Figure 13 show the map of Covid-19 most vulnerable. The graph suggests that the Covid-19 -most vulnerable in Nigeria are largely concentrated in the North-East. Interestingly, Figure 14a which shows the map of Nigerian households that experienced a negative income shock due to the outbreak are also largely concentrated in that region, suggesting a positive correlation between our computed Covid-19 vulnerability before the outbreak and household that experienced Covid-19 induced shocks. This suggest that had GoN taking more proactive steps before the virus made it into the country, these household would have been better off. Even at that, Figure 14b shows that households that have received any kind of government or non-government Covid-19 social protection assistance since the outbreak has been few states in the West and East. Yet, it is important noting that the shares have been relatively small. Whereas the quality of data does not allow us to examine in a detailed manner the assistance provided by GoN, this evidence questions the extent GoN has delivered on the different policy initiatives it informed the citizens that it has taking or would take to cushion the negative effect of the outbreak in the country.

7. Conclusion and Policy Recommendations

It is generally feared that the Covid-19 outbreak would be a true testament to the health infrastructure and system of a country. Whereas this put developing countries in a precarious situation as they are notorious for having a dilapidated and poor health infrastructure and system, the 2013—16 EVD outbreak success and failure stories in West Africa offer a potential learning opportunity on how countries can contain outbreaks. One of such countries that emerged a victor over EVD promptly despite its epileptic health care infrastructure and system and at a time when clinically approved drug for the virus was nonexistent is Nigeria. A natural expectation is that such a country shows dexterity in the fight against Covid-19 that is currently ravaging countries, by building on it is erstwhile EVD country-wide response. Unfortunately, anecdotal evidence offers no such evidence for Nigeria as the number of Covid-19 confirmed and death-related cases have been on the rise since it recorded its index case. More still, different rhetoric currently abounds in the media and policy space on the approach of the current Nigerian government [GoN] not being optimal in containing the virus.

Premised on the foregoing, this paper had set out with three broad objectives that are inspired by the desire to understand factors responsible for Nigeria's foremost victory over EVD and why the

country is unable to attain the same fit in its fight against Covid-19. To this end, as a first objective, we conducted a comparative study on the Ebola outbreak in Nigeria and other West African countries vis-à-vis Sierra Leone, Liberia, and Guinea, identifying the approaches that had been undertaken by Nigeria and these other countries. Among others, we found that cooperation among citizens and government and community health workers, and conventional control tools— early detection, contact tracing, isolation and monitoring of those exposed, adequate supplies of PPE for health workers, and strict procedures for infection prevention and control—were paramount in containing the EVD. Particularly, these factors matched with strong political will were responsible for Nigeria's timely victory over the EVD outbreak in 2014.

As a second objective, we assessed Nigeria's country-wide response to Covid-19, drawing inference from its past success factors during the EVD outbreak. We also highlight structural and systemic challenges undermining the country's fight against Covid-19. We observe a near-total absence of factors that led to the country's erstwhile victory in the current country-wide response to the Covid-19. For instance, unlike in the EVD, testing, contact tracing, and isolation have been limited so far since the Covid-19 outbreak in the country. More generally, we also find evidence of structural and system issues such as predominance informal economy and rural-urban poor, and high political distrust and population density as contributory factors to the country's inability to replicate a similar country-wide response as during the EVD crisis. Third, employing the spatial and equity approach on secondary data we identify the covid-19 vulnerable while assessing the social and spatial distribution of government and non-government Covid-19 social protection programs, and explore to what extent they target the most Covid-19 vulnerable populations in Nigeria. We find limited evidence that government and non-government Covid-19 social protection programs targeted the most Covid-19 vulnerable populations in Nigeria. This may have further complicated the country's fight against the current epidemic.

Different policy conclusions, both immediate and long-term, can be drawn from our study. One of the frontline EVD respondents in Liberia, Paul Farmer, while documenting his experience in the fight against EVD noted vehemently that the formula for success against EVD and threats like it is to "invest in a comprehensive model of prevention and care for the poor" (Farmer, 2014). Attaining this fit requires building a quality and inclusive health care system with a robust public

health component. It also requires either building or strengthening a country's capacity to prevent, detect, and respond to pandemics along the IHR core capacities. The urgent need for Nigeria's health care system and infrastructure to evolve in these direction cannot be overemphasized as our findings documents substantial gaps in these respective areas. Our findings about the late detection of the Covid-19 in the country, the belated and mild response of GoN at the onset of the outbreak that, other things equal, resulted to an early community transmission once again reemphasizes the importance of early detection and for heighten response to outbreak.

Nigerian government need to show more leadership and strong political will in the fight against Covid-19. Intensified testing in the country and at the different port of entry, strict adherence to Covid-19 guidelines in public functions, and robust awareness campaigns could be a good start. There is also the need to address copious structural issues that plaque the country, as the pose challenge to containing the virus. Among others, this relates to the predominance of informal sector and a lack of citizen-to-government trust in the country. The prevalence of large scale informality in the economy, not only show the vulnerability of the country to outbreak of the current magnitude but also a greater share of the country's population in need of social protection of any kind. Hence, the need for job formalization and the attendant benefits thereof in the country. High political distrusts in the country which has contributed in disincentivizing the citizens to adhere to the Covid-19 guidelines is only one out of the many negative effects that may be associated with this systemic issue, hence, the urgent need to address it. Finally, there is an urgent need for a more targeted social protection extension to the Covid-19 most vulnerable in the country.

Finally, learning effectively from a crisis to the extent that the affected country uses the garnered knowledge to contain the next crisis is a conscious act and requires a pragmatic approach. The ideal pragmatic approach requires process-tracing and simulation exercises to identify the success or failure factors along with the counterfactuals. The findings are then used to update the related institutional designs, build a toolkit for capability shortfalls that are regularly monitored and evaluated, and shared among the stakeholders as a knowledge roadmap. In our scoping literature, we did not find any such evidence in the context of Nigeria. At best, the country's colossal victory in the fight against EVD has only been recorded as a quantitative score or a historical landmark without any substantial scientific and qualitative narrative built around it. Moving forward, the

country's ability in strengthening its learning capability from past, present, and future crises depends on unlearning its old ways while adopting this ideal process.

References

ACAPS (2020). Nigeria: Vulnerabilities to Covid-19 and containment measures created. Retrieved 14 March 2020 from https://www.acaps.org/special-report/nigeria-vulnerabilities-covid-19-and-containment-measures

Adebisi, A., Umah, O., Olaoye, C., Alaran, J., & Sina-Odunsi, B. (2020). Assessment of health budgetary allocation and expenditure toward achieving universal health coverage in Nigeria. *International Journal of Health & Life Sciences*, 6(2).

Adegboye, A., Adekunle, I., & Gayawan, E. (2020). Early transmission dynamics of novel coronavirus in Nigeria. *International Journal of Environmental Research & Public Health*, 17(9), 3054.

Adesanya, A. (2020). Government preparedness and response towards Covid-19 outbreak in Nigeria: A retrospective analysis of the last 6 months. *Journal of Global Health*, 10(2).

Adogo, L.Y., Chuku, A., & Ajide, B., (2019). The Ebola virus saga in Nigeria: the viewpoint of a microbiologist. *GSC Biological and Pharmaceutical Sciences*, 09(02), 050–056.

Almutairi F., BaniMustafa A., Alessa M., Almutairi B., & Almaleh Y. (2020). Public trust and compliance with the precautionary measures against Covid-19 employed by authorities in Saudi Arabia. *Risk Management and Healthcare Policy*, 13, 753–760.

Althaus, C., Low, N., Musa, E., Shuaib, F., & Gsteiger, S. (2015). Ebola virus disease outbreak in Nigeria: Transmission dynamics and rapid control. *Epidemics*, 11, 80-84.

Amoo, O., Adekeye, O., Olawole-Isaac, A., Fasina, F., Adekola, O., Samuel, W., Akanbi, M., Oladosun, M., & Azuh, E. (2020). Nigeria and Italy divergences in coronavirus experience: Impact of population density. *The Scientific World Journal*, *2020*.

Amzat, J., Aminu, K., Kolo, I., Akinyele, A., Ogundairo, A., & Danjibo, C. (2020). Coronavirus outbreak in Nigeria: Burden and socio-medical response during the first 100 days. *International Journal of Infectious Diseases*, 98, 218-224.

Anthonia Obi-Ani, N., Ezeaku, O., Ikem, O., Isiani, C., Obi-Ani, P., & Chisolum, O. (2021). Covid-19 pandemic and the Nigerian primary healthcare system: The leadership question. *Cogent Arts & Humanities*, 8(1), 1859075.

Avenyo, K., & Ndubuisi, G. (2020). Coping during Covid-19: Family business and social assistance in Nigeria. *CEPR: COVID Economics Vetted & Real-Time Papers*, 51, 159-184.

Bell, B., Damon, I., Jernigan, D., Kenyon, T., Nichol, S., O'Connor, J., & Tappero, J. (2016). Overview, control strategies, and lessons learned in the CDC response to the 2014–2016 Ebola Epidemic. *Morbidity & Mortality Weekly Report*, 65(3), 4-11.

Blair, A., Morse, S., & Tsai, L. (2017). Public health and public trust: Survey evidence from the Ebola Virus Disease epidemic in Liberia. *Social Science & Medicine*, 172, 89-97.

CDC (2016a). 2014-2016 Ebola outbreak in West Africa. Retrieved 9 March 2021 from https://www.cdc.gov/vhf/ebola/history/2014-2016-outbreak/index.html

CDC (2016b). 2014-2016 Ebola outbreak in West Africa. Retrieved 9 March 2021 from https://www.cdc.gov/vhf/ebola/history/2014-2016-outbreak/cumulative-cases-graphs.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fvhf%2Febola%2Foutbreaks%2F2014-west-africa%2Fcumulative-cases-graphs.html

CDC (2016c). Cost of the Ebola pandemic. Retrieved 9 March 2021 from Cost of the Ebola Epidemic <B>Error processing SSI file</B>
 (cdc.gov)

CDC (2019). Centre for Disease Control and Prevention: Ebola. Retrieved 9 March 2021 from https://www.cdc.gov/vhf/ebola/treatment/survivors.html

CDC (2020). *Case Counts: The 2014-2016 Ebola outbreak in West Africa has ended*. Retrieved 9 March 2021 from https://www.cdc.gov/vhf/ebola/history/2014-2016-outbreak/case-counts.html

Cenciarelli, O., Pietropaoli, S., Malizia, A., Carestia, M., D'Amico, F., Sassolini, A., Di Giovanni, D., Rea, S., Gabbarini, V., Tamburrini, A., Palombi, L., Bellecci, C., & Gaudio, P. (2015). Ebola virus disease 2013-2014 outbreak in West Africa: An analysis of the epidemic spread and response. *International Journal of Microbiology*, 2015: 769121.

Clark, C., Davila, A., Regis, M., & Kraus, S. (2020). Predictors of Covid-19 voluntary compliance behaviors: an international investigation. *Global Transitions*, 2, 76–82.

Coltart, E., Lindsey, B., Ghinai, I., Johnson, M., & Heymann, L. (2017). The Ebola outbreak, 2013–2016: Old lessons for new epidemics. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 372(1721), 20160297.

Dabang, P., & Ukomadu, A. (2020). In Nigeria, looters target government warehouses stocked with Covid-19 relief. Retrieved 9 March 2021 from https://www.reuters.com/article/uk-health-coronavirus-nigeria-food-idUKKBN27P0YZ

Dahl, B.., Kinzer, M., Raghunathan, P., Christie, A., De Cock, K., Mahoney, F., Bennett, S., Hersey, S., & Morgan, O. (2014) CDC's response to the 2014–2016 Ebola epidemic — Guinea, Liberia, and Sierra Leone. *Morbidity & Mortality Weekly Report*, 65(3), 12-20.

Davies, A., & Jacobsen, K. (2010). Profiling urban IDPs. *Forced Migration Review*, (34), 13.

Day, M. (2020a). Covid-19: identifying and isolating asymptomatic people helped eliminate virus in Italian village. *BMJ: British Medical Journal (Online)*, *368*.

Day, M. (2020b). Covid-19: four fifths of cases are asymptomatic, China figures indicate. BMJ 2020;369:m1375.

Dixit, S., Ogundeji, Y., Onwujekwe, O. (2020). How well has Nigeria responded to Covid-19? Brookings. Retrieved 9 March 2021 from https://www.brookings.edu/blog/future-development/2020/07/02/how-well-has-nigeria-responded-to-covid-19/

Ejiogu, A., Okechukwu, O., & Ejiogu, C. (2020). Nigerian budgetary response to the COVID-19 pandemic and its shrinking fiscal space: financial sustainability, employment, social inequality and

business implications. *Journal of Public Budgeting, Accounting & Financial Management*, 32(5), 919-928.

Etim, E., & Daramola, O. (2020). The informal sector and economic growth of South Africa and Nigeria: A Comparative Systematic Review. *Journal of Open Innovation: Technology, Market, and Complexity*, 6(4), 134.

Eranga, E. (2020). Covid-19 pandemic in Nigeria: Palliative measures and the politics of vulnerability. *International Journal of maternal and child health and AIDS*, *9*(2), 220.

Evans, K., Goldstein, M., & Popova, A. (2015). Health-care worker mortality and the legacy of the Ebola epidemic. *The Lancet Global Health*, *3*(8), e439-e440.

Ezeibe, C., Ilo, C., Ezeibe, N., Oguonu, N., Nwankwo, A., Ajaero, K., & Osadebe, N. (2020). Political distrust and the spread of COVID-19 in Nigeria. *Global Public Health*, 15(12), 1753-1766.

Farmer, P. (2014) Diary Ebola. London review of books, Vol. 36 No. 20- 23

Fasina, O., Shittu, A., Lazarus, D., Tomori, O., Simonsen, L., Viboud, C., & Chowell, G. (2014). Transmission dynamics and control of Ebola virus disease outbreak in Nigeria, July to September 2014. *Eurosurveillance*, 19(40), 20920

Gao, Z., Xu, Y., Sun, C., Wang, X., Guo, Y., Qiu, S., & Ma, K. (2020). A systematic review of asymptomatic infections with COVID-19. *Journal of Microbiology, Immunology and Infection*.

Gatherer, D. (2014). The 2014 Ebola virus disease outbreak in West Africa. *Journal of General Virology*, *95*(8), 1619-1624.

GBD 2016 Healthcare Access and Quality Collaborators (2018) Measuring performance on the healthcare access and quality index for 195 countries and territories and selected subnational locations: A systematic analysis from the global burden of disease study 2016. *The Lancet*, 391(10136), 2236-2271.

Gilbert, M., Pullano, G., Pinotti, F., Valdano, E., Poletto, C., Boëlle, P., D'Ortenzio, E., Yazdanpanah, Y., Eholie, S., Altmann, M., Gutierrez, B., Kraemer, M., & Colizza, V. (2020). Preparedness and vulnerability of African countries against importations of Covid-19: A modelling study. *Lancet*, 395(10227), 871–877

Goldstein, D., & Wiedemann J. (2020). Who do you trust? The consequences of political and social trust for public responsiveness to Covid-19 orders. Retrieved 18 March 2021 from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3580547

Harapan, H., Itoh, N., Yufika, A., Winardi, W., Keam, S., Te, H., & Mudatsir, M. (2020). Coronavirus disease 2019 (COVID-19): A literature review. *Journal of Infection & Public Health,* 13(5), 667-673.

Holt, T., Millroy, L., & Mmopi, M. (2017). Winning in Nigeria: Pharma's next frontier. Retrieved 18 March 2021 from https://www.mckinsey.com/industries/pharmaceuticals-and-medical-products/our-insights/winning-in-nigeria-pharmas-next-frontier

Houlihan, C. F., Youkee, D., & Brown, C. S. (2017). Novel surveillance methods for the control of Ebola virus disease. *International Health*, *9*(3), 139-141.

Huang, C., Wang, Y., Li, X., Ren,L., Zhao, J., Hu, Y., Zhang, L., Fan, G., Xu, J., Gu, X., Cheng, Z., Yu, T., Xia, J., Wei, Y., Wu, W., Xie, X., Yin, W., Li, H., Liu, M., Xiao, Y., Gao, H., Guo, L., Xie, J., Wang, G., Jiang, R., Gao, Z., Jin, Q., Wang, J., & Cao, B. (2020). Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet,* 395, 497–506.

Iaccarino, M. (2019). Water, population growth and contagious diseases. *Water*, *11*(2), 386.

Ibáñez, A. M., & Moya, A. (2010). Vulnerability of victims of civil conflicts: empirical evidence for the displaced population in Colombia. *World development*, *38*(4), 647-663.

Ibrahim, L., Ajide, B., & Julius, O. (2020). Easing of lockdown measures in Nigeria: Implications for the healthcare system. *Health Policy and Technology*, *9*(4), 399-404.

Ihekweazu C. (2020). Steps Nigeria is taking to prepare, for cases of coronavirus. Retrieved 18 March 2021 from http://theconversation.com/steps-nigeria-istaking- to-prepare-for-cases-of-coronavirus-130704.

Ilesanmi, O., Afolabi, A., Akande, A., Raji, T., & Mohammed, A. (2021). Infection prevention and control during COVID-19 pandemic: Realities from health care workers in a north central state in Nigeria. *Epidemiology & Infection,* 149, 1-34.

ILO (2018). Women and men in the informal economy: A statistical picture. Retrieved 18 March 2021 from https://www.ilo.org/global/publications/books/WCMS_626831/lang--en/index.htm

Jahangiri, M., Jahangiri, M., & Najafgholipour, M. (2020). The sensitivity and specificity analyses of ambient temperature and population size on the transmission rate of the novel coronavirus (Covid-19) in different provinces of Iran. *Science of the Total Environment*, 728, 138872.

Kidd, R. (2020). Five principles for pandemic preparedness: lessons from the Australian COVID-19 primary care response. *British Journal of General Practice,* 70(696), 316-317.

KPMG. (2020). Nigeria: Government and institution measures in response to COVID-19. Retrieved 18 March 2021 from https://home.kpmg/xx/en/home/insights/2020/04/nigeria-government-and-institution-measures-in-response-to-covid.html

Kronbichler, A., Kresse, D., Yoon, S., Lee, K. H., Effenberger, M., & Shin, I. (2020). Asymptomatic patients as a source of COVID-19 infections: A systematic review and meta-analysis. *International journal of infectious diseases*, *98*, 180-186.

Lalot, F., Heering, S., Rullo, M., Travaglino, A., & Abrams, D. (2020). The dangers of distrustful complacency: Low concern and low political trust combine to undermine compliance with governmental restrictions in the emerging Covid-19 pandemic. *Group Process Intergroup Relation*. https://doi.org/10.1177/1368430220967986.

Marien, S., & Hooghe, M. (2011). Does political trust matter? An empirical investigation into the relation between political trust and support for law compliance. *European Journal of Political Research*, *50*(2), 267-291.

McPake, B., Dayal, P., & Herbst, H. (2019). Never again? Challenges in transforming the health workforce landscape in post-Ebola West Africa. *Human resources for health*, 17(1), 1-10.

Milcher, S. (2006). Poverty and the determinants of welfare for Roma and other vulnerable groups in Southeastern Europe. *Comparative Economic Studies*, *48*(1), 20-35.

Morisho, N., Kalubi, J., Park, S-J., & Doevenspeck, M. (2020). Same but Different? A Comparison of Ebola virus disease and Covid-19 after the Ebola epidemic in Eastern DRC (2018–20). Retrieved 13 March 2021 from https://africanarguments.org/2020/04/same-but-different-a-comparison-of-ebola-virus-disease-and-covid-19-after-the-ebola-epidemic-in-eastern-drc-2018-20/

Murphy, K. (2004). The role of trust in nurturing compliance: A study of accused tax avoiders. *Law and human behavior*, *28*(2), 187-209.

NCDC (2017). Nigeria Centre for Disease Control. Retrieved 18 March 2021 from https://ncdc.gov.ng/diseases/info/E.

NCDC. (2020a). Covid-19 Outbreak in Nigeria: Situation report. S/N: 010 [9th March, 2020]

NCDC. (2020b). COVID-19 Situation Report: Weekly Epidemiological report 11 (Epi Week 52: 21st December – 27th December 2020)

Nivette, A., Ribeaud, D., Murray, A., Steinhoff, A., Bechtiger, L., Hepp, U., Shanahan, L., & Eisner, M. (2020). Non-compliance with Covid-19-related public health measures among young adults in Switzerland: insights from a longitudinal cohort study. *Social Science & Medicine,* 268, 113370.

Oleribe, O., Crossey, M., & Taylor-Robinson, D. (2015). Nigerian response to the 2014 Ebola viral disease outbreak: Lessons and cautions. *Pan African Medical Journal*, *22*(Supp 1).

Olusola, A., Olusola, B., Onafeso, O., Ajiola, F., & Adelabu, S. (2020). Early geography of the coronavirus disease outbreak in Nigeria. *GeoJournal*, 1-15.

Omilabu, S., Salu, O., Oke, B., & James, A. (2016). The West African Ebola virus disease epidemic 2014–2015: A commissioned review. *Nigerian Postgraduate Medical Journal*, *23*(2), 49.

Onapajo, H., & Adebiyi, J. (2020). Covid-19 is a big scam' citizens' distrust and the challenge of combating coronavirus in Nigeria. Retrieved 13 March 2020 from https://republic.com.ng/february-march-2020/distrust-nigeria-coronavirus/

Onwujekwe, O., Orjiakor, C. T., Hutchinson, E., McKee, M., Agwu, P., Mbachu, C., Ogbozor, P., Obi, U., Odii, A., Ichoku, H., & Balabanova, D. (2020). Where do we start? Building consensus on drivers of health sector corruption in Nigeria and ways to address it. International Journal of Health Policy Management, 9(7), 286–296.

Onyemelukwe, C. (2020). Covid-19, misinformation, and the law in Nigeria. Retrieved 18 March 2021 from https://blog.petrieflom.law.harvard.edu/2020/08/19/misinformation-disinformation-covid19-nigeria-law/

Osayomi, T., Adeleke, R., Taiwo, J., Gbadegesin, S., Fatayo, C., Akpoterai, E., Ayanda, J., Moyin-Jesu, J., & Isioye, A. (2020). Cross-national variations in Covid-19 outbreak in West Africa: Where does Nigeria stand in the pandemic? *Spatial Information Research*, 1-9.

Otu, A., Ameh, S., Osifo-Dawodu, E., Alade, E., Ekuri, S., & Idris, J. (2017). An account of the Ebola virus disease outbreak in Nigeria: Implications and lessons learned. *BMC Public Health*, *18*(1).

Piot, P., Muyembe, J., & Edmunds, W. J. (2014). Ebola in West Africa: From disease outbreak to the humanitarian crisis. *The Lancet Infectious Diseases*, *14*(11), 1034-1035.

PWC (2016). Restoring trust to Nigeria's Healthcare System. Retrieved 18 March 2021 from https://www.pwc.com/ng/en/publications/restoring-trust-to-nigeria-healthcare-system.html

PWC (2020). Government's Covid-19 response measures. Retrieved 18 March 2021 from https://www.pwc.com/ng/en/covid-19/government-covid-19-response-measures.html

Richardson, T., McGinnis, T., & Frankfurter, R. (2019). Ebola and the narrative of mistrust. *BMJ Global Health*, 4

Richards, P., Mokuwa, E., Welmers, P., Maat, H., & Beisel, U. (2019). Trust, and distrust, of Ebola Treatment Centers: A case-study from Sierra Leone. *PloS one*, *14*(12), e0224511

Rico, A., Brody, D., Coronado, F., Rondy, M., Fiebig, L., Carcelen, A., Deyde, M., Mesfin, S., Retzer, D., Bilivogui, P., Keita, S., & Dahl, A. (2016). Epidemiology of epidemic Ebola virus disease in Conakry and surrounding prefectures, Guinea, 2014–2015. *Emerging Infectious Diseases*, *22*(2), 178-183.

Rocklöv, J., & Sjödin, H. (2020). High population densities catalyze the spread of Covid-19. *Journal of Travel Medicine, 27*(3), taaa038.

Sambala, Z., Kanyenda, T., Iwu, J., Iwu, D., Jaca, A., & Wiysonge, S. (2018). Pandemic influenza preparedness in the WHO African region: are we ready yet? *BMC infectious diseases*, *18*(1), 1-13.

Schuchat, A. (2020). Public health response to the initiation and spread of pandemic Covid-19 in the United States, February 24–April 21, 2020. MMWR. Morbidity and mortality weekly report (Vol. 69).

Shoman, H., Karafillakis, E., & Rawaf, S. (2017). The link between the West African Ebola outbreak and health systems in Guinea, Liberia and Sierra Leone: A systematic review. *Globalization and health*, 13(1), 1-22.

Shuaib, F., Gunnala, R., Musa, O., Mahoney, J., Oguntimehin, O., Nguku, M., Nyanti, B., Knight, N., Gwarzo, S., Idigbe, O., Nasidi, A., & Vertefeuille, F., (2014). Ebola virus disease outbreak—Nigeria. *Morbidity and Mortality Weekly Report*, 63(39), 867-872.

Simpson, D. (2015). Making a difference. The global Ebola response: Outlook 2015. *Global Ebola Response*. Retrieved 18 March 2021 from: https://ebolaresponse.un.org/sites/default/files/ebolaoutlook.pdf

Strasser, R. (2003). Rural health around the world: Challenges and solutions. *Family Practice*, 20(4), 457-463.

Tarwater, M., & Martin, F. (2001). Effects of population density on the spread of disease. *Complexity*, 6(6), 29-36.

Thalayasingam, P. (2009). Conflict, Vulnerability and Long-term Displacement: The Case of Puttalam. *Forced to Move: Involuntary Displacement and Resettlement—Policy and Practice*, 111-124.

United Nations. (2020). Policy brief: Impact of COVID-19 in Africa 20 May 2020. Retrieved 18 March 2021 from https://reliefweb.int/report/world/policy-brief-impact-covid-19-africa-20-may-2020

USAID (2020). UNAIDS facilitates establishment of the COVID-19 basket fund in Nigeria. Retrieved 18 March 2021 from https://www.unaids.org/en/20200408_Nigeria_covid_fund

Vetter, P., Dayer, J., Schibler, M., Allegranzi, B., Brown, D., Calmy, A., Christie, D., Eremin, S., Hagon, O., Henderson, D., Iten, A., Kelley, E., Marais, F., Ndoye, B., Pugin, J., Robert-Nicoud, H., Sterk, E., Tapper, M., Siegrist, C., Kaiser, L., & Pittet, D. (2016). The 2014–2015 Ebola outbreak in West Africa: Hands on. *Antimicrobial Resistance & Infection Control*, *5*(1).

Vinck, P., Pham, N., Bindu, K., Bedford, J., & Nilles, J. (2019). Institutional trust and misinformation in the response to the 2018–19 Ebola outbreak in North Kivu, DR Congo: a population-based survey. *Lancet Infectious Disease,* 19(5), 529–536.

Wang, Q., & Su, M. (2020). A preliminary assessment of the impact of Covid-19 on the environment–A case study of China. *Science of the Total Environment*, 138915.

WEF (2018). Public trust in politician. Retrieved 29 March 2021 from http://reports.weforum.org/pdf/gci-2017-2018-scorecard/WEF_GCI_2017_2018_Scorecard_EOSQ041.pdf

Weyer, J., Grobbelaar, A., & Blumberg, L. (2015). Ebola virus disease: History, epidemiology and outbreaks. *Current Infectious Disease Reports*, *17*(5).

WHO (2014a). Emergencies preparedness, response: Successful Ebola responses in Nigeria, Senegal and Mali. Retrieved 18 March 2021 from: https://www.who.int/csr/disease/ebola/one-year-report/nigeria/en/

WHO (2014b). Are the Ebola outbreaks in Nigeria and Senegal over? Retrieved 18 March 2021 from https://www.who.int/mediacentre/news/ebola/14-october-2014/en/

WHO (2015a). One year into the Ebola epidemic: A deadly, tenacious, and unforgiving virus. Retrieved 9 March 2021 from https://www.who.int/csr/disease/ebola/one-year-report/introduction/en/

WHO (2015b). Ebola Situation Report. Retrieved 18 March 2021 from http://apps.who.int/iris/bitstream/10665/192654/1/ebolasitrep_4Nov2015_eng.pdf?ua=1. Last Accessed March 20, 2021

WHO (2015c). Guinea: The Ebola virus shows its tenacity. Retrieved 18 March 2021 from https://www.who.int/csr/disease/ebola/one-year-report/guinea/en/

WHO (2015d). Successful Ebola responses in Nigeria, Senegal and Mali. Retrieved 18 March 2021 from https://www.who.int/csr/disease/ebola/one-year-report/nigeria/en/

WHO (2017). Joint external evaluation of IHR core capacities of the Federal Republic of Nigeria. Retrieved 18 March 2021 from https://www.who.int/ihr/publications/WHO-WHE-CPI-REP-2017.46/en/

WHO (2019). Maternal health in Nigeria: generating information for action. Retrieved 18 March 2021 from https://www.who.int/reproductivehealth/maternal-health-nigeria/en/

WHO (2020a). Ebola virus disease. Retrieved 18 March 2021 from: https://www.who.int/ news-room/fact-sheets/detail/ebola-virus-disease.

WHO (2020b) COVID-19 High risk groups. Retrieved 17 March 2020 from https://www.who.int/westernpacific/emergencies/covid-19/information/high-risk-groups

WHO. (2020c). Coronavirus. Retrieved 18 March 2021 from https://www.who.int/health-topics/coronavirus#tab=tab_1

WHO (2020d). WHO ramps up preparedness for novel coronavirus in the African region. Retrieved 17 March 2021 from https://www.afro.who.int/news/who-ramps-preparedness-novel-coronavirus-african-region

WHO (2020e). Newborns: improving survival and well-being. Retrieved 18 March 2021 from https://www.who.int/news-room/fact-sheets/detail/newborns-reducing-mortality

WHO (2020f). Children: improving survival and well-being. Retrieved 18 March 2021 from https://www.who.int/news-room/fact-sheets/detail/children-reducing-mortality

WHO (2020g). Health Cluster: Nigeria. Retrieved 18 March 2021 from https://www.who.int/health-cluster/countries/nigeria/en/

WHO. (2020h) Coronavirus disease 2019 (COVID-19) Situation Report – 46. Retrieved 18 March 2021 from https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200306-sitrep-46-covid-19.pdf?sfvrsn=96b04adf_2

Wilkinson, A., & Fairhead, J. (2017). Comparison of social resistance to Ebola response in Sierra Leone and Guinea suggests explanations lie in political configurations not culture. *Critical Public Health*, 27(1), 14-27.

Woolhouse, E., Rambaut, A., & Kellam, P. (2015). Lessons from Ebola: Improving infectious disease surveillance to inform outbreak management. *Science Translational Medicine*, 7(307), 307rv5-307rv5.

World Bank (2020). Nigeria releases new report on poverty and inequality in country. Retrieved 18 March 2021 from https://www.worldbank.org/en/programs/lsms/brief/nigeria-releases-new-report-on-poverty-and-inequality-in-country

World Bank (2020b). Covid-19 to add as many as 150 million extreme poor by 2021. Retrieved 28 March 2021 from https://www.worldbank.org/en/news/press-release/2020/10/07/covid-19-to-add-as-many-as-150-million-extreme-poor-by-2021

Worldometer (2021). Covid-19 Coronavirus pandemic. Retrieved 1 January 2021 from https://www.worldometers.info/coronavirus/?utm_campaign=homeAdUOA?Si%23countries

Yan, Y., Shin, I., Pang, X., Meng, Y., Lai, J., You, C., Zhao, H., Lester, E., Wu, T., & Pang, H. (2020). The first 75 days of novel coronavirus (SARS-CoV-2) outbreak: Recent advances, prevention, and treatment. *International Journal of Environmental Research & Public Health*, 17(7), 2323.

Zawilińska, B., & Kosz-Vnenchak, M. (2014). General introduction into the Ebola virus biology and disease. *Medica Cracoviensia*, 54(3), 57-65.

Zhou, P., Yang, L., Wang, G., Hu, B., Zhang, L., Zhang, W., Si, H-R., Zhu, Y., Li, B., H, C-L., Chen, H-D., Chen, J., Luo, Y., Guo, H., Jiang, R-D., Liu, M-Q., Chen, Y., Shen, X-R., Wang, Xi., Zheng, X-S., Zhao, K., Chen, Q-J., Deng, F., Liu, L-L., Yan, B., Zhan, F-X., Xiao, G-F., & Shi, Z-L. (2020). A pneumonia outbreak associated with a new coronavirus of probable bat origin. *Nature*, 579(7798), 270-273.