

Health Infrastructural Deficit - Nigeria the Time to Act Is Now

Wambebe Nathaniel Mopa^{1,2}, Xiaoli Duan^{1,2,*}

¹School of Energy and Environmental Engineering, University of Science and Technology, Beijing, China

²Center for Environmental Health Research, University of Science and Technology, Beijing, China

Email address:

jasmine@ustb.edu.cn (Xiaoli Duan)

*Corresponding author

To cite this article:

Wambebe Nathaniel Mopa, Xiaoli Duan. Health Infrastructural Deficit - Nigeria the Time to Act Is Now. *Central African Journal of Public Health*. Vol. 8, No. 5, 2022, pp. 203-212. doi: 10.11648/j.cajph.20220805.13

Received: July 5, 2022; Accepted: July 23, 2022; Published: October 11, 2022

Abstract: Nigeria internationally and locally is noted for its deplorable health system. Health infrastructure in Nigeria is at its low ebb as most health institutions battle with age long problem of weak, defective, insufficient and obsolete infrastructure. More so, poor maintenance culture that has pervaded most sectors of Nigeria also constitute a challenge in this sector especially as it relates to maintenance of building, medical equipment and vehicles. Other issues such as: poor management of drugs, shortage of drugs, expiry of drugs and vaccines, faulty compounding of drugs, shortage of health practitioner, poor use of telemedicine etc. are other factors bedeviling this sector. Despite several agitations and outcry on the deplorable health infrastructure and health system in Nigeria, efforts made by the government to revamp this sector is discouraging particularly against the background of the COVID-19 pandemic which further exposed the deplorable state of Nigeria's health infrastructure. This paper elicits attention into the Nigeria's deplorable state of health infrastructure, by stressing the need for Nigeria to act now in improving her health infrastructure especially in the face of COVID-19 pandemic, future pandemics and best practices obtainable in other climes. While discussing the importance of good health infrastructure, the paper discusses challenges to the development of health infrastructure in Nigeria and comparatively considered Rwanda as a best practice in this regard in proffering solutions to health infrastructural development in Nigeria.

Keywords: Health-System, Health Infrastructure, Coronavirus, Major Infrastructure Deficit, African Countries, Nigeria

1. Introduction

Health infrastructure is an intricate support for public health delivery and the nerve centre of public health system essential in encouraging good health services and well-being [1]. It offers the basis for planning, evaluating, delivering, and enhancing development in public health [1]. As such, the delivery of public health service in every country is hinged on its health infrastructure [2]. In Nigeria, health infrastructure is at its low ebb, as there is huge infrastructural deficit which constitute a major challenge to public health in Nigeria [3].

In Nigeria, the Federal, State and Local government is empowered to legislate on matters on health, considering that it is contained in the concurrent legislative list [4]. As such, diverse challenges facing health care sector can be analyzed

from different levels of health care thus: Tertiary health care (managed by the Federal Government), secondary health care (managed by the State Government) and primary health care (administered by Local Government) [5].

Interestingly, a common challenge of these three tiers of health care is the deficiency in healthcare infrastructure. Most health institutions battle with age long problem of weak, defective, insufficient and obsolete infrastructure [5]. More so, poor maintenance culture that has pervaded most sectors of Nigeria also constitute a challenge in this sector especially as it relates to maintenance of building, medical equipment and vehicles. Other issues such as: poor management of drugs, shortage of drugs, expiry of drugs and vaccines, faulty compounding of drugs, shortage of health practitioner, poor use of telemedicine etc. are other factors bedeviling this sector.

The COVID-19 pandemic further revealed Nigeria's

infrastructural deficit, such that the Secretary to Government of the Federation (SGF), Mr. Boss Mustapha, expressed concerned when he chaired the Nigeria's Presidential Task Force on COVID-19, by noting that, he oblivious of the state of the entire healthcare infrastructure, until he was appointed [6]. One year after this statement, his statement still remains relevant of health infrastructure in Nigeria.

Against this background, this paper aims at eliciting attention to the deplorable health infrastructure state in Nigeria, while stressing the need for Nigeria to act now in improving her health infrastructure especially in face of COVID-19 pandemic, future pandemics and best practices obtainable in other climes.

Relying on primary and mainly secondary sources of obtaining data, this paper commences with this introduction. It afterwards clarifies some concepts that relates to the paper and discusses the importance of good health infrastructure. The paper thereafter considers deficit of health infrastructure in Nigeria, while stressing the need for Nigeria to act now especially in the face of COVID-19 pandemic and emerging future pandemics. More so, the paper considers challenges to the development of health infrastructure in Nigeria and comparatively considered Rwanda as a best practice in this regard. Finally, the paper concludes and makes recommendations.

2. Conceptual Clarification

2.1. Health Infrastructure

Litanies of literature have defined this concept some of which includes the definition of Ademiluyi and Arowolo who gave a qualitative and quantitative perspective of health infrastructure as accessibility to health care delivery as well as the quality of care in a country [7]. This is evaluated by technological quality (computer equipment and consumables), physical (buildings, fixed structures, good road, electricity etc.) and human resources (health professionals such as doctors, pharmacists, nurses, midwives, laboratory technologist, sundry workers etc.) present at a particular period.

Kapur in his definition noted that health infrastructure being a basic provision for public health activities delivery consist of five components thus: public health organisations, skilled workforce, integrated electronic information systems, research and resources [8]. According to the author health infrastructure exceeds health policy outcome of a particular country, but concentrates on building material capacity in public health delivery mechanisms [8].

More so, American College of Physicians in defining public health infrastructure identified it as the essential foundation that provides supports for the delivery, planning and evaluation of public health practices and activities [9]. This is because a solid health infrastructure affords the ability to prepare for as well as respond or react to severe (emergency) and lingering (ongoing) dangers to the nation's health. Furthermore, the paper noted that there are three components of public health infrastructure which are:

capable and qualified workforce, up-to-date data and information systems and public health agencies pf assessing and responding to public health needs.

In addition, Luxon in defining health infrastructure notes that health infrastructure must incorporate the hospital, as in patient and acute care centre into a system with broader health care with the aim of facilitating domains with seven qualities thus: effectiveness, timeliness, patient experience, efficiency, equity, safety, and sufficiency [10]. More so, it is the author's view that infrastructure encapsulates an interwoven facet of an environment that is built with supporting elements, information technology, equipment, access, sustainable initiatives and staff, systems and processes, all geared towards enabling patients have a seamless service and an environment where their privacy and dignity are highly maintained.

Having considered these definitions, this paper defines health infrastructure as facilities be it physical, technological and human resources by which public health services are delivered or provided to the public.

2.2. Deficit

Black's Law Dictionary defines deficit as deficiency or disadvantage in amount or in quality of something [11].

Also, the Oxford Learner's Dictionaries defining deficit in the realm of economics noted that it is the amount by which money spent or owed is greater than money earned in a particular period of time [12]. Another definition proffer is that, it is the amount by which something, especially an amount of money, is too small or smaller than something else.

In defining deficit, this paper aligns with the definition of the Black's Law Dictionary to encapsulate a deficiency or disadvantage in amount or in quality of something.

3. Importance of Good Health Infrastructure

Benefit derived from good health infrastructure are enormous, considering that health infrastructure plays vital functions which includes the following:

- monitoring health status in a bid to identify and proffer solution to community health problems, [1].
- educating, informing as well as empowering people as it relates to health issues,
- create awareness as it relates to preventive measures,
- muster community partnership and actions towards identifying and solving health related problems,
- prevent epidemics as well as diseases spread and protect against environmental threats.
- encourages good health behavior and prevent injuries, promotes functional counselling and guidance as well as promote health services administration [1].

One of the components of health infrastructure is the built environment of a health care. This requires an integration of healthcare sites including the hospital in the broader community so as to make it readily accessible for the

members of the community [13]. Easy access which includes car parking, transportation facilities and visible signage within the premises of the hospital and environs enables patients their families to easily traverse all hospital services [13]. Furthermore, a spacious ward and patient area with enough space, lightings and good view promotes an environment that is patient friendly that enhances healing [10]. Also, good infrastructural arrangement ensure that related services are co-located. Where this is the situation, it enhances efficiency and timeliness of services [10].

In addition, where amenities such as shops, IT facilities, telephone TV / radio access, restaurant, postage, chaplains and child care services are available, they help improve patient and staff wellbeing.

Good health infrastructure also requires availability of appropriate medical equipment which is fit for purpose for high clinical services delivery. Also, it requires scrutiny of the life cycle of a every element of a device's life cycle from requirements specification, through procurement, evaluation of competing products, decontaminations, maintenance, procurement, funded plans for equipment replacement and quality assurance to disposal.

Also, good health infrastructure has a benefit of rapid identification of infectious disease outbreak through the internet. This is critical considering that rapid identification of infectious diseases propels effective initiation of public health intervention measure as well as alerting the general public timeously of the disease and alerting government agencies [14]. Other than identifying an outbreak's first evidence, it also helps with the data for day-to-day surveillance activities [15]. Commenting on this, the WHO in 2003 while dealing with the outbreak of SARS, noted that where a stronger public health infrastructure is developed, it will address the immediate threat of SARS, as well as form the basis of a future safety-net, protecting the world from future epidemics and even bioterrorist treats [16].

Furthermore, health data infrastructure, play vital role with a lot of benefits which includes: providing enabling ground for faster interoperative access to patient records by health care provider; reducing errors within individual patient's records and across records; reducing redundant testing and diagnostic procedures; producing more complete health records, more accurate health data and sustaining the increasing demand of patients for supple access to their own health information. More so, health data infrastructure also enhances better longitudinal tracking of patients and patient groups; provides research data to inform clinical care, facilitates better communication among health care providers and patients; reduces incidence of errors in clinical practice public health and biomedical research enables electronic detection of health care fraud etc. [17].

4. Deficit of Health Infrastructure in Nigeria: Why Act Now

Nigeria, though occupies a strategic position in Africa,

does not portray a good leadership role in the health care spare owing to its deficiency in the availability of health infrastructure which is obvious in her deficient health centres, medical and personnel equipment, mainly in rural areas [18]. Despite efforts made by the government, there remains a weak health care system characterized by lack of coordination, dearth of resources, fragmentation of services, inadequate supply of drug, inadequate and decaying infrastructure, inequitable distribution in access to care and resources as well as deplorable quality of care [19].

This situation has lingered for years basically as a result of Nigeria's reducing per capita spending on the health sector as revealed by data of the World Bank on Nigeria's health spending per capita, from 2000-2018 [20]. Although another analysis of Nigerian government health care expenditure in 2019, 2020 and 2021 reveals an increase in spending from 1,190.71 billion Naira in 2019 to 1,477.77 billion naira in 2021 [21]. In spite of this record, and regardless of the fact that Nigeria has the highest Gross Domestic Product (GDP) in sub-Saharan Africa [22] various statistics puts Nigeria as one of the poorest in health care delivery in the world such that the World Health Organization (WHO) in 2019 rated Nigeria as 187th out of 191 countries in terms of health care delivery with the third highest in maternal and infant mortality rate globally [23]. This is attributable to several setbacks of this sector as a result of inadequate funding considering that though Nigerian has the largest GDP of any African country, she spends less on healthcare in comparison with other large economies on the continent [24]. Other factors are attributable to disease outbreaks, inadequate health personnel, lack of modern equipment, and frequent strikes by health workers [23]. The precarious situation of the health sector has agitated reactions from various writers who observed that only the wealthy have access to adequate health care in Nigeria who enjoy health infrastructures in private hospitals or travel overseas for treatment, while the poor and less privileged are left to wallow in the decayed health infrastructure of public hospitals.

In fact, recently, the International Trade Administration, while analyzing healthcare in Nigeria observed that healthcare infrastructure in Nigeria is still underdeveloped and lacks modern medical facilities as some of the indicators of Nigeria's healthcare are some of the poorest in Africa [25]. Notwithstanding the fast-growing population of Nigeria such that it is estimated to reach 400 million people by 2050, medical professionals are in short supply, with only about 35,000 doctors contrary to WHO's recommended number of 237,000 [25]. This situation is partially attributed to the massive migration of healthcare workers overseas, such that, the Nigerian Medical Association recorded that Nigeria loses at least \$1.5 billion every year to medical tourism [25] and about 2000 medical doctors leave Nigeria annually [26]. In fact, the situation has worsened to the extent that other Nations come to Nigeria to massively recruit medical doctors. The recent massive recruitment exercise by Saudi Arabian authorities of Nigerian medical doctors in Abuja amidst the surge of the COVID-19 pandemic is indicative of

the decadence and the worsened situation of health sector in Nigeria [27]. The eagerness of Nigerian healthcare professionals to escape from the misery which they are ensnared for years and embrace another jurisdiction with better facilities, infrastructure, remuneration and conditions of service is indicative of the need for Nigeria to act now to salvage this ailing sector.

Furthermore, the uneven distribution of available health workers in municipal tertiary health care services delivery particularly in the South as observed by WHO, remains an issue. This is because primary health care majorly in the rural area are left with few health workers who struggle with dilapidated infrastructure [28].

It is against the background of the rot of health infrastructure that public officials and wealthy Nigerians travel to enjoy best medical facilities in countries that prioritize their health sector (by investing in their health infrastructure) leaving helpless Nigerians behind to bear the brunt of a comatose health sector. For instance, recently the Vanguard Newspaper recently recounted the ordeal of the Deputy Provost of the Nigerian Institute of Journalism who helplessly watched his wife died because there was no space in five public hospitals, he visited within seven hours without success [29]. In a piece titled, 'And There was No Space' Omojuyigbe narrated a heart-wrenching story of how he watched his wife take her last breath, having traversed five Lagos hospital in seven anxious hours and got the same cold lethal refrain, 'There is no space.' [29] Unfortunately, Omojuyigbe's experience is same as millions of Nigerians, trapped in a country where health infrastructure pales in comparison to what is obtainable in other climes.

5. Health Infrastructure in the Face of COVID-19 Pandemic

The novel COVID-19 pandemic further exposed the decayed state of health infrastructure in Nigeria. The WHO on the 30th of January, 2020, confirmed the novel COVID-19 pandemic as an international concern public health emergency, and on the 11th of March, 2020, it was affirmed a pandemic [30], which ravaged the world. COVID-19 pandemic overwhelmed the health systems of high-income countries as nations of the world struggle with the daily increasing number of death and infection ravaging the world public health system.

In Nigeria, after COVID-19 initial confirmed case on the 27th of February, 2020 [31], the incidence of the infection grew steadily from the imported first case and highbrow pattern to community transmission [32]. After the WHO's declaration, actions were taken in Nigeria by constituting the Coronavirus preparedness Group on the 31st of January, 2020 especially against the background of WHO's categorization of Nigeria among the 13 high-risk African countries as a result of Nigeria's weak healthcare system [33].

Prior to the first month of COVID-19 in Nigeria, the Nigeria Centre for Disease Control (NCDC) in preparation

for the surge had put measures in place by working with the federal, state and local government. Such measures include: rapid response teams training across the 36 states of Nigeria to respond to any emergency [34], activating emergency operations centres in 22 states in a bid to link up and manage with national incidence coordination centres, enacting policies geared towards limiting the spread of COVID-19, etc. [35]. Furthermore, initiatives were put in place to encourage large scale contact tracing through local government and community health network, including information awareness campaigns in public spaces in a bid to encourage social distancing and the use of internet-based contact tracing, or ICT, for instance the NCDC'S official What's App account, a free service to provide centralized, accurate information on COVID-19 [35].

Although some of these measures are commendable, however the state of the health sector in the face of this crisis is worthy of note. A survey carried out by some researchers, Ogoina et al [36] on 'A national survey of hospital readiness during the COVID-19 Pandemic in Nigeria,' revealed that among 20 (3 secondary and 17 tertiary) hospitals from six geopolitical zones, promptness or preparation score is within 28.2% to 88.7% (median 68.4%), and merely three (15%) hospitals were adequately ready [36]. The research revealed the availability of a medium of 15 isolation beds, 4 ICU beds, and four ventilators per hospital, though after the onset of COVID-19, over 45% procured ventilators and established isolation facilities. This research established that that majority of Nigerian hospitals were not prepared adequately to react to the COVID-19 outbreak and suggested the need for strengthened efforts as regarding, hospital preparedness, critical care for COVID-19 patients, prioritize challenges related to surge ability, staff protection and welfare [36].

A particular area that lacked adequate infrastructure at the outbreak of the virus in Nigeria was as regarding testing. The African Centre for Disease Control (Africa CDC) trained professionals from Nigeria and other African countries on COVID-19 diagnosis using Polymerase chain reaction (PCR) between February 6th and 8th [37]. At this time, vital equipment such as Gene-Xpert machines were not available as NCDC was making plans to make them available [38]. As at 2nd March, 2020, according to the NCDC report at week 10 of the pandemic, the laboratory testing capacity was expanded to five in addition to the hitherto lone laboratory of the Nigeria Institute of Medical Research (NIMR), Lagos [38]. At the 14th week of the outbreak with 214 confirmed cases in Nigeria, there was only 9 laboratories across 6 geopolitical zones in Nigeria with the daily capacity of laboratory testing increasing to 1500 a day [39]. The number of laboratories kept increasing steadily as weeks went by with a rapid number of infection rate.

In general, COVID-19 outbreak response in Nigeria is reactionary and medio-centric, considering that isolation centres were set up by federal and state governments after confirmed positive cases in Nigeria [32]. In fact, Ogun state that had the record of the index case had no molecular laboratory, the patient had to be moved to Lagos State for

diagnosis and treatment. Same experience from other states such as: Oyo, Abia, Akwa Ibom, and Sokoto, were reactive considering that, the government obtained medical equipment to combat the virus after recorded positive cases in these states. The insufficient proactive preparedness for the surge of the virus accounted for the panic created in Nigeria, in addition to the deplorable state of our health infrastructure which the pandemic blatantly exposed [32]. At this time, in view of the lock down and travel restrictions, it was impossible for 'wealthy Nigerians and politicians' to take foreign trips for treatment of COVID-19 as such they were stuck with the deplorable health infrastructures in Nigeria.

At this time, although intensive care units (ICU) and isolation centres were increasing, they were inadequate to handle the raising cases of infection as many states struggled to erect isolation and treatment facilities [32].

More so, at the surge of the pandemic, other issues such as scarcity of personal protective equipment (PPE), improper motivation for health workers, who as front liners were exposed to infection and died are other battling issues. These issues are traceable to the poor culture of taking care of health workers, and at this period of emergency, when health workers were at risk of infection, there were no life insurance, nor adequate protection afforded them [32]. More so, at this period, the action of importing Chinese medical experts and equipment by the Nigerian presidency to fight against the virus in Nigeria [40], raised several criticisms from various quarters who expressed cynicism that the importation of Chinese medical experts favoured the elite who could afford them, leaving citizens who had contacted the virus to struggle with insufficient medical care and health infrastructure [40]. As an alternative to importing Chinese experts, Nigerian doctors should have been given better opportunity and reinforcement [41].

In addition, at this period, health facilities and health workers were grossly inadequate in rural area where more than 60% of Nigerians reside [32].

It is safe for this paper to conclude this part by stating that, despite the timely knowledge Nigeria had of the ravaging impact of the pandemic in other countries, Nigeria could not swiftly and systematically adopt an approach that tackled the life-threatening emergency as a result of several factors which principally includes Nigeria's hitherto deliberate neglect of the health system. As such, in the face of COVID-19 emergency, there was nothing to fall back on. Buttressing this fact, Obi-Ani et al's research on the Nigeria's healthcare system from 1960 to COVID-19 pandemic remain relevant. Their research revealed that Nigeria has failed to give priority to her health care system, as from time-to-time Nigeria has failed to meet Nationwide Health Care Services Policy or where implemented, it is haphazardly done, thereby accounting for the weak foundation in the health sector [41]. In their research, they revealed that, just like how Nigeria failed to prepare, learn from and take proactive steps during the Ebola epidemic, same attitude was repeated by the government during COVID-19 pandemic.

At this point, with the number of confirmed cases

sprouting to 213,127 and the number of death toll at 2,960 as at November 13, 2021 [42], it behooves on Nigeria to work on her healthcare system by revamping health infrastructure. The COVID-19 pandemic is a wakeup call especially against the background that; COVID-19 pandemic is not likely to be the last pandemic the world will experience. Just as how the rich, powerful, and the poor as casualties succumbed to the pandemic (e.g., case of Abba Kyari [43] and Senator Rose Oko [44]) owing to our decayed health infrastructure, more lives irrespective of the class will be sacrificed owing to the decay health infrastructure in Nigeria if there be future pandemics.

6. Challenges to Health Infrastructure Development in Nigeria

Some factors that hinder health infrastructure development in Nigeria are as follows:

6.1. Poor Health Care Funding and Sustainability

This factor continuously poses a challenge to health infrastructure development in Nigeria. Lean budgetary allocation to the health sector hinders acquisition of requisite infrastructure. Nigeria currently allocates less than 15% of the nation's budget to the health sector, contrary to the recommendation made by African Leaders in 2001 and the WHO, that recommended that at least 15% of a nation's budget should be allocated by the nation to the health sector [45]. In fact, 2021 appropriation bill breakdown presented to a joint session of the National Assembly by President Muhammadu Buhari revealed only 4.526 percent (about N592.166 billion of the proposed N13.082 trillion) allocation to the health sector notwithstanding the current COVID-19 challenge as well as other pandemic threat [45]. In fact, the Permanent Secretary, Federal Ministry of Health, Abdulaziz Abdullahi informed the Guardian Newspaper that, he considers the 15 percent budget as a goal and a set target that Nigerian desires to attain, though, many factors hinder it as there are other contending interests from different sectors such as agriculture, education, security that the government must prioritize [45]. This has been the attitude of the Nigerian government for years as financing healthcare in Nigeria has been termed as insufficient with budgetary allocation scarcely exceeding 7% of the total budget of the nation [46].

Although, there is a slight rise in health's capital budget from N46.478 billion in 2020 to N131.741 billion in 2021 appropriation bill, experts in the health sector still observed that it is grossly inadequate when compared to other climes such as South Africa where the country's budgetary expenditure for 2020/21 was recorded as R1.98 trillion with health allocation as R229.7 billion (increased by three percent) [47], amounting to 12.5% of South Africa's budget [45].

6.2. Political and Bureaucratic Corruption

Corruption has remained a vice that has eaten all fabrics in

the Nigerian society, including the health sector. Commenting on this, Omoleke and Taleat [5] expressed concerns as regarding situations where teaching hospitals temporarily hire facilities, human resources and Chief Medical Director and specialist such as: cardiologists, image scientists, pediatrics, psychiatrists etc. when such teaching hospital is visited by an accreditation panel in a bid to meet the expected percentage set by the accreditation panel or visitors. Subsequent to the visit, the hospital goes back to the dilapidated infrastructure and shortage of man-power.

More so, corruption and ethical indecency is exhibited as seen in the attitude where patients are diverted to privately owned hospital by a public hospital doctor, pharmacist or nurse, where there are better infrastructures or services [5]. This attitude suggests their unwillingness to revamp the health sector, but rather benefit from the current challenges in this sector.

Corruption is also seen in areas of construction and rehabilitation of health facilities where as a result of bribes, kickbacks and political consideration influencing the contracting process, contractors fail in rendering standardized services and this results in high cost, low quality facilities or infrastructures [48]. More so, health sector corrupt practices are noticeable in equipment, drugs and other supplies purchase. Even in this process, bribes, political considerations and influences are major determinant thereby resulting in inappropriate, high cost, sub-standard equipment and drugs.

In addition, even when drugs and other supplies are acquired, corruption sways the distribution and the use, as incidences are recorded of theft, diversion or private sector resale of drugs/ supplies as such resulting in patient's lower utilization [48].

Lastly, on this challenge, corruption also sways education process of health professions, in that bribery to attain a place in medical school or other pre-service training, obtaining grades and political influence, nepotism in candidate's selection for training opportunities has resulted in churning out inept professionals working in health professions or practicing medicine [48].

6.3. Federal Government's Lack of Political Will and Commitment

Political will and commitment are vital to the development of health infrastructure and this must be expressed as a legal mandate and translated into policies increased public financing for health care. Unfortunately, this has constituted a major challenge in the health sector.

6.4. Health Care Workers' Poor Remuneration, Compensation and Other Push Factors

Poor remuneration and compensation, working condition or career progression opportunities discourages healthcare workers, thereby encouraging them to relocate from Nigeria to other countries that have these facilities readily available [49]. This results in shortage of healthcare personnel in

Nigeria such that the Nigerian Medical Association (NMA) revealed that with over 200 million population, to cater for the amount of this population, it would take about 25 years to produce enough doctors [50].

7. Best Practice- Lessons from Rwanda

This aspect considers the state of health infrastructure in Rwanda. The basis for choosing Rwanda is because it is a developing country same as Nigeria with history of genocide which saw a destruction of must health infrastructure. However, Rwanda made efforts to surmount these difficulties by rebuilding its healthcare system [51].

Rwanda internationally is known for its success in offering health care services that has universal. having guaranteed that its citizens have public health care access [52]. With a current population of 13,415,024 people [53], Rwanda has in place a decentralized, well-functioning healthcare public service system that is made up of 1700 health posts, 42 district hospitals, 500 health centers, and five national referral hospitals [52]. Also, Rwanda has in place private health services sector that is made up of two eye hospitals, two general hospital, eight dental clinics, fifty clinics and polyclinics, and one hundred and thirty-four dispensaries [52].

Rwanda despite her history has accomplished great improvement in several important health indicators, which includes maternal mortality and other health outcome [54]. Research conducted by Sayinzoga and Bijlmakers on, 'drivers of improved health sector performance in Rwanda: a qualitative view from within' revealed that community health workers and health insurance are factors that contributed mostly to Rwanda's remarkable achievement in the past decade. More so, their research revealed the importance of managerial skills and culture of continuous monitoring as other factors. More so, the widespread will power of the Rwandan people to rise performance and achieve targets is another factor [54].

As it relates to health financing, Rwanda as a country has been able to surpass the Abuja Declaration by allocating more than 15% of her budget to health [55], such that the United Nations noted that Rwanda has achieved great level of population coverage as a result of social protection systems that guarantee access to healthcare services [56]. Rwanda Vision 2020 gives priority to health financing considering that the country's Health Sector Financing Sustainability Policy aligned with Health Sector Policy 2015, is aimed at developing a wide-ranging financing framework for health systems based on best practices in global health care financing [57]. The commitment Rwanda has towards supporting health sector by financing it is reflected in the increase in the 2020/2021 fiscal year health sector budget. There was an increase in the health sector budget from FRW 245.4 billion in the 2019/20 revised budget to FRW 253.2 billion in 2020/21, thereby reflecting 3.2 percent nominal increase [58].

Community based health insurance schemes are in place, and these have afforded majority of the population access to health care services and drugs. More so, social and private

health insurance schemes are in place and it covers 80% of the Rwandan population [51].

As it relates to human resources, Rwanda prioritizes and considers human resources as the backbone of the country's health system, and dedicates a huge percentage of its budget to this course. As such, compared to other African countries, migration of health workers abroad is considered less of a problem in Rwanda [59]. Health workers in Rwanda are well paid and currently, a person working in health and medical in Rwanda typically earns around 1,030,000 RWF per month. Salaries range from 216,000 RWF (lowest average) to 3,090,000RWF (highest average) [60]. However, it is important to note that shortage of human resource is still a challenge which the government have invested significant resources in a bid through collaboration with development partners in postgraduate training programmes of health workers [51].

Furthermore, Government of Rwanda, through the Ministry of Health regulates health sector in coloration with health profession council, there are legal frameworks in place as well as statutory professional bodies to ensure the certification of health facilities, health professionals, health products and equipment [51]. More so, there are web-based data information management efforts put in place which includes the Integrated Disease Surveillance and Response System (which monitors a number of diseases), Community Health Information System etc.

As it relates to telemedicine, Rwanda has become a leading country in the World with a digital first universal primary care service, owing to collaboration with Babylon health [61]. By this technology, every one over the age of 12 in Rwanda can consult nurses or doctors within minutes through their mobile phones. This system reduces delay in accessing appointments and reduces the need for many hours travel in a bid to see a medical professional. Since the launch of this service in 2016, the service has recorded millions of registered users and over one million consultations have been delivered [61].

Also, partnership with other companies have also advanced health services in Rwanda for example Silicon Valley-based Zipline make use of drones to deliver blood, essential medical products, vaccines to hospitals, no matter how remote they are. As such, this reduces the time it takes to supply products for emergency situations. Also, by this service, hospitals need not worry about keeping their own supply of other rarer products and refrigerated blood [61].

As it relates to the management and response to the COVID-19 pandemic, Rwanda utilized its own digital expertise to respond to the pandemic. Rwanda's COVID-19 emergency response project explored digital health modernization to control the pandemic. This includes telemedicine to reduce the need for suspected patients and real-time digital mapping of the spread of the disease [61].

Upon the declaration of the pandemic by the WHO, Rwanda quickly set up a national crisis committee of significant ministries which put in place the COVID-19 Joint Task Force to manage the implementation of a readiness and response plan just in time for the first case of COVID-19

recorded on the 14th of March, 2020 [62]. At the declaration of the outbreak several preventive and awareness measures were put in place, with several members from across various parts working together in several areas of interventions which include Epidemiology which has to do with surveillance, lab testing, contact tracing, psychological support and case management. As at July 2020, test in thousands was conducted by the Rwandan Biomedical Centre such that over 200,000 samples were tested for COVID-19 by mid-July such that the laboratory began with the capacity to test nearly in thousand samples on daily basis and this increased by 15-fold in four months with a shift from manual extraction of RNA to an automated system that brings results in the shortest time [62]. Rwanda also decentralized COVID-19 testing through peripheral district laboratories to ensure that more persons are tested. They also engaged two mobile PCR platforms machines to test high-risk populations. Isolation centres were also set and advanced robots were introduced at treatment centres to manage temperature checks, keep records of COVID patients, and monitor patient status so as to reduce the risk of health care workers infections [62]. Other preventive and proactive measures utilized during the surge of the pandemic includes the use of electronic questionnaire in screening travelers returning to Rwanda, the production of ventilators by biomedical experts and engineers to meet the demand shortage of ventilators worldwide etc. With all these measures and more in place, no wonder Rwanda recorded low fatality of COVID as observed by Musanabaganwa et al [63] who noted that 10 months after its first case, Rwanda recorded 19316 cases and 133 COVID-19 related deaths translating to a case fatality rate of 1.3%. This is relatively low compared to the high rate of infection and fatality in other climes.

8. Conclusion and Recommendations

The importance of health infrastructure in achieving a good health system cannot be overemphasized. This paper has revealed Nigeria's inadequacies and dilapidated health infrastructure, especially when compared with Rwanda, a country with a tragic history that had to build its health system from the scratch, yet with a great infrastructure owing to the zeal of the government to prioritize the health of its citizen. Considering that a healthy population is a nation's most important asset and only a nation with good health infrastructure can achieve a healthy population, this paper recommends the following the lessons borrowed from Rwanda.

- a. The need to overhaul the Nigerian health system to meet standards and best practices obtainable in other climes. This will require developing health infrastructure, equipping hospitals, health centres, medical centres, health post, clinics and other health institutions with well-equipped modern medical gadgets, internet access, structural facilities, portable water, uninterrupted electricity, good communication system etc. Rwanda is already setting the pace in

telemedicine; Nigerian should learn from this jurisdiction.

- b. The need for Nigerian government to prioritize human resources in the health sector through adequate remuneration and a better condition of service so as to discourage health workers from migrating abroad. Also, the government need to invest in the work force through training and retraining so as to update them with modern and technological trends in medicine.
- c. The need for increased government funding of health sector. Nigeria should learn from Rwanda who despite other sectors adequately fund and prioritize the health sector. More so, government should depoliticize funds allocation to tertiary health institution and base fund's allocation on approved appropriation Act as well as the need of a particular hospital.

References

- [1] Kapur R, 'Significance of Health Infrastructure' (2020) https://www.researchgate.net/publication/342832865_Significance_of_Health_Infrastructure accessed 3 November, 2021.
- [2] Public Health Infrastructure 2020 <https://www.healthypeople.gov/2020/topics-objectives/topic/public-health-infrastructure> accessed 3 November, 2021.
- [3] Arimoro A E, 'The Corona Virus (COVID-19) Pandemic and the Challenge of Healthcare Infrastructure in Nigeria: What Role for Public-Private Partnerships' (2020) 3 (5) *Theoretical and Applied Law* https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3813226 accessed November 3, 2021.
- [4] Second Schedule and Fourth Schedule of the Constitution of the Federal Republic of Nigeria, 1999 (Third Alteration).
- [5] Omoleke I and Taleat B, 'Contemporary Issues and Challenges of Health Sector in Nigeria' (2018) 5 (4) *Res. J of Health Sci* https://www.researchgate.net/publication/322934869_Contemporary_issues_and_challenges_of_health_sector_in_Nigeria accessed Nov 11, 2021.
- [6] Adebawale N, 'My statement on Nigeria's poor health infrastructure misinterpreted-SGF Mustapha' *Premium Times* (Nigeria, April 10, 2020) <https://www.premiumtimesng.com/news/top-news/387249-my-statement-on-nigerias-poor-health-infrastructure-misinterpreted-sgf-mustapha.html> accessed Nov 3, 2021.
- [7] Ademiluyi I. A & Aluko-Arowolo, 'Infrastructural Distribution of Healthcare Services in Nigeria: An Overview' (2009) 2 (5) *Journal of Geography and Regional Planning*. Pp. 104-110 https://academicjournals.org/article/article1379432402_Ademiluyi%20and%20Aluko-Arowolo.pdf accessed 3 November, 2021.
- [8] Kumar, A, & Gupta, S. 'Health Infrastructure in India: Critical Analysis of Policy Gaps in the Indian Healthcare Delivery' <https://www.vifindia.org/sites/default/files/health-infrastructure-in-india-critical-analysis-of-policy-gaps-in-the-indian-healthcare-delivery.pdf> accessed November 3, 2021.
- [9] American College of Physicians, 'Strengthening the Public Health Infrastructure' (2012) A Position Paper https://www.acponline.org/system/files/documents/advocacy/current_policy_papers/assets/public_health.pdf accessed November 4, 2021.
- [10] Luxon L, 'Infrastructure- the key to healthcare improvement' (2015) 2 (1) *Future Healthcare Journal*. 4-7 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6465866/> accessed November 5, 2021.
- [11] Garner B. A, *Black's Law Dictionary* (8th ed, West Publishing Co 2004) 455.
- [12] Oxford Learner's Dictionaries, 'deficit' https://www.oxfordlearnersdictionaries.com/definition/american_english/deficit accessed 4th Nov, 2021.
- [13] Department of Health, *Introducing a new system of patient-led inspections of the hospital environment: engagement with third-sector organizations* (2012) <http://mrsaactionuk.net/PledSurvey.pdf> accessed November 5, 2021.
- [14] Wilson K, and Brownstein J, 'Early Detention of Disease Outbreaks using the Internet' (2009) 180 (8) *CMAJ*. 829-831 <https://www.cmaj.ca/content/180/8/829.short> accessed Nov, 2021.
- [15] Grein TW, Kamara KB, Rodier G, et al. 'Rumors of disease in the global village: outbreak verification' (2000) 6 *Emerg Infect Dis*; 97-102 <https://www.cmaj.ca/content/180/8/829.short> accessed Nov. 5, 2021; Heymann DL, and Rodier GR 'Hot Spots in a wired world: WHO Surveillance of emerging and re-emerging infectious disease' (2001) 1 (1) *Lancet Infect Dis*, 345-53.
- [16] WHO, 'World Health Organisation announces new public-private initiatives on disease surveillance and response' (2003) <https://www.who.int/news/item/22-05-2003-2dfab4e0-07b9-47bf-bf65-4ad4c4b4249c> accessed 7th November, 2021.
- [17] Jason, A *Robust Health Data Infrastructure* (AHRQ Publication 2014) https://www.healthit.gov/sites/default/files/ptp13-700hhs_white.pdf accessed 7th November, 2021.
- [18] Nnamuchi O, 'The Right to Health in Nigeria' (2010) project, Law School, University of Aberdeen https://www.researchgate.net/publication/228246564_The_Right_to_Health_in_Nigeria accessed November 11, 2021.
- [19] Osain Menzibeya, 'The Nigerian Health Care System: Need for Integrating Adequate Medical Intelligence and Surveillance Systems' (2011) 3 (4) *Journal of Pharm Bioallied Science* <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3249694/#ref2> accessed November 11, 2021.
- [20] The World Bank, 'Current Health Expenditure (% of GDP)-Nigeria)' <https://data.worldbank.org/indicator/SH.XPD.CHEX.GD.ZS?locations=NG> accessed November 8, 2021.
- [21] Statista, *Government's Healthcare Expenditure in Nigeria in 2019, with a forecast for 2020 and 2021 (in billion Nigeria Naira)* <https://www.statista.com/statistics/1126582/government-s-healthcare-expenditure-in-nigeria/> accessed 8th November, 2021.

- [22] World Bank, 'GDP (current US\$)-Sub-Saharan Africa' https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=ZG&most_recent_value_desc=true accessed 9th November, 2021.
- [23] Abelegbe A, 'Critical Analysis of the Nigerian Health Sector' (May 16, 2020 ThisDay News Paper) <https://www.thisdaylive.com/index.php/2020/05/16/critical-analysis-of-the-nigerian-health-sector/> accessed November 08, 2021.
- [24] Jon Whiteaker, 'Can FDI fix Nigeria's broken healthcare infrastructure?' (Investment Monitor, March 24, 2021) <https://www.investmentmonitor.ai/business-activities/real-estate/can-fdi-fix-nigerias-broken-healthcare-infrastructure> accessed 9th November, 2021.
- [25] International Trade Administration, 'Nigeria- Country Commercial Guide -Health Care' (published 13 October, 2021) <https://www.trade.gov/country-commercial-guides/nigeria-healthcare> accessed November 9, 2021.
- [26] James Eze, '2000 Medical Workers Leaving Nigeria annually-NMA' Premium Times Newspaper (Nigeria May 2, 2019,) <https://www.premiumtimesng.com/health/health-news/328151-2000-medical-workers-leaving-nigeria-annually-nma.html> accessed November, 2021.
- [27] Tribune Online, 'The Saudi Recruitment of Nigerian Doctors' Nigerian Tribune (Nigeria, September 2, 2021) <https://tribuneonline.ng.com/the-saudi-recruitment-of-nigerian-doctors/> accessed November 09, 2021.
- [28] WHO, 'Health Workers for all and all for Health Workers-Nigeria' <https://www.who.int/workforcealliance/countries/nga/en/> accessed November 11, 2021.
- [29] Ladelokun L, 'Citizen Omojuyigbe, Medical Trips and Nigeria's decaying health sector' The Vanguard Newspaper (Nigeria, August 19, 2021,) <https://www.vanguardngr.com/2021/08/citizen-omojuyigbe-medical-trips-and-nigerias-decaying-health-sector/> accessed November, 10, 2021.
- [30] World Health Organization, 'WHO Director-General's opening remarks at the media briefing on COVID-19-11 March, 2020' <https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-COVID-19---11-march-2020> accessed November 11, 2021.
- [31] Reuters, 'Nigerian Confirms First of Coronavirus- health ministry' (February 28, 2020) <https://www.reuters.com/article/china-health-nigeria-idUSL3N2AS006> accessed November 11, 2020.
- [32] Amzat J et al, 'Coronavirus Outbreak in Nigeria: Burden and Socio-medical response during the first 100 days' (2020) 98 Int Journal of Infectious Disease 218-224 [https://www.ijidonline.com/article/S1201-9712\(20\)30502-6/pdf](https://www.ijidonline.com/article/S1201-9712(20)30502-6/pdf) accessed November 11, 2021.
- [33] Marbot O, 'Coronavirus Africa Map: Which Countries are most at risk?' The Africa Report (27 February, 2020) <https://www.theafricareport.com/23948/coronavirus-africa-which-countries-are-most-at-risk/> accessed November 11, 2021.
- [34] Ihekweazu C, 'Steps Nigeria is taking to prepare for cases of coronavirus' The Conversation (January 28, 2020) <https://theconversation.com/steps-nigeria-is-taking-to-prepare-for-cases-of-coronavirus-130704> accessed November 11, 2021.
- [35] Sethi R et al, 'COVID-19 Rapid Response Impact Initiative: Towards Global Pandemic Resilience' (2020) Edmond J. Safra Centre for Ethics COVID-19 White Paper 11 <https://poseidon01.ssrn.com/delivery.php?ID=976118072096021065100119020069109096059080095032024041078113016074022110098095066125031006120043049043112119112067015119119081044000063069006096027000013075017094028032061002005124105093093126093092124104069028065102107075123089102077110066127067117089&EXT=pdf&INDEX=TRUE> accessed November 10, 2021.
- [36] Ogoina D, et al, 'Anational Survey of Hospital Readiness During the COVID-19 Pandemic in Nigeria' (2021) 16 (9) PLoS ONE <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0257567> accessed November 10, 2021.
- [37] Africa Centre for Disease Control and Prevention, 'Novel Coronavirus (2019-nCoV) Global Epidemic-11 February 2020' <https://africacdc.org/disease-outbreak/novel-coronavirus-2019-ncov-global-epidemic-11-february-2020/> accessed 11 November, 2021.
- [38] NCDC, 'An Update of the COVID-19 Outbreak in Nigeria, report at week 10' <https://ncdc.gov.ng/diseases/sitreps/?cat=14&name=An%20update%20of%20COVID-19%20outbreak%20in%20Nigeria> accessed November 11, 2021.
- [39] NCDC, 'COVID-19 Outbreak in Nigeria Situation Report S/N: 036 Date 4th April, 2020' <https://ncdc.gov.ng/diseases/sitreps/?cat=14&name=An%20update%20of%20COVID-19%20outbreak%20in%20Nigeria> accessed November 11, 2021.
- [40] Atoyebi O, Aworinde T, Olatunju D and Oyewale W, 'Chinese Medical Team arrives in Nigeria soon- Health Minister' Punch Newspaper (Nigeria 4 April, 2020) <https://punchng.com/chinese-medical-team-arrives-in-nigeria-soon-health-minister/> accessed November 13, 2021.
- [41] Obi-Ani. A N, et al., 'COVID-19 Pandemic and the Nigerian Primary Healthcare System: The Leadership Question' (2021) 8 Cogent Arts & Humanities <https://www.tandfonline.com/doi/pdf/10.1080/23311983.2020.1859075> accessed November 13, 2021.
- [42] NCDC, 'COVID-19 Nigeria' (Sunday 14 November, 2021) <https://COVID19.ncdc.gov.ng/> accessed November 14, 2021.
- [43] Fabiyi O, Alagbe J and Aworinde T, 'Coronavirus: Buhari's Chief of Staff, Abba Kyari, dies as cases hit 493' Punch Newspaper (18 April, 2020) <https://punchng.com/coronavirus-buharis-chief-of-staff-abba-kyari-dies-as-cases-hit-493/> accessed November 14, 2021.
- [44] Olasupo A, 'Nigerian Senator dies in UK' The Guardian Newspaper (March 24, 2020) <https://guardian.ng/news/nigerian-senator-dies-in-uk/> accessed November 14, 2021.
- [45] Muanya C, 'Why 15% budget allocation is tall order by FG' The Guardian (26 October, 2020) <https://guardian.ng/features/why-15-budget-allocation-to-health-is-tall-order-by-fg/> accessed November 15, 2021.
- [46] Adebisi Y A, et al, 'Assessment of Health Budgetary Allocation and Expenditure Toward Achieving Universal Health Coverage in Nigeria' (2020) International Journal of Health and Life Sciences <https://sites.kowsarpub.com/ijhls/articles/102552.html> accessed November 11, 2021.

- [47] Deloitte, 'Deloitte Commentary on South Africa Budget 2020/21' <https://www2.deloitte.com/za/en/services/tax/deloitte-commentary-2020-21-national-budget.html> accessed November 15, 2021.
- [48] Tormusa D, 'The Impediments of Corruption on the Efficiency of Healthcare Service Delivery in Nigeria' (2016) 12 (1) Online Journal of Health Ethics <https://aquila.usm.edu/cgi/viewcontent.cgi?article=1166&context=ojhe> accessed November 15, 2021.
- [49] Oyibocha, E. O et al, 'Sustainable Healthcare System in Nigeria: Vision, Strategies and Challenges' (2014) 5 (2) IOSR Journal of Economics and Finance <https://www.iosrjournals.org/iosr-jef/papers/vol5-issue2/D0522839.pdf> accessed November 15, 2021.
- [50] Emeka N. W and Chimere I, 'Medical Brain Drain in Nigeria and its impact on Sustainable Development Goal 3' (September 20, 2021) <http://southernvoice.org/medical-brain-drain-in-nigeria-and-its-impact-on-sustainable-development-goal-3/> accessed November 15, 2021.
- [51] Alliance for Health Policy and Systems Research and WHO, 'Primary Health Care Systems (PRIMASYS) Case study from Rwanda' <https://www.who.int/alliance-hpsr/projects/AHPSR-PRIMASYS-Rwanda-Abridged.pdf?ua=1> accessed November 15, 2021.
- [52] Rwanda Development Board, 'Health Services' <https://rdb.rw/investment-opportunities/health-services/> accessed November, 2021.
- [53] Worldometer, 'Rwanda Population (Live)' (November 16, 2021) <https://www.worldometers.info/world-population/rwanda-population/> accessed November 16, 2021.
- [54] Sayinzoga F & Bijlmakers L, 'Drivers of Improved Health Sector Performance in Rwanda: a qualitative view from within' (2016) <https://bmchealthservres.biomedcentral.com/articles/10.1186/s12913-016-1351-4> accessed November 16, 2021.
- [55] The African Exponent, 'Top 10 Countries with Improved Healthcare System in Africa 2020' <https://www.africanexponent.com/post/7167-top-10-african-countries-with-best-healthcare-system-2020> accessed Nov. 16, 2021; Alliance for Health Policy and Systems Research and WHO, 'Primary Health Care Systems (PRIMASYS) Case study from Rwanda' <https://www.who.int/alliance-hpsr/projects/AHPSR-PRIMASYS-Rwanda-Abridged.pdf?ua=1> accessed November 15, 2021.
- [56] Munyua A G, and Olalere N, 'Public Financing for Health in Africa: 15% of an Elephant is not 15% of a Chicken (United Nations)' <https://www.un.org/africarenewal/magazine/october-2020/public-financing-health-africa-when-15-elephant-not-15-chicken> accessed Nov. 16, 2021.
- [57] Ministry of Health, 'Health Sector Policy 2015' <https://www.moh.gov.rw/news-detail/health-sector-policy-2015> accessed Nov. 16, 2021.
- [58] UNICEF, 'Health Budget Brief Investing in Children's health in Rwanda 2020/21' <https://www.unicef.org/rwanda/media/2826/file/Health-Budget-Brief-2021.pdf> accessed November 16, 2021.
- [59] Lievens T et al, Diversity in Career Preferences of Future Health Workers in Rwanda (World Bank. Washington D. C, 2010) <https://documents1.worldbank.org/curated/zh/425671468308382194/pdf/544420PUB0EPI01BOX0349416B01PUBLIC1.pdf> accessed November 16, 2021.
- [60] Salary Explorer, 'Health and Medical Average Salaries in Rwanda. 2021' <http://www.salaryexplorer.com/salary-survey.php?loc=180&loctype=1&job=2&jobtype=1> accessed November 11, 2021.
- [61] Medical Technology, 'Telemedicine: Setting an Example: Rwanda as a Digital Health Success Story' https://medical-technology.nridigital.com/medical_technology_jun20/rwanda_digital_health accessed November 17, 2021.
- [62] World Health Organization, 'COVID-19 in Rwanda: A Country's Response' (20 July, 2020) <https://www.afro.who.int/news/COVID-19-rwanda-countrys-response> accessed 1 November 17, 2021.
- [63] Musanabaganwa C et al, 'One Hundred Thirty-three observed COVID-19 deaths in 10 months: unpacking lower than predicted mortality in Rwanda' (2021) 6 (2) BMJ Glob Health <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7907833/> accessed Nov 17, 2021.