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Keynote Address

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At the 2021 Igbinedion University Annual Research Summit

On the

Theme

“COVID-19 and Research and Development”

Igbinedion University Library Conference Hall

Okada, Edo State,

Nigeria

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Good morning.

I would like to thank the VC, Prof Lawrence Ikechukwu Ezemonye for the honor delivering this Keynote address. I have always admired the pioneer role of Igbinedion University as the first privately-owned university in Nigeria. Twenty-one years ago, when this university was founded as the first privately-owned university in Nigeria, very few gave it a chance to succeed. Today, it has graduated thousands of young Nigerians, making a great contribution to the development of Edo State and Nigeria in various dimensions. Congratulations to Igbinedion University, Okada!

I have been asked to speak on “Covid-19 and Research and Development.” This is an important and weighty topic. Its importance is easy to demonstrate. A google search for COVID-19 produced 55,900,000,000 entries; and 327,000,000 for SARS-CoV-2. A search for 2019 nCoV, COVID-19 produced 16,900 entries¹. Comparatively, a Google search for HIV/AIDS produced 196,000,000 entries. We have known SARS-Cov-2 and COVID-19, the disease caused by it for under 2 years while HIV/AIDS has been with us since 1981. The difference in these numbers-for HIV/AIDS and COVID-19/SARS-CoV-2-describes the year we have lived in and that some of us, thankfully, have survived. What a year.

I do not know about you and how you may have reacted to the news of COVID-19. This time last year I was anxious, worried, petrified.

Many of us have personal stories of our reaction to the pandemic. Let me share one of mine with you. One evening in late April last year, my older brother called me with a simple question “Which supermarket do you normally go to buy stuff?” I told him. A brief silence, which I did not find concerning, followed. And then he said, “three people who work at that supermarket have been reported to have died of COVID-19.” Now, I could locate a place of COVID-19 death. It was not Wuhan, it was not Northern Italy, it was not New York/NJ. It was my local supermarket, a place I visit quite often. The bad germaphobe that I am, my world really collapsed. I was sure that I must have caught COVID-19 from those three supermarket workers. Never mind that I later learned that one of the victims was a grocery packer, another a guard who infected her husband who did not work at the supermarket with the virus. It did not matter to me that other staff of the supermarket, 10, who had tested positive for the virus all recovered. All manner of thoughts passed through my mind. I quickly drew up my will. And I cancelled my decision to buy a new mobile telephone handset.

¹ Search conducted 01 May 2021

Better to leave an unconstrained bequest than to leave an in-kind bequest that could be worthless to my beneficiaries! You know, we economists always think in terms of optimization!

My initial reaction was soon overtaken by anger by Africa's weak scientific response to the pandemic in the presence of extremely dismal forecasts: Mrs. Melinda Gates of the Bill and Melinda Gates Foundation spoke with certainty that corpses will pile up on the streets of Africa's cities. Barely a month into the pandemic, in April 2020, the [United Nations Economic Commission for Africa](#) (ECA) published a report with the grim and catastrophic prediction that between 330,000 and 3.3 million Africans would die by the end of the first wave of the pandemic. In a report published in June, the World Health Organization (WHO) forecast that 190,000 Africans would die in the absence of mitigation measures, a less dire prediction than ECA's but numbing nonetheless. In August 2020, the Institute of Health Metrics and Evaluation (IHME) at the University of Washington, Seattle had an even less dire prediction: 126,225 deaths COVID-19-related deaths would occur in Africa by December 1, 2020 in the absence of mitigation measures. Everyone expected/predicted the worst covid-19 outcomes for Africa.

The African Union's response, and our nation's response at the outbreak of the pandemic was to line up at airports in Addis Ababa and elsewhere to receive gifts of medicines and personal protective equipment (PPEs)- ventilators, masks, respirators-from China and from the United Nations. Some countries and the European Union banned the export of PPEs. The US government hijacked/ceased PPEs destined for other countries. For the most part, Nigeria and the rest of Africa relied on the WHO and USCDC for scientific information on the virus. Without a National Science Advisor, Nigeria relied on bureaucrats to run the national response. Never have the weaknesses in the way Nigeria governs STI (R&D) been so disappointing and never has her scientific and technological dependence and vulnerability been so exposed. Prior to the pandemic, economists took as given that global supply chains are good for all. COVID-19 has taught us to be at least skeptical about the concept of a global supply chain; there is instead, a global chain of dependency. In case we need any reminders of the humiliating dependency, the decision of **Serum Institute of India** (SII), the major supplier of AstraZeneca vaccines to African countries, to halt all vaccine exports in response to the ongoing devastating second wave of the virus in India, has thrown Africa's COVID-19 vaccination efforts into turmoil. The heat map in the annex illustrates this dependence.

In the midst of all these, astonishing claims were made by some "scientists" in our country that they had a cure (not that they found a cure) for COVID-19. Not to be outdone, the uncountable number of prophets of all faiths joined the competition of claims: some claimed to have prophesized the "calamity"-calamity is a word Nigerian media love. Others asserted that COVID-19 was not a threat as long as one is "covered in and with the blood of Jesus". Those who were not prophets believed in hydroxychloroquine and a potpourri of herbs. Epistemic boundaries were breached, epistemic humility disappeared, and scientific discussion of the pandemic and of the virus became severely circumscribed as Nigerian Twitter and WhatsApp scientists and doctors sprung up like mushrooms.

But amidst all these assaults on science, on epidemiology, virology, microbiology, and disease modeling, I had hope. I believed science will ultimately triumph as it always has. And science has delivered. In a most remarkable and astonishing feat, science delivered efficacious vaccines in under a year. Today, in spite of the horrifying stories out of India, the world is on the cusp of taming SARS-CoV-2. The grim predictions for Africa are yet to materialize and appear unlikely to. Contrary to the opinions of many WhatsApp and Twitter virologists and scientists, there is as yet no evidence that the DNA of those of us who have received the mRNA vaccines (Pfizer/BioNtech and Moderna) has been altered or modified and that we have become mongrels of some sort.

The stories I have told above convey a message about me: I believe that science, technology, and innovation can provide answers and solutions to practically all the challenges facing societies. I was therefore very thrilled when I received the invitation from the VC to come and share with you some of my thoughts on the possible Impacts of COVID-19 on research and development going forward. For the purposes of this speech, I will use research and development interchangeably with science, technology, and innovation.

So why is it important to explore the impact of COVID-19 on research and development? What about HIV/AIDS? Malaria? [Ebola](#)? Lassa Fever? Haven't they had an impact on research and development? Each has contributed to advancements in R&D. Some of the medical technologies and treatments in use today were developed in response to these diseases and the pathogens that cause them. But none reminds us of the more than 50 million who succumbed to the Spanish Flu, the influenza pandemic, of 1918-1919. None has been as politically controversial and as enmeshed in religion as this pandemic: We prayed, even the atheists, secularists, and agnostics, among us prayed as we saw how vulnerable we all were and are.

In this Keynote address, although it is too early to heave a sigh of relief that the pandemic is over, I will discuss some ideas about the impact of COVID-19 on R&D as requested by the organizers. I applaud the breadth of topics that will be discussed in the breakout sessions. I am thrilled that the first breakout session will discuss the implications of the macroeconomy and development on COVID-19. This shows that the organizers recognize that without economic growth, there would not be much to discuss about the impact of covid-19 on research and development and that the argument for research and development must be nested in the macroeconomy and be an integral part of economic policy. However, peace and security matter enormously for the macroeconomy; the economy is unlikely to thrive and expand the possibilities for R&D in an environment characterized by generalized conflict and insecurity.

I will make the following points in this speech:

- a. The pandemic has exposed as never before our scientific, technological and innovation dependence on others as a country and as a people, and the near absence of science in our national policy and as a compelling policy imperative;
- b. The possible impact of the pandemic on the little research and development that is carried out in our university;
- c. The impact on microbiology and laboratory medicine as the most significant contribution to research and development;
- d. That in order for us to harness COVID-19 to advance research and development in Nigeria, our country has to address and overcome some challenges and become more truthful about the state of R&D and our scientific, research and development, innovation dependence on the rest of the world. It is only by doing that Nigeria can break the apron strings of STI (R&D) dependence on the rest of the world.

SARS-CoV-2 and COVID-19 One year on

More than a year, a very small set of people, mostly news junkies and scientists were intrigued by news out of China of a strange respiratory disease, pneumonia-like condition identified in Wuhan, Hubei Province. In late December 2020 and January 2021, anyone with access to CNN and BBC stood stunned before their television sets watching the drastic measures that China was taking to control this still unidentified novel respiratory disease. On 7 January 2020, the Chinese Centre for Disease Control and Prevention (CDC) successfully identified and classified the novel the new pathogen as a novel coronavirus.

The virus quickly spread to other parts of the world. The first countries to report cases of COVID-19 were Japan, South Korea, and Thailand. On 23 January 2020, the Chinese central government imposed a lockdown on Wuhan, the Chinese city where SARS-CoV-2, the virus that causes COVID-19.

The first COVID-19 case in Africa south of the Sahara was reported in Nigeria on 28 February 2020. The index case was an Italian expatriate returning to Nigeria from Christmas and New Year holidays in his home country. Alarm bells rang across the country and the continent. Nigeria's virus hunter, the Nigeria Centre for Diseases Control and Prevention (NCDC) immediately commenced efforts to not only trace, contact, and isolate everyone with whom the index case had been in contact, but to also monitor, trace, and test everyone entering Nigeria from overseas, with emphasis on travelers from Europe.

On 30 January 2020, the World Health Organization (WHO) declared a global health emergency after an extensive assessment of the epidemic and named the new pathogen SARS-COV-2, and the new disease that it caused COVID-19; it subsequently characterized the situation as a pandemic on 11 March 2021. The epicenter of the pandemic shifted from China to Europe and then to the United States, later shifted to [Brazil](#). As of the time of writing this keynote, [India](#) is the new epicentre. As at the time of writing this Keynote address, [globally](#), there have been 148,447,712 laboratory confirmed cases of COVID-19; 3,132,511 deaths, and 126,073,892 recoveries.

IMPACT OF COVID-19 on R&D

- ***Short term impact***

At the onset of the pandemic, there was confidence expressed that Africa in general and Nigeria in particular had the scientific capability to contain the virus. Reference was made to our success in containing the Ebola outbreak. There was a flicker of hope when a few days after SARS-CoV-2 was first identified in Nigeria, a group of scientists in Nigeria reported that they have [sequenced the genome](#) of the virus. Since then, not much has been heard from the scientific community. But there were impressive developments on the innovation and development side: domestic production of PPEs such masks took off and some pharmaceutical companies re-purposed spare capacity to the production of hand sanitizers and such/similar hand hygiene products.

Our national and continental scientific, R&D response was unlike Europe's and that of the industrialized countries. Take OECD countries for example. When the pandemic broke, these countries, responded quite aggressively with STI. And also at the personal level. Disappointed with the EU's response to COVID-19, the then [President](#) of the European Research Council (ERC), Mr. Mauro Ferrari, resigned his appointment in April 2020 after just four months on the job. In the US, President Trump announced operation WARP speed. Overall, according to a [report](#), OECD countries provided "funding for COVID-19-related research and innovation; governments, foundations and industry raising several billion dollars to [fund new vaccines and therapeutics](#). ... An impressive battery of fast-track policy measures were also rolled out to mobilise the STI ecosystem to provide solutions to the pandemic, solicit inputs from diverse actors, facilitate co-operation and knowledge sharing, ease barriers that slow down innovation (e.g., through regulatory flexibilities and accelerated intellectual property examinations), and enhance international collaboration on addressing the global challenge."

On the research front, open science became the norm; there was a flood of publications, largely in English, reporting research findings on the microbiology of the disease, its treatment, and the modelling of the trajectory of the virus. According to [Nature](#), by Jan 30, 2020, less than two months from the time the disease

was first reported, there were 54 publications in English on COVID-19. But that number rose to 23,634 unique documents by June 30, 2020, according to a [paper](#) published in August 2020, using data from Clarivate Analytics' web of Science, and Elsevier's Scopus (which do not index pre-prints). Of these, 47.6% were research articles; the top publishing countries were USA, China, and Italy while BMJ, Journal of Virology and The Lancet published the most COVID-19 related papers. In preparing this speech, I checked the [WHO Global COVID-19 database](#) and the number of scientific papers on SARS-CoV-2 and COVID-19 had risen to 249,362 in a little over a year².

This global research response to SARS-CoV-2 and COVID-19 is reason to rejoice. However, it hides a sad and depressing reality. As at March 2021, Africans accounted for [just 3% of COVID-19](#) of the authorship of these research reports even though our continent accounts for 17% of the world's population. Even more saddening, "Authors from other parts of the world made up two thirds (66%) of authors on African papers, but Africans comprised just 3% of authors on non-African papers." Moreover "almost two thirds (65%) of articles by Africans on COVID-19 were from just three countries: South Africa, Egypt, and Nigeria".

This poor research capacity and output find reflection in other areas: Of the 33 COVID-19 vaccine candidates under clinical evaluation at the end of August 2020, only [two were tested in Africa](#). South Africa was home to the phase 3 clinical trials of the Oxford/AstraZeneca and Johnson and Johnson Janssen vaccines.

In Nigeria and the rest of Africa, the R&D response to the pandemic was largely unorganized and at best a whimper. The response in Nigeria was bureaucratic. Local pharma companies are small and have limited or no R&D capacity. Universities were on strike and do not have adequate research infrastructure. Governments were not willing to fund R&D. I recall the Nigerian Minister of Health and the DG of NCDC in a speech placing all hope on scientific, R&D response to the pandemic on "our partners and collaborators". While the whole world, including Cuba, joined in the race to develop a safe and effective vaccine against COVID-19, Nigeria was in a race to distribute "palliatives" as though funding research and development and funding palliatives were mutually exclusive.

What probably explains Africa's limited contribution to COVID-19 research? I venture some arguments. The first is our very low confidence in ourselves and in our scientists, medical doctors, and researchers. The second is poor research infrastructure-the unique facilities and resources used to undertake research. Research is poorly funded in our country and most research institutions lack the resources to carry out effective research. Clearly, the research infrastructure problems were amplified by measures such as *social distancing*, *lockdowns*, and closing of universities and research institutions which were announced as part of efforts to stem the spread of the virus.

Social distancing and lockdowns probably played a role but not much in my view in my limited research and development productivity in Nigeria during this time. Scientists probably did not have access to their laboratories and research assistants during the lockdowns. And denied the opportunity to attend international conferences, they probably were not able to engage fully in global knowledge sharing on the virus and the disease it causes. Their overseas and local collaborators probably stayed home in their own lockdowns, writing up research that they had undertaken before the pandemic and were unavailable to collaborate.

Another possible factor is funding. Research and development is expensive. Most African countries, including Nigeria, pay lip service to science, technology, and innovation. We lie to ourselves about the importance of

² Search conducted 01 May 2021

research and development even as we know, based on the experience of other countries, that we are unlikely to join the league of developed countries if we do not have a strong and competitive research and development base. Years ago, African countries agreed to each allocate 1% of their GDP to STI. But years on, this commitment has been observed in the breach. Chart No. 1 (annex), based on World Bank data, shows allocation to R&D by African countries compared to Malaysia and Turkey.

Note that Nigeria last reported R&D expenditure data as a share on GDP in 2010, 11 years ago. In that year, Nigeria spent just 0.218% of GDP on R&D against Kenya 0.786%, South Africa 0.737%. But Turkey allocated 0.799% and Malaysia 1.3%. A vaccine candidate reportedly developed by [Nigerian scientists](#) using “DIOSynVax Technology targeting the strains of SARS-CoV-2 circulating in Africa” could not find funding. But vaccine development is very expensive-estimates put it at between \$200 -500 million-and requires government support as US, EU, UK, and other country experiences show. A WHO report argued that lack of funding, explains the reason why none of the [300 COVID-19 candidate vaccines](#) at various stages of development, was developed in Africa. See Fig 1.

Further, according to the [WHO](#), Africa has less than 10 manufacturers with vaccine production capacity. And all can be found in just 5 countries: Egypt, Morocco, Senegal, South Africa, and Tunisia. See Figure 2. This lack of manufacturing capacity and of resources is reflected in Fig 3 which summarizes the administration of COVID-19 vaccines as of Jan 18, 2021. No country in Africa had administered a vaccine as of that date.

But there is good news. [Egypt has started to manufacture](#) China’s Sinovac COVID-19 vaccine. South Africa’s [Aspen Pharmacare](#) will begin to manufacture Johnson & Johnson’s Covid-19 vaccine Janssen, although Aspen’s involvement will be limited to the last stage of the manufacturing process. Further, Ghana’s pharmaceuticals manufacturers were reported by [Bloomberg News](#) to have approached AstraZeneca to acquire the rights for local manufacture of its COVID-19 vaccine. These are important developments.

- ***Long-term impact***

a. One of the problems that R&D confronts in Nigeria in particular and in Africa in general is the **low level of trust and confidence** in local science. This is in spite of evidence that many Nigerian scientists have shown themselves to be globally competitive, and even as advances in medical microbiology and the allied sciences of epidemiology, virology, and molecular biology have provided new ways of, and deepened our understanding of the transmission and spread of diseases and new pathogens. On matters of health and death, we, sadly, all too often turn to religion and superstition. Very low confidence in local science and scientists, surfaced most glaringly now as never before by the failure/inability of Nigerian science to contribute to global efforts to find a COVID-19 vaccine and/or scientifically proven treatment for the disease, could limit the degree to which Nigerian society could turn the agonies of the past year into scientific and technological advances to improve the life chances of citizens and to prepare for the next pandemic.

b. But it could also be the case that the stunning scientific progress in other parts of the world over the past year could shame us and instigate **greater advocacy** for STI and R&D in the country. It could help build a national consensus on the urgency of upping national R&D activities and capacities. Much as Nigeria has had a Ministry of Science and Technology in one form or the other since the Shagari administration, there has been no demonstrated urgency (or at least, a sense of some urgency). The dedicated Universities of Science and Technology have under-performed as have university research and government-owned research institutes. Science education has failed as much of Nigerian society continues to believe in non-scientific explanations for objective phenomena. We are all witnesses to the claims of spiritual cures for COVID-19 and other diseases. The role that science has played in taming Covid-19 (the rapid development of vaccines

without which a return to normalcy would be years off after millions more have died), should affirm faith and confidence in science and instigate greater advocacy and support for R&D in Nigeria.

c. **Increased funding for research and development.** Assuming the pandemic succeeds in convincing Nigeria's government of the central role plays in finding solutions to society's many challenges, a possible long-term impact of COVID-19 on R&D could be increased domestic funding of science, independent of economic and political cycles, neither pro-cyclical nor counter-cyclical, and independent of a breakout of a pandemic. Scientists and universities have to engage more in curiosity-driven research, instead of use-driven research. Both are important. But if we are to prepare well for the next pandemic, we have to understand what pathogens and killers harbour in the animals and birds whose habitats we have been relentlessly destroying. We have to be prepared for disasters before they break. Our domestic funding is likely to find counter-part funding from global sources as I expect increased funding of global research, not just medical, pharmaceutical and vaccine research but also in epidemiology, disease modeling, and social research to be a consequence of this pandemic.

Increased funding will also help create a conducive environment to do research and development. It could also lead to the democratization of the R&D enterprise -which will make it less geriatric. Our culture stifles the youth. Youth ask a lot of questions – which is good for an R&D enterprise that is curiosity-driven, that pushes out the-frontiers of knowledge. This can be challenging to our hierarchical structures. Senior scientists seldom take the questioning, curious researcher kindly. Many a young person has spent an uncountable number of years pursuing a PhD in our universities because he or she dared disagree with a Professor. Science, R&D cannot thrive under such circumstances. Our scientific enterprise must be democratized.

d. **R&D in universities** – University-based research is central to Nigeria's research and development endeavor. Although the private higher education sector has grown in recent times and is making significant contributions to our economy, the public higher education sector remains the driver of the STI sector in the country. HEI's are implicated in R&D in three fundamental ways: as loci of R&D; as employers of R&D personnel and as R&D human resources suppliers. Our governments and R&D stakeholders, spurred by the vulnerabilities exposed by COVID-19 should reaffirm their commitment to university-based research and do all that is necessary to up the capacity and capability of our universities, private and public, to make Nigeria better prepared for the next pandemic if and when it comes. As well, resources should be provided to build epidemiological modelling capacity in our universities. Nigeria does not have a school of public health. The FGN, State Governments and proprietors of private universities should consider the possibility of setting up well-funded and adequately staffed schools of public health.

A pre-requisite for universities playing their role is industrial peace on our campuses. If Nigeria cannot recruit and retain her best to pursue academic and professional careers in R&D (STI), its national competitiveness and ability to deal with pandemics and disasters will suffer. Nigeria needs to reform her public universities to create a conducive environment for staff, students, and country.

e. **Research infrastructure:** One good outcome of the pandemic is the huge and impressive expansion of molecular laboratories in the country, from three in March 2020 to more than 37 in March 2021. This is quite impressive. This "system" of laboratories should be built on as it could have a positive knock-on effect on the practice of laboratory medicine, microbiology, virology research, pharmaceuticals research and biomedical engineering. The huge expansion of the network of NCDC laboratories in so short a time shows what can be achieved in and by this country if only we set our minds on it. These laboratories present the possibilities for the building and reinforcement of capacities in areas of disease surveillance, diagnosis and other things and the development of appropriate diagnostic tools and instruments. Government should also

create incentives for pharma companies and biomedical engineering companies to invest in R&D and in research infrastructure. It is impossible to talk of PPP in R&D with the private sector that does not perform R&D.

f. The widespread adoption of **digital technologies** will promote and optimize the use of research infrastructure; and the partnerships and collaborations (at all levels-national, regional, and international programmes; among public institutions and between private and public) so essential for success in research and development. But as I have noted earlier, there was a torrent of publications on COVID-19 publications, 246,000 according to the latest figures available on the WHO database. Most of these, including the prints are available online and could be accessed freely. But limited digital infrastructure, expensive [broadband cost](#), unstable internet connections remain a problem. In Nigeria, for example, the cost of 1 GB of mobile data in 2020 was \$0.88 against \$0.66 in Ghana and \$0.51 in Algeria.

g. **Artificial intelligence** has played a role-from modelling to vaccine development-in efforts to stem the spread of the virus. As early as January 2020, [researchers at Stanford University](#) began to use AI and ML to identify proteins that could be included in a potential COVID-19 vaccine. Pfizer [CEO Albert Bourla](#) credited artificial intelligence as one of three reasons why his company was able to create a highly effective COVID-19 vaccine in record time. A research team at the [University of Southern California's \(USC\) Viterbi School of Engineering](#) "developed a method to speed the analysis of vaccines and zero in on the one that will be most efficacious". The **merger of information technology and biotechnology** that renowned Israeli historian/philosopher, Yuval Noah Harari, warned about in his books *Homo Deus* and *21 Lessons for the 21st Century*, appears to have been hastened by COVID-19. Clearly, this merger when concluded will have a most disruptive and far-reaching impact on how R&D is done. Policy makers, scientists and R&D stakeholders must recognize that Nigeria does not have the digital infrastructure and the skills required to be an important player in this new world. These should be developed as a matter of urgency.

Conclusion

For years, our society has lied to itself about the importance of science, technology, and innovation. Nigeria has had a Federal Ministry of Science and Technology for more than 30 years and has a network of government-owned specialized, sector-specific research institutes and universities. But COVID-19 has exposed much of that as a lie. Our only human vaccine manufacturing establishment ceased operating years ago. We act as though the advice by one of Russia's greatest writers, Fyodor Dostoyevsky in his book *Brothers Karamazov* "*Above all, don't lie to yourself. The man who lies to himself and listens to his own lie comes to a point that he cannot distinguish the truth within him, or around him, and so loses all respect for himself and for others. And having no respect he ceases to love.*"

COVID-19 is unlikely to have a transformative impact on research and development in Nigeria unless we as a people and as a country stop being untruthful to ourselves about the importance we attach to the scientific enterprise. We have to be honest and tell the truth that we are a scientifically very backward and R&D dependent country. Accepting that truth, is in my view, a first step towards creating a conducive environment for R&D that does not now exist because it will make epistemic humility part of our DNA.

We need to create at all levels of our society, including at primary, secondary, and higher education, a conducive environment for research and development, for science, technology, and innovation: an environment, to paraphrase the [Director of the US National Science Foundation](#), Dr. S. Panchanathan, that promotes, an environment that recognizes, an environment that rewards, an environment that scientists, researchers and developers can comfortably embed themselves in and carry out their socially useful and

urgently needed work. Towards this end, Nigeria and Africa must **govern science**, technology, and innovation better and much more competently.

We have the structures that could make this happen at home and on the continent. The National Research and Innovation Council (NRIC), the highest decision-making organ of our country in research and innovation-should be fully empowered and the [National Research and Innovation Fund](#) generously funded. The NRIC should work closely with the African Union's ASRIC to drive research and development. Universities should begin to live true their responsibility and calling as research centres of excellence. The policy documents-e.g. The National STI strategy, ECOPOST, the AU'S STISA-2024, the AU's [Pharmaceutical Manufacturing Plan for Africa](#) provides goods road maps for harnessing COVID-19 to advance R&D in our country, in our sub-region and across the continent to advance our nation's and continent's STI independence. PPE, medicines, and/or vaccine nationalism is unlikely to disappear with the stemming of SARS-CoV-2.

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I now conclude with a story from ***Pale Rider: The Spanish Flu of 1918 and how it changed the World***, Laura Spinney's captivating book on the Spanish Flu of 1918, of Rene Dujarric de la Riviere, who was a young scientist at the Pasteur Institute before the outbreak of WW 1. Assigned as a military doctor, Mr Dujarric saw many young soldiers fall ill with the flu and die. Concerned, he joined the hunt for the cause of the flu. Sometime in October 1918, Dujarric asked a friend of his and fellow Pasteurian, Antoine Lacassagne, to do him a favor-to inject him with the filtered blood of a flu patient so that he can confirm/reject his hypothesis of the cause of the flu. Troubled by the moral dilemma of carrying out such a request, Lacassagne refused. However, Dujarric persuaded him to, telling him that "it was better I do it, in the best conditions, than that he inject himself." Dujarric experienced symptoms after the injection.

A few days after that first experiment, Dujarric performed yet another experiment on himself! He "painted his throat with a filtered emulsion of flu patients' sputum". And then waited. Experiencing no further symptoms, he concluded that the first experiment had immunized him against the second.

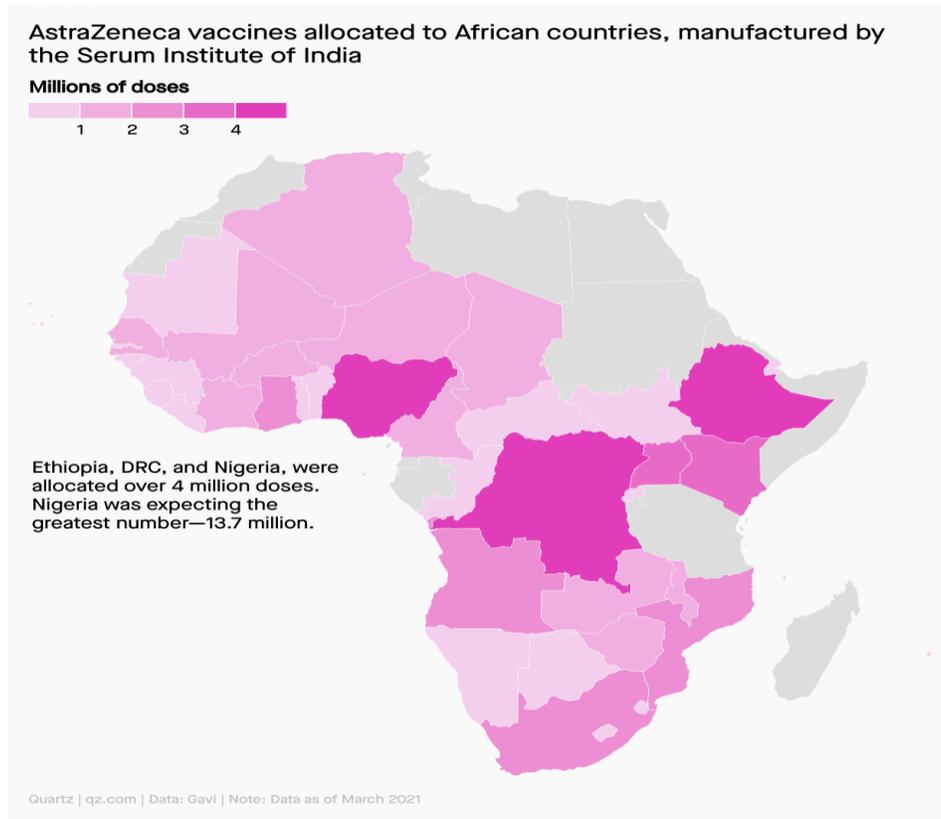
This was a huge and important finding. Dujarric was **inspired** by a deadly disease that killed more than 50 million people to experiment on himself to advance the frontiers of research and development to stop the deadly march of the flu on mankind. It will take more than additional government and/or reform of Nigeria's research infrastructure for COVID-19 to leave a lasting positive impact on research and development in Nigeria. It will also take the commitment to science to research and development, of individual scientists. If Covid-19 inspires Nigerian and African scientists to selflessly pursue/do science for the benefit of all, then it would have left an enviable and lasting impact on research and development, in spite of the enormous grief, harm/damage it has caused.

Thank you very much for listening. I wish the conference great success.

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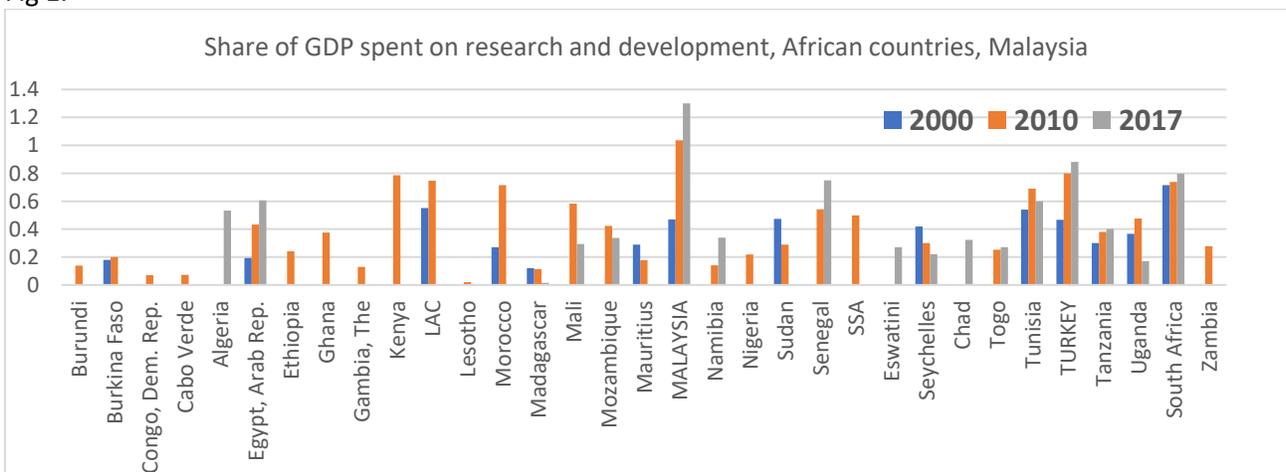
Annexes - Tables and charts

Chart 1



Source: Quartz Africa available at <https://qz.com/africa/>

Fig 1.



Source: World Bank Development Indicators

Fig 2.

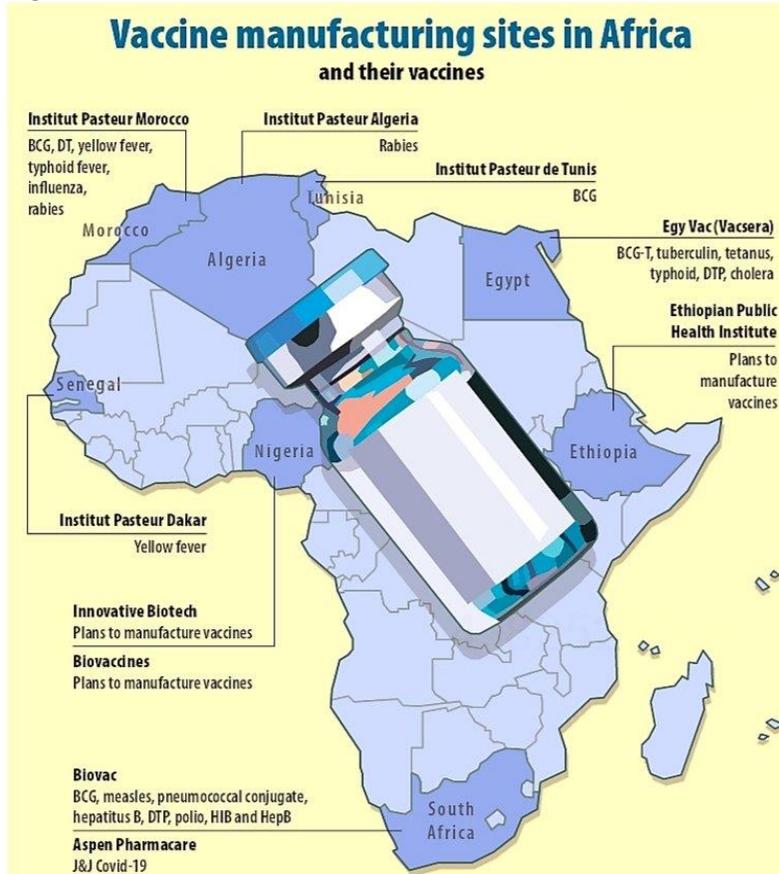
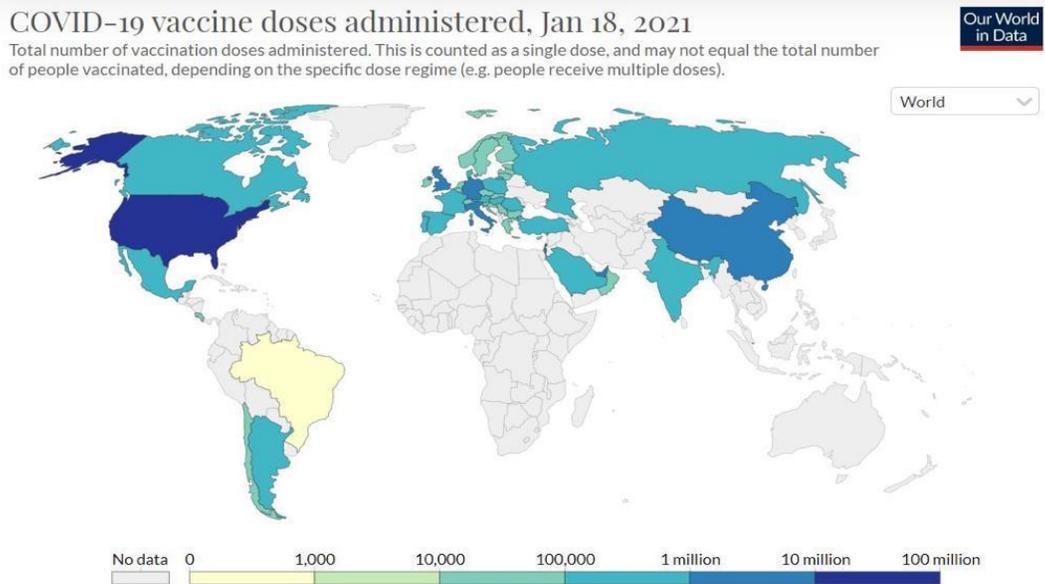


Figure 3



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