

Covid-19 Declines: The Implications for the End of the Pandemic

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Abstract

The memories of COVID-19 amid conspiracy theories have come to stay. The unprecedented impact of the pandemic in all facets of life cannot be overemphasized, although the rapid response from all sectors and experts have yielded a commensurate decline in COVID-19 outbreak thereby bringing about a bounce-back in all sectors. This review positively implicated some key areas of human endeavor as COVID-19 pandemic threats gradually fades away based on vaccine discovery and ongoing vaccine administration as well as the perceptions and considerations by the general public to vaccine. Going forward is the need for a robust One-Health approach for the well-being of everyone in all facets of life.

Keywords: COVID-19 declines, implications across various sectors, Vaccine and public perceptions, Pandemics, One-Health

Introduction

Pandemics have a particular place in the memories of the societies. They cause the global society to live in a state of fear and anxiety and disrupt the natural flow of life, and everybody has a particular experience regarding the pandemic. Many major pandemics have occurred throughout history, and the crises associated with

pandemics have made great adverse impacts on health, economy and even national security around the world [1]. The outbreak of the novel coronavirus disease (COVID-19 also known as SARS-CoV-2) by the World Health Organization (WHO), has been declared a pandemic by the WHO. The rapid spread of the COVID-19 pandemic is something that nations and the world perhaps have never encountered before. In

December of 2019 the infection of the COVID-19 virus was first reported in Wuhan which is the seventh largest city of China. Research suggest that the outbreak began from the workers and customers slaughtering animals such as pig, dog, rat, civet cat, rat, and snakes among others at a wholesale market in Wuhan. The pandemic has ignited scientists and researchers to explore the genetic nature of the new COVID-19, its infection trends and patterns, and new tests for diagnosis [2].

During an early 4-week interval in the COVID-19 pandemic, emergency department (ED) visits were substantially lower in 2021 than during the same 4-week period in 2020. These decreases were especially pronounced for children and females and in the Northeast of U.S. In addition to diagnoses associated with lower respiratory disease, pneumonia, and difficulty breathing, the number and ratio of visits (early pandemic period versus comparison period) for cardiac arrest and ventricular fibrillation increased [3]. According to Patel (2020), most people were grateful that they had some information, the use of mask and social distancing measure where introduced and adopted by most countries to reduce the spread of the COVID-19 [4].

Feng *et al.* [5] proposed preventive measure for governments and public health agencies to embrace and improve rational recommendations on appropriate face mask use to complement other preventive measures, such as hand and fomite hygiene. WHO currently recommends that people should wear facemasks if they have respiratory symptoms or if they are caring for persons with symptoms [5]. As the number of persons hospitalized with COVID-19 increased, in an early report from Austria, Hong Kong, Italy, and California, there was a sharp drop in the numbers of persons seeking other emergency medical care than COVID-19. This prompted the United States on March 13, 2020, to declare a national emergency to combat COVID-19 [3]. As at the time of writing this report, COVID-19 has total confirmed cases of 113,094,441 with total recovery case of over 88,757,670 and total death case of 2,509,899. Since the outbreak of severe acute respiratory syndrome coronavirus 2

(SARS-CoV-2), the virus that caused COVID-19, the use of face masks, fomite and hand hygiene has been recommended in China and other Asian countries such as South Korea and Japan and other parts of the globe. Some provinces and municipalities in China have enforced compulsory face mask and social distance policies in public areas. However, China's national guideline has adopted a risk-based approach in offering recommendations for using face masks among health-care workers and the general public [5]. This is in a bid to contain the spread of the deadly COVID-19. Countries worldwide have implemented strict controls on movement in response to the COVID-19 pandemic. The aim is to cut transmission by reducing close contact, but the measures have profound consequences [3]. In the U.S on March 13, 2020, President Donald Trump declared an urgent need to fight the rampaging spread of COVID-19 which led to several social interventions such as social distancing, compulsory face mask use, lock down of institutions and industries, closure of borders, ban of gathering above 50 persons per time among others across the country. These social interventions are reducing the transmission rate of the virus and, in turn, reducing the risk of death for the most vulnerable populations. During the influenza 2009 A/H1N1 pandemic, the implementation of social distancing interventions, including nationwide school closures and cancellation of public gatherings, was associated with a 30% reduction in the transmission rate [3,6].

Decline in Cases

Center for Disease Control (CDC) recommended wearing of face mask as one of the preventive strategies to slow the spread of SARS-CoV-2, the virus that causes COVID-19. As shown in Figure1 below, decline in case was observed because face masks substantially reduce exhaled respiratory droplets and aerosols from those infected wearers and reduced exposure of the uninfected wearers to the viral pathogen [7]. According to a research carried out by Lisa *et al.* [8] in six Universities in the United States (US) between the periods of September to November 2021, mask mandates have been shown to decrease SARS-CoV-2 case

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transmission. Similar case was observed (Figure 2), and widespread mask use was a core intervention for curbing the COVID-19 pandemic. Government mandate in the US on face mask use in public was shown to be associated with a decline in the daily COVID-19 growth rate by 0.9, 1.1, 1.4, 1.7, and 2.0 percentage points in 1–5, 6–10, 11–15, 16–20, and 21 or more days after state

face mask orders were signed respectively. Fourteen (14) States and the District of Columbia as of February 1, 2021, had universal masking mandates. Mask wearing was mandated by executive order for federal property as well as on domestic and international transportation conveyances, in and out of university premises in the United States [7,8].

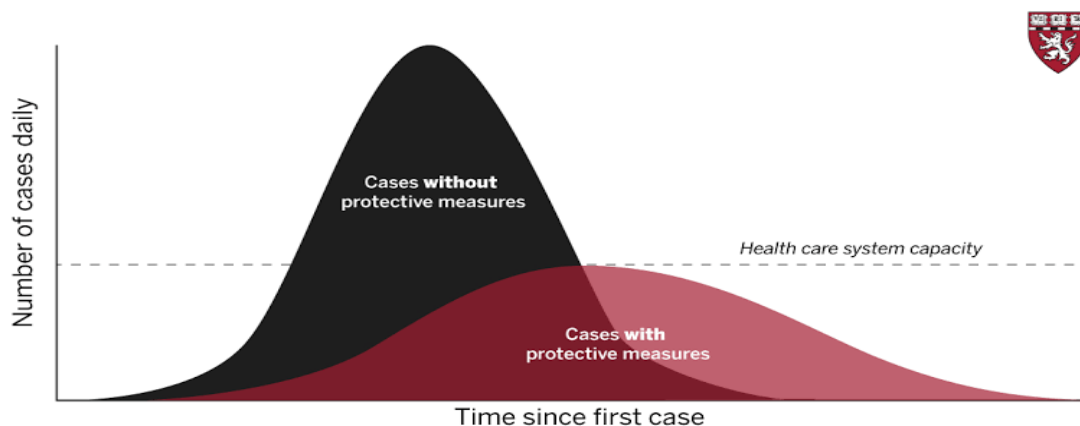


Figure 1: Number of daily COVID-19 cases against time since first case (Source: Malhotra,2020 [9]). The report in Figure 1 above shows a rise in the case for people without protective measures (mask) and a decline in case for people with protective measures (mask) since first case. However, proper masking will go a long way to help reduce the spread of transmission of COVID-19 in the end of the pandemic.

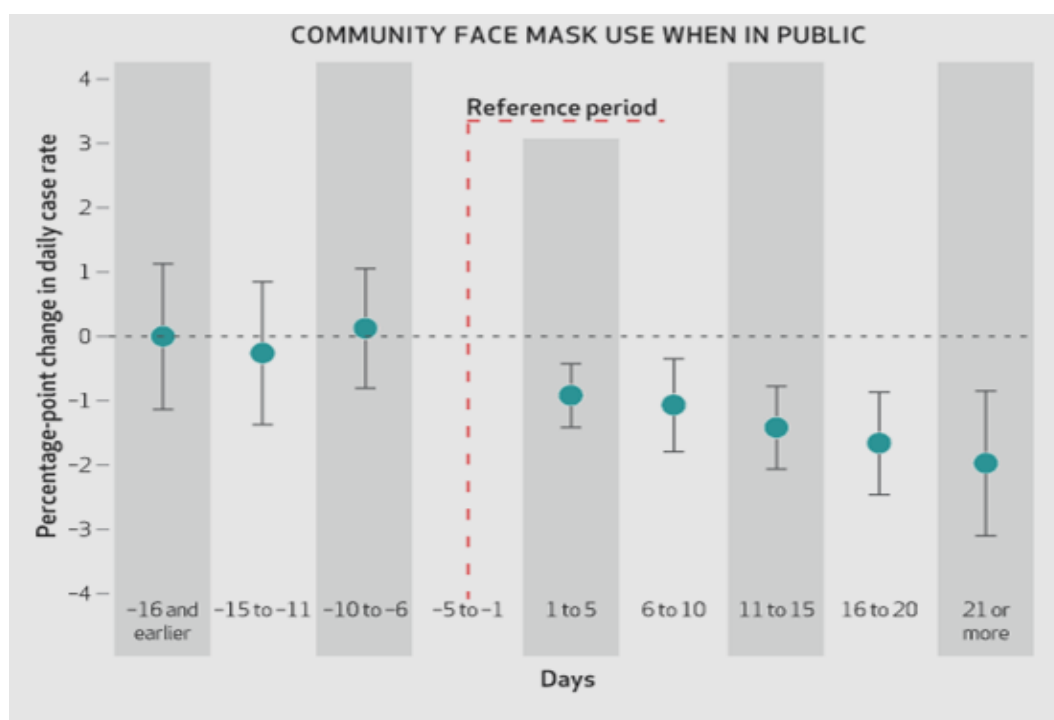


Figure 2: Decline in case after government face mask mandate order in some states in the US (Source: Lyu and Wehby, 2020 [10]). As shown in Figure 2 above, is a decline in COVID-19 cases after government mandate for facemask use in public issued by fifteen States plus Washington, D.C., between April 8 and May 15, 2020. The reference period (1-5 days before the mandate order was signed) to the 21 days or more (after the mandate was signed). There was a significant decline in daily COVID-19 growth rate after the mandating of face covers in public, with the effect increasing over time after the orders were signed. Specifically, the daily case rate declined by 0.9, 1.1, 1.4, 1.7, and 2.0 percentage points within 1–5, 6–10, 11–15, 16–20, and 21 or more days after signing, respectively.

According to a work by Brooks *et al.* [7], the significance of good fit to maximize overall mask performance was clearly pointed out. The purpose of medical procedure masks was to reduce exhalation; inhalation and source control (e.g., maintain the sterility of a surgical field). The extent to which they reduce exhalation and inhalation of particles in the aerosol size range varies substantially, in part because air can leak around their edges, especially through the side gaps [7]. However, good and proper wearing of mask has been the major and even the best means to curb the spread of COVID-19, thereby forcing a decline in the pandemic.

Decline in Hospitalizations

The intent of masking is to reduce emission of virus-laden respiratory droplets, that is common among those who are infected with SARS-CoV-2 but do not show symptoms or are pre-symptomatic; masks also help reduce inhalation of respiratory droplets by the wearer [11]. The COVID-19 pandemic has challenged, and in many cases, exceeded the capacity of hospitals and intensive care units (ICUs) worldwide, but masking recommendation as mandated and adopted has led to a great decline in hospitalization of person with cases of COVID-19 since the pandemic [12]. According to a research conducted in 2021 by Lennon *et al.* [13], the New York City (NYC) patients appeared sicker than Hershey Medical Center (HMC) patients on presentation. Hershey Medical Center's lower population density (993 persons per square mile versus NYC's 27,000) may be protective; enough to overcome HMC's lower intent to comply with public health recommendations compared to NYC [13].

Decline in Deaths

According to Jeffrey [14], there was a substantial, continued decline in mortality rate among individual aged 50 years or more diagnosed with COVID-19 in the State of Florida. At every ten-year age group, from those aged 50–59 years to those aged 80 years or more, a great decline was observed. Focusing on those aged 60–69 years old, a decline in case mortality among hospitalized patients was observed during the first three diagnostic intervals (March

29–April 18, April 29–May 19, and May 21–June 10 in the year 2020 respectively), but a rebound in case mortality in the final diagnostic interval (June 14–July 4, 2020).

A report by De Flora and La Maestra [15] shows the cumulative numbers of COVID-19 cases and deaths in Italy, Italian regions and autonomous provinces during the months of March, April, May, and June 2020. Between March and April, the number of cases was around 100,000 over the national territory. Hence, there was a decline in death to approximately 25,000 cases in May and then to 8000 cases in June, for a total of 233,413 cases during these 4 months. Aside other factors such as lockdown, stringent containment measure; change in climate may have been one of the main factor for the sharp decline in case observed due in part that the virus facilitates its outbreak during cold season. A study that reported mortality rate only for patient that has specific result (discharge or death) shows that due to variation in thresholds for hospitalization, mortality case was impressively lower [14,15].

Vaccine Distributions and Public Perceptions across Continents

A study carried out by Rosiello *et al.* (2021) in 10 countries in Asia, Africa and South America which are India, Pakistan, Sudan, Nigeria, Iran, Bangladesh and Brazil, Chile, Tunisia, and Egypt. The COVID-19 vaccine acceptance rates were observed to be influenced by the vaccine based on the efficacy and safety profiles. The result of the study shows how communication about COVID-19 vaccine safety and efficacy can affect its acceptance and distribution. Specifically, at the scenarios of low possibility (5%) of side effects (e.g., fever or localized pain), with an efficacy of 75%, the vaccine acceptance rates across the ten countries exceeded 67% [16].

Chile's mass COVID-19 vaccination campaign started in February 2021. Following a period of 8 weeks, more than 25% of the population received the first dose; this made Chile to be ranked among the countries with the highest vaccines rates per capita. A timely availability of vaccine among others was the major factor for Chile's success [17].

In the United States about 70% of the adult populations have been vaccinated with at least one dose of a COVID-19 vaccine. This progress represents a marked achievement in vaccinations that has led to steep declines in COVID-19 cases and deaths, vaccination coverage and the protections provided by it remains uneven across the country [18].

By the end of 2021 twelve COVID-19 vaccine manufacturers intended plans for vaccine production, with an estimated capacity of approximately 10 billion doses [19]. As the pandemic comes to an end with decline in cases with person down with COVID-19, two vaccines manufacturer (Pfizer- Bio NTech and Moderna) were accepted for urgent use in the United States for the prevention of COVID-19 in December, 2020 [20]. After administration and evaluation of first doses, it was reported that Moderna COVID-19 detected 10 cases of anaphylaxis. Anaphylaxis is potentially life-threatening and requires immediate treatment. All 10 anaphylaxis cases reported after receipt of Modern a COVID-19 vaccine occurred in women, among which might have some type of allergy or history of allergic reaction [21].

The Pfizer Bio NTech COVID-19 vaccine has raised many concern on how much protection a single dose can proffer, following reports from Israel that it is much lower than expected. With more than 75 percentages of older people vaccinated, report shows 33 percentages decline in cases of COVID-19 after administration of first dose [22]. According to Nguyen *et al.* (2021), from September to December 2020, there was an increase in willingness to be vaccinated by approximately 10 percentage among all adults. Furthermore, there was an increase with ≥ 65 years' adults willing to be vaccinated and a decrease with those not willing to be vaccinated [23]. Despite increase in willingness to be vaccinated, only about half of persons aged 18-64 years surveyed in United States report were likely to receive COVID-19 vaccination [24].

Most healthcare workers are hesitant and skeptical, as efforts are ongoing to promote confidence about the effectiveness of COVID-19 vaccine since influenza vaccine effectiveness in 2017-18 was perceived low risk for virus

transmission. Frequently cited reasons for vaccine hesitancy included the perceived rapidity of vaccine development; inadequate information received about vaccine safety, side effects, and administration; and skepticism regarding the clinical trials and vaccine approval processes. Observing qualitative and quantitative vaccination among all population is paramount to control the spread of COVID-19 and bringing an end to the pandemic [24].

Implication of COVID-19 Decline on Biodiversity Conservation

Many opportunities have been created and harnessed since the emergence of COVID-19 crisis in the transformation and metabolism of the economy. This transformation and metabolism does not continue to erode biodiversity and ecological life-support systems. This involves adopting a long term vision and assuming short term costs [25] and some information has given us insight to identify some dimension for managing and conserving wildlife in years to come. Since the advent of COVID-19 crisis conservation funding, reduced management capacity and collapse of community-based natural resource management enterprises in Africa's wildlife has been threatened [26]. However, investment strategies/plans toward managing wildlife so as to avoid the loss of benefits derived from ongoing conservation or management actions obtained in previous years should first be set in place for every country experiencing extended lockdown periods. Proper funding is needed to be appropriated for both monitoring and direct conservation actions as part of the investment plans [27]. The crisis demands a concerted international effort to protect and support Africa's wildlife, wildlands and people that are dependent on them. Therefore, to minimize negative impact of the crisis through decisive effort and critical management; African governments, the international community, donors and conservationists should collaborate. At this critical juncture, business as usual could be catastrophic, but decisive and collaborative action can ensure that Africa's wildlife survives COVID-19 and that more resilient conservation models benefit humans and wildlife for generations

[28]. Some preliminary conclusions are possible, although it is quite quick to access the overall impacts of the COVID-19 pandemic on biodiversity and our ability to protect it. At this point, protected areas appear to be safe and, in many places, biodiversity is benefitting from reduced human activities. Research has been disrupted, but only time will tell if this will have long-term consequences [29]. It is imperative for scientists to come up with ways to counter pandemic(s) impact on research so as to have an uninterrupted and unbreakable biodiversity studies.

Implication of COVID-19 Decline on Environmental Health

The earth is a mixture of various organisms, some of which have contributed immensely, some are still contributing (e.g. blue-green algae or cyano bacteria green house gas emissions) respectively and some are the major cause of diseases in humans and wildlife. The origin of some disease organisms or their vectors is intertwined with the nature of human societies and their activities (e.g. influenza strains can develop via a complex mechanism that involves birds and pigs as well as humans). When environmental conditions become conducive for disease causing organisms and their vectors to spread and when species barriers are crossed new human and animal diseases can arise [30].

Environmental health should be considered systematically and paramount, since the inception of COVID-19 an acute infectious pandemic, which has opened pathway of knowledge in several discipline and research orientations that go beyond COVID-19: the ecological origin of diseases, the interaction between environmental health stressors and infectious diseases, and an integrated assessment of societal impacts of the disease, the global response and the recovery plans [31]. As the global economy finds a new pathway with respect to the COVID-19 pandemic, aid agencies, development banks and Non Governmental Organizations (NGOs) should invest in building waste management systems that will reduce reservoir of disease causing organisms, since improper waste disposal often harbor vector of diseases and disease causing organisms. In a quest to reduce

waste from the environment, governments should not overlook or shy away from their responsibility in recognizing the role and management of waste services and implement policies for the transition to a sustainable future. Such efforts would advance multiple Sustainable Development Goals including SDG 11, SDG12 and SDG14 which calls for cities to ensure effective waste management; reduce waste management through prevention, reduction, recycling and reduce marine pollution of all kinds respectively [32].

A study conducted by Somani *et al.* (2020) identified the pros and cons of COVID-19 on the Indian environment. The implementation of lockdown and border closure among other restriction measures brought about improvement of ambient air quality (about 30% increase in air quality index), surface water that was not good for bathing became fit for drinking, reduction in the municipal solid waste (MSW) generation, reduced noise pollution due to low human activities and emission of greenhouse gas (GHG) which reduced to about 25% compared to the pre COVID-19 [32]. The negative effects on the environment in terms of increase in the biomedical waste (BMW) generation was due to limited capacity and service provision, mixed effect of carbon dioxide emission have been observed [33].

Implication of COVID-19 Decline on Education

The pandemic has an incredible implication on closure of schools more especially the early years (from 5-16 years) but those from poor family backgrounds have experienced the largest impact. Furthermore, as a result of current economic crisis instigated by the pandemic, many more families have faced other challenges such as increased poverty and food insecurity, resources needed for online learning, suitable space to study as most families lives in cramped house, student finance [34].

The COVID-19 pandemic which started at the beginning of the year and an academic year hindered most students in Asia and Australia from resumption. Although, it was not the same case for most European and North American universities,

the pandemic hits in the middle of the teaching year. Online teaching became generally accepted and also a means to teach students as international students from China (where the pandemic started) and other part of the world could not gain access into Australia [35]. For students to adapt in this current pandemic it is imperative to promote positive engagement such as online teaching that will benefit both students and their learning, university communities and society more broadly. This will help mitigate the level of destruction caused by the pandemic on education in part to the German-American political theorist, Hannah Arendt, who argued that 'in every crisis a piece of the world, something common to us all, is destroyed' [36]. This implies student's capacity to develop and keep sound social well-being and stable mental health depends largely on relationships they keep in campus. But sadly, we are faced with a progressive pattern of lockdowns and social distancing caused by the COVID-19 pandemic which in a long term created lack of emotional support and broader societal effects which highlighted are; financial constraints, remote online classes, and uncertainty about the future due to COVID-19 and lockdowns, research institutions are facing huge challenges in managing research operations (there are difficulties to set up gatherings in a research setting particularly in the areas requiring bench work and human subjects, as well as fieldwork, and this is causing significant losses to research studies) [37, 38]. The pandemic forced most companies and industries to retrench their workers and this led to loss of job (income) for most families and students who self-finance their studies. However, most students had issues with their ability to manage their educational financial commitments. The switch to an online class is another emotional challenge for most students. For example; resources needed for online learning, suitable space to study as most families live in cramped house is not readily available [34, 37].

Implication of COVID-19 Decline on Aviation and E-Commerce Industries

There was an increase in cases recorded in Australia and most part of the world at the beginning of the pandemic in

Mid-March 2020, and as part of measure to curb the spread of the virus among others, government of various countries imposed strict travelling restrictions. This brought a down slope in the use of public transport to about 80% in early April 2020 compared to the pre-COVID-19 era. As the pandemic comes to an end and aviation industries reopen, we expect to witness a rise to normalcy in number of passenger [39].

The operation and understanding of airlines differs by the following ways; Full service network carriers (FSNC) and Low-cost carriers (LCC). FSNC are more exposed to international traffic and most started observing reduction in early February, while LCC due to their lower exposure to international traffic reduced their supply later. The pandemic in itself has helped to unravel and justify the significance of air cargoes; however, government hijacked the shipment and supply of basic products such as food and medical items in order to protect her citizens [40] as mentioned in International Air Transport Association (IATA) (2019), "aviation's global stature as an economic engine is evident in the statistics. If the global aviation sector were a country, its total contribution (direct, indirect, induced and catalytic) of USD 2.7 trillion to the gross domestic product (GDP), and the 65.5 million jobs it supports, would be comparable to the United Kingdom's economic size and population." In 2018, the official statistics report as much as 4.3 billion passengers, while SABRE data calculated 3,773,950,899 (thus 87.7% of the IATA official datum). Selection of routes for which forecast and scenario calculation was possible. About 3,580,700,282 passengers was observed, therefore 94.8% of the whole SABRE data and 83.2% of the official IATA datum. The total number of jobs supported by aviation is 65.5 million according to IATA (2019) [37] that was pre-COVID-19, but the impact of the travel restriction led various industries to cut down number of workers in order to maintain social distancing measure of not more 50 persons per gathering while some went into total closure.

There has been a tremendous impact on world e-commerce since the emergence of COVID-19 pandemic; it is no longer business as usual. Some consumers (52%) are avoiding crowded areas and

others (32%) stated that until they get vaccinated they will not go out for shopping [41] which made all industries, supermarket, stores and market suffered severe changes due to the COVID-19 pandemic. The pandemic has forced global economy to decline but it is not so for some sector (e-commerce) how the pandemic became a stepping stone for their rise because consumers drift from the use of physical store to an online store in other to obey the government isolation measures and recommendations of stay at home. As seen that more than half of respondents in Vietnam, China and India declared that they do purchase online more frequently than before, followed by Italy with one third of respondents [42].

Moving Forward: How can COVID-19 Transform Global Health and Development?

Igoe and Chadwick (2020) asked some global and health development thinkers and leaders to share in their own words, insights and predictions [43], and these were their responses below:

Ngozi Okonjo-Iweala the Chair of the Board at Gavi, the Vaccine Alliance and Nigeria's former minister of finance stated that, "It is clear that the outcry in virtually every country about the lack of equipment and supplies to test for and protect against COVID-19 will lead countries to reexamine their supply chains for critical health and livelihood related products. This will lead to a surge of nationalism with respect to the need to produce pharmaceuticals, medical supplies, and equipment domestically. Even countries that traditionally had no capability in these areas will seek to develop the same. The realization that the economic costs of a pandemic can be huge, far surpassing investments in research and prevention, will lead to billions more dollars of investment in research, vaccines, therapeutics, and non-medical methods of prevention. This will mean that trillions of dollars in economic losses, loss of life, and loss of livelihoods for millions of poor people all over the world will be averted."

Secondly, Madhukar Pai the Director of McGill Global Health Programs posited that, "I am anxious that rich countries,

having suffered huge economic losses, will use COVID-19 as the excuse to cut development assistance for health and reframe global health as a limited "national security" exercise. The pandemic could become the new excuse for nationalism, isolationism, anti-immigration policies, and institutionalized racism. We are already starting to see some of this. All of this could increase inequities that already plague global health, and further concentrate power among the elite in the global north."

Also, Jean Van Wetter the Director General of Enabel, the Belgian development agency opined that, "With this crisis, the North-South paradigm is definitely over. The monopoly that traditional development actors have had in the last 40 years will quickly erode. China and South Korea used to be aid recipients until not so long ago. Now they are helping the World Health Organization, Italy, and other European countries to cope with the crisis. Chinese charities are distributing masks to European governments, as Europe and the United States have been doing in developing countries for years. Some of the largest hospitals in Europe are now calling for donations from the public. Doctors without Borders — MSF — known for its international operations in conflict and poor areas, is now deploying medical camps in the centre of Brussels!"

Lastly, San Bilal the Head of trade, investment, and finance of European Centre for Development Policy Management think tank expressed his feelings in four phases as thus, 1) "The COVID-19 crisis has the potential to radically change development for the better. It shows how interconnected and interdependent our world has become: There is no way of tackling the COVID-19 crisis at national levels only; "helping you is helping me," "solidarity is in my self-interest;" international cooperation and multilateralism are back!

2) Secondly, COVID-19 illustrates our common vulnerability, across borders, beyond North-South, East-West, public-private divides, and the limits of our segmented approach to development; a more holistic, comprehensive, and coordinated approach is back!

3) Thirdly, strategic interventions by the state become central again, to

address the health, social, economic, food impacts of COVID-19: with a major economic contraction, public budgets will have to become more strategic, more focused, more counter-cyclical and leverage more (private) finance for development; social policy matters, private sector is key, the state is back!

4) Fourthly, COVID-19 stimulus and recovery packages are needed, and provide a golden opportunity to engage in ambitious sustainable transformation initiatives by all, including developing countries, based on systemic changes toward more sustainability, inclusivity, and equity; active transformative sustainable approaches and a “green deal” agenda are back! Our world is fragile - let’s work together to preserve, enrich, and enlighten it.”

The Way Forward for Nigeria in the Post-COVID-19 Era

Nigeria cannot continue to think and act the same way it was doing before the COVID-19 pandemic outbreak. It just cannot afford that mistake. The opportunity to really embrace mind shift, affords conversion of the ‘disruption shock’ into a wave of powerful change that can reshape learning, government infrastructure, the pattern of work and the method of engaging global economy [44]. The value and importance of data in the midst of the pandemic crisis has clearly shown that data is the new gold. How we all can collaboratively capture and safely use data through the technology ecosystem available to us is a game-changer going forward for planning in government, business and social economies [44].

The fact that developed countries placed restrictions on vaccines going to developing nations, should serve as an eye opener to all moving forward. Trade-Related Aspects of Intellectual Property Rights (TRIPS) agreement had made provisions for any country with capacity to override patent rights and manufacture vaccines and as such, Nigeria must rise up to the occasion. The Nation must now have capacity to manufacture vaccines and also be looking at extending it to include therapeutics and diagnostics [45].

A Road Map to Approach the Next Pandemic

Federal engagement and collaboration are essential given the interconnected nature of communities, states, and nations in a global pandemic. In the next three to five years, policymakers must invest in the infrastructure and coordination needed to prepare for future public health crises [46]. It is not a matter of if there will be another pandemic. The question is: When and how well prepared will the nation be to protect communities against the next national public health emergency — and how successfully will the nation navigate the remainder of the current crisis? [46]. In July 2020, the Association of American Medical Colleges (AAMC) issued, “The Way Forward on COVID-19: A Road Map to Reset the Nation’s Approach to the Pandemic,” a comprehensive plan with 10 evidence-based actions to reset the trajectory of the country’s response to the COVID-19 pandemic includes;

1. The White House (seat of power) must lead the national pandemic response and ensure coordination among departments and agencies.
2. The federal government must engage industry and research universities at the outset of the next public health emergency and commit to purchasing diagnostics, therapeutics, and vaccines in advance.
3. The federal government must ensure an effective supply chain for all critical goods and materials
4. Congress (legislative arm of government) must appropriate robust and continuous funding for public health infrastructure (including the Assistant Secretary for Preparedness and Response).
5. Federal and state governments must relax regulatory restrictions on clinical care during a national emergency.
6. Government and the private sector must invest in data infrastructure to promote health and health equity.
7. Federal and state policy must increase the supply and well-being of physicians and other health professionals.

8. Congress must continue its ongoing commitment to basic and clinical research.

9. The federal government should expand and improve health insurance coverage.

10. All stakeholders must commit to improving equity and patient centered care through engagement with communities.

Conclusion

Amid the up-rise in the pandemic, proper measures such as masking, social distancing lockdown amongst others helped to mitigate and curb the spread of the deadly covid-19. Despite fear and anxiety of the world and the negative impact of the pandemic, the e-commerce industries among others recorded hike in patronage. Government of various countries took over most sector and placed sanctions and restrictions on activities to curtail the spread of the virus. Although activities are going back to normalcy, yet fear grips individuals, communities, governments and the whole world on what would possibly be the next phase of the pandemic. Hence, the need for a One-Health approach so as to remain safe.

Nations must also learn from the fact that the failure to plan for future pandemics could devastatingly impact Nation's vital and critical sectors including Health, Economy and Security in ways yet to be imagined. Sustaining the momentum of what has come to be tolerated, as the COVID-19 normality must continue. However, not as a tolerance but as an ability to embrace a better new normality, including our learning and the adoption of digitization to drive innovation for a resilient future.

References

- [1] Bostan S, Erdem R, Öztürk YE, Kılıç T, Yılmaz A. (2020). The Effect of COVID-19 Pandemic on the Turkish Society. *Electronic Journal of General Medicine*. 17 (6): 1-8. em237. <https://doi.org/10.29333/ejgm/7944>
- [2] Barua S. (2020). Understanding Coronanomics: The economic implications of the coronavirus (COVID-19) pandemic. Draft Manuscript. 44pp. <https://ssrn.com/abstract=3566477>
- [3] Kathleen H, Kite-Powell A, *et al.* (2020). Impact of the COVID-19 Pandemic on Emergency Department Visits — United States, January 1, 2019–May 30, 2020. *Center for Disease Control*. 69(23): 699-704. doi: 10.15585/mmwr.mm6923e1.
- [4] Patel ZM. (2020). Reflections and new developments within the COVID-19 pandemic. *International Forum of Allergy & Rhinology*. 10(5): 1-2. DOI: 10.1002/alr.22582
- [5] Feng S, Shen C, *et al.* (2020). Rational use of face masks in the COVID-19 pandemic. *The Lancet Respiratory Medicine* 8(5): 434-436. [https://doi.org/10.1016/S2213-2600\(20\)30134-X](https://doi.org/10.1016/S2213-2600(20)30134-X)
- [6] Chowell G, Mizumoto K. (2020). The COVID-19 pandemic in the USA: what might we expect? *The Lancet*. 395(10230):1093-1094. [https://doi.org/10.1016/S0140-6736\(20\)30561-4](https://doi.org/10.1016/S0140-6736(20)30561-4).
- [7] Brooks J, Beezhold D, *et al.* (2021). Maximizing Fit for Cloth and Medical Procedure Masks to Improve Performance and Reduce SARS-CoV-2 Transmission and Exposure, 2021. *Center for Disease Control and Prevention*. 70(7): 254–257
- [8] Lisa B, Riggs M, *et al.* (2021). Observed Face Mask Use at Six Universities — United States, September–November 2020. *Center for Disease Control and Prevention*, 70(6), 208–211
- [9] Malhotra S. (2020). Harnessing Computer Vision for Social Distancing Amidst COVID-19. *Oodles AI*, 28th April 2020. Retrieved on 10th January 2022 from <https://artificialintelligence.oodles.io/blogs/computer-vision-for-social-distancing/>
- [10] Lyu W., Wehby GL. (2020). Community Use of Face Masks and COVID-19: Evidence from A Natural Experiment of State Mandates in The US. *Health Affairs*. 39(8): 1419–1425. doi:10.1377/hlthaff.2020.00818
- [11] Heesoo J, Miller G, *et al.* (2021). Decline in COVID-19 Hospitalization Growth Rates Associated with Statewide Mask Mandates — 10 States, March–October 2020. *Center for Disease Control and Prevention*. 70 (6):212–216.
- [12] Mehta S, Machado F, Kwizera A, *et al.* (2021). Covid-19: A heavy toll on Healthcare workers. *The Lancet Respiratory Medicine*. 9(3): 226-228
- [13] Lennon R, P Demetriou TJ, *et al.* (2021). Characteristics and Outcomes Among Hospitalized COVID-19-Positive Patients in a Nonurban Environment. *Journal of Military Medicine*. 189: 1088-1093. doi/10.1093/milmed/usab044/6132049

- [14] Harris JE. (2020). COVID-19 Case Mortality Rates Continue to Decline in Florida. The Preprint Server for Health sciences. 10pp. doi: <https://doi.org/10.1101/2020.08.03.20167338>
- [15] De Flora S, La Maestra S. (2020). Growth and Decline of the COVID-19 Epidemic Wave in Italy from March to June 2020. *Journal of Medical Virology*. 93: 1613-1619 <https://doi.org/10.1002/jmv.26499>.
- [16] Rosiello DF, Anwar S, Yufika A, *et al.* (2021). Acceptance of COVID-19 vaccination at different hypothetical efficacy and safety levels in ten countries in Asia, Africa, and South America. *Narra J*, 1(3): e55 <http://doi.org/10.52225/narra.v1i3.55>.
- [17] Aguilera X, Mundt AP, Araos R, Weitzel T. (2021). The Story Behind Chile's Rapid Rollout of Covid-19 Vaccination. *Journal of Travel Medicine and Infectious Disease*. 42(2021): 1-3. ISSN 1477-8939. <https://doi.org/10.1016/j.tmaid.2021.102092>
- [18] Ndugga N, Hill L, Artiga S, Halder S. (2021). Latest Data on Covid-19 Vaccinations by Race/Ethnicity. Kaiser Family Foundation. 1-10.
- [19] Wang W, Wu Q, *et al.* (2020). Global, regional, and national estimates of target populationsizes for covid-19 vaccination: descriptive study. *Biomedical Journal*, 371: 4704 | doi: 10.1136/bmj.m4704
- [20] Painter EM, Ussery EM, *et al.* (2021). Demographic Characteristics of Persons Vaccinated During the First Month of the COVID-19 Vaccination Program — United States, December 14, 2020–January 14, 2021. *Center for Disease Control*, 70: 174–177. DOI: <http://dx.doi.org/10.15585/mmwr.mm7005e1>
- [21] CDC COVID-19 Response Team; Food and Drug Administration. (2021). *Allergic Reactions Including Anaphylaxis After Receipt of the First Dose of Moderna COVID-19 Vaccine — United States, December 21, 2020–January 10, 2021*. United States Department of Health and Human Services/Centers for Disease Control and Prevention. 70(4): 125–129. DOI: <http://dx.doi.org/10.15585/mmwr.mm7004e1> external icon.
- [22] Mahase E. (2021). Covid-19: Reports from Israel suggest one dose of Pfizer vaccine could be less effective than expected. *Biomedical Journal*, 372: 217 <http://dx.doi.org/10.1136/bmj.n217>
- [23] Nguyen K, Srivastav, A, *et al.* (2021). COVID-19 Vaccination Intent, Perceptions, and Reasons for Not Vaccinating Among Groups Prioritized for Early Vaccination — United States, September and December 2020. *Center for Disease Control and Prevention*. 70(6): 217–222.
- [24] Gharpure R, Angela G, *et al.* (2021). Early COVID-19 First-Dose Vaccination Coverage Among Residents and Staff Members of Skilled Nursing Facilities Participating in the Pharmacy Partnership for Long-Term Care Program — United States, December 2020–January 2021. *Center for Disease Control*. 70(5): 178-182. doi: 10.15585/mmwr.mm7005e2.
- [25] Sandbrook C, Gómez-baggethun E. Adams WM. (2020). Biodiversity Conservation in a Post-COVID-19 Economy. *Oryx*. 56(2): 277–283. doi:10.1017/S0030605320001039
- [26] Lindsey P, James A, *et al.* (2020). Conserving Africa's Wildlife and Wildlands Through the COVID-19 Crisis and Beyond. *Nature Ecology and Evolution*. 4: 1300–1310. <https://doi.org/10.1038/s41559-020-1275-6>
- [27] Manenti R, Emiliano M, *et al.* (2020). The Good, the Bad and the Ugly of COVID-19 Lockdown Effects on Wildlife Conservation: Insights from the first European Locked Down Country. *Journal of Biological Conservation*. 249: 108728. <https://doi.org/10.1016/j.biocon.2020.108728>.
- [28] Corlett RT, Primack RB, *et al.* (2020). Impacts of the Coronavirus Pandemic on Biodiversity. *Journal of Biological Conservation*. 246: 108571. <https://doi.org/10.1016/j.biocon.2020.108571>
- [29] Aletta F, Osborn D. (2020). *The COVID-19 global challenge and its implications for the environment – what we are learning*. UCL Open: Environment. 1(5): 1-3. <https://doi.org/10.14324/111.444/ucloe.000008>
- [30] Barouki R, Manolis K, *et al.* (2020). The COVID-19 pandemic and global environmental change: Emerging research needs. *Environment International*. 146 : 106272. <https://doi.org/10.1016/j.envint.2020.106272>
- [31] Ombugadu A, Tanko NS, *et al.* (2021). Novel COVID-19: The Surge in Plastics (Known-Unknowns), Its Impacts on Public and Environmental Health and The Way Forward. *Biomedical Journal of Scientific Research and Technical Research*. 33(4): 26000-26013. DOI: 10.26717/BJSTR.2021.33.005437
- [32] Somani M, Abhishek S, *et al.* (2020). Indirect implications of COVID-19 towards sustainable environment: An investigation in Indian Context. *Bioresource Technology Reports*. 11: 100491. <https://doi.org/10.1016/j.biteb.2020.100491>

- [33] Montacute R. (2020). Implications of the COVID-19 crisis for educational inequality. Social Mobility and COVID-19. 15pp. Retried from <https://www.suttontrust.com/wp-content/uploads/2020/04/COVID-19-and-Social-Mobility-1.pdf>
- [34] Ratten, V. and Jones, P. (2021). COVID-19 and Entrepreneurship Education: Implications for Advancing Research and Practice. The International Journal of Management Education, 19(1), 100432. <https://doi.org/10.1016/j.ijme.2020.100432>
- [35] Raaper R, Brown C. (2020). The COVID-19 Pandemic and the Dissolution of the University Campus: Implications for Student Support Practice. Journal of Professional Capital and Community. 5 (3/4): 343-349. <https://doi.org/10.1108/JPCO-06-2020-0032>
- [36] Sundarasan S, Chinna K, *et al.* (2020). Psychological Impact of COVID-19 and Lockdown among University Students in Malaysia: Implications and Policy Recommendations. International Journal of Environmental Research and Public Health. 17(17): 6206; doi:10.3390/ijerph17176206
- [37] Rashid S, Yadav SS. (2020). Impact of Covid-19 Pandemic on Higher Education and Research. Indian Journal of Human Development. 14(2): 340-343. doi:10.1177/0973703020946700
- [38] Munawar HS, Khan SI, *et al.* (2021). Insight into the Impact of COVID-19 on Australian Transportation Sector: An Economic and Community-Based Perspective. Sustainability. 13(3): 1276. <https://doi.org/10.3390/su13031276>
- [39] Suau-Sanchez P, Voltes-Dorta A, Cugueró-Escofet N. (2020). An early assessment of the impact of COVID-19 on air transport: Just another crisis or the end of aviation as we know it? Journal of Transport Geography. 86. 102749. <https://doi.org/10.1016/j.jtrangeo.2020.102749>.
- [40] Iacus SM, Natale F, *et al.* (2020). Estimating and Projecting Air Passenger Traffic during the COVID-19 Coronavirus Outbreak and its Socio-economic Impact. Journal of Safety Science. 1(129): 104791. <https://doi.org/10.1016/j.ssci.2020.104791>
- [41] Bhatti A, Akram H, *et al.* (2020). E-commerce trends during COVID-19 Pandemic. International Journal of Future Generation Communication and Networking. 13(2): 1449-1452. ISSN: 2233-7857 IJFGCN
- [42] Pantelimon F, Georgescu T, Posedaru B. (2020). The Impact of Mobile e-Commerce on GDP: A Comparative Analysis between Romania and Germany and how Covid-19 Influences the e-Commerce Activity Worldwide. Informatica Economică. 24(2): 27-41 DOI: 10.24818/issn14531305/ 24.2. 2020.03
- [43] Igoe, M., Chadwick, V. (2020). After the pandemic: How will COVID-19 transform global health and development? Retrieved from <https://www.devex.com/news/after-the-pandemic-how-will-covid-19-transform-global-health-and-development-96936>.
- [44] Short L, Ojo E, Falana G. (2020). What is the way forward for Nigeria, post- COVID-19? Retrieved from <https://guardian.ng/features/health/what-is-the-way-forward-for-nigeria-post-covid-19/>.
- [45] Anuka O. (2022). Nigeria must strengthen industry to manufacture vaccines. Retrived from <https://punchng.com/nigeria-must-strengthen-industry-to-manufacture-vaccines-okonjo-iweala/>
- [46] Grover A, Rasouli T, Pincus L, Lin A. (2021). The Way Forward Starts Now: Lessons From COVID-19. Washington, DC: AAMC. 19pp.

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