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Evidence-Based Preparedness for Post COVID-19

Yayehyirad Kitaw and Mirgissa Kaba

Abstract

In spite of skepticisms at various levels, the COVID-19 pandemic posed unprecedented impact on global health and economy. Although projections have yet to materialize, African countries are not at their worst with COVID-19. Yet, the worst is probably in the making despite swift, progressive, and adaptable responses many African countries have taken based on lessons from countries affected by the pandemic earlier. While efforts are underway to contain the current pandemic, the almost certain hit by another pandemic may call for appropriate preparation. This review aims to shade light on the need to align current COVID-19 prevention and management with preparation for the potential next one. A rapid review of available evidence was undertaken using clearly defined inclusion criteria and data analysis methods. The immediate focus of preparedness is coordination of interventions where evidence generation, policy making, public and private sector as well as community engagement is required to contain the current COVID-19 pandemic. Improved/adapted mathematical projections to guide decisions; improved/adapted methods for risk communication and community engagement; improved methods/technologies for surveillance, case detection and containment; optimal use of all the limited available resources; and strengthening partnerships at all levels need to be strengthened. Current endeavors should pay attention to strengthen the surveillance system for early detection; provision of adequate health care infrastructure; strong and capable health workforce and financing. Furthermore, strengthen research capacity to play its role to shape the post-COVID-19 is critical by strengthening inter and intra-disciplinary research capacities; forging partnerships at all levels. Evidently COVID-19 has posed unprecedented challenge to the globe at large. Yet, it also offered opportunities to reassess existing health system vis-à-vis the pandemics. Besides, useful lessons from COVID-19 are that it does not discriminate human beings across the globe by economy, political system and socio-cultural backgrounds. This is a useful lesson for global solidarity and align efforts to contain post COVID-19 implications as well as to prevent and manage similar such pandemics in the future.

Keywords: post COVID-19, responses to COVID-19, next pandemic, preparedness

1. Introduction

“This is like a world war, except in this case, we’re all on the same side” (Gates 2020)

In spite of skepticisms at various levels including by scientists, the COVID-19 pandemic is spreading at unprecedented speed across borders severely impacting

global health and economy [1–3]. Globalization, which has often been celebrated for interconnecting countries, has now offered much more space and opportunity for the pandemic to easily cross boundaries and has seemingly ‘tipped the scales in favor of pathogens’ [4, 5]. The pandemic is still unchecked with thousands of life lost every day. Although the highly severe projections have yet to materialize [6, 7], COVID-19 is now well established in Africa [8, 9]. Estimates of future deaths projected to be in millions, in Africa, because of general poverty, malnutrition, prevalence of diseases such as HIV and TB, constrained health services etc. [6, 10]. While the potential role of climate, demography, BCG and other vaccines, and weakness in the reporting system including low rate of testing could not be ruled out [10–16], the relatively low number of cases seem to be in part because many African countries have taken swift, progressive, and adaptable responses despite resource limitations. Some studies indicate that, having garnered experience from several recent epidemics, Africa might have got it right after all [17] even though there is ‘no room for complacency’ [15, 18, 19].

Lockdown and social/physical distancing has been imposed in several countries. These and pandemic related pressures on the health system could have potentially unintended consequences including disruption of routine health services; widespread economic challenge and hunger; worsening food insecurity; and increased violence with major impact on health/mortality [20, 21]. Even though the basic principles of infection control are universal, their concrete applications should be context specific [22]. Decisions must be based on risk sciences and as thorough risk and cost–benefit analyses [23, 24]. There are indications that early interventions could avert substantial number of infections and deaths [25, 26]. Thus, governments and public health authorities must play a balancing role as the evidence does not indicate a simple trade-off between lives lost to the pandemic and economic recession related to response [27]. The bottom line is policies must be internationally coordinated, as WHO has called for since the disease has first appeared, and must recognize that neither abandoning control nor eternal lockdown are healthy options [10, 28, 29].

The Director General of the World Health Organization (WHO) indicated that the outbreak is a test of political, financial and scientific solidarity for the world to fight a common enemy that does not respect borders... what matters now is stopping the outbreak and saving lives [30]. However, this solidarity has failed to materialize to date because the pandemic has highlighted weaknesses in both ‘authoritarian’ and ‘democratic’ states with all trying to trade blames or downplay the danger for various reasons [4, 31, 32]. As compared to the previous pandemics, the current one shock the fabrics of society and threatens to change the course of history. As in previous pandemics, ‘public hysteria, fear, and conspiracy theories tend to derail public health responses’ [5]. ‘We Are Living in a Failed State’ – for USA no less [33] but also the world order is being seriously tested [34], with some predicting revolutions ‘re-inventing Communism’ or ‘a new barbarian capitalism’ [35]. The post-pandemic is going to be tough although it is considered as an opportunity to re-evaluate what we want to prioritize as a civilization [36]. Therefore, it is imperative that we prepare for it as we struggle through the current one.

Most predictions of the next pandemic had influenza in mind, even though other catastrophe such as asteroids, mega volcanic eruptions or coronal mass ejection (CME) cannot be ruled out. Influenza is a truly universal disease. No virus poses a greater threat to more people [37, 38]. It is only good fortune that we haven’t seen another pandemic as severe as 1918 [39]. It is almost a certainty that there will be another influenza or other (of the some hundreds of new coronavirus species and the 10,000 potentially zoonotic mammalian viruses) [40] pandemic of one magnitude/type or another [30, 37]. The world is more interconnected. Global travel, internal

migration; and large-scale population displacement following natural disasters or conflicts has increased tremendously [41]; humans have seemingly ‘tipped the scales in favor of pathogens’ [5]. Ethiopian Airlines alone transported more than 10 million passengers in 2018, 21% more as compared to 2017 [42].

Bearing in mind that rarely has scientific provisions been as challenged as it is now even in the most developed countries, it is advisable to remember that medical scientists in general and tropical medicine specialists in particular ignore history at their peril [35, 39, 43]. So we should, as we struggle to control the current one, do so with preparation for the future in mind and hopefully break ‘the cycle of panic then forget’ since the first recorded pandemic [5, 44].

To date we have more tools at our disposal: better surveillance and diagnostic systems, stronger frameworks and regulations, such as the Global Health Security Agenda and Joint External Evaluations (JEE), and a deeper understanding of how diseases spread and what is needed to stop the spread of the virus [38, 41, 45]. So, what led to the near global chaos in the current pandemic was that, in spite of repeated warnings, the global community was ill prepared including the fact that lifesaving innovations are not reaching those who need them [29, 38, 41]. If the virus continues to spread throughout 2020, it will demonstrate in a very cruel way how well the public health systems of individual countries are functioning. These will be very important lessons in preparation for a future pandemic, which could be even more dangerous [46]. Already, attempts are being made to draw lessons from the various country experiences [47, 48]. Evidently, there is a political/economic dimension to pandemic preparedness. Epidemic preparedness is not beyond any country’s capacity although take proactive action remains a matter of political choice [38]. Uncannily, the COVID-19 pandemic began a few weeks after the end of PREDICT-2, the last-standing United States Agency for International Development (USAID) Emerging Pandemic Threats funding program, which supported a decade of virology, ecology, and epidemiology around the world [40].

As all low-income countries (LIC), Ethiopia is predicted to be heavily impacted by the current pandemic [49]. However, the force and united action garnered to fight the virus to recover from the COVID-19 economic losses and address the plethora of challenges that are impeding progress and sustainable development [50].

A global ‘governance crisis is unfolding’ [18]. While adjustments to the Public Health Emergency of International Concern (PHEIC) declaration process might be warranted [51], the rule, as advised globally, should be to follow World Health Organization’s advice, end secrecy in decision-making and cooperate globally [24, 29, 52].

This should be done while resisting undue biologicalization/biomedical tunnel vision” (Thorp HH, 2020) of the disease or seeing the goal of containing COVID-19 as a purely technocratic or law-and-order problem and developing context-specific, ethical approach to physical distancing [8, 22].

This rapid review was undertaken to articulate ways to support the current efforts to mitigate COVID-19 pandemic, leverage current efforts to strengthen the health system including monitoring and surveillance systems for early detection, management of future such pandemic and leverage current effort to strengthen research and evidence generation.

2. Materials and methods

We employed a rapid review of evidences in the forms of publications and reports on coronaviruses and associated policy and management. Although

numerous evidences are available, some are to date non-conclusive and others were not relevant to the theme in question. The rapid review thus helps to scope fragmented, opinion-based, large scale and sometimes-contradictory resources for easy use.

2.1 Search strategy

We searched through reports as well research outcomes on PubMed, and Google Scholar databases employing the key terms: “COVID-19”, “SARS-CoV-2”, “corona virus”, and “viral infections”, post “COVID-19”. Additional resources from the databases and dashboards on the websites of relevant institutions and guidelines of international organizations such as the World Health Organization (WHO), Center for Disease Control and Prevention (CDC) and the Ethiopian Public Health Institute (EPHI) were include as we saw it fit. The search period went as far back as 2016 to July 15, 2020.

2.2 Inclusion criteria

Considering the broad scope of the theme under discussion, we maintained flexibility in terms of the documents that were eligible. Publications ranging from observational to experimental studies and from grey literatures to editorials and perspectives were included.

2.3 Data extraction and analysis

Data extraction and analysis included bringing together the evidences generated from different sources under current interventions and improving, leveraging the pandemic response to strengthen health systems, research and education. The research team comprising of four senior public health experts reviewed the contents of evidences separately to align them under defined categories.

3. Results and discussion

The findings is presented following specific themes in line with the objectives of the review. As such, articulation of ways to support current effort to contain the pandemic, strengthening the health system including monitoring and surveillance systems for early detection and management of future such pandemic and research interest were the major themes under which the findings are summarized.

3.1 Articulate ways to support current effort

The immediate focus of all concerned should, understandably, be to support the country articulate better ways to move out of the current crisis with as limited damage as possible. Moving out of the current crisis will clearly be a whole-society/ multi-sectoral effort as the pandemic will have major impact on the economic and social determinants of health [2, 49, 53]. Depending on measures taken, various outcomes are possible [54]. Experience show that pandemics hold several surprises and their control will require highly coordinated effort from all, scientists and policy makers in particular. WHO could strengthen the global effort by focusing on providing regularly updated recommendations from independent expert committees on preventive strategies and potential treatments for COVID-19; proposing universal and standardized ways of epidemiological data collection and reporting

from countries. It could seek for ways of accelerating the evaluation, selection, and prequalification of diagnostic tests; consolidate information on COVID-19 vaccine research progress and work upstream with partners to ensure equitable access and affordability of therapeutics and vaccines as they become available. It could facilitate logistical coordination and supply of reagents, personal protective equipment, and potential treatments. Finally, it could support countries with fragile health systems to maintain continuity of routine health care, particularly for chronic diseases, and primary health care [29]. Since we currently have only non-pharmaceutical response measures, the involvement of social and behavioral scientists is critical [55]. Success in the science with strong political and social leadership determine which scenarios unfold, so it is time to focus on what we can all do to help [56].

In the health sector, this implies strengthening the primary health care (PHC) approach i.e. empowering people and communities; developing multisectoral policy and action for health; and strengthening and integrating health services, with good-quality primary care supported by essential public health functions at the core [22]. The aim should be to 'crush the curve' of the pandemic [57].

3.1.1 Improved/adapted mathematical projections/outbreak science to help guide decisions

Mathematical projections/outbreak science has become the driving force behind the pandemic responses with growing calls to follow science including potential lessons from other risk science experiences [23]. However, we should bear in mind that mathematical models are useful exploration of questions are also dangerous way to assert answers. Various teams, primarily comprised of academic modelers, organized by, for example, the World Health Organization, the US Centers for Disease Control and Prevention have been involved [58, 59]. Obviously, research does not get much more policy-relevant since governments across the globe relying on these projections [59]. However, there is yet a lot to be learned about how the virus spreads that the models should be constantly updated with increasing knowledge and information; a formidable task even with the best surveillance systems [60]. Because any single data type is likely to yield under- or over- estimate of the extent and spread of the disease, it is important to consider multiple data types and be cautious in relying on estimates without considering sources of bias [41]. Models (equation-based, agent-based ...) are, at best, simplified representations of reality based on assumptions on the behaviors of the virus (reproductive rate, incubation period, death rate ...), environmental/climate and individuals/societies including demographic composition and mobility [61, 62]. Even the best systems need regular updating and improvement based more on real data derived from epidemiologic investigations rather than assumptions [41, 63, 64]. In short, models should be used with prudence and we should ensure that modelling should not be considered with certainty than the models deserve; and politicians must not be allowed to offload accountability to models of their choosing.

In the Ethiopian context, the situation is compounded by the weak health management information system, diverse population and limited experience at modeling [65]. A recent modeling, for example (**Figure 1**), seems to clearly underestimate deaths by their won assumptions, leaving out possible deaths among those not hospitalized [66]. However, evidences reveal that majority of confirmed cases and deaths are from Addis Ababa.

Countries are expected to develop their own estimates based on demographic and epidemiological characteristics and update them periodically as data/info improves while networking and learning from the various efforts elsewhere. Typically, repeated runs with varying inputs and assumptions are undertaken on

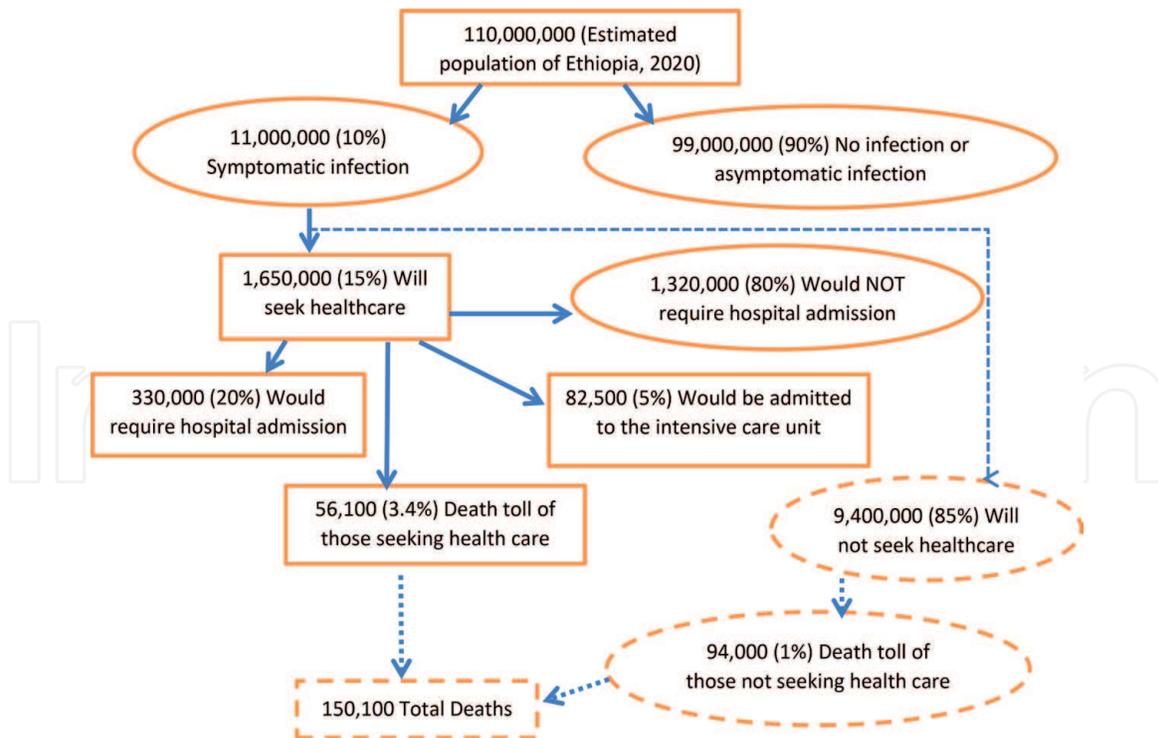


Figure 1. Attempt at Modeling the COVID Pandemic for Ethiopia. (Source: Adapted from [66], --- authors additions)

several modes to avoid too much reliance on one mode [58]. The need, to develop the capacity to generate real-time, reliable, accessible and actionable data to empower leaders to act faster [42].

Based on experiences from the US, we should aim to change the health system by accelerating use of telemedicine; move away from traditional models of employer-based health insurance; move away from nursing homes; address health disparities and the social determinants of health; improve drugs affordability; increase local production of drugs; enhance epidemic preparedness with more task shifting and improved financial management [57].

Organizational structures vary from country to country [58] but, in the Ethiopian context, the Federal Ministry of Health (FMOH), the Ethiopian Public Health Institute (EPHI), Regional Health Bureaus (RHB) etc. are destined to play the major role. It seems advisable to create a multi/interdisciplinary (epidemiologists, clinicians, health managers, social scientists, mathematicians ...) team in 2–3 universities and establish network or even a National Infectious Disease Forecasting Center or revamp EPHI to play this role [42]. The network/center should have a direct link with policy makers, adequate funding and access to data during outbreaks. Models are only as robust as the data used to build them. In many settings, the infrastructure for collecting, collating, and cleaning high-quality data is underdeveloped [58]. The network/center could attempt to create one data bank; the aim being to achieve precision public health which requires robust primary surveillance data, rapid application of sophisticated analytics to track the geographical distribution of disease, and the capacity to act on such information. It could also join the WHO Global Research and Innovation Forum [30, 62]. Its term of reference (TOR) could include other non-epidemic issues see, for example, BARDA, CDC Health Economics and Modeling Unit; The Research and Policy for Infectious Disease Dynamics (RAPIDD) group in the Fogarty International Center at the National Institutes of Health (NIH), The International Initiative on Spatial Life course Epidemiology (ISLE) which could serve as possible contacts. Collaboration

with other (neighboring) African countries should be promoted [42, 62]. It is also important to consolidate training in field epidemiology and outbreak science methodologies [58] and, remember that no public-health research is complete until the key findings are effectively communicated and, ideally, implemented [67].

3.1.2 Improved/adapted methods for communication

The experience to date has, if need be, taught us the importance of timely, honest, credible, empathetic, informative and balanced information as lack of information can become misinformation and lead to untowardly consequences [23, 27, 32]. Even ensuring clear and effective communication with staff and students in higher education systems could prove challenging [68]. Credible sources such as religious or community leaders should be identified and engaged as appropriate. Attention should be paid to 'infodemic', the misinformation type – i.e., conspiracy theories, fake news etc. – in particular, on messenger apps and social media which could harm public health and put millions of lives at risk [55, 69].

The information should be conveyed using local context and vernacular languages and as jargon free as possible, making science accessible [67]. It should avoid language [that] creates a public health discourse that seems reactive rather than proactive, reductive rather than holistic, disempowering rather than empowering [70]. This has proved a slippery ground even under seemingly more auspicious circumstances that leads to increasing erosion of trust in science [71, 72]. There is, therefore, need to be especially careful to communicate transparent information about our capabilities, uncertainties, disagreements or agreements and being trustworthy including on vaccines indicated areas for improvement [73, 74]. A study in a major town, after less than two weeks of the outbreak in Ethiopia shows widespread misconceptions about the pandemic [75]. There have also been calls to make full use of digital technologies but their limitations in deprived areas, where access to the internet is relatively scarce, patients have little digital literacy, and language barriers abound should be factored [9, 76, 77].

3.1.3 Improved methods/technologies for surveillance, identification and containment

Innovations are required in testing, contact tracing, treatments, vaccines, policies for opening up since no single system can capture all parameters of the pandemic, multiple, complementary surveillance systems should be implemented [78].

Testing - for diagnosis and clinical management or for surveillance and outbreak control - is critical but countries such as Ethiopia are facing a daunting task because of limited facilities, testing kits, reagents etc. The case reports are likely to be an underestimate as, by mid-March, Ethiopia has carried out only about 11,000 tests/10 for every 100,000 people compared to, for example, about 280 for South Africa, 2,000 for Australia and 1,560 for the United States [42]. Ethiopia has, thus, a long way to go to reach testing levels recommended by WHO. There are indications that global solidarity has faltered as market restrictions are being imposed by a number of countries [32]. Ethiopia, as for other African countries, should plan for its own quality assurance of diagnostic tests, drugs, and vaccines production, including antibody and nano-technology based testing [79, 80]. These could be along the lines of the Africa CDC initiative of Partnership to Accelerate COVID-19 Testing (PACT) and the Ethiopian Food and Drug Authority (EFDA) Digital Health Activity (DHA) system. It should also explore the potentials of pooled testing in the Ethiopian context [42, 81].

For contact tracing, Ethiopia should bolster its relatively strong community level services by mobilizing health extension workers (HEW), health development army (HDA), model families etc. [65, 82] using tested epidemic models and experiences in other settings [77, 83]. It could enhance this by using digital technology, ‘coronavirus apps’ – with due attention to privacy and other pitfalls [84, 85] not only for contact tracing but also for testing, isolation and physical/social distancing [86]. Overall, control of the pandemic will require action at the individual, community, and population levels as recent data show that asymptomatic cases could play a major role in transmission.

Evidence shows that strict implementation of physical distancing, optimum use of face masks, respirators, and eye protection in public and health-care settings provide, in spite of some contextual challenges, high levels of protection against transmission [26, 87]. A systematic review and meta-analysis [88]. Mobility/lockdown restrictions could have variable results depending on areas – high for retail and recreational areas and transit stations but could be challenged by lockdown fatigue or the practicalities of daily living [89].

The development of safe and effective vaccine, including the potential use of vaccines for other diseases such as BCG and polio, is a priority [12, 14]. In terms of personal protection equipment (PPE) for care providers in particular, treatments – which seem to be a long shot, country specific guideline should be developed as well as strengthen inter-African collaboration policies for opening up etc. [87]. Access pool and to categorize Covid-19 vaccines as ‘global good’ and GAVI’s Covax Advance Market Commitment and other initiatives, the temptation to prioritize producer countries will be high. As often seen, the potential of selfish gain trumping over collective good is high [39].

Vaccine hesitancy has, to date, been low in Ethiopia [90], but measures should be taken to ward off the global trend of vaccine hesitancy and politicization [73, 91]. Measures should also be taken to strengthen the vaccine delivery system as whether new or already in use, is only as effective as the system that provides it.

3.1.4 Optimal use of all the limited available resources

Ethiopia’s health care system, already highly limited, will be extremely strained by the response to the pandemic [65]. As in other LIC, there are already signs that essential services such as immunizations, reproductive health etc. could be sidelined for various reasons with dire consequences [15, 22, 92, 93].

There are also indications that the pandemic could affect pregnancy outcomes and, in general, exacerbate social inequalities in health [94]. Therefore, ensuring access to basic support water, sanitation, and hygiene to most vulnerable ones is important [15, 56, 95–98]. The system should also improve quality of care including improved supply chain, adopt improved technology for delivery of health care for new therapies and roll out vaccines as soon as they become available including mitigating potential hesitancies based on already mounting misinformation [99, 100].

3.1.5 Forging partnerships at all levels

COVID-19 is menacing the whole of humanity and so the whole of humanity must fight back. Individual country responses are not going to be enough [9]. As Bill Gates put it some 3 years ago, ‘What the world needs – and what our safety, if not survival, demands – is a coordinated global approach. Specifically, we need better tools, an early detection system, and a global response system’ [101]. UN agencies at all levels (local, national, continental and international) and across all disciplines and sectors, WHO in particular, should lead in forging partnerships.

All stakeholders in Africa, the AU and CDC Africa in particular, should contribute towards a unified continent-wide anti-COVID-19 Strategy [10].

3.2 Leverage current effort to strengthen the health system including monitoring and surveillance systems

The post-pandemic demands on the health care, because of increases in chronic mental or physical health conditions, are bound to exacerbate the burden on the system – the solution of which may benefit future such challenges [36, 102]. The resources mobilized to control the current pandemic and others could contribute to strengthen the health system in general and in preparation of future pandemics in particular [9, 49]. We should always have in mind the adage that when it comes to fighting infectious diseases, the best offense is a strong defense [103]. Strengthening implies helping the country ‘prepare for pandemics the way the military prepares for war’. This includes simulations and other preparedness exercises so we can better understand how diseases will spread and how to deal with things like quarantine and communications to minimize panic [101]. Various forms of health system for outbreaks preparedness are critical for considerations.

3.2.1 Strong monitoring and surveillance systems for early detection

Strong monitoring and surveillance system implies adequate number of contact tracers, adoption of the one health approach and improved laboratory and technical capacities including digital technology [9, 104]. The country’s laboratory and technical capacities are highly limited even for routine health care provision calling for major effort will be required to ensure universal access [65].

3.2.2 Adequate and accessible health care infrastructure

As mentioned above Ethiopia’s health system is, as for Africa in general, under-resourced and unprepared to withstand the onslaught of pandemics [105]. Investing in strong health systems is our best bet to protect ourselves and stop local outbreaks before they turn into global pandemics [103]. This would mean improving availability, access and quality of services i.e. progress towards UHC which could face challenges in the post pandemic period [106]. Experiences from similar events, developing Community Care Centers (CCC) within Health Posts could be attempted [107]. Besides, remote shared care delivery’ such as shared medical appointments (SMAs) could be adapted to the Ethiopian context [108].

3.2.3 Strong and capable health workforce

A strong and capable health workforce, including sufficient numbers of adequately trained critical-care physicians is required for appropriate response [87]. As compared to most African countries, Ethiopia has major health workforce crisis and, even though dented by recent ‘flooding strategy’, the workforce remains inadequate and of dubious quality.

3.2.4 Adequate financing

The health care system is highly underfunded and heavily dependent on foreign financing [65]. Pandemic preparedness will require dedicated and adequate financing bearing in mind that the amount of financing preparedness is minuscule compared to pandemic costs [109].

3.3 Leverage current effort to strengthen research and evidence generation

‘The challenge for humans is to learn as much about influenza viruses as these viruses have already learned about us.’ Higher education and research institutions should play a major role in this learning process and in helping to shape the post-COVID-19 world [110]. In conjunction with health research institutions, it should make meaningful contribution to this as all countries need to develop strong and sustainable core capacities at the intersection of health systems and research i.e., proactive, empowered and coordinated research committed to fair and equitable access [30]. Hence, there is good reason to support priority research agenda that leads to the development of sustainable global research platforms pre-prepared for the next disease X epidemic. This will allow for accelerated research, innovative solutions and Research and Development of diagnostics, therapeutics and vaccines, as well as the timely and equitable access to these life-saving tools for those at highest risk [38]. Even before the pandemic, universities, ‘sinking ships’?, were facing several challenges. These could be exacerbated by the post-pandemic situation. Thus, as indicated for US public universities, universities must not just adapt but lead with new models to resolve/mitigate current and future challenges and optimally use opportunities [68, 111, 112]. But, to date, in spite of the national commitment to evidence based development, the Ethiopian higher education and research institutions have contributed little and the prospects could be grim if, as projected and in line with historical trends during economic downturns universities come out of the pandemic weakened [90, 113–116]. One way to avert this could be to leverage the national and international/global solidarity that will be galvanized in response to the pandemic to strengthen university labs, develop research universities, forge partnerships and garner sustainable funding. In line with this, it is important to strengthen the labs in the universities and create strong coordination with other labs in the country to enhance tests and participate in sero-epidemiological studies [116, 117].

3.3.1 Develop a number of ‘research universities’

‘Research universities’¹ would serve as resource centers for prioritizing and effective translation of science into both operational and policy action with the objective is to make a difference [38, 118, 119]. In short, paraphrasing what has been indicated in a different context, universities with ‘civic values, openness, and societal relevance’, where financing is [no longer] the leading factor, but one where contributing to the world beyond forms a leitmotif for actions [111]. They would guide policy decision including mathematical projections; developing surveillance, diagnostics, primary health care, and effective health security measures; assessing and promoting the potential role of traditional medicine/control measures and other essential topics [2, 59, 120].

Educators, policy-makers, employers and investors must urgently give thought to what a post-COVID world should look like and what role higher education institutions must play to make that world a reality. In short, they should serve as resource centers to inform policy in general and on how to maintain a cohesive and good-quality learning environment if and when the next pandemic, recession or natural disaster occurs [121].

¹ Only AAU, as member of The African Research Universities Alliance (ARUA), currently approaches this status ranking 16th among African best universities in *Times Higher Education ranking*. For some background material and the debate on the teaching versus research role of the university see NRC 2012, Barron 2015, Shapira 2015, van der Zwaan 2017, Cloete et al. 2020, Kraemer-Mbula et al. 2020.

They will also contribute to strengthening, in particular, the staff of the growing number of (new) higher education institutions thus promoting beneficial interactions with senior peers and mitigating the impact on the quality of an already highly challenged education system [45]. Projections in other settings indicate that the post pandemic period will generally need greater access to higher education and vocational training programs, probably including a more online experience with blended learning [121, 122]. All these will require thought-through solutions ensuring meaningful research impact and ‘reconciling the needs of scientists and society at large.

3.3.2 Forge partnerships

As is the case for health services, ‘research universities’ in particular, should forge partnerships at all levels (local, national, continental and international), and across all disciplines and sectors. There are indications that the pandemic may foster good, even though limited in Africa, relation between the higher education community and governments [68]. In the short term, this could mean tapping into the relatively high reactive research funding [112]. Partnerships could include the Coalition for Epidemic Preparedness Innovations (CEPI), the African Research Universities Alliance (ARUA), the African CDC, the Guild of European Research-Intensive Universities (the Guild), Diaspora scientists etc. This implies applying ‘the all-of-government and all-of-society approaches’ recommended by WHO [7, 123, 124]. The potential of S-N-S/South–North–South triangulation should be explored [125]. The establishment of a scientific coordinating committee incorporating health/medicine, social sciences, mathematics/technology, One Health/human-animal-environment interface [38] etc. with focus on the multi-inter and trans-disciplinary, applied and context/country specific health policy and systems research (HPSR) for which Ethiopia is among leaders in LIC should also be explored [126].

3.3.3 Ensure sustainable financing

‘Innovation does not happen by chance. It has to be nurtured and funded’ [127]. Efforts to raise research grants from various sources are left to individual staff members instead of the institutions as a whole. Sustainable success will only be achieved if these efforts are supplemented and scaled up by the state and industry and are duly documented and synergized.

4. Conclusion

The unique feature of the current pandemic is its unprecedented global coverage as compared to several other flu-like outbreaks. Although case fatality is still incomparable to the Spanish flu of 1918, this pandemic could yet to cost human life and jeopardize global economies as well as impact the social and political landscape of individual countries. Although the pandemic has posed so much challenge, it could also offer opportunities to reassess the health system and improve on how it could readily respond to such pandemics, improve research and education in health sciences to develop competencies and evidences to respond to outbreaks of different size. While countries are to align their effort to contain the pandemic, commensurate measure should be taken to prevent and manage potential similar pandemics in the future. Globally, COVID-19 offered an opportunity for human beings across the world to recognize such outbreaks do not discriminate by geography, economy, political system and socio-cultural backgrounds. As such, human beings across

the world are expected to see for mechanisms to strengthen global solidarity, align efforts to contain post COVID-19 implications as well as to prevent and manage similar pandemics in the future. Such lessons are particularly outstanding for Africa and Ethiopia where the health system is not as strong and prepared to such unexpected pandemic. African leaders may have drawn as much lesson to better articulate plans on how to respond to emerging pandemics, review its health system to preposition for such pandemic and improved mechanisms put in place to generate evidence use for planning to respond.

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Author details

Yayehyirad Kitaw¹ and Mirgissa Kaba^{2*}

1 Senior Public Health Consultant, Addis Ababa, Ethiopia

2 Department of Preventive Medicine, School of Public Health, Addis Ababa University, Ethiopia

*Address all correspondence to: mirgissa.kaba@aau.edu.et

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