COMMENTARY

Application of the socio-ecological model in the efforts to end COVID-19 in Sub-Saharan Africa: The challenges and success stories

Elvis E. Tarkang[1,2,3]*, Hubert Amu[1]

1. Department of Population and Behavioural Sciences, School of Public Health, University of Health and Allied Science, Ghana
2. HIV/AIDS Prevention Research Network Cameroon
3. School of Nursing and Public Health, University of KwaZulu-Natal, Durban, South Africa

***Corresponding Author: Elvis E. Tarkang**; E-mail: ebeyang1@yahoo.com

Abstract

The Novel Coronavirus (COVID-19) was detected in December 2019 in the Hubei Province of China. Also known as 2019-nCoV, the outbreak was declared a pandemic by the World Health Organization (WHO) in March 2020. The WHO thus proposed country and technical guidelines in responding to the COVID-19 pandemic. This paper reviewed the preparedness of sub-Saharan African (SSA) countries in ending the pandemic through the adoption of the WHO guidelines. The Socio-Ecological Model was adopted as a conceptual framework in conducting our analysis. We realized that while striving to implement the WHO guidelines, a plethora of microsystem, mesosystem, exosystem, macrosystem, and chronosystem factors make it difficult for SSA countries to achieve the desired results aimed at halting the spread of the virus. SSA countries may, therefore, not be able to end the COVID-19 pandemic soon. We recommend various interventions including short- and long-term loan facilities from donor agencies, decentralization of COVID-19 testing to sub-national levels, and increased community engagement to improve risk communication and adherence to public health measures to end the spread of COVID-19 in SSA.

Keywords: Sub-Saharan Africa; COVID-19; The Novel Coronavirus; Socio-Ecological Model; World Health Organization (WHO)

Background

On December 31, 2019, there was an outbreak of a respiratory illness in Wuhan, Hubei Province, China[1]. By January 7, 2020, the illness was identified as a Novel Coronavirus (2019-nCoV) and on 11 February 2020, the World Health Organization (WHO) officially named it as COVID-19. Coronaviruses constitute a huge family of viruses that cause upper-respiratory tract infections. There are hundreds of coronaviruses, with the majority occurring among animals including cats, bats, pigs, and camels[2]. They sometimes, however, occur among persons—called a spillover event—and can cause disease. Three of the coronaviruses cause serious morbidity and mortality[2]. One of them is the novel coronavirus (SARS-CoV-2), which causes COVID-192. COVID-19 was declared a global pandemic by WHO on March 11, 2020[3]. As of May 09 2020, 215 countries, areas, or territories[4], out of the 241 recognised by the WHO[5], had recorded cases as the virus. A total of 3,855,812 confirmed cases and 265,862 deaths were recorded. In SSA, 39,248 cases were recorded with 1,311 deaths[4].

This paper is underpinned by the socio-ecological model (SEM) as the conceptual framework. The SEM was propounded by Urie Bronfenbrenner in the1970s[6] and formalised as a theory in the 1980s[7]. The model entails nested circles that put the individual most affected by a health problem (COVID-19) in the centre surrounded by various systems or levels of influence: the micro, meso, exo, macro, and chronosystems[8]. The model also posits that a health problem (COVID-19) is affected by the interactions between the characteristics of the individual, the community, and the environment, which entails the political, social, and physical components[8] (See Figure 1). It is thus relevant in explaining the COVID-19 situation in SSA and the factors which might make it difficult for the sub-region to end the pandemic soon. The WHO's country and technical guidance on COVID-19[9] are also adopted in discussing SSA's preparedness in ending the pandemic vis-à-vis the SEM.

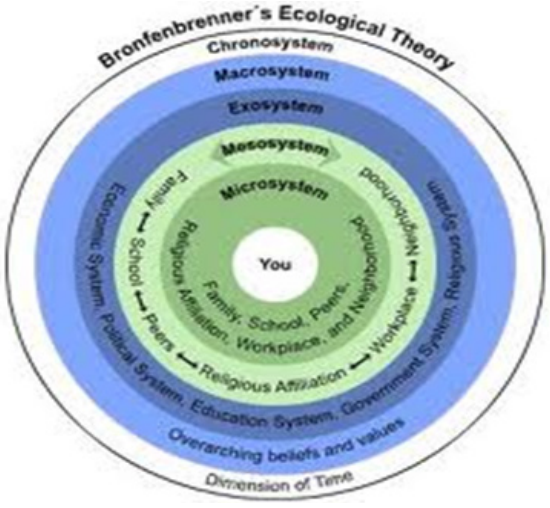

Figure 1: Socio-Ecological Model

Source: Bronfenbrenner[6]

Challenges associated with ending COVID-19 in SSA

Micro and Meso systems factors

The microsystem of the SEM involves the relationships and

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interactions of individuals affected by COVID-19 with their immediate surroundings such as family and close friends, while the mesosystem goes further to comprise people that the individuals have direct contact with, for instance at school, work, neighbourhood, and church[8]. These two systems directly influence the individual most affected by COVID-19[7]. The micro and meso systems factors of the SEM relate to the public health guidelines of the WHO[10], which are mainly public health measures. The WHO contends that public health interventions constitute important mechanisms in reducing transmission, and preventing the spread of COVID-19. Specific guidelines recommended include hand hygiene, wearing of masks, traveller's health advice, self-isolation and treatment of ill individuals, environmental cleaning, and avoidance of crowded areas[10].

Concerning respiratory etiquette, it is recommended that individuals cover their mouth when coughing or sneezing to avoid infecting others, provided they are positive of COVID-19. For hand hygiene, individuals and their close networks are to wash their hands under running water with soap frequently and use alcohol-based hand sanitisers[10]. The key challenge of hand hygiene in SSA countries is that people are unable to afford hand sanitisers[11]. This comes at the backdrop that there have been price hikes in the cost of hand sanitisers in the wake of the COVID-19 outbreak[11,12]. The vast majority are just not used to the practice of regular hand washing, especially, as most of the communities in SSA countries lack a constant supply of running water[13]. The issue of price hikes also applies to the inaccessibility and use of face masks, making it difficult for the populace to purchase and use them[14,15].

Exosystem factors

The exosystem according to the SEM entails social networks and community level contexts, which exert both positive and negative interactive forces on the individual affected by COVID-19[8]. This relates to case management and health services guidelines of the WHO[10]. Health facilities are expected to prepare for substantial upsurges in COVID-19 cases while continuing the provision of routine essential health services. Triage systems are then needed to decrease the risk of exposing other patients or health professionals to COVID-19. The health facilities are also to prioritise treatment for high-risk patients and to manage demands on supplies, staff, and facilities[10]. Of high priority is the need to set up surge triage, screening areas, treatment and critical care units (including staffing and supplies like oxygen) at health facilities.

Logistical and human resource challenges endemic in the health systems of SSA countries[16], however, pose threats to the ability of health facilities in these countries to adequately respond to the pandemic. Due to the fiscal challenges faced by SSA countries, hospitals generally lack PPE such as hand gloves, face masks and shields, goggles, aprons, and gowns needed to effectively handle COVID-19 cases[17]. There have thus been complaints by the health professionals and hospitals across the sub-region regarding their lack of preparedness in this regard[16]. Contact tracing of infected persons, which is mainly carried out by health workers[18,19] is, therefore, likely to be fraught with challenges as the personnel tracing such contacts are exposed to the risk of contracting the virus. The overarching implication is that people who test positive for the virus may be left in the communities to infect others and only captured as positive cases when they show symptoms of the virus at which point, they would have infected several other people.

As the number of COVID-19 cases keeps increasing in SSA[20], the possibility of people needing hospitalization and those needing ventilators would also keep increasing. The challenge with this, however, is that most hospitals in SSA countries have already been known to have huge infrastructural deficits such as bed capacity, oxygen, and ventilators, juxtaposed with the huge populations they serve[21-24]. The implication is that hospitals may not be able to treat the number of cases needing emergency care such as oxygen and ventilators. As such, the death toll would increase while the case count also soars as countries such as Cape Verde (2.6 days), Sierra Leone (3.1 days), United Republic of Tanzania (4.1 days), Burundi (6.2 days), Mali (6.8 days), Eswatini (7.3 days), Gabon (7.3 days), Guinea (7.7 days), Ghana (8.1 days), Sao Tome and Principe (8.7 days), Liberia (9.0 days), Botswana (9.2 days), and Equatorial Guinea (9.7 days) have a COVID-19 doubling time of fewer than 10 days[25].

Risk communication and community engagement guidelines by the WHO10, also constitute important guidelines at the exosystem level of the COVID-19 response. The guidelines require the use of consistent strategies to communicate with local governments, non-Governmental Organisations (NGOs), public health, media, and community-based networks regarding the prevention and control of COVID-19. The guidelines also encourage the promotion of culturally empathetic and appropriate community engagement strategies to detect and rapidly respond to public perceptions and counter misinformation[10]. The fact that these have not been implemented effectively in SSA countries has led to increasing situations of stigma and discrimination of people who test positive for COVID-19[26]. The possible implication of the increased stigma and discrimination is that people showing symptoms of the virus would not go to the hospital or call the COVID-19 response teams to take the test early to avoid the further spread of the virus to others. This is probably largely due to the inadequate community engagement and sensitization in SSA on the disease to create adequate awareness on the need for social support for those infected[27]. Thus, even though most SSA countries have deployed various avenues of educating the public on the COVID-19 pandemic, the interventions have been woefully inadequate in reaching the vast majority of the populace. Community leaders/stakeholders have for instance not been actively engaged to ensure they also constitute the COVID-19 response teams[28]. Community/lateral spread of COVID-19 is, therefore, likely to keep increasing unless such stakeholders are effectively engaged to reach out to their subjects on the control and prevention measures.

Macro and Chrono systems factors

The strategic preparedness and response plan for COVID-19 seeks to slow and stop the transmission, prevent outbreaks and delay the spread[10]. It also aims at providing optimised care for all patients, especially the seriously ill, while minimising the effects of the pandemic on health systems, social services, and national economies. At the macro and chrono system levels of the SEM[7] which relate to the socio-cultural and the national policy levels of influence of COVID-19 response in SSA, WHO policy guidelines recommend national coordination as key in the fight against the pandemic[10]. With this, there is expected to be enhanced whole-of-society coordination mechanisms to

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support preparedness and response, including the security, transport, health, trade, finance, and other sectors. Public health emergency operations centres and other emergency response systems are also to be enhanced early.

SSA countries, however, have funding/fiscal challenges, which pose serious threats to their COVID-19 preparedness and response capabilities. This is because, even before the COVID-19 pandemic, about 40% of SSA countries were at risk of slipping into major debt crises; the number of countries in debt distress or at high risk of doing so doubled from eight in 2013 to 18 in 2018[29]. As debt levels increased, so did the burden of servicing them. Funds, which could otherwise be invested in the society goes to repaying loans[29]. With these fiscal challenges, it becomes economically challenging for SSA countries to adequately respond to the COVID-19 pandemic.

Transport arrangements, which aid the COVID-19 response as stipulated by the WHO, entail social distancing in vehicles where the original number of passengers carried in vehicles are reduced to ensure that the possibility of transmission is also reduced[10]. The challenge with this in SSA, however, is that operators of public transport, which is the main means of transportation in these countries, already complain of high vehicle operating costs (such as repairs, spare parts and fuel) juxtaposed with the low fares charged to passengers[30]. Without national policies, which ensure fuel prices are reduced and or transportation fares increased, adherence to this guideline becomes difficult and thus defeats efforts to control the spread of the pandemic. It is, however, worth noting that political dynamics at the national level would not make it expedient to increase transportation fares in a time when lots of people have lost their jobs and many businesses are crumbling because of the COVID-19 pandemic and thus affecting the general income levels[31], in a sub-region mainly dominated by the non-formal sector workers[32]. Moreover, some countries have abolished public transport altogether as part to the measures to control the spread of COVID-19.

The WHO's policy guidelines regarding laboratory testing for COVID-19 posit that good laboratory practices are instrumental in ensuring that laboratory testing supports the public health COVID-19 response[33]. The effective and efficient response is, however, threatened when demands for testing exceed capacity. This includes the situation where there is a backlog for testing and it is not possible to achieve a turn-around time of within 24–48 hours, or where critical staff become infected and are unable to perform their duties (when being in quarantine). In SSA, most countries do not have the testing capacity due to financial and logistical constraints[34] and are thus not able to efficiently carry out the WHO recommendation of Test, Treat, and Track (T3)[35], which has been adopted for COVID-19 response.

Due to the limited number of laboratories testing samples for COVID-19, it takes about 3-5 days to receive the results of suspected cases. By that time, those that test positive would have infected more people as community transmission has increased tremendously in the sub-region[36]. The WHO thus recommends that countries should plan for surge capacity by establishing decentralized testing capacities in sub-national laboratories under the supervision of the COVID-19 national reference laboratories[33]. Most countries in SSA, however, do not have such plans in place and this has dire negative consequences for the control of the pandemic in the sub-region. While countries such as Cameroon, Ghana, Kenya, Nigeria, and South Africa have expanded national testing to multiple labs, there is still a huge gap left in terms of the number of samples needing testing[37-39]. There have also been rising rates of corruption in Africa, where, for instance, many countries have already reported theft of covid 19 funds at the expense of health workers/covid 19 patients' safety[40].

To control the spread of COVID-19, most countries across the globe have imposed various restrictions, including lockdowns and closure of international borders[41]. The WHO recommends that in principle and when practicable, such measures could be relieved in a slow, controlled, and step-wise manner[42]. Such decisions according to the WHO should be based on the incidence of confirmed and probable COVID-19 cases, rate of hospitalisations and Intensive Care Unit (ICU) admissions, the proportion of positive cases among the people tested, number of deaths, results of serological testing, and stocks of personal protective equipment (PPE)[42]. While not meeting these guidelines, some SSA countries have relieved some of their measures, which include releasing total to partial and from partial to no lockdown situations[41]. The challenge is a possible upsurge in cases in such countries, which then defeats efforts to end the pandemic[44].

Success stories

Despite the myriad of challenges that inhibit SSA's efforts at ending COVID-19, there have been some success stories worth mentioning. In Senegal, the Institut Pasteur has developed a $1 COVID-19 testing kit[45]. The country has also spearheaded the production of 3D-printed ventilators. Senegal thus, has the third-highest COVID-19 recovery rates globally[45]. In Ghana, a rapid diagnostic test kit has been developed by scientists at the Kwame Nkrumah University of Science and Technology (KNUST) and Incas Diagnostics[46]. The test kit is currently being optimised for Covid-19 testing to propel the country's efforts at controlling COVID-19[46]. To address overcrowding in many African cities which is a challenge to the public health response, many African countries had set up quarantine centres and makeshift hospitals to cater for that. To address the challenges regarding access to hand sanitisers and nose masks, some countries like Cameroon, Ghana, Kenya, Gabon and South Africa have implemented public-private partnerships and community-based initiatives to boost the production of sanitisers and cloth face masks[47,48]. Some of the successes have even led to speculations of why many African countries have not yet experienced a second wave of COVID-19.

Limitations

A major limitation to our commentary is that it is based on our expert postulations of the state of COVID-19 management in SSA informed by available literature and may not reflect exactly the full extent of the current COVID-19 situation in the various SSA countries. Also, some countries might have implemented interventions towards addressing the COVID-19 pandemic, but which we are not aware of and are, therefore, not captured in our commentary.

Conclusion and recommendations

The WHO has issued very useful guidelines to help control and eventually end the spread of COVID-19 globally. While striving to achieve these guidelines, a plethora of microsystem, mesosystem, exosystem, macrosystem, and chronosystem factors make it difficult for SSA countries

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to implement them. SSA may not be able to eradicate the COVID-19 pandemic if the myriad of challenges persists.

To reduce the microsystem, mesosystem, exosystem, macrosystem, and chronosystem bottlenecks and accelerate progress towards ending COVID-19 in SSA, the following recommendations have been proffered:

1. Countries should decentralize the testing of COVID-19 cases to sub-national levels to ensure the turn-around time is within 24 hours.

2. All countries should introduce mass testing into their populace to increase the detection and treatment rate.

3. As much as possible, more health facilities should be established to accommodate the surge in cases. Alternatively, the capacity of existing health facilities should be improved through the provision of more beds, oxygen, ventilators, and PPEs.

4. There should be increased community engagement to improve risk communication and adherence to public health measures, as well as reduce stigma.

5. Public education efforts should be improved to reiterate the need for social distancing and wearing of face masks.

6. Producers of nose masks and hand sanitisers should be entreated and or regulated to reduce the prices of these items.

Contribution of Authors

EET conceived and designed the study; HA did the literature search and wrote the first draft of the manuscript; EET critically reviewed the manuscript; both authors approved the final manuscript.

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