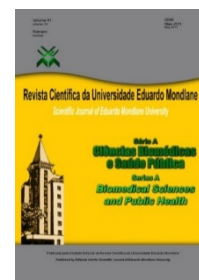


Pre-print



THE AFRICAN MIRACLE: why COVID-19 seems to spread slowly in Sub-Saharan Africa

Edgar Manuel Cambaza

Universidade Eduardo Mondlane (UEM), Faculdade de Ciências, Departamento de Ciências Biológicas, Moçambique

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Artigo de revisão

THE AFRICAN MIRACLE: why COVID-19 seems to spread slowly in Sub-Saharan Africa

Edgar Manuel Cambaza

Universidade Eduardo Mondlane (UEM), Faculdade de Ciências, Departamento de Ciências Biológicas, Moçambique

ABSTRACT: Sub-Saharan Africa has high prevalence of several infectious diseases when compared to other areas, mostly due to deficient healthcare systems, poverty and low education levels, and the tropical setting, facilitating zoonosis and dissemination of pathogens. However, “miraculously”, COVID-19 is not affecting the area as much as expected in terms of both incidence and severity. What is happening? This paper aims to present and discuss plausible explanations for the “African miracle”. COVID-19 is not spreading quickly in Sub-Saharan Africa perhaps due to a combination of the following factors: (1) late entry, after the World Health Organization (WHO) published several guidelines, including the Strategic Preparedness and Response Plan, (2) relatively low rate of migration, especially international, (3) low population density, with most people in rural areas, (4) experience in management of deadly infectious diseases, (5) well-coordinated response, according to WHO guidelines, (6) predominance of younger populations, (7) cross immunity due to high prevalence of other infectious diseases and related countrywide vaccination programs, and (8) high temperature and humidity, associated with low prevalence of COVID-19. It is an oversimplification to assume that COVID-19 would affect Sub-Saharan Africa severely simply as a function of the vulnerable healthcare systems or poverty.

Keywords: COVID-19; SARS-CoV-2, Sub-Saharan Africa.

O MILAGRE AFRICANO: por que COVID-19 parece se disseminar lentamente na África Subsaariana

RESUMO: A África Subsaariana tem alta prevalência de várias doenças infecciosas quando comparada com outras áreas, sobretudo por causa dos seus sistemas de saúde deficientes, pobreza e baixos níveis académicos, e o ambiente tropical que facilita a zoonose e disseminação de patógenos. Contudo, “miraculosamente”, COVID-19 não está a afectar a área tanto quanto se esperava em termos de incidência e severidade. O que está a acontecer? Este artigo pretende apresentar e discutir explicações plausíveis para o “milagre africano”. Talvez a doença não se esteja disseminar rapidamente na África Subsaariana como resultado dos seguintes factores: (1) chegada tardia, depois da publicação de várias directrizes da Organização Mundial da Saúde (OMS), incluindo o Plano Estratégico para Preparação e Resposta, (2) baixa taxa relativa de migração, especialmente internacional, (3) baixa densidade populacional, com a maioria da população em áreas rurais, (4) experiência na gestão de doenças infecciosas mortais, (5) resposta bem coordenada, de acordo com as directrizes da OMS, (6) predominância de populações mais jovens, (7) imunidade cruzada resultante da alta prevalência de outras doenças infecciosas e programas nacionais de vacinação, e (8) altas temperaturas e humidade, associadas à baixa prevalência de COVID-19. É prematuro assumir-se que COVID-19 afectará severamente a África Subsaariana simplesmente como função dos sistemas de saúde precários ou da pobreza.

Palavras-chave: COVID-19; SARS-CoV-2, África Subsaariana.

Correspondência para: (correspondence to:) ecambaza@iscsd.ac.mz

INTRODUCTION

Since COVID-19 started spreading outside China, there was a recurrent concern on its potential impact through the so-called weaker health systems (HOUSSIN *et al.*, 2020), particularly in Sub-Saharan Africa. Melinda Gates manifested on CNN Business serious doubt about Africa's ability to respond to COVID-19 based on her observation of precarious hygiene practices in the continent (GATES, 2020). Tedros Ghebreyesus manifested similar concerns during press conferences of the World Health Organization (WHO) (HOUSSIN *et al.*, 2020). However, the disease somehow seems more frequent in the developed world (WHO, 2020c). Considering the rate at which COVID-19 spreads through the developed world, it would be reasonable to assume an even higher rate in areas with limited means to prevent or control the disease, but Sub-Saharan Africa is defying such trend. Some people believe African countries are underreporting cases, and perhaps there was initially some truth in such allegations, considering that the first test kits arrived to African laboratories no sooner than 6 February 2020 (when there were 28,276 confirmed cases globally) (WHO, 2020d). Yet, even if that were true, how to explain the considerably low records of cases of severe pneumonia in hospitals or even obits from such cause?

There is a considerable body of literature discussing on how COVID-19 might impact African countries, most stressing the intuitive belief that COVID-19 would present dissemination and death rates comparable or above the ones observed in developed countries (RENZAHO, 2020; WADOUM and CLARKE, 2020). Renzaho (2020) believed the only hope in Sub-Saharan Africa laid on strengthening the borders and addressing poverty-related issues, clearly underestimating the healthcare systems and the entire experience acquired by dealing with other as deadly infectious diseases. Some countries of WHO African Region do present high numbers of confirmed cases (by 9 May 2020), for instance, South Africa (8,895), Algeria (5,369), Ghana (4,012), Nigeria (3,912) and Cameroon (2,265), but these countries and other from the region combined so far presented 1.05% of the confirmed cases and 0.498% of the deaths globally. For most, it seems to be a miracle or some divine intervention protecting the African continent, but it is worth considering a few other reasons why COVID-19 is not yet hitting Africa as much as elsewhere.

The current paper aims to present some plausible causes why the frequency and severity of COVID-19 have been low through Sub-Saharan Africa by the mid-May 2020. First, it will summarize the current situation in the continent, and then present the potential features affecting the dynamics of transmission and severity of the pandemic in Africa.

COVID-19 IN SUB-SAHARAN AFRICA

The first confirmed case of COVID-19 in Africa occurred in Cairo, Egypt, 14 February 2020. Nigeria registered the first confirmed case in Sub-Saharan Africa, on 28 February 2020. According to WHO Regional Office for Africa (2020a), by 11 May 2020 COVID-19 has been detected in 53 African countries, with 63,015 cumulative cases, 2,283 deaths, being South Africa the most affected country, with 10,015 cases (Figure 1). Particularly in WHO Africa Region, there were 43,047 cumulative cases. The cases have been increasing since the disease entered the continent.

Because of my first-hand experience, Mozambique will be the source of most examples. Mozambique is a Southeastern African country surrounded by Tanzania (north), Malawi (northwest), Zambia and Zimbabwe (west), South Africa and Eswatini (southwest) and the Indian Ocean (east). The area is 801,590 km², the population is approximately 29,496,004 (2018 estimate), and the GDP per capita is US \$493. The area is tropical humid, with high prevalence of infectious diseases, including HIV (around 11.5%). The Ministry of Health reported the first case

on 22 March 2020 (NYUSI, 2020). By 9 May 2020, Mozambique had 82 confirmed cases, most from local transmission.

POTENTIAL BARRIERS FOR COVID-19 PROPAGATION AND SEVERITY IN SUB-SAHARAN AFRICA

It is important to know that Sub-Saharan Africa is not a “monolith” socio-politically and environmentally. For instance, the East Coast has plenty of Asian influence while the West Coast is more westernized, religious practices, traditions, constitutions and economical features are diverse. For the sake of consistency, the potential barriers for COVID-19 mentioned in this paper are common in most, if not all, Sub-Saharan African countries, and the subject will be open for discussion.

Late entry, migration and population density

The first confirmed case of COVID-19 in Sub-Saharan Africa, on 28 February 2020, occurred almost one month after WHO declared the Public Health Emergency of International Concern (PHEIC) (30 January 2020), (World Health Organization 2020b). By 3 February 2020, WHO had already published the Strategic Preparedness and Response Plan for COVID-19 (World Health Organization 2020a) and several other guidelines to prevent or manage cases. These facts, plus the access to information on experiences from other countries, allowed Sub-Saharan African countries to timely adopt effective strategies to minimize the impact of COVID-19 on their populations.

Most would agree that COVID-19 quickly spread through the world because of the intense commercial migrations between China and the rest of the world, and it is clear that African countries are not comparable to the US or European countries as China's trading partners (CHIU and REN, 2019). Thus, developed countries have potentially imported a higher number of people positive for SARS-CoV-2. Furthermore, Sub-Saharan African countries have less developed infrastructure for transportation and it means a level of migration, both locally and internationally, not comparable to what is observed in the developed world. Therefore, the less intense movement of people implies less encounters in which COVID-19 can be transmitted. Furthermore, enclosed spaces such as buses and trains might increase the risk of mass transmission.

Another major feature in Sub-Saharan African countries is the populations' low density. Though there are a few large cities, most are not as big as the counterparts in the developed world, and most people still live in rural areas. A less dense population suggests a lower propensity for transmission, or R_0 . Judging by this fact alone, it does not seem surprising at all that densely inhabited areas of the United States or European Union have large numbers of people with COVID-19, considering its transmission through droplets.

Experience, response and coordination

Sub-Saharan African countries are well-known for having high prevalence of infectious diseases if compared to other areas in the world, including the highly contagious deadly respiratory disease tuberculosis. Local authorities, particularly the health-related, have wide experience dealing with outbreaks of infectious diseases. Thus, one can regard COVID-19 as mostly an amplifier for the non-stopping struggle against a wide range of communicable illnesses, adding to a fear of infection and death already present everyday throughout the Sub-Saharan African communities.

In the case of Mozambique, the government is notably involved in the response at several levels. The President declared live on TV the National State of Emergency, the Parliament ratified the decision, and the Ministries started implemented the preventive measures for COVID-19, all within a few days. The mass media presents daily the progress of the investigations and the country's situation. Even before there were confirmed cases, schools from the primary to tertiary

levels interrupted classes, and the government forbidden sports, religious and entertainment gatherings. Currently, the country adopted level 3 of response (WHO, 2020a), allowing the circulation of people, yet imposing masks in public spaces among other measures.

So far, there is no specific treatment for COVID-19 but plenty can and is being done to control its symptoms (CASCELLA *et al.*, 2020). From this perspective, the immune system itself is eliminating SARS-CoV-2 from the body. Healthcare systems all over the world have in-built capacity to deal with fever, cough, sneezing and even pneumonia, and Sub-Saharan African countries are not an exception, particularly when they result from infectious diseases. Several people with difficult access to the healthcare system have at least contact with traditional healers, and there is little doubt about their experience with the symptoms associated with mild cases of COVID-19 (AUDET *et al.*, 2016; AYUB *et al.*, 2018).

Why is the scientific community “silent” about Covid-Organics, or CVO? Recently the Malagasy Institute of Applied Research (IMRA), in Madagascar, developed an herbal tea allegedly effective against COVID-19 (AL JAZEERA MEDIA NETWORK, 2020; BBC, 2020). The President, Andry Rajoelina, and local celebrities such as the singer Tence Mena, endorsed the medicine. According to Nordling (2020) there is some controversy, as some members of the Academy of Medicine suggest that CVO should be further tested. According to news sources such as BBC and Al Jazeera (AL JAZEERA MEDIA NETWORK, 2020; BBC, 2020), WHO and the Centre for Disease Control and Prevention (CDC) of the United States received the information with backlash, urging people not to use the herbal cure. This news are dubious, because WHO Regional Office for Africa (2020b) encouraged African countries to study and use local medicines such as CVO. Furthermore, the ONG La Maison de l'Artémisia *et al.* (2020) presented evidence that *Artemisia annua*, the source of CVO's active compound, has potential to cure COVID-19, and published a call for projects to develop *A. annua* based medicines. Thus, CVO is research-based. Perhaps CVO requires further studies, but why is it receiving much negative attention from the media and discredit from the scientific community when drugs such as hydroxychloroquine (GAUTRET *et al.*, 2020) and BCG (CURTIS, *et al.* 2020) at least received the benefit of the doubt? One could argue that hydroxychloroquine and BCG are already known medicines for other diseases, but so is artemisine (the active component of CVO) for malaria, and the Max-Planck Institute is brazenly following the steps of IMRA (SEEBERGER and SCHULZE, 2020) to later claim the discovery and related accolades. Indeed, Youyou received the Nobel Prize of Medicine in 2015 for demonstrating the efficacy of artemisine against malaria.

One important feature of most Sub-Saharan Africa is the rarity of expert organizations with influence or capacity of response to outbreaks of infectious diseases comparable to WHO's. Countries with very “strong” healthcare systems or highly influential organizations, such as CDC in the United States, had the tendency to develop their own guidelines or protocols to deal with COVID-19 pandemic, with less influence of WHO. Sub-Saharan African countries are following WHO guidelines strictly, though each adapting to its own context, and according to its resources. This fact is certainly contributing to a much well-coordinated effort to control COVID-19.

Health and environmental features

COVID-19 tends to be more severe in people with underlying conditions such as cardiovascular disease or diabetes (LI and XIA 2020; RUAN *et al.* 2020). The disease was early found to be associated with aging, certainly because of the underlying illnesses (LEE *et al.* 2020; REMUZZI and REMUZZI, 2020). From this logic, Sub-Saharan African population might not be affected as much as the others due to a relatively higher predominance of younger people (Figure 2).

Another feature worth considering is non-specific immunity, acquired through exposition to other pathogens than SARS-CoV-2. It is common knowledge in Mozambique that the average citizen expects to be exposed to pathogens related to measles, tetanus and other infectious diseases at least once in his or her lifetime. For this reason, the National Immunisation Program

(2014) offers a range of vaccines such as tetanus (TT) vaccine for pregnant women, and for the children it offers BCG for tuberculosis, OPV for poliomyelitis, vaccine for measles, pentavalent DPT-HepB-Hib for diphtheria, pertussis, tetanus hepatitis B and *Haemophilus influenzae* type B, and Pneumococcal Conjugate Vaccine (PCV). Such “cocktail” of vaccines might be promoting some cross-immunity against SARS-CoV-2. For instance, scientists are considering that BCG immunized individuals are resisting COVID-19 (REDELMAN-SIDI, 2020), at least in terms of severity and case fatality rate.

Regarding environmental factors affecting the propagation of COVID-19, temperature and humidity has perhaps been the most widely mentioned through the literature, and there is strong evidence of their association (MA *et al.*, 2020; WANG *et al.*, 2020). Virtually the entire Sub-Saharan Africa is located in the tropical area, and there is no doubt that COVID-19, so far, had its biggest impact in temperate and cold areas. Even within Sub-Saharan Africa, South Africa is the country with the highest number of confirmed cases and it is the coldest area, almost entirely below the Tropic of Capricorn, with some parts with snow-producing winters. Just like influenza, COVID-19 seems to be a “winter disease”, propagated when people have to spend most time indoors. This is indeed one explanation why it is a nosocomial disease (LU *et al.*, 2020).

CONCLUSION

In several ways, people have been underestimating the potential of Africa to endure COVID-19 pandemic, even Africans themselves. This must be due to bias, panic and misinformation, overshadowing simple explanations within the realm of reason or even common sense. It is an oversimplification to assume that COVID-19 would affect Sub-Saharan Africa severely as a function of the vulnerable healthcare systems or poverty. The low incidence of COVID-19 in Sub-Saharan Africa is not a miracle. Miracle is in the eyes of those failing to use in the African context the same analytical tools applied to study the dynamics of COVID-19 propagation and severity elsewhere, at least using the same variables, without any pre-assumption of the continent’s incapacity to manage a worldwide pandemic. In truth, Sub-Saharan African countries have been managing all along diseases such as HIV/AIDS, tuberculosis, malaria, cholera and many other infectious diseases. It is perfectly reasonable to fear the worst scenario in Sub-Saharan Africa, but it is no longer realistic to regard African leaders and the population in general as passive observers of approaching public health, particularly with the current level of awareness of how deadly and transmissible COVID-19 is.

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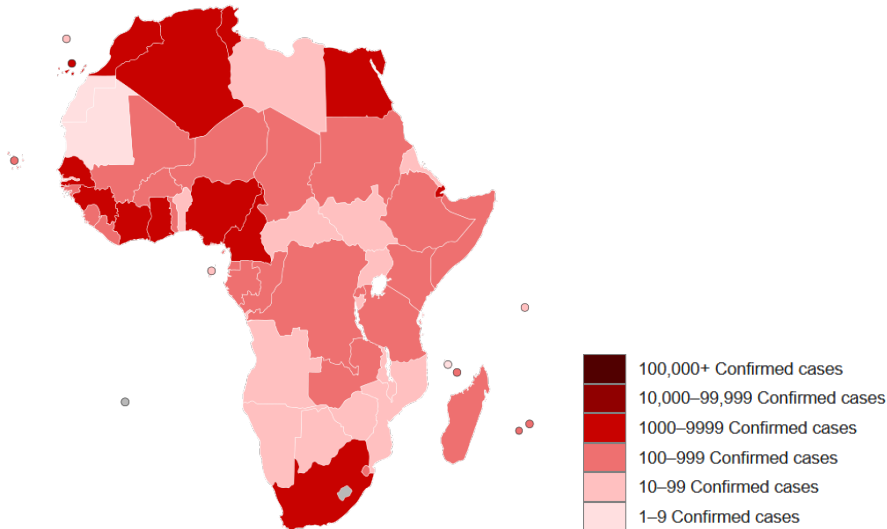


FIGURE 1: Map of the COVID-19 outbreak as of 4 May 2020 in Africa. Source: Canuckguy *et al.* (2020), under the Creative Commons Attribution-Share Alike 4.0 International license.

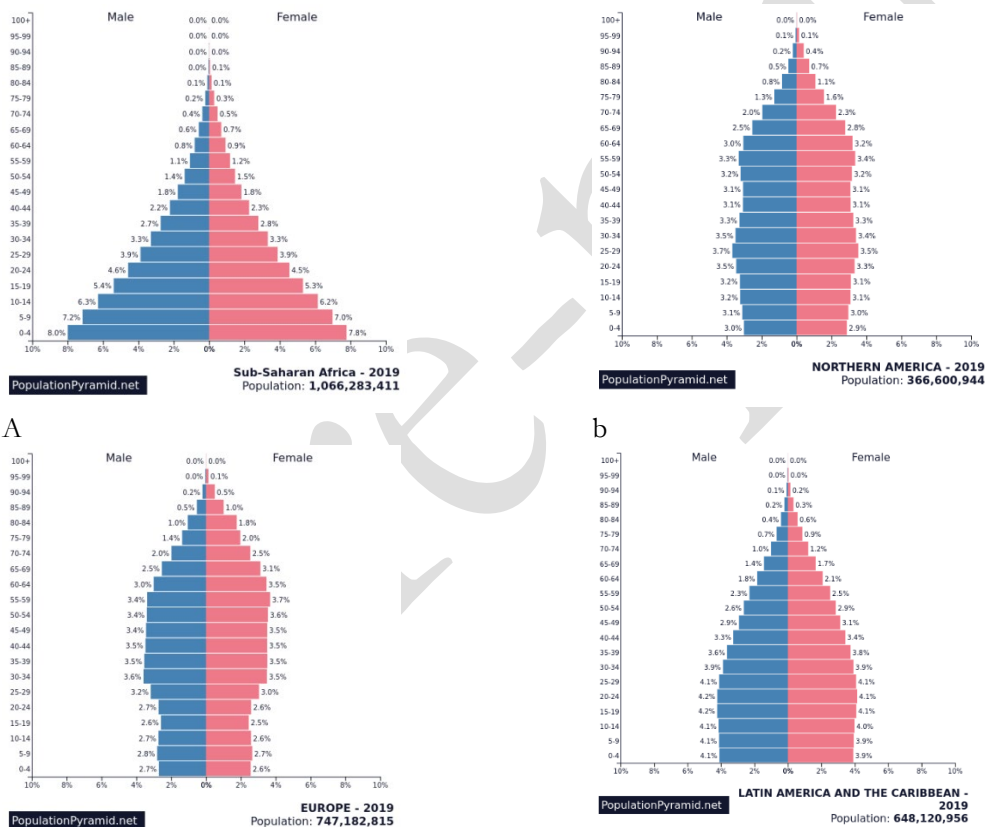


FIGURE 2: Population pyramids in 2019 of (a) Sub-Saharan Africa, (b) North America, (c) Europe and (d) Latin America and the Caribbean. Source: PopulationPyramid.net (2019), made available under a Creative Commons license CC BY 3.0 IGO.