

Low uptake of COVID-19 vaccines in Kenya: is it due to vaccine hesitancy, vaccine inaccessibility or both?

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Summary- The efficiency of vaccine campaigns to control coronavirus 2019 disease (COVID-19) is not only reliant on vaccine efficacy and safety but rather the rate of vaccine acceptance among the general public. Globally, the success in controlling this pandemic depends mainly on how the target populations take heed and accept the various intervention measures: both non-pharmaceutical as well as pharmaceutical approaches. While the development and eventual approval of COVID-19 vaccines was hailed as a magic bullet in the fight against this pandemic, their global acceptability and eventual uptake has not been encouraging at all. This work sets out to provide an up-to-date assessment of the current COVID-19 vaccination situation in Kenya while pointing at the possible causes as well as suggesting potential ways through which the present situation can be made better.

Index Terms- COVID-19; vaccine; hesitancy; inaccessibility; pandemic

Significance for public health

The COVID-19 pandemic has stretched the public health systems globally and thus collated efforts to attain herd immunity *via* vaccinations should be lauded and the apparent limitations to the acceptance of vaccines identified for probable action going forward. Through such, the adverse effects associated with the pandemic at hand will be mitigated much to the benefit of the health of the entire public at large.

I. INTRODUCTION

Since December 2019, the Coronavirus disease (COVID-19)- caused by the novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)- has greatly ravaged the globe disrupting trends and norms immensely (Zhu *et al.*, 2020). At the initial stages, its control was mainly premised on non-pharmaceutical interventions but by December 2020, a number of candidate vaccines had undergone both preclinical and clinical evaluation(s) with several of them i.e., Johnson & Johnson, Pfizer-BioNTech, Moderna, Sinopharm BBIBP and Oxford-AstraZeneca etc., receiving approval for eventual roll out (Rutayisire *et al.*, 2020; Xiao & Torok, 2020; Zhang, 2020). The utility of these vaccines in controlling COVID-19 is not merely dependent on their efficacy and safety but the rate of uptake too

by the target populations. Thus, the impact of COVID-19 vaccination programmes on disease transmission, morbidity and mortality relies heavily on the population's willingness to accept the vaccine(s) hence low uptake could derail global efforts towards eradication of the current pandemic. As a preventive approach, vaccination was thought to be the magic bullet against COVID-19 but the recent development of numerous SARS-CoV-2 variants seems to complicate these efforts (Mahase, 2021; Rubin, 2021). The latest of such variants is the B.1.1.529 initially reported in the Republic of South Africa, also known as Omicron, which is apparently more transmissible with possibilities of evading the protective immunity generated by the current vaccines but how these changes impact on the virus's other properties i.e., the associated disease severity, or the therapeutic medicines, diagnostic tools, or other public health and social measures is still not obvious (<https://www.who.int/en/activities/tracking-SARS-CoV-2-variants/>). As per the Darwinian theory of evolution, a pool of unvaccinated persons is a possible COVID-19 viral reservoir enabling their continued growth and multiplication thence presenting more opportunities for other SARS-CoV-2 variants to emerge especially in the current face of climate change (Goldman, 2021).

In this commentary, we explore the current COVID-19 vaccination status in Kenya highlighting the possible factors slowing vaccines' uptake finally suggesting possible ways of ameliorating it.

II. COVID-19 VACCINATION STATUS

Globally, the success levels of the vaccine(s)' roll-out vary with the African continent lagging not only in the number of vaccine doses received but also the number of persons (both adults and children) actually vaccinated (either fully or partially) (<https://www.who.int/>). The initial concerns by the World Health Organization (WHO) not just on the ability of most developing nations to afford these vaccines but also on the equitable access in addition to the logistical support that should be accorded to them by the developed nations seem to have been eased through mechanisms like the COVID-19 Vaccines Global Access (COVAX) Facility, Africa Vaccine Acquisition Task Team (AVATT) and other Bilateral mechanisms (<https://www.gavi.org/covax-facility>). At the initial stages, most developed nations were accused of vaccine hoarding in an effort

to guarantee the safety of their populations first; a move which though selfish but was nevertheless expected. However, the realization that skewed access to such preventive efforts could only prolong the pandemic's global presence (with the rallying clarion call being "No one is safe until everyone is made safe through vaccination") possibly led them to reconsider their earlier approach (<https://africacdc.org/tag/vaccination-inequality/>).

While through the COVAX Facility, other stakeholders as well as individual governments across Africa, several vaccine types and doses have been procured and delivered the uptake is seemingly not just commensurate yet! According to data obtained from the Africa CDC vaccine dashboard, only 13.65% of the continental population had received the first dose while only 9.11% of the total population having completed the vaccination cycle with respect to COVID-19 as at 1st January 2022 with just 56.9% of the total vaccine doses supplied having been administered (<https://africacdc.org/covid-19/>). According to Dyer (2021), unvaccinated persons are 11 times more likely to die from COVID-19 than their fully vaccinated counterparts, thus bolstering evidence that the inoculations confer powerful protection, even against some variants hence the current slow uptake of the COVID-19 vaccine across Africa might only serve to increase the associated disease burden but also enhances the losses in revenue occasioned by the lockdowns, curfews and movement restrictions in a bid to contain the viral transmissions. In Kenya, the COVID-19 vaccine uptake situation is no better as only close to 7.32% of the total population having received full vaccination with just 35.75% of the vaccine doses supplied having been administered yet millions of doses composed of varied vaccine types i.e., Johnson & Johnson, Pfizer–BioNTech, Moderna, Sinopharm BBIBP and Oxford– AstraZeneca were available towards the close of December 2021 (<https://africacdc.org/covid-19/>).

As per the Ministry of Health, the number of COVID-19 vaccine doses received in Kenya as at 30th December 2021 was 23 279 820 out of which 8 368 112 doses have been administered with 5 022 592 constituting the first dose while 3 345 520 representing the second dose recipients; the average second dose uptake is thus 57.10% (<https://www.health.go.ke/home/>). Having begun the vaccination exercise on the 3rd April 2021, the Kenyan Government intends to have at least 10 million adults fully vaccinated against COVID-19 by December 2021 but by 30th December 2021 only 5.3% of the adult population had attained full vaccination (<https://www.health.go.ke/home/>) see the Appendices. It is time the current debate on COVID-19 prevention strategies shifted from vaccine acquisition to how mobilization efforts should be rolled out to enhance individual voluntary uptake (Loembé & Nkengasong, 2021). Across Kenya, the levels of vaccine uptake vary with most counties especially those with higher urbanicity indices recording decent figures while those in arid and semi-arid regions associated not only with lower urbanicity indices but also with pastoralists having the lowest vaccine doses administered. Of the total vaccines made available in Kenya by the government efforts only 35.75% have been administered as at 30th December 2021 (<https://www.health.go.ke/home/>) implying that the rate of vaccine voluntary acceptance by the populace is fairly low thence more innovative strategies to better this situation need be urgently deployed.

Herd immunity can be achieved through vaccination or *via* previous infections, which eventually lead to natural or physiological immunity (Anderson *et al.*, 2020; Cihan, 2021; WHO, 2021). It is possible that some sections of the general population could prefer physiologic immunity, rather than obtaining immunity *via* vaccination. The difference in consequences between these two approaches in attaining herd immunity are immense; achieving herd immunity through previous infection would possibly take significantly longer thus incurring an immense cost on the economy, health care resources, as well as peoples' lives in general. Vaccination therefore, not only remains as the safest but equally a quicker alternative through which the much sought-after herd immunity can be attained by any population with respect to any disease/ health burden.

III. WHY THE CURRENT COVID-19 VACCINATION SITUATION IN KENYA?

With the seemingly obvious advantages associated with COVID-19 vaccination, one wonders what could be responsible for the low uptake of this vital preventive initiative currently witnessed in Kenya.

While cognizant that such a scenario could be a factor of fairly complex causes, broadly they can be divided into:

- i. Vaccine-related factors,
- ii. Individual- related factors and
- iii. Policy- related factors.

3.1 Vaccine-related factors

- i. The mode of vaccine inoculation

Most if not all COVID-19 vaccines are inoculated mainly through injection thus implying that people who suffer from trypanophobia i.e., the extreme fear of medical procedures involving injections or hypodermic needles are unlikely to participate. While one might think that such persons could be a minority thence inconsequential, it should however be noted that at least 20% of the global population possibly suffer from trypanophobia (Khan *et al.*, 2015; McLenon & Rogers, 2019). In essence, it implies that if injecting is the only mode of inoculating these vaccines, then voluntary uptake by such a category of persons might not be possible. However, recent indications of trials of needle-free COVID-19 vaccines having begun especially targeting new variants (<https://www.bbc.com/news/uk-england-59642182>) is great news as these individuals' category will seemingly be well taken care of much sooner than later.

- ii. Number of vaccine shots needed for complete dose

Given that persons could volunteer to participate in the vaccination exercise, the lower the number of shots needed to ensure a complete dose would enhance the compliance rates. Using the example of persons suffering from trypanophobia, someone might decide to work on their fears and take a single jab especially if the eventual benefit outweighs the discomfort involved. However, if several shots have to be delivered then the rate of compliance will possibly reduce given the phobia associated with the mode of vaccine inoculation. Since all, if not most, of the current COVID-19 vaccines are inoculated in specific locations, it infers that for persons to be vaccinated they have to travel not once but severally especially for the vaccines requiring multi-shots to constitute a complete dose. While such could seem

not much of an issue to some people, to others it could be very significant. Consider persons living in areas that do not have well-developed transport infrastructure i.e., where not only the cost is prohibitive but also availability of the transportation means too is equally limiting. Another interesting category of persons are those leading a mobile lifestyle like the nomadic pastoralists who move frequently with their livestock in search of both water and pasture. With these two categories of persons, administering a single-shot vaccine will likely result in higher compliance rates. Such incidences of vaccine truancy have been reported in other countries with risks of disease resurgence thought to be an eventual possibility (Kriss *et al.*, 2021). There are various reasons why someone might prefer a particular vaccine, but according to medical experts, the most important thing is getting vaccinated and getting a booster dose irrespective of the vaccine type.

3.2 Individual-related factors

Although such factors can be as diverse as the individuals under consideration, they can be divided into those relating to persons who are health-care workers and those who are not health-care workers:

a. Individuals who are not health-care workers

i. Culture/Religion

Communities with insignificant urban influence still hold onto their traditions dearly and thus could potentially resist any practice or intervention of whatever nature deemed as “foreign”. Persons in such communities are then less likely to be partakers of products associated with such non-indigenous practices meaning that the eventual number of actual vaccinations taken up in such communities would be fairly low, if at all. This is potentially not unique to vaccines associated with the COVID-19 pandemic alone.

As has been shown with previous vaccines like the polio vaccine, measles etc., churches such as the Catholic have stood against their inoculation among their faithfuls. Equally if for example a vaccine was developed from a pig component yet adherents of a particular religion do not use pork products like among the Muslims, its deployment is likely to be resisted within regions occupied by such faithfuls in the process hindering its uptake. For the COVID-19 vaccine, insinuations that it is the mark of beast are rife with suggestions that through this vaccination, one is then ‘marked for the devil’ (Letšosa, 2021).

ii. Level of education

The level of education could both be a blessing as well as a curse in the vaccine uptake. While persons who are fairly knowledgeable and informed are expected to easily accept to be vaccinated, the opposite too is possible. With more information comes not only the positive side of the vaccine i.e., disease prevention but also the information associated with the possible side-effects, both real and perceived, hence making such persons hesitate to participate in the exercise. It is therefore vital not to assume that vaccine uptake will be positively correlated with the level of education hence each case should be treated as it comes with no generalizations to help tackle that the particular concerns a certain population could be having concerning the exercise in question!

iii. Source of information

As the old adage goes “an informed society is an empowered one” but red flag(s) should be- from what source is the information

flowing? How credible is it? In the current era of social media, people can access information about anything from any source at any time and place. This is a good thing only if the source is credible otherwise it could lead to negative influence against the particular issue or activity under consideration i.e., COVID-19 vaccination in this case. Due to the current infodemic situation, sections of the Kenyan populace have erroneously associated vaccination with infertility among the recipients although no scientific data supports such insinuations all leading to a drastic reduction in the willingness of persons to participate in the same (Banerjee & Meena 2021; La Bella *et al.*, 2021; Pool *et al.*, 2021).

iv. Autonomy and personal freedom

The prevailing sense of personal freedom informs personal attitudes towards choices made and currently, the uptake of COVID-19 vaccines is no exception as individuals prefer to make their own choices about it. While freedoms always come with limits, the inability of persons to appreciate where the boundary between individual autonomy and communal interdependence lies and how it affects decisions about undertakings for mass benefits is rife. Individuals need to understand that though autonomous, they don’t live in a bubble but rely on others not only for their survival but safety too thus the need to undertake some practices which are well beyond their personal considerations.

b. Individuals who are health-care workers

i. Insufficient health-care workers that are not well motivated and facilitated

The vaccine inoculation exercise requires knowledgeable staff not only to enhance its efficiency but the safety of the recipients too. However, majority of the health facilities are currently understaffed thus any redeployment of staff on vaccination drives imposes further strain (Ngugi, 2021). Another constraint emanates from the need for facilitating those undertaking the vaccination exercise lack of which lessens its success. We hypothesize that such a lean yet inadequately facilitated labor-force suffers from reduced morale hence diminishing the efficiency with which any given goal i.e., the COVID-19 vaccination campaign, can be achieved (Okanga, & Kamara, 2017). As noted by WHO, delays in procuring/ acquiring the COVID-19 vaccination syringes significantly slows vaccine inoculations (<https://www.afro.who.int/pt/node/15549>).

ii. Perception of health care workers against the vaccine

Health workers across the Kenyan health-care system are the main source of medical information for the immediate public. It is thus critical that they are well informed and positively convinced about the benefits of any medical intervention(s) *vis-a-vis* the associated risks. As a matter of fact, a significant majority if not all health care workers should lead the vaccination exercise by example in undertaking the vaccination itself. This is crucial as vaccination would reduce chances of them being infected further stretching an already strained work-force when it is needed most but equally, if they happen to be infected chances that they can act as super-spreaders are rife as only fully vaccinated persons have a diminished ability to transmit the COVID-19 infection to others (Shah *et al.*, 2021; Torjesen, 2021). This is due to the fact that they engage on a daily basis with a diverse clientele that is constituted mainly by persons who are already not totally healthy thus more vulnerable. However, research has shown that their willingness to

accept the COVID-19 vaccine and even their general perception about the same are surprisingly low (Angelo *et al.*, 2021).

3.3 Policy-related factors

- a. Weak implementation of policies that enhance citizenry trust in government

Among the key factors in gaining acceptance of a new practice like vaccination is trust especially in the government of the day (Trent *et al.*, 2021). Media misinformation can cause public doubts about disease spread, prevention, lethality, and vaccine safety, and can promote mistrust of the government, policymakers, health authorities, and pharmaceutical companies. Many members of the public have been exposed to conspiracy theories (especially on social media) such as the claims that novel coronavirus was intentionally created by the government or that health organizations have exaggerated COVID-19's lethality and numbers for economic and political gain. Such misinformation calls into question authorities' integrity and undermines the available efforts to increase COVID-19 vaccine uptake. It is therefore critical that legal policies to help entrench and enhance the supposedly dwindling public confidence in governmental organizations either from the civil service or even the political leadership of the day.

- b. Weak implementation of policies enhancing mandatory adoption of practices enhancing national good (or safety in the current case)

Acknowledging the fact that the freedom to make individual decisions is a constitutional right, it should be made clear that the population good and benefit should outweigh individual ones. With this, a legal framework to be a requirement not only for civil servants but the general populace to take the COVID-19 vaccine unless on health grounds as a civil responsibility failure to which then criminal charges can be preferred or some privileges denied (<https://www.bbc.com/news/world-africa-59367726>). In recent times, the Government of Kenya through its Ministry of Health pronounced ultimatums that persons who will not have been vaccinated by 21st December 2021 won't be able to have access to some services especially in public places and offices although some human rights organizations opposed this directive terming it oppressive (<https://www.hrw.org/news/2021/12/14/kenya-vaccine-requirements-violate-rights>). While such were commendable efforts by the Kenyan Government to enhance COVID-19 vaccine uptake, a declaration by the High Court of Kenya that such declarations were actually illegal seems to have watered them down (<https://www.aljazeera.com/news/2021/12/14/kenyan-court-suspends-mandatory-vaccination-order>). By coming up with such laws, the public good, which in this case would be achieving the much-desired herd immunity against the COVID-19, would be hastened in effect lessening both the morbidity as well as mortality resulting from it. While the Health Act (2017) provides a solution to such cases, its plausible that its weak implementation or lack of it (implementation) could be responsible for such scenarios.

- c. Weak implementation of policies enhancing information dissemination only by credible, relevant and competent institutions and or personalities

Early on in the pandemic, social media exposure and conservative media exposure were both correlated with higher levels of misinformation about the COVID-19 virus. Cases of threads outlining how the pandemic was only but a hoax created

for individual greed were often abounding. Sadly, a high-ranking official in the Ministry of Health, Kenya appeared to downplay the logic and efficacy of the COVID-19 vaccines during a public address broadcasted live across the country (<https://www.youtube.com/watch?v=eO1Bhj41Pis>). Equally, concerns about the speed of COVID-19 vaccine development have often been based on the mistaken belief that mRNA technology used for some of these COVID-19 vaccines is entirely new yet the first successful use of mRNA technology in animals was reported more than 30 years ago, and tremendous mRNA advances have been made over the past decade (Wu *et al.*, 2021). Placing accurate information on social media with credible sources will help to counter this misinformation. While the legal basis for disseminating only justifiable and accurate information is well grounded in the Kenya Information and Communications (Amendment) Bill, 2019, its weak implementation or lack of it by the relevant government institutions seems to be the main impediment.

However, simply delivering factual information is actually inadequate. Confidence among the populace can be heightened through discussions, eliciting their concerns, and involving them in the vaccine recommendations. It is crucial to remember that the language through which such vital information is framed in before delivery matters in improving vaccine confidence. For example, greater trust might be engendered in the vaccine development and dissemination process by labeling it "Operation prevent COVID-19 with due diligence and enhanced safety," rather than "Operation Warp Speed. After the presence of B.1.1.529 (Omicron) variant was reported South African scientists were according to Penny Moore, a South African virologist, working "at warp speed" to understand the variant's properties (<https://www.nature.com/articles/d41586-021-03552-w>).

IV. CONCLUSION

Generally, the willingness to be vaccinated against COVID-19 especially among the middle- and low-income nations is high but data obtained from the ongoing vaccination exercise in Kenya indicates otherwise (Arce *et al.*, 2021). It is therefore critical that efforts be put in place to aid translate this acceptance and willingness into actual vaccine uptake.

Herd immunity, which is desired for a population to be declared relatively safe from an infection, develops whenever at least 70% of the total population have either been exposed to the disease-causing microbe and in turn recovered or alternatively been immunized against the health challenge (Anderson *et al.*, 2020; Frederiksen *et al.*, 2020; Cihan, 2021; Garg *et al.*, 2021; Lucero-Prisno *et al.*, 2021; WHO, 2021). Possibly, it was with this understanding that WHO set a global target for countries to fully vaccinate 10% of their populations by the end of September; 40% by the end of December; and 70% by mid-2022. However, in Africa only 5 countries (Cabo Verde, Mauritius, Morocco and Seychelles) have so far attained this feat while globally more than 70 countries have reached the 40% target (<https://www.afro.who.int/pt/node/15549>).

Most nations boasting of enhanced success in the COVID-19 vaccination drive attribute this achievement to not only the presence of enough vaccines but also committed health

professionals, an engaged political leadership, presence of strong community outreach programs, in addition to a willing population. Basing on experiences from fairly successful nations with respect to COVID-19 vaccines' deployment, the following are suggested to better the current Kenyan situation:

i. Boost the morale and facilitation of the health workers.

This can be done by enhancing training, facilitation and provision of the required personal protective equipment for health workers. Equally, the creation of a special cadre be within the health workforce and be specifically trained to focus on vaccinations. While we hasten to mention that the health challenges requiring interventions might differ, having an elite specialized workforce, similar to a rapid deployment unit, with a particular focus and mandate can be more productive in dealing with enhancing confidence levels to aid in dealing with vaccine hesitancy which was highlighted by WHO as a key threat to attaining population health. This would go a long way in tackling future novel pandemics that are likely to occur given the climate change currently being experienced globally.

ii. Engage the political, religious and community leadership in executing this exercise

Among the reasons for most persons not accepting the vaccine is lack of confidence as far as the safety is concerned. Confidence levels about the vaccine(s) and the entire practice can be increased in the populace through the use of trusted persons who mainly happen to either be politicians, religious leaders or other community leaders like teachers etc. who can lead by example to publicly undergo the vaccination exercise. By doing so the other persons will hopefully ape them and follow suit thus increasing the rate of vaccine uptake.

iii. Design clear, accurate and targeted outreach programs

Appreciating the diverse cultural, religious as well as academic levels and backgrounds that most persons are at implies that not one message or outreach program can actually fit all while attaining the intended goal. This therefore calls for more targeted but accurate ways of relaying the messages like through social media platforms to target the youths, radio and television advertisements with a customized information depending on whether youths and or old persons are the focus. If youths are targeted then some of the musicians can be involved to come up with songs that convey the desired information but if the old persons are the target, then some advertisements can run just before or during the broadcasting of the news bulletins, equally the local administrators can organize for meetings with them. As for the village 'poor' who might have smartphones, radios and even television sets organizing roadshows to traverse the rural areas while delivering the message in the local languages could have a bigger impact with possibly higher returns too. Such information should be delivered by persons who are perceived to be as neutral as possible to avoid any potential backlash either from the would be political or even business rivals. Religious leaders, who according to Viskupic & Wiltse (2021), are more trusted by the general populace should as well help take up a leading role in this by providing for short sessions within the church programmes where the congregants can be taken through educative teachings on the current challenge at hand together with the pros and cons associated with the approved preventive and control strategies. Most, if not all, messages delivered during these outreaches should

target at reducing the immense complacency against COVID-19 within the population for them to perceive the reality of this disease as a health challenge of our time with vaccination being an effective preventive option for themselves and family.

iv. Embrace technology in dealing with some common issues during these uncommon times

Technology i.e., short message services (SMS) can be exploited to help deliver individualized information on mobile phones. This can be done in a way that in different regions the local language is deployed making the target population valuable partners in the vaccination drive. Through this a large proportion of persons can be reached within a short period of time without breaching the need for social distance as opposed to the face-to-face meetings.

In conjunction with the Independent Electoral and Boundaries Commission (IEBC), the Ministry of Health in Kenya should encourage politicians to embrace the online mode of campaigning in an effort to avoid incidences of overcrowding now that the general elections are coming up in 2022. This is now more relevant than ever especially with the recent detection of the Omicron variant of the SARS-CoV-2 which is thought to be more transmissible compared to the delta variant (<https://edition.cnn.com/2021/12/13/health/omicron-variant-mild-alarming/index.html>).

v. Manufacture COVID-19 vaccines locally

To help solve the current concerns of the shorter shelf-lives associated with most vaccine donations, the Government of Kenya should consider partnering with some vaccine manufacturing firms to establish local manufacturing plants within the country as in the case of Rwanda (<https://africacdc.org/news-item/communique-on-progress-made-on-vaccine-manufacturing-in-africa-kigali-rwanda-06-07-december-2021/>). This will not only deal with the import challenges but equally help create employment opportunities (hence ameliorating some of the manpower lay-offs associated with COVID-19) for the locals while also making its citizens 'own' the products thereof as they will be deemed as part of the locally manufactured ones. It has been shown that most developing nations have often been forced to dump the close-to-expiry COVID-19 vaccines donated to them by the COVAX programme (<https://www.aljazeera.com/news/2022/1/13/poorer-nations-dump-close-to-expiry-covid-vaccines-unicef>).

V. DOES THE CURRENT LOW COVID-19 VACCINES' UPTAKE IN KENYA RESULT FROM VACCINE HESITANCY OR VACCINE INACCESSIBILITY?

Despite the global successes associated with vaccination programmes, serious challenges related to vaccine hesitancy, which represents a continuum between vaccine acceptance and refusal, have been recorded (Dube *et al.*, 2013; MacDonald, 2015). Encouragingly, vaccine hesitancy has already received unprecedented global attention, stimulated by the World Health Organization recognizing it as a priority issue (WHO, 2014). Vaccine hesitancy, which according to WHO is among the top 10 threats to global health (WHO, 2014), is a reluctance or refusal to be vaccinated or to have one's children vaccinated against

contagious diseases like COVID-19 could be responsible for the current vaccination status in Kenya. However, as opined by Bedford *et al.*, (2018) such under-vaccination mostly arises from factors related to access or pragmatics but not necessarily from the much-hyped vaccine hesitancy.

Although achieving herd immunity in Africa might be such a herculean task, enhancing vaccine acceptability among the target populace could better it (Cihan, 2021; Lucero-Prisno *et al.*, 2021). The current low COVID-19 vaccine(s) uptake in Kenya possibly emanates not only from vaccine hesitancy but equally on the inaccessibility of vaccines to certain sections of the target populace. Therefore, to achieve global herd immunity, African countries need not only benefit from fair and equitable distribution of the approved COVID-19 vaccines but equally efforts targeting the apparent vaccine hesitancy *via* increasing the target population's confidence in the available vaccine(s), enhancing the convenience with which the target population can access the available vaccine(s) at very minimal costs (or even none!) if at all. If these suggestions are not considered, most persons might possibly fail to comply with the WHO recommendations as far as the number of vaccine doses is concerned implying that uptake of the second dose in most vaccine inoculations (for the multiple dose vaccine types) could be relatively poor. With such most vaccines might even go bad as their expiry dates could pass before they are inoculated. None compliance with the required vaccine dosages would be counterproductive since for multiple dose vaccine types, according to Goldberg *et al.*, (2021), high levels of protection are restored upon vaccination with double dose as opposed to just a single dose (Hall *et al.*, 2021).

Aware that some campaigns for increased vaccine doses' donations into the African continent are currently ongoing; while such is a noble activity, we note that similar efforts too should be directed at transforming the individual willingness to be vaccinated to actual vaccine uptake by the target populace since for example as at 30th December 2021, just 35.75% of the total vaccine supplies in Kenya has been administered (<https://www.health.go.ke/home/>) while close to 56.9% of the total vaccine supplied on the African continent had been administered (<https://africacdc.org/covid-19/>). It is therefore critical that all relevant stakeholders foster their commitment towards community sensitization on COVID-19 vaccines while in the process integrating these vaccines within the existing healthcare services (Lucero-Prisno *et al.*, 2021) as we are likely to have this disease with us for quite some time.

All in all, irrespective of the myths surrounding the current vaccination drive, research indicates that vaccinating reduces morbidity and mortality with respect to COVID-19 (Samson *et al.*, 2021) implying that as a people we either get vaccinated and reduce the effects of COVID-19 or continue suffering since this disease is here with us and it might be so for some time to come. While noting how vital vaccination is in the fight against COVID-19, the other preventive strategies like the need to observe social distancing, proper and consistent use of face masks in addition to hand washing using detergents should not be abandoned as they should be complementary to each other. This has never been as critical especially in Kenya where the most recent statistics indicate not only a resurgence in the COVID-19 infections but equally an intense period of political activities heading into the general elections in August 2022.

With the current challenge posed by the omicron variant of the COVID-19, the protective capability associated with approved vaccines cannot be guaranteed (Bates *et al.*, 2021) hence the recommendation for a booster dose for those who had completed the recommended doses as per the vaccine administered, a challenge that is currently being considered by Kenyan authorities (<https://www.reuters.com/world/africa/kenya-start-giving-covid-19-booster-shots-2021-12-25/>). However, even with the effectiveness of these mRNA vaccines now confirmed (Ioannou, 2021; Kotaki *et al.*, 2021), if the above highlighted issues are not addressed then compliance won't be automatic.

Since this work was not based on research findings, it would be prudent that a countrywide survey to establish the actual causative factors for the present low uptake of COVID-19 vaccine(s) be commissioned. Through this, more responsive efforts in addition to our submissions herein can be developed based on the findings therein.

REFERENCES

- [1] Africa Centre for Disease Control and Prevention COVID-19 dashboard (<https://africacdc.org/covid-19/>).
- [2] Anderson, R. M., Vegvari, C., Truscott, J., & Collyer, B. S. (2020). Challenges in creating herd immunity to SARS-CoV-2 infection by mass vaccination. *The Lancet*, 396(10263), 1614-1616.
- [3] Angelo, A. T., Alemayehu, D. S., & Dachew, A. M. (2021). Health care workers intention to accept COVID-19 vaccine and associated factors in southwestern Ethiopia. *PLoS ONE*, 16(9), e0257109.
- [4] Arce J S. S., Shana S. Warren, Niccolò F. Meriggi, Alexandra Scacco, Nina McMurry, Maarten Voors, & Yam, E. (2021) COVID-19 vaccine acceptance. Policy brief. International Growth Centre.
- [5] Banerjee, D., & Meena, K. S. (2021). COVID-19 as an "Infodemic" in Public Health: Critical Role of the Social Media. *Frontiers in Public Health*, 9, 231.
- [6] Barello, S., Nania, T., Dellafiore, F., Graffigna, G., & Caruso, R. (2020). 'Vaccine hesitancy' among university students in Italy during the COVID-19 pandemic. *European journal of epidemiology*, 35(8), 781-783.
- [7] Bates TA, McBride SK, Winders B, et al., Antibody Response and Variant Cross-Neutralization After SARS-CoV-2 Breakthrough Infection. *JAMA*. Published online December 16, 2021. doi:10.1001/jama.2021.22898.
- [8] Bedford H., Attwell K., Danchin M., Marshall H, Corben P. and Leask J. (2018). Vaccine hesitancy, refusal and access barriers: The need for clarity in terminology. *Vaccine* 36: 6556–6558.
- [9] Burke, P. F., Masters, D., & Massey, G. (2021). Enablers and barriers to COVID-19 vaccine uptake: An international study of perceptions and intentions. *Vaccine*, 39(36), 5116-5128.
- [10] Cihan, P. (2021). Forecasting fully vaccinated people against COVID-19 and examining future vaccination rate for herd immunity in the US, Asia, Europe, Africa, South America, and the World. *Applied Soft Computing*, 111, 107708.
- [11] Dube E, Laberge C, Guay M, Bramadat P, Roy R, Bettinger J. (2013). Vaccine hesitancy: An overview. *Human vaccines & immunotherapeutics*, 9(8):1763–73. doi:10.4161/hv.24657.
- [12] Dyer, O. (2021). Covid-19: Unvaccinated face 11 times risk of death from delta variant, CDC data show.
- [13] Frederiksen, L. S. F., Zhang, Y., Foged, C., & Thakur, A. (2020). The long road toward COVID-19 herd immunity: vaccine platform technologies and mass immunization strategies. *Frontiers in immunology*, 11.
- [14] Garg, S., Singh, M. M., Deshmukh, C. P., Bhatnagar, N., Borle, A. L., & Kumar, R. (2021). Critical interpretative synthesis of herd immunity for COVID-19 pandemic. *Journal of Family Medicine and Primary Care*, 10(3), 1117.
- [15] Goldberg, Y. et al., (2021). Protection and Waning of Natural and Hybrid COVID-19 Immunity. *medRxiv preprint*. doi: <https://doi.org/10.1101/2021.12.04.21267114>. <https://www.medrxiv.org/content/10.1101/2021.12.04.21267114v1>.

- [16] Goldman, E. (2021). How the unvaccinated threaten the vaccinated for COVID-19: A Darwinian perspective. *PNAS*, 118(39).
- [17] Hall Victoria Jane, Sarah Foulkes, Ferdinando Insalata, Ayoub Saei, Peter Kirwan, Ana Atti, Edgar Wellington, Jameel Khawam, Katie Munro, Michelle Cole, Caio Tranquillini, Andrew Taylor-Kerr, Nipunadi Hettiarachchi, Davina Calbraith, Noshin Sajedi, Iain Milligan, Yrene Themistocleous, Diane Corrigan, Lisa Cromey, Lesley Price, Sally Stewart, Elen de Lacy, Chris Norman, Ezra Linley, Ashley D Otter, Amanda Semper, Jacqueline Hewson, Silvia D'Arcangelo, The SIREN Study Group, Meera A Chand, Colin S Brown, Tim Brooks, Jamin Islam, Andre Charlett, Susan Hopkins. (2021). Effectiveness and durability of protection against future SARS-CoV-2 infection conferred by COVID-19 vaccination and previous infection; findings from the UK SIREN prospective cohort study of healthcare workers March 2020 to September 2021 medRxiv,2021.11.29.21267006;doi:https://doi.org/10.1101/2021.11.29.21267006,https://www.medrxiv.org/content/10.1101/2021.11.29.21267006v1 .
- [18] <https://africacdc.org/news-item/communique-on-progress-made-on-vaccine-manufacturing-in-africa-kigali-rwanda-06-07-december-2021/> .
- [19] <https://edition.cnn.com/2021/12/13/health/omicron-variant-mild-alarming/index.html>
- [20] <https://www.afro.who.int/pt/node/15549>
- [21] <https://www.aljazeera.com/news/2021/12/14/kenyan-court-suspends-mandatory-vaccination-order>
- [22] <https://www.aljazeera.com/news/2022/1/13/poorer-nations-dump-close-to-expiry-covid-vaccines-unicef>
- [23] <https://www.bbc.com/news/uk-england-59642182>
- [24] <https://www.gavi.org/covax-facility>
- [25] <https://www.healthcareitnews.com/news/emea/himss21europe-vaccine-hesitancy-associated-lack-trust-governments>
- [26] <https://www.hrw.org/news/2021/12/14/kenya-vaccine-requirements-violate-rights>
- [27] <https://www.reuters.com/world/africa/kenya-start-giving-covid-19-booster-shots-2021-12-25/> .
- [28] <https://www.who.int/>
- [29] <https://www.who.int/en/activities/tracking-SARS-CoV-2-variants/>
- [30] <https://www.youtube.com/watch?v=eO1Bhj41Pis>
- [31] Ioannou, N. G. (2021). COVID-19 Vaccination Effectiveness Against Infection or Death in a National U.S. Health Care System. *Annals of Internal Medicine*. <https://doi.org/10.7326/M21-3256>, <https://www.acpjournals.org/doi/10.7326/M21-3256> .
- [32] Jacobson, R. M., Sauver, J. L. S., & Rutten, L. J. F. (2015, November). Vaccine hesitancy. In *Mayo Clinic Proceedings*, 90(11)1562-1568. Elsevier.
- [33] Kampf, G. (2021). COVID-19: stigmatizing the unvaccinated is not justified. *The Lancet*, 398(10314), 1871.
- [34] Karafillakis, E., Dinca, I., Apfel, F., Cecconi, S., Würz, A., Takacs, J., ... & Larson, H. J. (2016). Vaccine hesitancy among healthcare workers in Europe: A qualitative study. *Vaccine*, 34(41), 5013-5020.
- [35] Kenya Information and Communications (Amendment) Bill (2019). Special Issue Kenya Gazette Supplement No. 125, National Assembly Bills No.61. [Online]. Kenya: The Government Printer, Nairobi.
- [36] Khan, F., Memon, B., Ur-Rehman, H., Muhammad, S. S., & Ali, A. (2015). Prevalence of needle phobia among young patients presenting to tertiary care government hospitals of Karachi, Pakistan. *Int J Res*, 2(1), 127-135.
- [37] Kotaki, R., Adachi, Y., Moriyama, S., Onodera, T., Fukushi, S., Nagakura, T., ... & Takahashi, Y. (2021). Two doses of mRNA vaccine elicit cross-neutralizing memory B-cells against SARS-CoV-2 Omicron variant. *bioRxiv*.
- [38] Kozlov, M. (2021). COVID vaccines have higher approval in less-affluent countries. *Nature*.
- [39] Kriss JL, Reynolds LE, Wang A, et al., (2021). COVID-19 Vaccine Second-Dose Completion and Interval Between First and Second Doses Among Vaccinated Persons — United States, December 14, 2020–February 14, MMWR Morb Mortal Wkly Rep 2021; 70:389–395. DOI: <http://dx.doi.org/10.15585/mmwr.mm7011e2>.
- [40] La Bella, E., Allen, C., & Lirussi, F. (2021). Communication vs evidence: What hinders the outreach of science during an infodemic? A narrative review. *Integrative Medicine Research*, 100731.
- [41] Lalumera E, (2018). Trust in health care and vaccine hesitancy. *Rivista di estetica*, 68, 105-122.
- [42] Letšosa, R. (2021). What has the beast's mark to do with the COVID-19 vaccination, and what is the role of the church and answering to the Christians?. *HTS Teologiese Studies/Theological Studies*, 77(4).
- [43] Liu, Y., Liu, J., Xia, H., Zhang, X., Fontes-Garfias, C. R., Swanson, K. A., ... & Shi, P. Y. (2021). Neutralizing activity of BNT162b2-elicited serum. *New England Journal of Medicine*, 384(15), 1466-1468.
- [44] Loembé, M. M., & Nkengasong, J. N. (2021). COVID-19 vaccine access in Africa: Global distribution, vaccine platforms, and challenges ahead. *Immunity*, 54(7), 1353-1362.
- [45] Lucero-Priso, D. E., Ogunkola, I. O., Esu, E. B., Adebisi, Y. A., Lin, X., & Li, H. (2021). Can Africa achieve herd immunity?. *Global Health Research and Policy*, 6(1), 1-6.
- [46] Lucia, V. C., Kelekar, A., & Afonso, N. M. (2021). COVID-19 vaccine hesitancy among medical students. *Journal of Public Health*, 43(3), 445-449.
- [47] MacDonald NE (2015). Vaccine hesitancy: Definition, scope and determinants. *Vaccine*, 33(34):4161–4. doi:10.1016/j.vaccine.2015. 04.036. PMID:25896383.
- [48] Mahase, E. (2021). Covid-19: Do vaccines work against omicron—and other questions answered. *BMJ*, 375:n3062.
- [49] Mascola, J. R., Graham, B. S., & Fauci, A. S. (2021). SARS-CoV-2 viral variants—tackling a moving target. *Jama*, 325(13), 1261-1262.
- [50] McLenon, J., & Rogers, M. A. (2019). The fear of needles: A systematic review and meta-analysis. *Journal of advanced nursing*, 75(1), 30-42.
- [51] Mendel-Van Alstyne, J. A., Nowak, G. J., & Aikin, A. L. (2018). What is 'confidence' and what could affect it?: A qualitative study of mothers who are hesitant about vaccines. *Vaccine*, 36(44), 6464-6472.
- [52] Muthuri, R. N. D. K., Senkubuge, F., & Hongoro, C. (2020, December). An Investigation of Healthcare Professionals' Motivation in Public and Mission Hospitals in Meru County, Kenya. In *Healthcare*, 8, 4, p. 530. Multidisciplinary Digital Publishing Institute.
- [53] National COVID-19 Vaccine Deployment Plan, 2021. National vaccine & Immunization program acceleration of COVID-19 vaccination program in Kenya (updated August 2021). Ministry of Health, Republic of Kenya (<https://www.health.go.ke/home/>).
- [54] Ngugi, B. (2021 November 12). Blow to jobless Kenyan nurses as UK halts recruitment. *The East Africa*. <https://www.theeastafrican.co.ke/tea/news/east-africa/blow-to-jobless-kenyan-nurses-as-uk-halts-recruitment-3616864> .
- [55] Okanga, D. A., & Kamara, D. (2017). Influence of staff motivation on the performance of Thika level 5 hospital in Kenya. *Strategic Journal of Business & Change Management*. 4(2).
- [56] Pool, J., Fatehi, F., & Akhlaghpour, S. (2021). Infodemic, Misinformation and Disinformation in Pandemics: Scientific Landscape and the Road Ahead for Public Health Informatics Research. *Studies in Health Technology and Informatics*, 281, 764-768.
- [57] Rubin, R. (2021). COVID-19 Vaccines vs Variants- Determining How Much Immunity Is Enough. *Jama*, 325(13), 1241-1243.
- [58] Rutayisire, E., Nkundimana, G., Mitonga, H. K., Boye, A., & Nikwigize, S. (2020). What works and what does not work in response to COVID-19 prevention and control in Africa. *International Journal of Infectious Diseases*, 97, 267-269.
- [59] Samson, LW, et al., (2021). Associations Between County-level Vaccination Rates and COVID-19 Outcomes Among Medicare Beneficiaries. (Research Report No. HP-2021-23). Washington, DC: Office of the Assistant Secretary for Planning and Evaluation, U.S. Department of Health and Human. Available at: <https://aspe.hhs.gov/reports/covid-19-vaccination-rates-outcomes> .
- [60] Shah, A. S., Gribben, C., Bishop, J., Hanlon, P., Caldwell, D., Wood, R., ... & McAllister, D. A. (2021). Effect of vaccination on transmission of SARS-CoV-2. *New England Journal of Medicine*, 385(18), 1718-1720.
- [61] Szilagyi, P. G., Thomas, K., Shah, M. D., Vizueta, N., Cui, Y., Vangala, S., ... & Kapteyn, A. (2021). The role of trust in the likelihood of receiving a COVID-19 vaccine: Results from a national survey. *Preventive Medicine*, 153, 106727.
- [62] The Health Act (2017). Special Issue Kenya Gazette Supplement No. 101, Acts No. 21. [Online]. Kenya: The Government Printer, Nairobi.
- [63] Torjesen, I. (2021). Covid-19: One in four vaccinated people living in households with a covid-19 case become infected, study finds. *BMJ*. 375: n2638.

- [64] Trent, M., Seale, H., Chughtai, A. A., Salmon, D., & MacIntyre, C. R. (2021). Trust in government, intention to vaccinate and COVID-19 vaccine hesitancy: a comparative survey of five large cities in the United States, United Kingdom, and Australia. *Vaccine*.
- [65] Viskupic, F., & Wiltse, D. (2021). The Messenger Matters: Religious Leaders and Overcoming COVID-19 Vaccine Hesitancy.
- [66] World Health Organization (2014). Meeting of the Strategic Advisory Group of Experts on immunization, October 2014 – conclusions and recommendations. *Wkly Epidemiol Rec*, 89(50):561–76. PMID:25513671.
- [67] World Health Organization (2020). Coronavirus Disease (COVID-19): Herd Immunity, Lockdowns and COVID-19. Available online: <https://www.who.int/news-room/q-a-detail/herd-immunity-lockdowns-and-covid-19> (accessed on 4th December 2021).
- [68] Wu, K., Werner, A. P., Koch, M., Choi, A., Narayanan, E., Stewart-Jones, G. B., ... & Edwards, D. K. (2021). Serum neutralizing activity elicited by mRNA-1273 vaccine. *New England Journal of Medicine*, 384(15), 1468-1470.
- [69] Xiao, Y., & Torok, M. E. (2020). Taking the right measures to control COVID-19. *The Lancet Infectious Diseases*, 20(5), 523-524.
- [70] Zhang, W., (2020). Prevention and Control of COVID-19. *World Scientific*. doi:10.1142/11834.
- [71] Zhu, H., Wei, L., & Niu, P. (2020). The novel coronavirus outbreak in Wuhan, China. *Global health research and policy*, 5(1), 1-3.

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6.0 Appendices

These tables contain information obtained from the Government of Kenya *via* the Ministry of Health’s official website (<https://www.health.go.ke/home/>) as at 30th December 2021.

6.1 Table 1: Cumulative persons partially vaccinated as at 30th December 2021

Cumulative persons partially vaccinated as at 30 th December 2021	Vaccinations by Gender			
	Male	Female	Intersex	Transgender
5 839 270	2 848 916	2 987 960	2220	174

6.2 Table 2: Cumulative persons fully vaccinated as at 30th December 2021

Cumulative persons fully vaccinated as at 30 th December 2021	Vaccinations by Gender			
	Male	Female	Intersex	Transgender
4 155 832	2 114 752	2 038 292	1547	131

6.3 Table 3: Vaccine doses dispensed as at 30th December 2021

Current status	Total doses administered
Total doses administered	10 002 184
Doses administered above 18 years (Primary schedule)	9 976 783
Partially vaccinated above 18 years	5 820 951
Fully vaccinated above 18 years	4 155 832

Second dose uptake above 18 years	55.8%
Proportion of adults fully vaccinated	5.3%
Doses administered 15 to 18 years	20 121
Booster doses administered	5 280

6.4 Figure 1: Global COVID-19 vaccination status as at 10th January 2022

