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Research Article

Media Tracking of Early Sentiments about COVID-19 Vaccine in Africa

James Ayodele^{1*}, Benjamin Djoudalbaye², Nekerwon Gweh²

¹World Health Organization Office for the Eastern Mediterranean, Nasr City, Cairo, Egypt

²Division of Health Diplomacy, Policy and Communications, Africa Centers for Disease Control and Prevention, Addis Ababa, Ethiopia

*Correspondence to: James Ayodele, World Health Organization Regional Office for the Eastern Mediterranean, Monazamet El Seha El Alamia Street, Nasr City, Cairo 11371, Egypt; Email: jamesfal@hotmail.com

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Abstract

Background: Advances in digital technology have made real-time listening and analysis of traditional and social media discussions possible over a selected geographical area. However, the technology is currently not widely available to inform public health risk communication.

Aim: This paper reports the use of digital rumor monitoring system to present major sentiments tracked by Africa Centres for Disease Control and Prevention (Africa CDC) over traditional and social media regarding the COVID-19 vaccine during the first 9 months of the COVID-19 pandemic.

Methods: Rumors and misinformation about the COVID-19 vaccine were tracked by Africa CDC over the digital rumor monitoring system from March to November 2020. Traditional media analysis was conducted using African media and human-curated aggregation of open-source content from various African sources. Social media analysis was conducted using geo-located African Twitter and Facebook sources, resulting in a set of content from the media.

Results: COVID-19 vaccine had the highest traction among COVID-19 rumors monitored in Africa between March and September 2020. Critical narratives were observed mainly in South Africa, Democratic Republic of Congo, Nigeria, and Kenya, where they undermined public views of the COVID-19 vaccine and the vaccine trials. Analysis shows underlying potential for vaccine acceptance is overshadowed by anti-vaccine rhetoric partly influenced by insufficient information about the vaccine in the public domain and the disapproval of "Western vaccine" by Africans.

Conclusion: Realtime digital monitoring of rumors and misinformation about public health issues over social and traditional media is now possible. Health authorities and health institutions need transition to this real-time monitoring and build the capacity of their staff to use information from real-time analysis of rumors and misinformation for designing response. Larger scale investment in the technology is critical to make it available for wider use at the national and sub-national levels in Africa.

Keywords: COVID-19, vaccine, sentiments, digital tracking, social listening, realtime tracking, Africa

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1 INTRODUCTION

Social listening has been a valuable tool for monitoring and understanding conversations around issues globally^[1]. It is available for receiving feedback from communities on emerging issues such as public health emergencies, disease outbreaks, and pandemics like COVID-19, allowing such feedback to be analyzed for intervention designs^[2].

Advances in digital technology have made real-time listening and analysis of traditional and social media discussion possible over selected geographic areas and the design of timely and appropriate responses before the issues escalate. Using Boolean search terms, digital technology offers the possibility of segregating discussions for focused analysis of a desired phenomenon or group, e.g. gender, location, age, and sentiments^[3,4].

Digital social listening^[1] can be cost-effective for monitoring community perspectives. When applied to public health, it offers the possibility of observing and analyzing social behavior for behavior change interventions, including identifying social influencers for targeted campaigns.

One positive aspect of the COVID-19 pandemic is the emergence of innovations that hold great potential for public health. One of such innovations is the use of digital technology to monitor and understand conversations and attitudes towards the COVID-19 pandemic and related issues such as the vaccine and social measures^[5]. The technology had existed before COVID-19, but more institutions began using it during the pandemic.

This paper presents major sentiments tracked by Africa Centres for Disease Control and Prevention (Africa CDC) over traditional and social media about COVID-19 vaccine during the first few months of the pandemic using digital rumor monitoring. It aimed to answer the question "What do African Facebook, Twitter and traditional media audiences think about the COVID-19 vaccine?"

2 METHODS

In 2020, Africa CDC set up a digital rumor monitoring system to understand public discuss about the COVID-19 pandemic in Africa and obtain background information for messaging and response. The system was based on Novetta's Rapid Narrative Analysis^[6], which used human observation and machine learning to provide insight about specific social conversations over a geographical location and a range of issues. Using custom queries developed by combining Boolean keyword matching

and metadata of self-identified African users, we used the monitoring system to track COVID-19 discussions on Facebook, Twitter and traditional media from March to November 2020. The geo-located African Twitter sources provided a set of content from the media; quote-level metadata were then added to the framework, and relevant results were recorded for reporting. Weekly reports and trends were generated for traditional and social media mentions of the COVID-19 pandemic. COVID-19 vaccine discussions were then segregated for this report.

Traditional media analysis was conducted using media discussion of COVID-19 vaccine in Africa and human-curated compilation of content available over key African media sources. Article- and quote-level metadata were then added to the framework of Novetta Mission Analytics^[6], and relevant results were documented. Social media analysis was conducted using Twitter and Facebook discussions of COVID-19 vaccines from African sources, and this produced a set of content from the media. The quotes were then added to the framework of Novetta Mission Analytics, and results were recorded based on relevance. Twitter and Facebook were chosen because they were among the most frequently used social media platforms in Africa; Facebook was the most used at the time of developing the monitoring platform^[7].

Rumors were categorized into three types—major, moderate, minor—depending on the severity of their consequences, including whether they could cause harm, could stop people from accessing services, could cause conflict, could result in risky behaviors, could put frontline workers, partners and communities at risk, could stigmatize certain groups, or could pose a significant reputational risk. Major rumors included those considered to be of high impact and required urgent attention, moderate rumors were considered concerning and having the potential for a lasting effect, and minor rumors included those with potential to develop and have serious consequences.

3 RESULTS

COVID-19 vaccine had the highest traction among COVID-19 rumors monitored in Africa between March and September 2020 (Figure 1). Traditional and social media discussions about vaccines were highest in April when African users responded critically to a video conversation by two French scientists to conduct clinical trials in Africa "where there are no masks, no treatments, no resuscitation" African users saw this as racist and amplified the statements of Ivorian footballer, Didier

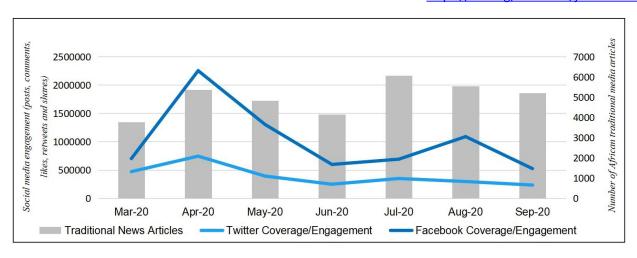


Figure 1. Traditional and social media coverage of vaccines in Africa, March-September 2020.

Drogba, who denounced the use of Africans as "human guinea pigs"^[10].

Discussions about the COVID-19 vaccine in Africa gained traction again in late June 2020 when public focus shifted from home remedies and herbal cures to discussions about COVID-19 vaccine trials. Analysis from 21 to 27 June showed almost half (41%) of messaging on traditional and social media in Africa focused on vaccines (Figure 2).

Sentiments against the COVID-19 vaccine were observed in the 5 regions of Africa. However, they were strongest in Central, Southern and Western Africa.

3.1 Vaccine Sentiments by Sub-region in Africa 3.1.1 South Africa

The strongest oppositions to the COVID-19 vaccine were observed in South Africa, following the announcement on 22 June 2020 of a collaborative trial of the Ox1Cov-19 vaccine by the University of Witwatersrand, University of Oxford, and Oxford Jenner Institute, and consequent emergence of the hashtag, #SayNoToWitsVaccine^[11].

Announcement of the vaccine trial triggered antivaccine voices with social media posts and narratives, in addition to physical protests at the University of Witwatersrand on 1 July 2021^[12]. There were other public demonstrations and an online petition, which has now been deleted, to remove COVID-19 vaccine from South Africa. As of 9 July 2020, the petition had been signed by 9730 people. The protest organizer, Phapano Phasha, said: "The people chosen as volunteers for the vaccination look as if they're from poor backgrounds, not qualified enough to understand. We believe they are manipulating the vulnerable"^[13].

Protesters waved banners showing: "We are not guinea pigs", "No safe vaccine", and several other

slogans. Some South Africans had wrongly perceived the COVID-19 vaccine to be a plan to render them infertile, and some said COVID-19 was part of a 3-step plan to kill 30 million people, mostly Africans. Others felt it was part of plans by developed countries to make Africa a dumping ground for vaccines, echoed by some Twitter posts: "The narrative we got is our continent is a dumping ground." [13]

"If you want to test, test in areas which they call the epicenter of the world." [14]

"They want to use South Africa to traffic the Bill Gates vaccine throughout Africa. That's why now we are getting outrageous new infections everyday." [15]

One Facebook user said: "Corona didn't kill us rapidly as they planned, so this is their plan B, plan C is coming in November, the bosses target is to kill 30 million people, mostly Africans." [16]

Some social media comments re-echoed the sentiment that Africans were being used as "guinea pigs", which was first observed in early April 2020, following the circulation of the video showing two French scientists proposing to conduct vaccine trials in Africa^[8].

Another rumor gained traction for a few days in the Southern Africa region in mid-September that the Namibian Government was planning mandatory vaccination with an unspecified "injection" for every citizen of the country. The Namibian Health Minister, Dr Kalumbi Shangula, however, responded immediately, describing it as "untruths and fake narratives," and his post was shared widely over traditional and social media^[17].

The pause of the COVID-19 vaccine trial in South Africa, following the brief pause of the partner trial in the United Kingdom by AstraZeneca on 8 September 2020 out of an "abundance of caution" after a patient

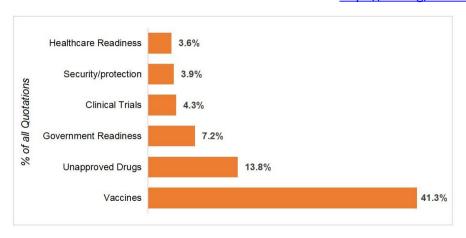


Figure 2. Top sub-messages tracking on traditional and social media, 21-27 June 2020.

developed an unspecified illness, triggered a new round of damaging rumors across Africa in early September 2020^[18].

Despite assurances that the vaccine trial was not related to neurological illnesses experienced by the volunteer, social media users, particularly in South Africa, were quick to vilify the vaccine trial further, saying that the COVID-19 vaccine could cause multiple sclerosis and transverse myelitis. These negative outcomes further deepened public distrust in the COVID-19 vaccine and other routine vaccinations, leading to an increase in misinformation and rumors.

However, some South Africans showed high interest in locally produced vaccines and others felt there was no need for the vaccine because of the reduction in the daily number of cases in September 2020.

3.1.2 Central Africa

In Central Africa, negative public perception was driven partially by distrust of wealthy and powerful individuals, including top government officials, politicians, and the American billionaire and philanthropist, Bill Gates. The Democratic Republic of the Congo (DRC) was a hotspot for the rumor that the goal of the COVID-19 vaccine was to depopulate Africa, and the main stronghold for this rumor was North Kivu Province (Figure 3). North Kivu was a major hotspot for the 10th Ebola Virus Disease outbreak and citizens were faced with the dilemma of accepting or rejecting another potential threat to their lives and livelihood. They claimed that the "Europeans" and "Whites" had come up with another gimmick to continue their "laboratory experiment" that began with Ebola vaccine trials.

Although there was misinformation in other parts of the country, North Kivu was the most prominent source. Rumors were spread more often via radio in the Northwest and through WhatsApp in the South-eastern region of DRC. The most accused individual was Dr Jean-Jacques Muyembe, who was revered for successfully leading the Ebola response. Following his announcement of the COVID-19 vaccine trials in the DRC, he was criticized for allegedly becoming corrupt for "European" money. This led to a 60% decline in the use of his quotes on various platforms.

The Facebook page, Tu vois Les Retombées^[19] played a major role in driving new rumors about COVID-19 vaccines. The group's origins are unclear; the administrator is registered in South Africa, however, the intimate knowledge of DRC and of local French dialect indicates origins or strong ties in the DRC.

On 10 June 2020, the page posted that Emmanuel Macron, President of France, had made it obligatory for Africans willing to visit Europe to be vaccinated or risk being molested, even when COVID-19 vaccine had not been found. "Urgent, les africains doivent se révolter maintenant, trop c'est trop. Emmanuel Macron: déclare obligatoire le vaccin contre le Covid-19 aux visiteurs africains, le pays africain qui va refuser ne doit pas Voyager en Europe au cas contraire il y'aura massacre a l'aéroport. Ce message doit faire le tour d'Afrique pour dénoncer ce system européen," the post read^[19].

This post drove predominantly negative responses towards President Macron, and Europe in general, with continued references to the belief that Europeans were jealous of Africans because Africa had fewer COVID-19 cases and deaths than Europe. It combined several popular disinformation narratives, including anti-World Health Organization (WHO) sentiment, accusations of European treatment of Africans as "guinea pigs", statements falsely attributed to popular figures like the president of the United States, the Director-General of WHO, and others, as well as support for COVID-Organics, a local herb promoted at that time by the Government of Madagascar as cure for COVID-19. This

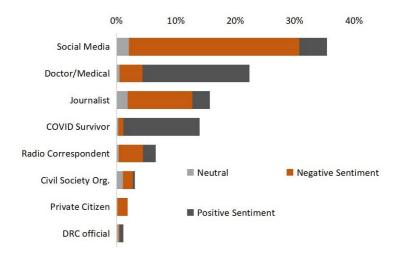


Figure 3. Sentiments towards the COVID-19 vaccine in DRC, 20 April-5 November 2020.

and other posts attracted disdain and aggressive feedback on the maligned individuals, and triggered distrust of some world leaders and claims of racist motives.

Another related post on the same page showed President Putin of Russia contradicting President Macron. This related post appeared to be the most popular in the history of the group at that time. It had gained 2200 shares, suggesting that the post was viewed and amplified by roughly 13.0% of the group's 16 600 followers^[20].

3.1.3 West Africa

In West Africa, anti-vaccine sentiment was strongest in Nigeria and was due mainly to the distrust in government organizations such as the Nigeria CDC, and the perceived mission of developed countries to depopulate or exterminate Africans. Many citizens questioned the need for a vaccine when, as perceived, Zithromax and Hydroxychloroquine could be used to treat COVID-19. The following narratives, which have been deleted, were common: "Do not trust American scientists—they want to depopulate Africans—there is something very wrong with the COVID-19 vaccine."

"We don't trust anything with letter "C" in Nigeria anymore. NCDC, NDDC, EFCC, APC."

No vaccine is needed—there is already a cure—Zithromax and Hydroxychloroquine."

There were rumors that Nigerian youth were given the vaccine and were immune to COVID-19 infection, and that Nigerian researchers had developed a DNA-based vaccine, which was ready for human trials but lacked funding for development^[21].

3.1.4 East Africa

In Eastern Africa, anti-vaccine sentiments were most common in Tanzania and Uganda, partly because of the fear of foreign influences on African affairs and the denial by the Tanzanian Government of the existence of COVID-19, their rejection of prevention measures, and decision to stop reporting cases in May 2020.

Contrary to the situation in South Africa, the announcement by the Kenya Medical Research Institute (KEMRI) on 18 September 2020 to participate in the ChAdOx1 nCoV-19 vaccine clinical trials, in partnership with the University of Oxford, garnered some initial positive sentiments over social and traditional media^[22]. Some Kenyans saw it as a better way of spending money allocated for COVID-19 response, which was alleged to have been misappropriated by government officials and attracted the creation of such hashtags as #COVIDMillionaires.

However, there were also negative sentiments on social media, because many Kenyans perceived the trial as a plot by government officials to cover up the scandal regarding misappropriation of COVID-19 funds. There were comments like: "So they want to tell us that the billions unaccounted for went to research on vaccines." "Let them test the vaccine on our leaders first, if they SURVIVE then the vaccine is SAFE and if they DIE then our country is SAFE." [23]

3.1.5 North Africa

Tracked negative sentiment towards the COVID-19 vaccine was less intense in North Africa, it was most prevalent in Algeria. Vaccine discussions in the region was dominated by the lack of confidence in the vaccine because of the speed at which it was developed.

3.2 Negative Sentiments Against Developed Countries and Health Authorities

The announcement of the vaccine trial in South Africa unearthed deep-seated distrust in clinical trials and treatments led by foreign companies as well as health

authorities such as the WHO, and individuals like the President of South Africa and Bill Gates^[24,25]. Protesters referred to the vaccine trial and development processes as "Agenda 21" (different from Agenda 21 of the United Nations), a colloquial term used by extremists to refer to conspiracy theories and totalitarian governments, and linked it to an alleged Bill Gates agenda to depopulate Africa^[26]. They said the COVID-19 vaccine was a South African government led plan to help pharmaceutical companies generate profit from the sales of vaccines.

Social media users perceived Bill Gates negatively as a symbol and originator of the COVID-19 vaccine, as indicated in the following statements, which have been deleted from social media: "Bill Gates is the initiator of the COVID-19 vaccine."

"The infertility vaccine is masquerading as a cure for COVID-19."

"The plan is to kill 30 million people, mostly Africans." "The Bill Gates vaccine's vision is to exterminate all Africans."

The Bill Gates conspiracy began as a small rumor about his involvement in the COVID-19 vaccine and evolved into a much more dangerous and consequential rumor, accusing him of the intent to administer the COVID-19 vaccine to exterminate Africans. Unchecked by official countermessaging, these rumors became a platform for expanding public resistance to vaccines^[27].

Public distrust in Western vaccines re-emerged in July when the Oxford vaccine trials were suspended. One Farrakhan had requested African presidents to reject the COVID-19 vaccine and accused Dr Fauci of the United States National Institutes of Health and Bill Gates of an agenda aimed at "depopulating the earth and deciding who should live and who should die." [28] Images of Farrakhan and clips of his speech were circulated widely on Twitter and the hashtags #HandsoffFarakhan and #WeareFarrakhan became prominent on social media after YouTube attempted to remove his message from the platform. These rumors about Bill Gates and the anti-American vaccine sentiment were prevalent in South Africa and Nigeria.

As some African social media users expressed distrust in the "American vaccine", Russia's announcement of a COVID-19 vaccine on 11 August 2020 split South African social media users into three: those who supported an "American vaccine", those who supported a "Russian vaccine", and those who viewed both vaccines as dangerous for-profit schemes.

"Wish this man could be my president. Russian first, unlike our president here at home; family, friends, and businesses partnership first."^[29]

"30 days from now don't be surprised to see Putin's daughter with...the superman strength of 10 men." [30]

"If it's not American, it's not legit. Let's wait for Trump to discredit it, not on scientific basis but because it's Russia." [31]

"The Russians will come with an expensive vaccine and America will come with a free vaccine. These two countries are vintage arch-rivals."[32]

The Bill Gates conspiracy continued to garner high traction as social media users continued to accuse him of having financial interest in the Russian vaccine to boost his business interest in Africa. There were rumors and speculations that the South African president had sold South Africans as guinea pigs to Western pharmaceutical companies^[33].

3.3 Messaging in Response to the Rumors

In response to COVID-19 vaccine rumors in Africa, messages by relevant authorities were disseminated mainly through the traditional media (Figure 4). The four leading sources of information were WHO, the United Nations, Nigeria CDC, and UNICEF. These messages, which came in the form of press releases, statements, or press briefings, were shared on social media. Between March and September 2020, Africa CDC was mentioned discussing vaccines in ~183 traditional media articles, most of which were in June and July, following a two-day virtual conference on Africa's role in the development of COVID-19 vaccine.

Tracked messages focused more on how Africans would get the vaccine and did not directly address vaccine rumors and misinformation. There was minimal response to misinformation that the COVID-19 vaccine was a white supremacist tool, a depopulation scheme, or that the vaccine would have neurological side effects.

The call to African countries to join the global COVID-19 vaccine alliances and participate in efforts to produce and distribute the COVID-19 vaccine in Africa received positive feedback on traditional media, but drew negative sentiments on social media.

Response by government officials was minimal and was in the form of statements on vaccine accessibility and the need for more vaccine trials in Africa. These statements triggered negative sentiments by African social media users, who saw the discussions as a government scheme, in collaboration with the West, to depopulate Africans, who they said already had inherent herd immunity to COVID-19.

Although Africa CDC did not directly address rumors targeted at Bill Gates, the continuous, consistent, public acknowledgement of its partnership with the Bill & Melinda Gates Foundation, led to a gradual decline in negative sentiments about Bill Gates and the perceived

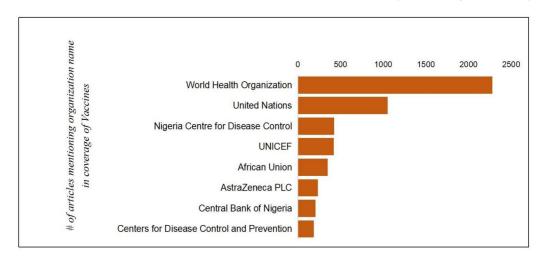


Figure 4. Traditional media messaging on COVID-19 vaccine in Africa, March to September 2020.

depopulation agenda.

Using trend analysis reports from the rumor tracking system, Africa CDC, in partnership with the WHO Regional Office for Africa, designed an evidence-based, vaccine acceptability, influencer campaign for DRC, South Africa and Nigeria, the three countries where rumors and misinformation about COVID-19 vaccine were most predominant. DRC was later excluded from the campaigns. Planning for the campaign began in October 2020 and details are not included in this report.

4 DISCUSSION

The viral nature of social media has allowed antivaccine narratives and rumors to spread globally and in Africa, particularly. Critical narratives were observed in South Africa, DRC, Nigeria, and Kenya, where citizens undermined public views of the COVID-19 vaccine and the vaccine trials.

Insufficient information in public domain from the relevant authorities about the vaccine and vaccine trials during the initial phases played a key role in the disapproval and anti-vaccine sentiments observed on social media. South Africa's prominent role as a host country for the AstraZeneca COVID-19 vaccine trial served as a common trigger for anti-vaccine related messaging. Although South African scientists continued to publish information about the status of the trial, the limited public-facing information campaigns to address public concerns about the vaccine created an information gap, leading to misinformation, rumors, and mistrust. This failure to address the information gap has been a driver for vaccine hesitancy quotes and negative narratives in monitored media^[34].

In contrast, there was initial positive sentiment for the clinical trials in Kenya, most probably because the government held initial discussions and provided information about the trials^[35]. KEMRI had explained that the trials team had obtained "all valid licenses from relevant authorities", referring to approvals by the KEMRI Scientific Ethics Review Committee, the Pharmacy and Poisons Board, the National Commission for Science, and Technology and Innovation^[36]. The South African case may have provided key lessons to Kenya on the need to communicate the commencement of clinical trials to the public. However, apart from the explanations, a cash payment incentive was offered to volunteers in Kenya.

Amplification by traditional and social media outlets of news about the vaccine trials and the public protest in South Africa illustrates the ability of rumors and misinformation about public health issues to spread quickly and effectively between media platforms. It shows the need for health authorities to be alert to media discussion of health issues and to respond appropriately in real-time. Health authorities in Africa still depend largely on traditional methods such as focus group discussion or other face-to-face forums to monitor discussions and inform the design of health interventions. These methods are, however, not feasible when it is impossible to physically access communities as it was during the COVID-19 lockdown and could cause significant delays in designing a response. They allow rumors and misinformation to continue unchecked and when rumors and misinformation about public health issues remain unchecked for a long time, they trigger stronger resistance to the uptake of remedies and garner the potential to spread and evolve on multiple media platforms. With time, such rumors and misinformation become more likely to be publicly perceived as "verifiable" and "true", as already observed during the Ebola virus disease outbreak in DRC^[37,38].

Social media was a major platform for the spread of rumors and misinformation about the COVID-19 vaccine

and anti-vaccine sentiments during the period covered by this analysis. Using the same media, in addition to the traditional media used by health authorities, could have been more helpful in countering such rumors and misinformation and reducing the resistance and antivaccine sentiments.

The growing confidence and trust in Africa CDC as a continental institution leading Africa's response to the COVID-19 pandemic and its continuous association with the Bill and Melinda Gates Foundation as a trusted partner contributed to the reduction in negative sentiments against Bill Gates. Most Africans saw Africa CDC as an Africa-owned institution. At the same time, there was high interest in the "Russian vaccine" by South African social media users. These suggest an underlying potential for vaccine acceptance overshadowed by anti-vaccine rhetoric that is partly influenced by disapproval of "Western vaccine" or Western influence.

This analysis reports vaccine rhetoric on traditional and social media. The social media analysis focused mainly on Facebook and Twitter, two of the most actively used social media platforms. While it provides insight into a substantial portion of social media discussion about the issue, it did not analyse discussion on other social media platforms like Instagram, TikTok, YouTube, etc. This is a limitation of the analysis. There are other limitations. The analysis covered March to November 2020 because the rumor monitoring contract was terminated due to cessation of funding, therefore, the findings cannot be generalized for other periods beyond the analysis. This analysis did not assess the weights of the positive, negative, and neutral sentiments and cannot suggest which of the sentiments was most prevalent.

5 CONCLUSION

Real-time monitoring of rumors and misinformation about public health over social and traditional media is now possible, but response by health authorities has not evolved in real-time. Planning for the vaccine acceptability campaign by Africa CDC and WHO AFRO began in October, many months after rumors and misinformation about COVID-19 vaccine had been circulating on social media. Digital listening technology is relatively new to public health experts and many of them do not have the capacity to use it to analyse information and design responses. It is therefore important for public health institutions to build the capacity of their staff to use real-time analysis of rumors and misinformation for designing communication responses in the future.

This analysis shows the potential for using digital tools to analyse public health discussion for designing evidencebased, targeted risk communication and community engagement. Rumor monitoring platforms are currently expensive and only few institutions can initiate and maintain the contract for extended periods. Larger scale investment in the technology is critical to reduce cost and make it available for wider use. Health authorities should support the establishment of such digital platforms and related capacity so that countries can use them to analyse trends and inform responses to health emergencies. This will enrich response to public health rumors and misinformation in Africa.

Real-time monitoring of rumors and misinformation should be complemented by real-time response through engagement with the public on social media because this is where most misinformation about health issues is propagated nowadays.

This analysis examined the general outlook in Africa, which is the mandate of Africa CDC and the African Union. Africa is a large continent and the context in each country and at the sub-country level differs. Individual countries would benefit more from monitoring systems that are country-specific, and this should be the target for investments in digital social listening for public health interventions.

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Conflicts of Interest

The authors declared that they have no competing interests.

Author Contribution

Ayodele J, Gweh N and Djoudalbaye B monitored the tracking dashboard and the reports and made weekly summary presentations on them to African Union Member States and partners. Ayodele J drafted the article and all authors reviewed and made their contributions to the content.

Abbreviation List

CDC, Centres for Disease Control and Prevention DRC, Democratic Republic of the Congo KEMRI, Kenya Medical Research Institute WHO, World Health Organization

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