# Tweets on COVID-19 Pandemic in Nigeria: Lesson Learned

## Abstract

**Aim & Scope:** Communication and Agenda Setting in the Post COVID-19 Era.

**Purpose of the Study:** This study seeks to show the ways Twitter has been used to track the early pandemic detection, to monitor the dissemination of information and to explore the public awareness and attitudes of Nigeria. This is done in order to address the public health surveillance challenges in Nigeria to better inform future efforts to leverage Twitter's public health potential.

**Problem Addressed:** Developing countries, including Nigeria perpetually finds it difficult to proactively and actively monitor disease outbreaks especially in its early stages due to the poor quality of manpower, scarcity of public health data and absence of automated surveillance.

**Methodology:** From February 20 - May 6, 2020, English Tweets mentioning COVID-19 and related keywords were collected in 11 batches via NCapture™ plugin available on Google Chrome. The analysis includes a time series analysis to track the distribution of data and content analysis to analyze the knowledge and attitudes of Nigerians.

**Results:** A total of 67,989 tweets (1,484 unique and 66,505 retweets) citing COVID-19 and related keywords were returned. The Tweets started to emerge on Twitter earlier to the first confirmed case in Nigeria, while maintaining a dangling-upward movement. Matters arising from the tweets include dearth of information on COVID-19, and optimism among others. Owing to the study of a specific dataset of Twitter collected at the earliest stage of the current pandemic in Nigeria, The results provide insight into the intersection of social media and public health surveillance.

**Recommendations:** Results show how helpful Twitter is to educate education in public health. Health organisations and the government may benefit from paying attention to the both amusing and emotional contents from the twitter community in order to formulate a viable policy for treatment and control.

## Introduction

Coronavirus disease (COVID-19) was initially called Novel Coronavirus (2019-nCoV) during its earliest stages of discovery in Wuhan City, Hubei Province of China (WHO, 2020d). The disease was announced by the World Health Organization (WHO) as a pandemic in March 11, 2020 (WHO, 2020b); the first pandemic since the H1N1 swine flu in July, 2009 (WHO, 2009). Nigeria confirmed her first case of COVID-19 in Lagos State on February 27, 2020, when an Italian who works in Nigeria returned from Milan, Italy to Lagos, Nigeria on the 25th of February 2020 (Nigeria Centre for Disease Control, 2019). As at May 4, 2020 more than 3, 435, 894 people globally have been infected with the virus, out of which 239, 604 persons had died with other several active cases. The reported number of infected people in Africa was 30, 536, and 2, 388 from Nigeria, with 1,085 and 85 deaths respectively according to the World health Organization (WHO), although the Nigeria Centre for Disease and Control (NCDC) reported a total of 3,047 cases in the country (WHO, 2020a; Nigeria Centre for Disease Control, 2020a).

During the eariest period of COVID-19 pandemic, a combination of practices was intitated by many countries to contain the pandemic, reduce the death toll, and assuage the climate of fear. Many countries, including Nigeria, introduced multi-level response strategies like; lockdown, contact tracing and self-isolation or quarantine; public health procedures such as handwashing and/or sanitizing, social distancing and the use of face mask; anticipating severe health cases that could require isolation, oxygen, and mechanical ventilation; prevention of and management of infections in healthcare facilities; and delaying or canceling large-scale public meetings (Bedford et al., 2020; Sjödin et al., 2020). However, despite various interventions, particularly in Nigeria, surveillance, and containment remains difficult, not just because of the adverse effect of a typical infectious pandemic diseases (WHO Regional Office for Africa, 2016), but also as a result of poor surveillance of public health outbreaks in the country (WHO, 2001; Nnebue et al., 2014; Isere et al., 2015; Luret et al., 2015; Fall et al., 2019). With COVID-19 in Nigeria and the upsurge in the daily number of reported cases across the country (Nigeria Centre for Disease Control, 2020a), public panic is expected to be on the rise as a result of fear. On the other hand, it is also possible for the public to experience what is referred to as “caution-fatigue”; a situation where individuals become impatient with warnings, don't believe the warnings to be relevant, or de-emphasize the actual risk (Gollan, 2020). Consequently, the certitude of containing the disease in the nearest future is unknown.

Surveillance of public health involves monitoring of disease incidence and events related to health to enable a timely intervention in disease control (Buehler et al., 2004). Globally, health surveillance systems are playing a major role in both outbreak detection and response management of Infectious Diseases (IDs). However, in developing countries, disease outbreaks are difficult to monitor due to some reasons. Quality of manpower, scarcity of public health data and absence of automated surveillance systems have all been identified (Lur et al., 2015; Ali et al., 2016). Currently in Nigeria, the collection, collation, analysis and interpretation of disease-related data in public health institutions are often incomplete and untimely (Abdulraheem et al., 2004; Luret et al., 2015; Fall et al., 2019). For improved surveillance systems, a range of priority steps are recommended. The use of digital technology to promote inter-agency contact with the public. WHO had developed interim global surveillance for COVID-19, which allows ‘Case-based reporting’, ‘Aggregated reporting, and ‘Member State Self-Reporting Platform by the national authorities of WHO member states (WHO, 2020c). Similarly, the Federal Ministry of Health (FMoH) had before now, developed a conceptual framework for preparedness and response to public health concerns at both epidemic and pandemic levels. The framework was modelled on the WHO ‘Pandemic Alert Phasing Protocols’ as well as on various stages of the 'pandemic curve’(Federal Ministry of Health, 2013). Surveillance and Laboratory was the first strategy enlisted by FMoH, should the country experience a pandemic.

The earliest phase of COVID-19 pandemic in Nigeria can be exemplified by the earliest lockdown phase in the country. Nigeria first went into lockdown in late March following the first case on February 28 and the successive increased cases of coronavirus in the country. However in April 27, President Buhari, approved a phased and gradual easing of lockdown measures in three states; Abuja, Lagos, and Ogun. The total lockdown was later reduced to a curfew from 5pm till 6am beginning from 4 May, although some states modified the curfew hours to commence at 10pm and expire at 5am (Al Jazeera, 2020a; Al Jazeera, 2020b; AS.com, 2020).

In an early phase of a pandemic like the 2019-nCoV, defined as ‘*WHO Phase 4: Nigeria Sub-Phasing: Phase 4c*’ ‘Surveillance and Laboratory’ action should include; providing pandemic surveillance advisories to the health community; underscoring the necessity for correct and prompt reporting to surveillance cohorts; improve surveillance to detect early cases, evaluate viral virulence and ascertain exclusive viral physiognomies; improve laboratory action protocols to intensify capacity at significant laboratories; Observe the health alert networks and extra sources of pandemic statistics; surveillance for animal disease occurrences that are possible to impend the human populace; Deliver intermittent updates to significant leaders, home and foreign organizations and other significant stakeholders; Confirm that data reported to WHO follows the International Health Regulations (IHR). The overall surveillance data will aid government response to the pandemic (Federal Ministry of Health, 2013). ‘Surveillance and Laboratory’ action in Nigeria remained almost the same despite that the pandemic is entering a different and more severe phase (Nigeria Pandemic Alert Phases 4f, 5f & 6f), where impacts are severe on the health sector and potentially severe on non-health systems such as; the disruption of utility, transportation, public safety, and practically every other aspect of economic and social infrastructure (Federal Ministry of Health, 2013; Osayantin et al., 2020).

While emerging diseases should be viewed with national surveillance and control strategies, resources are often limited (Fall et al., 2019), especially in Nigeria (Ali et al., 2016). Since surveillance systems are not timely, accurate, effective or adaptable, information gaps can occur (Hall et al., 2012; Abdulraheem et al., 2004). For instance, a discrepancy in data was noticed between the national reporting channel (Nigeria Centre for Disease Control, NCDC) and international report from WHO (Nigeria Centre for Disease Control, 2020b; WHO, 2020a). Optimal public health outbreak surveillance should, therefore, use multiple data collection, analysis, and dissemination techniques in an exhaustive way (Khan et al., 2010). Tools for the transfer of knowledge to support the management of outbreaks are therefore needed (Ridley, 2004; Kieny et al., 2016). Social Network Sites (SNSs) allow the public to play an active role in news event coverage and diffusion. Users express their perspectives, thoughts, and fears when transmitting health incidents beyond the context of public health. (Khan et al., 2010; Sullivan et al., 2012; Ahmed et al., 2010).

The need to create and exchange knowledge related to health is increasingly relevant for tracking outbreaks (Odlum & Yoon, 2015). Nigeria’s national response to the COVID-19 pandemic has sustained reliance on science, data and experiences drawn from other nations, and consideration of the couintry’s peculiar environment to address the pandemic, while maintaining the guidelines issued by WHO (OSGF, 2020). Surveillance via electronic media, on the Internet, offers significant opportunities for public health practice. (Khan et al., 2010). According to Signorini et al. (2011), one of the most common SNSs is Twitter, a microblogging platform that allows tweeting (reporting, sharing, and addressing news events that can provide valuable information) (Mittal & Patidar, 2019; Bae & Lee, 2012). Twitter users communicate via direct messages or implored answers, which can be disseminated primarily via retweeting (forwarding) (Odlum & Yoon, 2015). In Nigeria, Twitter accounts for the largest SNSs after Facebook with 30.4% of the entire social media users. Its usage increased by 6.33% since the first case of the Coronavirus in February 2020 (GlobalStats, 2020). Twitter has been seen as an evolving broadcasting platform for public health education and news, demonstrated by its utility during H1N1 pandemic planning activities in 2009 and the Ebola Virus Disease (EVD) outbreak in 2014 (Sullivan et al., 2012; Odlum & Yoon, 2015). The ability of Twitter in terms of broad reach, timeliness, and low overhead captures prevalent disease trends, collects information, and disseminates knowledge. Moreso, its usefulness supports its ability in new and creative ways to affect public health outbreak surveillance (Khan et al., 2010; Odlum & Yoon, 2015).

This study aims to explore the use of an effective SNS tool during an emergency in public health, and provide a snapshot of the pandemic COVID-19 tweets to capture early detection of disease, monitor the information trends and assess public knowledge and attitudes. Twitter has proved to effective in public health surveillance particularly during the Ebola outbreak in West Africa (Odlum & Yoon, 2015; Vorovchenko, 2015). When compared with public health practioners and experts, the Twitter community may be less knowledgeable about the dynamics of a particular disease, however, their tweets usually coincide with news events and expresses their attitudes towards such disease. Tweets on such outbreaks can therefore provide a unique opportunity for public health organisations and the government to listen to their audience/citizens in order to share scientifically accurate information, and formulate a viable policy for treatment and control. The government and public health organisations could do more to engage with the Twitter community during the global pandemic. The government may benefit from paying attention to the both amusing and emotional contents from the twitter community (Vorovchenko, 2015).

## Methods

This study collected tweets (unique and retweets) in batches via Google Chrome based version of NCapture™ from February 20, 2020; a week before February 27, the date of COVID-19 first case in Nigeria; and May 6, 2020; two days after the commencement of lockdown relaxation in Nigeria. This is done to understand the information dissemination trends, public perception and attitudes to COVID-19 pandemic particularly at the early stage of the pandemic. Each batch of tweets consist of 7 days tweets starting from February 20 through May 6, 2020, totaling 11 weeks.

The tweets are collected in English and the keywords used for the identification of COVID-19 related tweets in Nigeria was informed by trending words on Twitter and most search words on google between February 20, 2020, and May 6, 2020. They include; coronavirus, COVID-19, COVID, staysafe, lockdown, distancing, curfew, quarantine, pandemic and palliatives. Through the advanced search option available on Twitter, all keywords generated a dataset within a specified time range were collected. Elements of the data collected for every tweet included timestamp, username, content (unique tweet), and retweet(s).

To assess COVID-19 information dissemination trends, the number of posts (tweets and retweets) were categorized by dates within the week before the first case of COVID-19, and the commencement of lockdown relaxation in Nigeria. Using Microsoft Excel Charts, the descriptive statistics, including the bulk of posts (tweets and retweets) within the country were linked with the segmented time range. In addition, a content study was carried out using natural language processing to collect public information, expectations , and attitudes about COVID-19.

## Results

## Trends of information spread with Time

In Nigeria, a sum of 67,989 tweets citing COVID-19 and related keywords were returned (1,484 unique and 66,505 retweets) from Feburary 20 - May 06, 2020 (Fig 1). Eactly a week before the first reported case in Nigeria, a total of 225 tweets (0.4%) were returned. It represented the lowest number of tweets across the 11 weeks under study. Following the announcement of the first case in Nigeria, Twitter experienced an unsurge in the number of tweets mentioning coronavirus and related keywords for the next one week; Feburary 27 – March 04, 2020. A total number of 6,551 tweets were captured. For the third week; March 05 – 11, 2020, there was an outrageous deline in the curated tweets. Only 825 tweets were mentioned. The number of tweets then begin to rise again for the fourth week (1,994 tweets) and fifth week (12,202 tweets); the highest number of tweets recorded during that period. The sixth week; March 26 – April 01, experience another notable decline in the number of tweets (6,490 tweets). It however slighty increase in the seventh week (9,003 tweets) and slightly decline in both week eight (7445 tweets) and week nine (5991 tweets). Week ten saw a massive increase only second to week five (10,026 tweets) and then decreases on week eleven (7,207 tweets). Arriving at the linear trend focast, the intercept of the spread was caluculated as 2250.22, while the slope is at 654.65.

**Fig 1.** Trend of Information spread and time trends in Coronavirus related tweets between a week before the first reported case and the end of the first phase of National lockdown in Nigeria. NCDC.

## Early pandemic detection

Tweets mentioning coronavirus and related keywords started to emerge on twitter earlier to the official alert of the first confirmed case. Twitter community in Nigeria discussed several subjects around the pandemic. At this time, Nigerians on Twitter use the coronavirus and other trending hashtags majoly to promote or disseminate their tweets to a wider audience even when the tweets has nothing to do with the coronavirus pandemic (for instance, “*Relaxing. Unwinding. Chilling. The Xovar life goes by many names.Winking face Face with tears of joy Start your week with a wide smile! \*\*\* #MondayMotivaton #mondaythoughts #lagos #nigeria #UnilagBlackOut #Covid\_19 #HelloDearEx*”). A good number of Nigerians on Twitter discussed ‘Chloroquine’ as a possible treatment for coronavirus (For instance, “*If Chloroquine can cure CoronaVirus, Who know,Tetracycline might be the cure for HIV/Aids*”, “*Shouldn't we be grateful that we have malaria, since Coronavirus can't enter this country because of Chloroquine*?).

After the first confirmed case of coronavirus in Nigeria, coronavirus related tweets increased. Tweet frequency steadily increased and declined with reported cases of coronavirus in Nigeria from Februray 20 – March 18, 2020. The number of reported cases has been steadily increasing up to only 8 confirmed cases in the country. Twitter, however, exploded with 12,202 tweets (unique and retweets) between March 19 and March 25 as official sources in the country had reported 51 confirmed cases in the country. Nigerians must have been bewildered by the outrageous number of cases in the country as series of tweets expressed fear, and confusion. A tweet with 2,700 retweets explain the upsurge of confirmed cases: (“*Let me explain this Coronavirus thing in network marketing Each infected person with COVID19 is expected to bring two new people in, those two new people expected to bring 4 people in and so on. Do the math”).*

## Content analysis

The tweets show so many dynamics in the pattern of thought of those posting. From the data set. The following assumptions are deducible:

1. In the early stages of the virus (20th February to mid-March), some of the popular perceptions of the various included that it is elitist virus only common to the rich. Moreover, as infection rate increased and fatality worsens, narratives began to change.

 When would Nigerian elites express this kind of hysteria for Lassa Fever, which has killed more people than Coronavirus in Nigeria? FYI Nigeria is currently dealing with its largest Lassa fever outbreak. Abi poor lives are secondhand lives?

 There's so much unknown about covid 19 virus

 People of Nigeria, pls adhere to washing your hands properly, is the best way to prevent the virus

1. Nigerians expressed optimism in overcoming the virus if information is adequetly disseminated.

 We once fought Ebola so I’m sure we can handle Covid-19. However this will take a collective effort! Only a few % of Nigerians have access to information on how to prevent the spread of the virus so we need to help spread the info!

 Don't panic fellow Nigerians. We will act and defeat #Covid\_19 just like Ebola and co

 With the first case of coronavirus in Nigeria, all we need now is positivity please. We will overcome

1. Chloroquine was seen as a potential cure for COVID-19 pandemic

 To think that Chloroquine was stopped because malaria parasite became resistant to it & its itchy side effects. Now, The stone which the builders rejected Has become the chief corner stone.

 Chloroquine that I hate with passion, however cheap it used to be. Glad it's about to run out, at least for a while. Please go and be useful to our contemporaries infected with Coronavirus.

 If you like be smoking Chloroquine phosphate, if you don't take necessary precautions, you will catch COVID 19!

1. It was also rumour that ‘black blood’ was immune to the virus.

 Africans living in Africa are completely immune to #coronavirus virus

 The sun and heat alone in NIGERIA will do the work

 Covid-19 firewall, made in Nigeria

 #Coronavirus has no nationality, gender, race, ethnicity or religion. It does not discriminate & neither should we. Imperative for humanity to join hands &develop a united outlook towards tackling this virus

1. Discussion around the fact that it is an imported virus (Index case) was also quite popular. The change of attitude mentioned in the previous point was also aided by increased community spread of the virus in Nigeria.

 My people, remember all those Surgical masks you are all buying for the Coronavirus, well, they were all made in China. Are you thinking what I’m thinking?

 85 death from covid 19 yet, people are still in doubt, waiting for one of their family members to die of the disease first

 If 650 people died of COVID-19 within a space of 1 week, in Kano alone, then; 1. We have the highest death rate in the world. 2. The figures NCDC publish are a joke.

1. From Mid-March to late April (following heightened community spread and death) people seemed to take the virus more seriously. Various measures at curtailing the spread began to trend more and more honest conversations surfaced. Tweets about measures like lockdown, social distancing, washing of hands became very trendy. Knowledge was recognised as power and fundamental in defeating the virus.

 If you think you are wise, be wise enough to stay safe and stop moving around unnecessarily. Wait till the lockdown is over!

 Hi people, are you about going out for shopping or any other activities since the lockdown has been eased a bit? Please don't forget to wash your hands properly with an antibacterial hand wash once you get back home. #StaySafe #StaySafeNigeria #Covid\_19 #COVID19

 The pandemic is a very real problem but experts stress that preparation and knowledge are both key to limiting the spread of the disease. We can slow down the virus together.Sending you all good thoughts for the week. #COVID19 #CoronaVirusUpdate

1. Alongside this new narrative about the various are other issues some of these twitter users believe are sacrosanct and deadly- Lassa fever, PovertyVirus, Killings across different parts of the country. With lockdown and government intervening measures came various challenges like corruption-distribution of palliatives, ventilator crisis, the poor state of healthcare facilities across the country etc.

 Nigeria has so many viruses, we have; Coronavirus Lassa Virus Security virus Spiritual virus Poverty virus Sexual virus

 Since Covid-19 broke out Boko Haram has been on recess waiting for their sponsors who are scared of dying to give orders

 ICPC calls on the general public to report any form of corrupt practices in the on-going distribution of palliatives for the COVID 19, especially the Conditional Cash Transfers (CCT)

1. Following these concerns are the economic, social and political consequence of the pandemic and its curtailing measures.

 The COVID-19 is a pandemic that does not only concern others, but touches everyone of us. We must all act with prudence and great responsibility. The time for economic impact assessment will certainly come…

 Nigeria need to be restore back to factory rest after covid 19 pandemic. We are difficult human beings our politicians and leaders aside.

 Many children will be born in December 2020, ostensibly as a result of reduced forms of non-sexual recreational pursuits. This boom in population will be one of the after-effects of the impact of COVID-19.

Some of the good that a platform like Twitter has done include rapid novel information dissemination (conventional platform like textbooks and journal do not have this type of reach).

## Discussion

Valuable and accurate knowledge is the basis for monitoring of disease outbreaks (Hall et al. 2012). This study shows how tweets can be collected and analysed to assist early warning systems for disease outbreaks and to track health education messages (Tappero & Tauxe, 2011). In addition, the Centre for Disease Control (CDC) have proposed that, public health education crises involve researching public awareness and perceptions and disseminating mass media communications. Twitter, offer the capacity to promote attainment of these objectives, that offer additional opportunities of improving health education in respect to individual, period and location (Hall et al., 2012).

1. **Timely detection and early signals**

This study shows how Twitter promotes and aids early warning systems for the monitoring of disease outbreaks. The specific dataset represents the early phase of public health notifications about the recent COVID-19 outbreak in Nigeria.. This study has two novel findings. Result showed an dangling-upward movement in the amount of tweets citing COVID-19 and related keywords beginning on February 20, 2020, a week before the official reported case in Nigeria. Although Twitter is adopted and used in resource-limited places like Nigeria, it has been shown that the number of related COVID-19 tweets increased during the days leading up to the official news alerts. The results show how Twitter is used in areas where monitoring systems for disease outbreak monitoring are not optimal for promoting early warning systems. Prompt systematic collection, interpretation and transmission during break-out and surveillance efforts of health-related data are essential for containment and control (Henning, 2004). Failure to acknowledge a threat to public health or lack of interventions can result when information is not available in good time (Hall et al., 2012). Africans have increased their participations in global discussions. There have been reports of social media development in Nigeria (GlobalStats, 2020) and Africa (Odlum & Yoon 2015). Studies have shown Africans to use SNSs like Facebook and Twitter primarily on their cell phones online (Odlum & Yoon, 2015). Nothing may ignore or exceed the SNS value. SNS data are and will continue to be useful in support of global health programs and findings (Essoungou, 2010).

1. **Nigerian perceptions, needs and education**

Nigerian perceptions have been analysed via the trend of information spread with time. The communication revealed and news alerts have been reflected by public concern. Tweets occurred in connection with health warnings, precautions, solidarity, distrust in government ability, similar diseases and aftermath of the pandemic. It was noted that the frequency and fear of COVID-19 related tweets have a dangling-upward movement, with rising numbers of cases and deaths in the country.

Although tweeting increased across the country, the highest number of tweets in the seleted time range was captured between March 19 and March 25 as official sources reported 51 confirmed cases in the country.

Dissemination of health information is important during disease outbreak response in support of public health interventions (Odlum & Yoon, 2015). However, in order to ensure effective communication, the need for health education must be effectively disseminated. Results from this study showed how the analysis of tweets can be valuable to identify and measure the necessity to intervene in public health. Messages are spread and widely spread by tweeting. Results show that health alerts are effectively disseminated. On February 27 (the date of COVID-19 first case in Nigeria) the number of retweets in the COVID-19 public concern increased significantly. Generally speaking, tweets looked for health information and confirmed that appropriate messages were needed to accompany health education warnings. It can be contended that prevention messages will be instantaneously insignificant following health warnings (Odlum & Yoon, 2015). Results from this study shows that news of COVID-19 education messages was still minimal one week after the official report on Feburary 27, 2020. In the early periods of news and health alerts few health organisations and individuals tweeted about COVID-19 prevention. However, due to limited follow-up and reach, there was insufficient distribution and no major news agencies retweeted such prevention messages. The following institutions do not represent the general population and have higher functional and health literacy.

The COVID-19 tweets reflected a number of topics. Most themes that identified knowledge lacunae included deficiencies in health education. COVID-19 information were both provided and requested. Users of the Twitter SNSs requested information on infection, preventative activities and government’s ability in containing the outbreak. This knowledge offers an insight into particular areas for mass delivery of health education. Generally, the positive and negative impact of twitter as a medium of information amidst a major pandemic like COVID-19 must be examined. In doing this, it will be important to also state the role Twitter is playing in censoring potentially harmful information (infodemics). Some of the impacts of this harmful information that trended this period can caused severe mental health issues; spread of misinformation. To counter rumors and claims from social media products aimed at preventing COVID-19, Twitter was used by NCDC to provide warning (NCDC, 2020). Some of the good that a platform like Twitter has done include rapid novel information dissemination (conventional platform like textbooks and journal do not have this type of reach).

Compassion in the form of motivation was also identified in the analysis as Twitter users spred the message of hope and optimism. Results further support the need to improve educational efforts to diminish fear as evidenced in many of the captured tweets. Given that the spread and death toll of COVID-19 in Nigeria has increased rising fear is unavoidable. Displaced anxiety leading to irrational thinking or actions is a significant obstacle to the prevention , control and treatment of outbreaks.

## Limitations of this study

The generality of this analysis is constrained by one single language ( English) and SNS (Twitter). The search strategies used potential changes with hashtags in order to include the highest number of related tweets of COVID-19. Future studies on data sources can leverage on various SNSs, blogs or community-based websites to understand and disseminate COVID-19-related information.

## Conclusions

In order to complement news warnings on COVID-19 and pandemics, there is a current, urgent need for successful health education communications. In recent COVID-19 cases in Nigeria, official report, particularly NCDC released many confused and ineffective communications, bringing legislation into question the capacity of the department to deal with the COVID-19 health crisis (Nigeria Centre for Disease Control, 2020b). While awareness is available, Nigerians remain confused, frightened and unbelieving. In alternative, during the Ebola Disease Virus (EDV) outbreak in Nigeria, the influence of health education and communication in Nigeria is something to be experienced. The WHO had praised the country for their swift and effective public health response by rapid monitoring and isolation as an epidemiological implementation of the international standing (Odlum & Yoon, 2015). The successful response of Nigeria during the EDV outbreak confirms the importance of health communication. Similar mass distribution activities can be assisted by Twitter.

Twitter is immense in outbreak monitoring that allows data to be captured in real time. SNSs are increasingly being used globally. A broader concept of outbreak monitoring in public health is important because information in social media can be used to promote and improve existing early warning systems. Regardless of character restrictions, Twitter users give many dimensions of concern. Our analysis shows no determination in health-education, despite obvious public unease. Twitter enables public participation and feedback by government and health departments during outbreak monitoring activities. Twitter will remind content of desired results for efficient data messaging. Entry to these data makes it possible to determine the behavioral response with greater precision and sensitivity. Since fear and awareness deficits fuel epidemics, population-specific and literacy-specific health education campaigns need to be supplemented by disease warnings to help deter and monitor action.

## Reference

Abdulraheem, L., Monehin, J., Akanbi, A., Onajole, A., & Bamgbala, A. (2004). Disease Notification Among Physicians in a Nigerian Tertiary Health Institution. *Nigerian Medical Practitioner*, *45*(6), 111–115. https://doi.org/10.4314/nmp.v45i6.28715

Ahmed, O. H., Sullivan, S. J., Schneiders, A. G., & Mccrory, P. (2010). iSupport: do social networking sites have a role to play in concussion awareness? *Disability and Rehabilitation*, *32*(22), 1877–1883. https://doi.org/10.3109/09638281003734409

Al Jazeera. (2020a). *Businesses reopen as Nigeria eases coronavirus lockdown | Coronavirus pandemic News*. https://www.aljazeera.com/news/2020/05/businesses-reopen-nigeria-eases-coronavirus-lockdown-200504094440082.html

Al Jazeera. (2020b). *Nigeria: Buhari to unwind COVID-19 lockdown in key states*. https://www.aljazeera.com/news/2020/04/nigeria-buhari-unwind-covid-19-lockdown-key-states-200427200057949.html

AS.com. (2020). *Coronavirus | Nigeria to reopen schools in latest phase of lockdown lifting*. https://en.as.com/en/2020/06/30/latest\_news/1593516061\_849840.html

Bae, Y., & Lee, H. (2012). Sentiment analysis of twitter audiences: Measuring the positive or negative influence of popular twitterers. *Journal of the American Society for Information Science and Technology*, *63*(12), 2521–2535. https://doi.org/10.1002/asi.22768

Bedford, J., Enria, D., Giesecke, J., Heymann, D. L., Ihekweazu, C., Kobinger, G., Clifford Lane, H., Memish, Z., Oh, M., Alpha Sall, A., Schuchat, A., Ungchusak, K., Wieler, L. H., Strategic, W., & Advisory Group for Infectious Hazards, T. (2020). COVID-19: towards controlling of a pandemic. *The Lancet*, *395*, 1015–1018. https://doi.org/10.1001/jama.2020.2648

Buehler, J. W., Hopkins, R. S., Overhage, J. M., Sosin, D. M., Tong, V., & CDC Working Group (2004). Framework for evaluating public health surveillance systems for early detection of outbreaks: recommendations from the CDC Working Group. *MMWR. Recommendations and reports : Morbidity and mortality weekly report. Recommendations and reports*, 53(RR-5), 1–11.

Essoungou, A.-M. (2010). A social media boom begins in Africa. *Africa Renewal*, *24*(4), 3–4. https://doi.org/10.18356/ff4217a4-en https://www.un.org/africarenewal/magazine/december-2010/social-media-boom-begins-africa

Fall, I. S., Rajatonirina, S., Yahaya, A. A., Zabulon, Y., Nsubuga, P., Nanyunja, M., Wamala, J., Njuguna, C., Lukoya, C. O., Alemu, W., Kasolo, F. C., & Talisuna, A. O. (2019). Integrated Disease Surveillance and Response (IDSR) strategy: Current status, challenges and perspectives for the future in Africa. In *BMJ Global Health* (Vol. 4, Issue 4, p. e001427). https://doi.org/10.1136/bmjgh-2019-001427

Federal Ministry of Health. (2013). *Nigeria National Pandemic Influenza Preparedness and Response Plan* (Issue September). http://www.ncdc.gov.ng/themes/common/docs/protocols/16\_1490369515.pdf

GlobalStats. (2020). *Social Media Stats Nigeria*. Statcounter. https://gs.statcounter.com/social-media-stats/all/nigeria

Gollan, J. K. (2020). *Do You Have COVID-19 Caution Fatigue?* Northwestern Medicine. https://www.nm.org/healthbeat/healthy-tips/emotional-health/do-you-have-covid-19-caution-fatigue

Hall, H. I., Correa, A., Yoon, P. W., Braden, C. R., & Centers for Disease Control. (2012). Lexicon, definitions, and conceptual framework for public health surveillance. *Morbidity and Mortality Weekly Report. Surveillance Summaries*, *61*(3), 10–14.

Henning, K. J. (2004). Overview of syndromic surveillance: What is syndromic surveillance? *MMWR Morb Mortal Wkly Repr*, *53*, 5–11. https://www.cdc.gov/mmwr/preview/mmwrhtml/su5301a3.htm

Isere, E. E., Fatiregun, A. A., & Ajayi, I. O. (2015). An overview of disease surveillance and notification system in Nigeria and the roles of clinicians in disease outbreak prevention and control. *Nigerian Medical Journal*, *56*(3), 161. https://doi.org/10.4103/0300-1652.160347

Khan, A. S., Fleischauer, A., Casani, J., & Groseclose, S. L. (2010). The next public health revolution: Public health information fusion and social networks. *American Journal of Public Health*, *100*(7), 1237–1242. https://doi.org/10.2105/AJPH.2009.180489

Kieny, M. P., Rottingen, J.-A., & Farrar, J. (2016). The need for global R&D coordination for infectious diseases with epidemic potential. *The Lancet*, *388*(10043), 460–461. https://doi.org/10.1016/S0140-6736(16)31152-7

Luret, Tolulope, O. A., Yetunde, O. T., Benjamin, U., & Ayuba, I. Z. (2015). Challenges of integrated disease surveillance response reporting among healthcare personnel in Mangu, Plateau State, Nigeria. *Journal of Public Health and Epidemiology*, *7*(4), 108–113. https://doi.org/10.5897/JPHE2015.0714

Lur, L. A., Afolaranmi, T. O., Tagurum, Y. O., Uzochukwu, B., & Zoakah, A. I. (2015). Challenges of integrated disease surveillance response reporting among healthcare personnel in Mangu, Plateau State, Nigeria. *Journal of Public Health and Epidemiology*, *7*(4), 108–113. https://doi.org/10.5897/JPHE2015.0714

Mittal, A., & Patidar, S. (2019). Sentiment Analysis on Twitter Data. *Proceedings of the 2019 7th International Conference on Computer and Communications Management*, 91–95. https://doi.org/10.1145/3348445.3348466

NCDC. (2020). *NCDC on Twitter*. https://twitter.com/NCDCgov/status/1284201104822149122

Nigeria Centre for Disease Control. (2019). *First case of corona virus disease confirmed in Nigeria*. https://ncdc.gov.ng/news/227/first-case-of-corona-virus-disease-confirmed-in-nigeria

Nigeria Centre for Disease Control. (2020a). Covid-19 Situation Report: Situation Report 59. In *Nigeria Centre for Disease Control* (Issue May).

Nigeria Centre for Disease Control. (2020b). COVID-19 Situation Report Situation Report 66. In *Nigeria Centre for Disease Control*.

Nnebue, C., Onwasigwe, C., Adinma, E., & Adogu, P. U. (2014). Challenges of data collection and disease notification in Anambra State, Nigeria. *Tropical Journal of Medical Research*, *17*(1), 1. https://doi.org/10.4103/1119-0388.130173

Odlum, M., & Yoon, S. (2015). What can we learn about the Ebola outbreak from tweets? *American Journal of Infection Control*, *43*(6), 563–571. https://doi.org/10.1016/j.ajic.2015.02.023

Osayantin, H., Saidu, A., & Aifuwa, S. A. (2020). Coronavirus pandemic outbreak and firms performance. *Management and Human Resource Research Journal*, *9*(4), 15–25. www.cird.online/MHRRJ

OSGF. (2020). *Remarks by the Chairman, Presidential Task Force On Covid-19 At The National Briefing of Monday, June 1, 2020*. https://www.osgf.gov.ng/news media/news/post/remarks-chairman-presidential-task-force-covid-19-national-briefing-monday-june-1-2020

Ridley, R. G. (2004). Research on infectious diseases requires better coordination. *Nature Medicine*, *10*(12S), S137–S140. https://doi.org/10.1038/nm1153

Sjödin, H., Wilder-Smith, A., Osman, S., Farooq, Z., & Rocklöv, J. (2020). Only strict quarantine measures can curb the coronavirus disease (COVID-19) outbreak in Italy, 2020. *Eurosurveillance*, *25*(13), 1–6. https://doi.org/10.2807/1560-7917.es.2020.25.13.2000280

Sullivan, S. J., Schneiders, A. G., Cheang, C.-W., Kitto, E., Lee, H., Redhead, J., Ward, S., Ahmed, O. H., & McCrory, P. R. (2012). ‘What’s happening?’ A content analysis of concussion-related traffic on Twitter. *British Journal of Sports Medicine*, *46*(4), 258–263. https://doi.org/10.1136/bjsm.2010.080341

Tappero, J. W., & Tauxe, R. V. (2011). Lessons learned during public health response to cholera epidemic in Haiti and the Dominican Republic. *Emerging infectious diseases*, *17*(11), 2087–2093. https://doi.org/10.3201/eid1711.110827

Vorovchenko, T. (2015). *# Ebola and Twitter : lessons learned*. University of Oxford.

WHO. (2001). *Protocol for the Assessment of National Communicable Disease Surveillance and Response Systems Guidelines for Assessment Teams*. http://www.who.int/emc

WHO. (2009). *WHO | Pandemic (H1N1) 2009 - update 57*. https://www.who.int/csr/don/2009\_07\_03/en/

WHO. (2020a). Coronavirus disease (COVID-19) Situation Report – 105. In *World Health Organization*. https://doi.org/10.1001/jama.2020.2633

WHO. (2020b). Coronavirus disease 2019 (COVID-19) Situation Report – 51. In *WHO Bulletin* (Issue March). https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200207-sitrep-18-ncov.pdf?sfvrsn=fa644293\_2

WHO. (2020c). Global Surveillance for human infection with coronavirus disease (COVID-19). In *WHO Bulletin*. https://www.who.int/publications-detail/global-surveillance-for-human-infection-with-novel-coronavirus-(2019-ncov)

WHO. (2020d). Novel Coronavirus (2019-nCoV) Situation Report - 1. In *WHO Bulletin* (Issue JANUARY).

WHO Regional Office for Africa. (2016). *Mapping the Risk and Distribution of Epidemics in the WHO African Region A Technical Report*. http://www.fao.org/docrep/004/y1997e