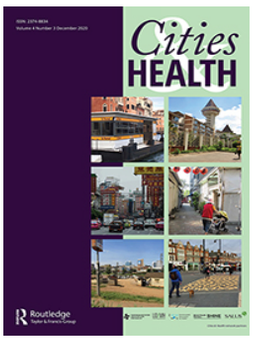

Cities & Health

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/rcah20

The other pandemic: social media engagement around non-communicable disease preventive behaviours during Nigeria's COVID-19 lockdowns

Ebele R. I. Mogo, Taibat Lawanson, Richard Unuigboje, Yossabel Chetty, Victor Onifade, Damilola Odekunle, Toluwalope Ogunro, Nfondoh Blanche, Rose Alani, Louise Foley, Clarisse Mapa-Tassou, Felix Assah, Olalekan Popoola, Camaren Peter & Tolu Oni

To cite this article: Ebele R. I. Mogo, Taibat Lawanson, Richard Unuigboje, Yossabel Chetty, Victor Onifade, Damilola Odekunle, Toluwalope Ogunro, Nfondoh Blanche, Rose Alani, Louise Foley, Clarisse Mapa-Tassou, Felix Assah, Olalekan Popoola, Camaren Peter & Tolu Oni (2022): The other pandemic: social media engagement around non-communicable disease preventive behaviours during Nigeria's COVID-19 lockdowns, Cities & Health, DOI: 10.1080/23748834.2022.2073540

To link to this article: https://doi.org/10.1080/23748834.2022.2073540

Published online: 16 May 2022.

CITIES & HEALTH
https://doi.org/10.1080/23748834.2022.2073540

Routledge
Taylor & Francis Group

COMMENTARY AND DEBATE

The other pandemic: social media engagement around non-communicable disease preventive behaviours during Nigeria's COVID-19 lockdowns

Ebele R. I. Mogo[a], Taibat Lawanson[b,c], Richard Unuigboje[b], Yossabel Chetty[d], Victor Onifade[b,c], Damilola Odekunle[b], Toluwalope Ogunro[c], Nfondoh Blanche[e], Rose Alani[f], Louise Foley[a], Clarisse Mapa-Tassou[e], Felix Assah[e], Olalekan Popoola[g], Camaren Peter[d] and Tolu Oni[a]

[a]MRC Epidemiology Unit, Global Diet and Activity Research Group and Network, University of Cambridge, Cambridge, UK; [b]Department of Regional and Urban Planning, University of Lagos, Lagos, Nigeria; [c]Center for Housing and Sustainable Development, University of Lagos, Lagos, Nigeria; [d]The Centre for Analytics and Behavioural Change NPC, and the Graduate School of Business, University of Cape Town, Cape Town, South Africa; [e]Health of Populations in Transition Research Group (HoPiT), University of Yaoundé I, Yaoundé, Cameroon; [f]Air Quality Monitoring Research Group, University of Lagos Department of Chemistry, Lagos, Nigeria; [g]Yusuf Hamied Department of Chemistry, University of Cambridge, Cambridge, UK

ABSTRACT

Given the complexity of global health crises such as the COVID-19 pandemic, it is typical for crisis-focused interventions to have a multiplicity of impacts. Some of these impacts may yield positive or negative externalities for health priorities that do not have the same perceived urgency. The interplay between COVID-19 prevention (a high priority, high perceived urgency issue) and non-communicable disease (NCD) prevention (a high priority, low perceived urgency issue) provides a good case in point. By analysing tweets during Nigeria's COVID-19 lockdowns, we identified avenues for social media to help adapt crisis responses to a wider range of wellbeing concerns.

ARTICLE HISTORY
Received 10 March 2022
Accepted 25 April 2022

KEYWORDS
Physical activity; mental health; wellbeing; social media; coronavirus; Nigeria

Commentary

The coronavirus pandemic is unlikely to be the last major global disruption (Silva de Amorim and Baltazar 2020). Just like this pandemic, future disruptions such as climate change-related conflicts and natural disasters will also have repercussions beyond the traditionally assumed limits of public health (Mogo 2020). They will require public health actors to combine the traditional responsibility of scaling cost-effective top-down responses with addressing the diverse cultural, social, and economic contextual factors crucial for their success (Stake 2021). Interventions aimed at tackling such complex disruptions can have multiple and even conflicting impacts across time, health domain and place (Oni *et al.* 2021).

The interplay between COVID-19 prevention (a high priority, high perceived urgency issue) and non-communicable disease (NCD) prevention (a high priority, low perceived urgency issue) provides a good case in point. NCDs such as diabetes and cardiovascular conditions are considered an emerging pandemic in Africa due to the rapid rise in disease burden (Allen 2017). Preventive behaviours to address this burgeoning epidemic are amenable to change through investments in inclusive access to healthy food, physical activity, and social participation which are significantly mediated through public spaces (Mogo *et al.* 2022). However, COVID-19 control measures such as lockdowns also curtail access to public spaces, which support behaviours that can prevent NCDs. Synergies may exist between crisis responses and non-crisis health priorities. For example, intersectoral collaborations in the context of COVID-19 prevention could yield co-benefits for NCD prevention (Oni *et al.* 2020). It is important to understand the impact of crisis responses on the broader wellbeing of populations, to build synergies and address possible negative externalities.

In 2019 (prior to the global outbreak of COVID-19), we began a study exploring NCD related risk factors and outcomes in the context of public space infrastructure development in Lagos, Nigeria and Yaounde, Cameroon (UrbanBetter 2022). With the governance of public spaces changing due to ensuing lockdowns, we expanded the focus of our research to consider how activities to address behaviours around the COVID-19 crisis may impact behaviour change around the (perceived to be) less urgent but similarly high priority issue of NCDs.

We identified social media as an avenue to gather insights into unfiltered and real-time engagement around NCD preventive behaviours, while bypassing the need for in-person data collection which was not feasible during lockdown. Social media analytics, a process of gathering and analysing data from social networks such as Facebook, Instagram, Twitter, and

CONTACT Tolu Oni tolu.oni@mrc-epid.cam.ac.uk MRC Epidemiology Unit, Global Diet and Activity Research Group and Network, Institute of Metabolic Science, University of Cambridge, Cambridge Biomedical Campus, Cambridge CB2 0QQ, Cambridge, UK

LinkedIn, is often used by brands for market research. This helps them track online conversations about their products, with emergent information used to guide corporate decision-making.

We had initially aimed to study social media engagement in both Nigeria and Cameroon given that these two countries were the focus areas for the ALPhA study. However, during a pilot search where we built a query on social media data originating from Nigeria and Cameroon, we noticed that social media content from Cameroon constituted only 2.4% of the total information analysed, with the rest being from Nigeria. All the top tweet authors recorded, that is, people whose tweets had the widest reach and mentions were from Nigeria. Relative population sizes may help to explain the comparative tweet volume. For example, Cameroon has a population of 27,744,989, about 13% of Nigeria's which is 214,028,302 (Worldometer 2021). About 53% of Cameroon's population, constituting 14,741,256 people, is urban, while about 44% of Nigeria's population, constituting about 102,806,948 people, is urban.

Another factor that may explain this difference is access to the internet. Nigeria had 61.2% of internet users in December 2019 compared to 23.1% in Cameroon in that same year (Internet World Stats 2021). Furthermore, political suppression has become a growing concern in many African countries. In 2016, the government of Cameroon released an official statement labelling social media as 'a new form of terrorism'. It pointed out that sites including Twitter and Facebook had created 'a social pandemic, perpetuated by amateurs, who do not have a sense of etiquette and decorum' (Ndongmo *et al.* 2021). Furthermore, while Nigeria implemented strict lockdowns with discernible phases of pre, peri and post lockdown, there was little by way of movement restrictions implemented and enforced in Cameroon. For these reasons, the analysis was limited to Nigeria, suggesting that social listening projects may be best suited to settings with high access to the internet, which tend to be urban areas.

We aimed to understand social media engagement on NCD risk reduction e.g. physical activity, obesity, mental wellbeing, in the context of a crisis. Previous research findings have demonstrated the potential for social media to identify health service needs (Saha *et al.* 2022) and perceptions around preventive healthcare seeking behaviours (Ryu and Pratt 2022), as well as the value of social media in facilitating the spread of information and mobilisation efforts during crises (Osoro 2017). We considered the Helsinki ethical principles in the conduct of our study (World Medical Association 2013). Our project satisfied these principles by engaging in a research project that could be beneficial to the population studied, only making use of data that was already in the public domain, and not creating further risks of transmission of COVID-19 through in-person data collection.

We used Brandwatch (2022), a tool that tracks publicly available social media data from various sites to aggregate data from these sources. Brandwatch captures public reactions to marketing campaigns, classifies related negative and positive sentiments, and monitors the geographical spread of these sentiments. Dimensions of publicly available data collected by Brandwatch include shares, likes, conversations, comments, mentions, impressions, sentiments, location, and industries of sharers. Sentiment analysis on Brandwatch adopts three main steps, which include the use of knowledge-based rules, machine learning, and the development of customisable rules (Brandwatch 2022). Information shared online is categorised as positive, negative or neutral based on generic language specific characteristics of the text. Information that is categorised as neutral or unclassified based on the knowledge-based system is passed through language and industry specific classified information which has been trained to identify sentiments. Users are also able to set up specific rules around sentiment classification that are peculiar to unusual events or to their brands to refine their results. This process has recorded between 30-80% agreement with human classifiers in the past (Brandwatch 2022). However, it is useful for identifying key trends which can then be triangulated against other sources of information for validation.

Other social listening platforms available include Digimind, Sprout Social, Falcon.io, Sprinklr, to mention but a few. However, we decided to use Brandwatch based on the expert recommendation of our collaborators at the Centerfor Analytics and Behavioural Change in South Africa (CABC 2022). At the CABC, output from Brandwatch had been previously triangulated against expert input, government reports and their in-house social listening platform, Anansi, and found reliable for purposes similar to those of our study. The team also used Brandwatch in several African countries including South Africa, Ghana, Senegal, Nigeria and Tanzania on social listening projects that were used to identify and understand social unrest, to track social cohesion and division, and to explore vaccine hesitancy (CABC 2022). For this reason, we considered it most appropriate to our study aims.

Information we captured through our query (Figure 1) included: i) which individuals and organisations were generating the most discussions on NCD preventive behaviours and overall wellbeing during the pandemic; ii) where people were sharing from; and iii) how the content of discussions relating to NCD preventive behaviours evolved before, during, and after the lockdown period.

```
(Exercis* OR excersis* OR exersiz* OR excercis* OR exorsic* OR excersiz* OR exceris* OR
fitness OR fit OR "keep fit" OR "stay fit" OR "getfit" OR unfit OR health OR sport* OR jog* OR
gym* OR cardio OR workout* OR "work out" OR workoutroutine OR "workout routine" OR routine* OR
"workout session" OR "Family workout" OR "self care" OR selfcare OR workouttogether OR
"workout together" OR yoga OR sportswear OR sportsware OR activewear OR activeware OR "active
wear" OR "active ware" OR "gym gear" OR "excercise clothes" OR "mental health" OR "fitness
app" OR Anxiety OR Stress OR depress* OR lonely OR cycl* OR bike OR outdoors OR nutri* OR diet
OR weight OR obes* OR overweight OR skinny OR fat OR thin OR slender OR "in good shape" OR
"health problems" OR habits OR swimming OR run* OR play OR football OR Basketball OR Skate OR
Surf OR Beach OR hike OR walk OR "jumping jack*" OR jumpingjack* OR starjumps OR "star jump*"
OR squat* OR bench OR plank OR "leg raise" OR legraise OR "Knee Lift*" OR kneelift* OR sit-up
OR situp OR pushup OR push-up OR lunge* OR "physical activity" OR "public spaces")
```

Figure 1. A broad query structure was used to ensure that the maximum number of mentions could be found.

A key component of the query development was identifying a near exhaustive list of synonyms for words related to NCD behavioural risk factors e.g. mental health, fitness, walking. We also compiled a list of iterations of commonly misspelt words so as not to leave out any relevant posts. Given the vastness of social media conversations, a 'NOT' parameter was added to the Boolean query, to remove extraneous information that constituted noise. In the field of social media listening, noise is a term that is used to describe tweets that appeared in our dataset because they met some parameters within our query but were unrelated to our query. Trending issues present an opportunity for hashtag hijacking, when a trending hashtag is used to draw attention to an unrelated topic. A large volume of mentions was still returned in the final cleaned dataset, therefore approximately 93% of the data was retained for the analysis.

The period of analysis covered an eight-month period from January to August 2020. This allowed us to capture how conversations and public perceptions around behavioural NCD risk factors changed in response to the spread of COVID-19 and the enforcement of mitigation measures. Data were analysed using simple descriptive statistics such as tweet mentions, the highest number of mentions concerning a particular query, the nature of people and organisations tweeting, and the underlying sentiments the tweets expressed. Charts, frequencies, percentages, and sample tweet images were used to display the findings. Below, we reflect on the insights gathered from this approach.

Identifying distinct changes in public concerns in the context of crisis responses

We designed our query to focus on Nigeria's lockdown period, which can be broken down into four stages between January and August 2020 (Ibrahim *et al.* 2020). These periods are the pre-lockdown period from 2 February to 29 March 2020; the total lockdown during which major public space restrictions occurred from 30 March – 3 May 2020; the easing up of lockdown from 05 May – 15 July 2020, and the post-lockdown period from 16 July and beyond. We did not restrict our search by age and gender. Our approach allowed us to explore how social media engagement changed during these periods, both in terms of the conversation topics and the conversation volume. Our query output suggests that while there was a fair amount of conversation online in Nigeria around health, fitness in the context of COVID-19 during the pre-lockdown phase (Figure 2), total mentions increased by 46% as the total lockdown was put in place (Figure 3) and the access of residents to public spaces was further curtailed.

In our data set, conversation spikes related to NCD preventive behaviours during the pre-lockdown phase were related to changing developments in response to the pandemic, such as the identification of Nigeria's first COVID-19 case (Figure 7) and the suspension of major football leagues (Figure 8). Over time, tweets on NCD preventive behaviours with the most engagement in the form of retweets and likes were those that called for caution in protecting health, those concerned with the high percentage of pandemic-related deaths in people with underlying NCDs, and those that projected alarm over increasing COVID-19 cases in Lagos (Figures 9 and 10).

As the lockdown period eased (Figure 4), negative sentiments decreased and conversations moved from alarm to health advice and challenging health misinformation. Finally, toward the post-lockdown phase (Figures 5 and 6), conversation spikes included interests in weight loss and mental health. Posts about depression also became more prominent.

Identifying atypical collaborators for strengthened public health responses

Using the data extracted, we traced the evolution of the conversation and identified atypical yet influential actors involved in disseminating messaging around NCD preventive behaviours in the context of COVID-19 to the public. Across all four lockdown periods examined, we consistently noted that the conversations were driven more widely by individuals than by accounts which had been marked as organisational accounts by Twitter. Messaging came from

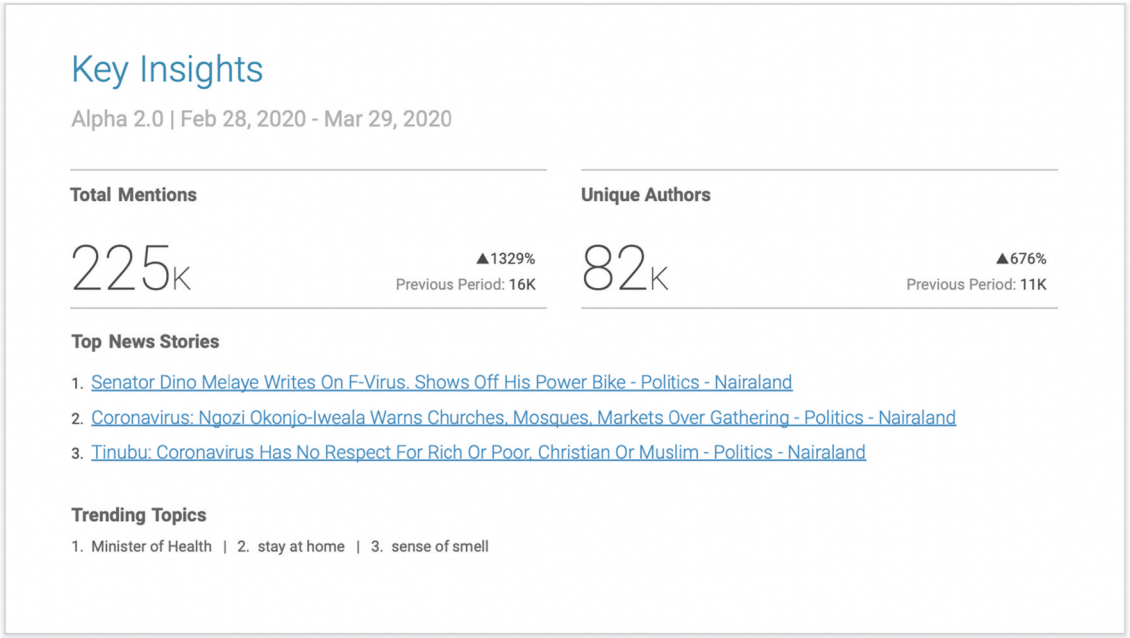

Figure 2. Key insights on conversations on NCD preventive behaviours in the context of COVID-19 from blogs, news and Twitter during Nigeria's pre-lockdown period.

Figure 3. Key insights on conversations on NCD preventive behaviours in the context of COVID-19 from blogs, news and Twitter during Nigeria's total lockdown period.

famous Nigerian personalities including social media influencers, comedians, musicians, footballers, and prominent businesspeople; with more robust engagement than messaging from health organisations. Notably, we found that social media influencer accounts like @Aproko_doctor with a similar number of followers as the Nigerian Centre for Disease Control (NCDC) (1.1 million at the time) had significantly more retweets and likes from their social media content compared to that of the NCDC.

We were also able to evaluate the engagement of traditional actors. While having significantly less engagement than tweets from influential individuals, organisational actors including the global and national accounts of the World Health Organization, the Lagos State Ministry of Health, UNICEF Nigeria, Nigerian Centre for Disease Control, and the Nigerian Federal Ministry of Health played a role in sharing health messaging. Businesses such as Konga Nigeria and the Nigerian Exchange Group; government agencies

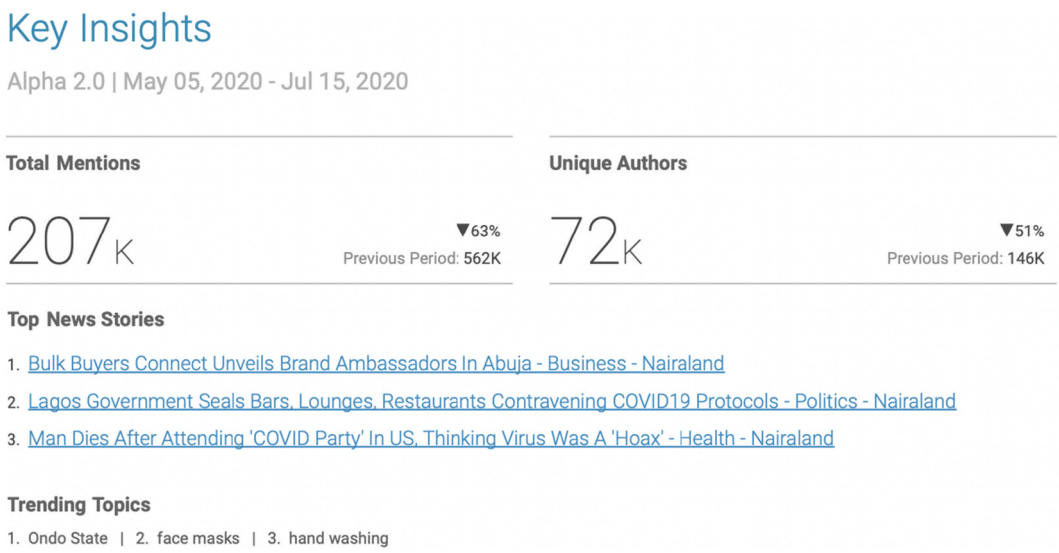

Figure 4. Key insights on conversations on NCD preventive behaviours in the context of COVID-19 from blogs, news and Twitter during Nigeria's easing up of lockdown period.

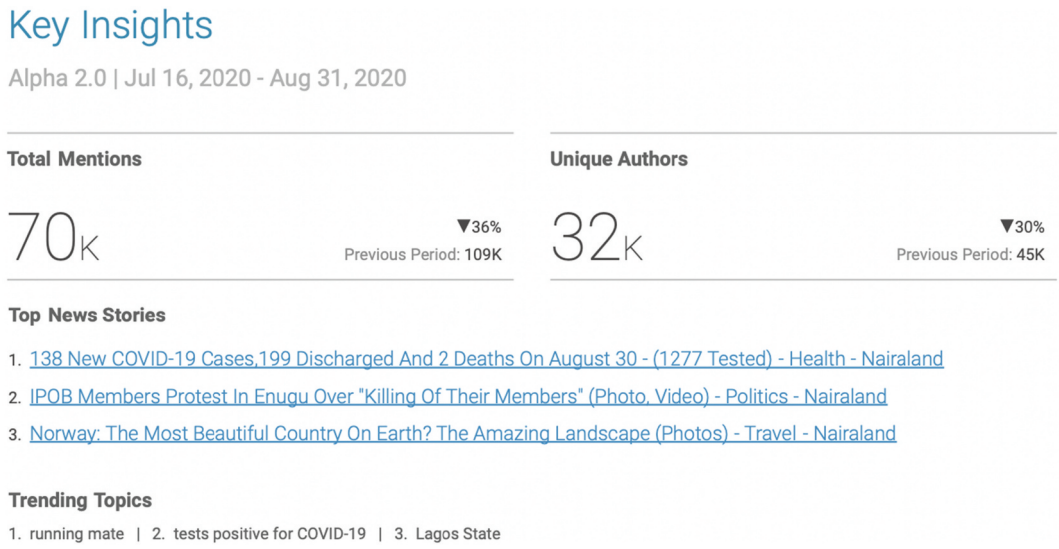

Figure 5. Key insights on conversations on NCD preventive behaviours in the context of COVID-19 from blogs, news and Twitter during Nigeria's post-lockdown period.

including the Nigerian Police Force and media agencies such as the Daily Trust Newspapers also shared health messaging during this time period.

The importance of contextually-informed public health measures

Traditional survey methods have a significant time lag between the collection and interpretation of data with the work of interpreting large data sets resting primarily with researchers that may lack insights into the context behind the data. By contrast, the use of social media analysis enabled not only the capturing of public perceptions in near real-time, but also contextual information, such as replies, clarifying tweets, pictures, retweets and other forms of engagement, to ground-truth the meanings inferred from these perceptions.

Data analysed identified a conflict between the stay-at-home measures to interrupt disease transmission on the one hand and the demand for public space opportunities for recreational physical activity on the other (Figures 10-15). This is reflected in tweets making observations about people meant to be indoors who were out on the streets playing sports instead (Figure 16).

Additionally, the government's suspension of the use of various public spaces and admonitions to stay calm and obey lockdown orders stood in stark contrast

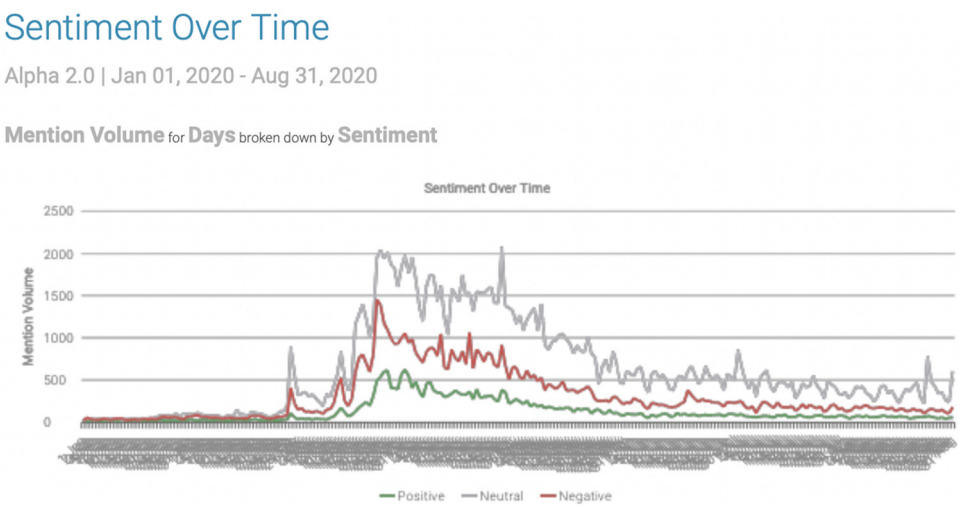

Figure 6. The evolution of sentiments on NCD preventive behaviours in the context of COVID-19 from blogs, news and Twitter from January to August 2020.

Figure 7. A tweet providing details on the first coronavirus patient.

to the public's concerns about the feasibility of lockdown for poorer Nigerians and the perceived elitist nature of banning interstate travel by road while permitting flights (See Figures 9 and 10). This ability to understand how high level responses may impact the public and sub-populations e.g. low-income groups, when responding to rapidly evolving situations could help to improve crisis responses.

Implications for practice

Our findings suggest that in rapidly evolving crises, social media analysis could be considered as part of a complementary set of tools needed to inform the design of robust responses. Themes that arise from social media conversations can inform the tailoring of crisis responses to various sub-populations and their needs. For example,

Figure 8. A sample discussion on the suspension of major football leagues.

Figure 9. A twitter discussion on the connection between COVID-19 risks and underlying NCDs.

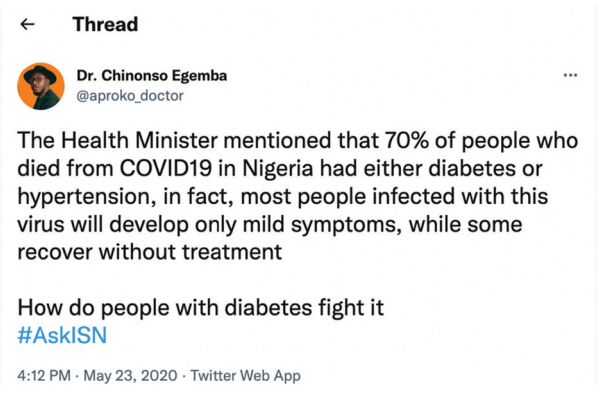

Figure 10. An example of a social media discussion on NCDs in the context of COVID-19. Several of the discussions by influencers were evidence informed but did not necessarily link to traditional health authorities.

an early identification of a demand for public spaces in the context of the closure of these spaces during lockdowns could inform alternative arrangements to support physical and mental health. Changes in public concerns over time, such as in the pre-lockdown, lockdown and post-lockdown periods as identified above, could be used to evolve public health messaging for appropriateness to changing needs.

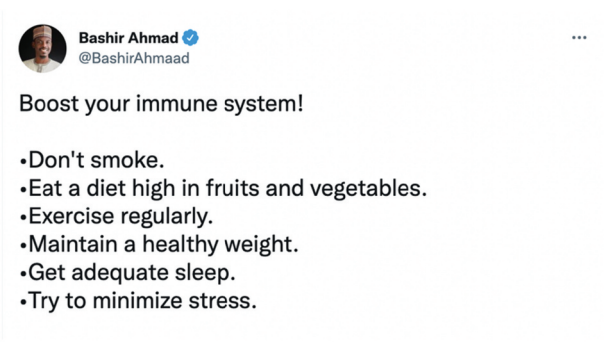

Figure 11. A sample discussion during the lockdown period.

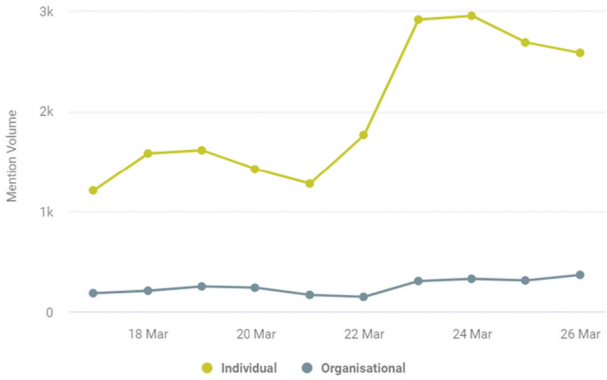

Figure 12. Individual tweets consistently shaped the discourse on public health far more than tweets from organisations, including public health agencies.

Figure 13. One of several tweets drawing attention to closed school periods being used to socialise, not necessarily to isolate.

Figure 14. A sample of the discussions on the infeasibility of isolating for several Nigerians in light of socioeconomic pressures.

Figure 15. An example of various tweets drawing attention to the perceived elitist nature of lockdown measures.

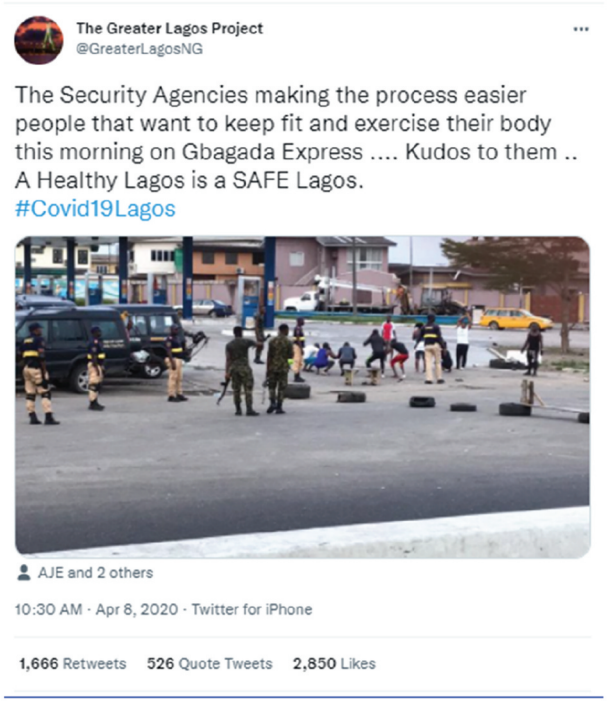

Figure 16. A trending theme during the lockdown period was the use of public space for physical activity, sometimes inviting punishment from government forces enforcing lockdown as seen above (also see Lawanson et al. 2020).

Social media can also be valuable in understanding key stakeholders driving discourse in the context of crisis. Our approach made it easy to identify influential yet atypical disseminators of health messaging, particularly social media influencers. Some of these individuals would otherwise have been difficult to identify. These actors could prove valuable in the design of robust and timely multi-sectoral responses to health issues. Our findings also suggest it is worth exploring how to support such digital actors with evidence-informed communication that links to the relevant health authority sources to avoid sharing mis-information. This is due to their prominent role in communicating with the public and the higher levels of engagement they achieve in comparison to traditional health authorities.

Identifying influential actors also provides insights on how to frame messages on health-related topics to ensure a stronger reach and engagement. For example, we found that the public responded better to the use of humour, satire and everyday lived experiences deployed by individual influencers to share health information compared to more technical advisories deployed by the institutional accounts. Such information could be used in near real time tailoring of public health messaging on behaviour change in times of crisis.

Our analysis also focused specifically on NCD preventive behaviours in the context of the COVID-19 lockdown, particularly given the inadequate consideration of lockdowns on other facets of health promotion. However in the context of COVID-19, misinformation, disinformation and/or denial of the pandemic could have had an impact on people's response to lockdown measures. In a survey of respondents from English speaking African countries, Osuagwu *et al.* (2021) noted prevalent misinformation around how to prevent and to treat COVID-19. Exposure to misinformation was found to vary based on education, employment status, age, sex and knowledge of the clinical symptoms of COVID-19. During a crisis, social media can also support the identification of digital sources of misinformation and/or disinformation in order to improve access to evidence-based information.

Social media analytics capture the perception of people with active social media accounts, a factor that is limited by social media bans and access to the internet in Nigeria. In 2021, only 15.8% of the Nigerian population accessed social media, with a significant proportion joining in 2020 (Kemp 2021). We also found more social media data from Lagos, Ibadan, Abuja and Kaduna, all major Nigerian cities. Another potential limitation of using social media analytics is that it is better at flagging social media conversations in popular global languages such as English than discussions in indigenous languages. For these reasons, this approach should be considered complementary to existing approaches, and may be comparatively more valuable in cities.

Finally, social media analytics is dependent on publicly shared information, which itself is determined by various factors. For example, people may be more willing to share on informative topics (Lee *et al.* 2011) and on topics that spark strong sentiments such as emergencies (Simon *et al.* 2015) than on stigmatised or taboo topics. However, in anticipation of future rapidly evolving health disruptions, more research is warranted to explore the ways that this tool could be used in data-poor contexts as part of the public health toolbox to understand evolving public sentiments, to frame messages more effectively, and to engage traditional as well as atypical multisectoral actors.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This project is supported by a Cambridge-Africa ALBORADA Research Fund COVID-19 Emergency Award. The ALPhA (Informal Appropriation of public space for Leisure Physical Activity) study is funded by the British Academy Urban Infrastructures of Wellbeing Programme [Grant reference UWB190032] awarded to TO. LF, EM, FA, TO are in part funded by the National Institute for Health Research (NIHR) (16/137/34) using UK aid from the UK Government to support global health research. The views expressed in this publication are those of the author(s) and not necessarily those of the NIHR or the UK government. TL is also supported by United Kingdom Research and Innovation (UKRI) under the ARUA-UKRI GCRF Partnership Programme for Capacity Building (Ref: ES/T003804/1) which established the African Research Network for Urbanisation and Habitable Cities.

ORCID

Ebele R. I. Mogo http://orcid.org/0000-0003-0880-0750
Victor Onifade http://orcid.org/0000-0002-0072-0791
Toluwalope Ogunro http://orcid.org/0000-0001-6517-056X
Louise Foley http://orcid.org/0000-0003-3028-7340
Clarisse Mapa-Tassou http://orcid.org/0000-0002-0709-1449
Felix Assah http://orcid.org/0000-0003-3301-6028
Tolu Oni http://orcid.org/0000-0003-4499-1910

References

Africa Centre for Disease Control, Mar 2020. Communique by the Emergency Meeting of African Ministers of Health on the Coronavirus Disease Outbreak. Available from: https://africacdc.org/download/communique-by-the-emergency-meeting-of-african-ministers-of-health-on-the-coronavirus-disease-outbreak/.

Africa Internet Users. Population and Facebook Statistics. Internet World Stats, 2020. Available from: https://www.internetworldstats.com/stats1.htm [Accessed 28 January 2021].

Allen, L., 2017. Are we facing a noncommunicable disease pandemic? *Journal of epidemiology and global health*, 7 (1), 5–9. doi:10.1016/j.jegh.2016.11.001

Brandwatch, 2022. *Sentiment Analysis*. Available from: https://www.brandwatch.com/wp-content/uploads/brandwatch/Brandwatch-Sentiment-Analysis.pdf

Center for Analytics and Behavioural Change, 2022. *University of Cape Town, South Africa*. Available from: https://cabc.org.za.

Haider, N., *et al.*, 2020. Passengers' destinations from China: low risk of novel Coronavirus (2019-nCov) transmission into Africa and South America. *Epidemiology and infection*, 148 (41), 1–7. doi:10.1017/S0950268820000424

Ibrahim, R.L., Ajide, K.B. and Julius, O.O., 2020. Easing of lockdown measures in Nigeria: Implications for the healthcare system. *Health policy and technology*, 9 (4), 399–404. doi:10.1016/j.hlpt.2020.09.004

Kemp, S., 11 Feb 2021). *Digital 2021: Nigeria*. Data Reportal. Available from: https://datareportal.com/reports/digital-2021-nigeria

Lawanson, T., *et al.*, 2020. The urban environment and leisure physical activity during the COVID-19 pandemic: a view from Lagos. *Cities & health*, 1–4. doi:10.1080/23748834.2020.1806459

Lee, C., *et al.*, 2011. *Why do people share news in social media?*, 129–140. doi:10.1007/978-3-642-23620-4_17

Mogo, E., 2020. *Using innovation to transform human and planetary health*. UNHCR Innovation Service. Available from: https://www.unhcr.org/innovation/wp-content/uploads/2021/10/using-innovation-to-transform-human-and-planetary-health_web.pdf .

Mogo, E.R., *et al.*, 2022. A Systematic review protocol of opportunities for noncommunicable disease prevention via public space initiatives in African cities. *International journal of environmental research and public health*, 19 (4), 2285. doi:10.3390/ijerph19042285

Ndongmo, K., *et al.*, 2021. *Social media, repression and the crisis in Cameroon. Africa is a country*. Available from: https://africasacountry.com/2019/01/social-media-repression-and-the-crisis-in-cameroon [Accessed 28 January 2021].

Oni, T., *et al.*, 2020. Implications of COVID-19 control measures for diet and physical activity, and lessons for addressing other pandemics facing rapidly urbanising countries. *Global health action*, 13 (1), 1810415.

Oni, T., *et al.*, 14 Oct 2021. The case for community-based approaches to integrated governance of climate change and health: perspectives from Lagos, Nigeria. *Journal of the British Academy*, 9s7, 7–32. doi:10.5871/jba/009s7.007

Oni, T., *et al.*, 2021. Implications of COVID-19 control measures for diet and physical activity, and lessons for addressing other pandemics facing rapidly urbanising countries. *Global health action*, 13, 1. doi:10.1080/16549716.2020.1810415

Osoro, C.M. 2017. *Effectiveness of social media in crisis communication: the case of Westgate Mall attack*. Doctoral dissertation. University of Nairobi.

Osuagwu, U.L., *et al.*, 2021. Misinformation about COVID-19 in sub-Saharan Africa: evidence from a cross-sectional survey. *Health security*, 19 (1), 44–56. doi:10.1089/HS.2020.0202

Ryu, H. and Pratt, W., 2022. Microaggression clues from social media: revealing and counteracting the suppression of women's health care. *Journal of the American medical informatics association*, 29 (2), 257–270. doi:10.1093/jamia/ocab208

Saha, K., *et al.*, 2022. Social media discussions predict mental health consultations on college campuses. *Scientific reports*, 12 (1), 1–11. doi:10.1038/s41598-021-03423-4

Silva de Amorim, W. and Baltazar, J., 2020. Pandemics, global risks and adaptation: challenges for a changing world. *Research in globalization*, 2. doi:10.1016/j.resglo.2020.100023

Simon, T., *et al.*, 2015. Socializing in emergencies—a review of the use of social media in emergency situations. *International journal of information management*, 35 (5), 609–619. Available from: https://www.sciencedirect.com/science/article/pii/S0268401215000638.

Stake, A., 6 May 2021. *To manage syndemics, think like an octopus*. Foresight Global Health. Available from: https://foresightglobalhealth.com/to-manage-syndemics-think-like-an-octopus/.

Urban Better, 2022. *The informal appropriation of public space for leisure physical activity in Lagos and Yaoundé*. Available from: https://urbanbetter.science/alpha/

World Medical Association, 2013. World medical association declaration of Helsinki: ethical principles for medical research involving human subjects. *JAMA*, 310 (20), 2191–2194. doi:10.1001/jama.2013.281053

Worldometer, 2021. *Population*. Available from: https://www.worldometers.info/world-population/cameroon-population/ [Accessed 28 January 2021].