Title: Online conversations on COVID-19 vaccines in Eastern and Southern Africa: a longitudinal analysis of social listening data.

Authors: Silvia Sommariva, Helena Ballester Bon, Sofia de Almeida, Jenna Mote, Sijmen Brouwers, Massimiliano Sani, Natalie Fol.

Corresponding author Information: ssommariva@unicef.org

Affiliations: UNICEF Eastern and Southern Africa Regional Office, Social and Behaviour Change section, Nairobi, Kenya.

Abstract

Introduction. Social listening programmes across digital channels are increasingly becoming an integral part of health preparedness and response planning. To best support communication and programmatic strategies, it is essential to adopt a social listening approach that balances cross-sectional in-depth analysis of the ongoing online conversation to identify key concerns, information voids and misinformation, with a longitudinal view of how discourse evolves over time and how topics recur or emerge. This study analyses online conversations about COVID-19 vaccines in Eastern and Southern Africa, using a taxonomy developed and refined in collaboration with social and behaviour change teams working in the field to increase vaccine acceptance and uptake.

Methodology. The COVID-19 vaccine taxonomy was developed and applied to filter online conversations tracked into nine subtopic categories. The taxonomy has been used and its search strings refined on a weekly basis to provide analysis and recommendations for vaccine acceptance and uptake. In this analysis, the taxonomy is applied on longitudinal data of conversations about COVID-19 vaccines in 21 countries in Eastern and Southern Africa over the period December 1, 2020 - December 31, 2021. Metrics included in the analysis included volume of posts or articles and related user engagement. Qualitative analysis of content was conducted to identify key concerns, information voids and misinformation.

Results. Over 300,000 articles and posts about COVID-19 vaccines shared by users or outlets geolocated in the region were analysed. These results generated over 14 million engagements on social media and digital platforms. The analysis shows how conversations about access and availability of vaccines have represented the largest share of engagement over the course of the period. Conversations about vaccine effectiveness and safety represented the second and third largest share of engagement, with peaks observed in August and November 2021. Online interest in childhood vaccination increased over time as vaccine eligibility criteria expanded in some countries in the region. Conversations mentioning mandates and certificates peaked in the last quarter of 2021 as governments and private sector entities expanded vaccine requirements.

Conclusions. Findings from this study show the importance of monitoring conversation trends over time and adjust the analysis to include emerging topics. The analysis also points to the need to consider concerns, information voids and misinformation around effectiveness and safety of vaccines in the context of overall concern for vaccine availability and access in Eastern and Southern Africa. This is fundamental to inform social and behaviour change strategies that promote vaccine demand effectively, without increasing public frustration over vaccine availability challenges and downplaying concerns for vaccine equity.

Introduction

Analysing the layers of influence on immunization-related behaviours is a complex and necessary process to identify and course-correct strategies aimed to increase vaccine demand. Insights drawn from social listening activities, defined as the systematic monitoring and analysis of public discourse on selected online and offline channels, can contribute to shedding a light on how the vaccination experience unfolds in a specific context, which barriers individuals encounter and how they can be engaged in solutions. (1) (2)

The field of social listening for public health preparedness and response planning precedes the COVID-19 crisis; however, the pandemic has put a spotlight on the need for public health systems to be a proactive part of the conversation to address information voids, correct false information, capture questions and concerns. (3) (4) (5) (6) The COVID-19 vaccine rollout, in particular, has taken place at the intersection of two challenging phenomena from a social listening perspective: the COVID-19 infodemic, in which digital communication and social media have facilitated the sharing of an unprecedented volume of information, and the long-standing digital presence of the anti-vaccine movement. (5) (7) (8) (9) The challenges for vaccine demand promotion in this context have therefore been unprecedented. (10)

To capture fast-evolving conversations and pick up on early signals of misinformation, social listening strategies have been conceived to plan for frequent tracking and analysis of the data available, often on a weekly or even more frequent basis. These constant data monitoring efforts have led to a large volume of social listening data, which can be further leveraged to understand how discourse evolves over time, which trends persist, and which new issues emerge.

On the African continent, COVID-19 vaccine demand generation efforts have been facing several challenges, ranging from misinformation affecting beliefs and knowledge, to barriers to access points of service, to after-service concerns. Online social media and digital news monitoring tools, in conjunction with other findings collected through ground-level channels and helpline centers. (1) This study analyses online conversations about COVID-19 vaccines in 21 countries of Eastern and Southern Africa during a 13 months period, using a taxonomy developed and refined in collaboration with social and behaviour change experts working in the field of vaccine acceptance and uptake. The goal is to understand which vaccine issues have been most central to the public conversation on digital channels, how the focus has evolved over the course of the period considered, and how these insights inform demand generation activities in the region.

Methods

Data collection

Data on online public content about COVID-19 vaccines, including social media posts, user comments and articles were collected from a wide range of channels relevant to the Eastern and Southern Africa region. Data collection was based on the social listening strategy developed and implemented by UNICEF in Eastern and Southern Africa, in collaboration with partners, for COVID-19 Risk Communication and Community Engagement (RCCE). (11) Channels included in the monitoring were popular social media (Facebook, Twitter, Instagram), digital news, blogs and forums geolocated in one of the 21 countries in Eastern and Southern Africa. Search queries on Google were also reviewed on a weekly basis using Google trends. Relevant posts and articles were identified using keyword-based Boolean search strings about COVID-19 vaccines, resulting from a review process among social and behaviour change

experts working in the field of vaccine demand. Data were collected for the period December 2020 – December 2021.

Data analysis

A COVID-19 vaccine taxonomy was developed and applied to segment online conversations tracked into subtopic categories. COVID-19 subtopics were identified based on digital social listening activities conducted in the region over the course of the pandemic response, as well as questions and rumours identified in 2020. For each subtopic, keyword-based Boolean search strings were developed using the same consultation process mentioned above. Keywords included English, French, Portuguese, Swahili, and additional local languages depending on input provided by UNICEF country offices in the Eastern and Southern Africa region. The resulting search strings were used to filter data on COVID-19 vaccines and categorize it into subtopics. The taxonomy was tested and validated by review of the top 100 posts/articles retrieved, and edits to the search strings were made to improve retrieval precision rate. Metrics analyzed included volume of posts or articles and related engagement. Qualitative analysis of content was conducted on a weekly basis to identify key concerns, information voids and misinformation.

Table 1. *Social listening taxonomy for COVID-19 vaccine conversations*

Subcategory	**Description**
Effectiveness	Content discussing how well vaccines are working in the real world. Example keywords: effective*, success*, immun*
Safety	Content discussing risks associated with vaccination. Example keywords: AEFI*, unsafe, side effect*
Children	Content mentioning children as a target group for the vaccine. Example keywords: child*, infant, teen*
Certificates	Content mentioning vaccine-related documentation. Example keywords: certificate*, passport*, proof
Clinical trials	Content mentioning research studies that evaluated or are evaluating the effects of the vaccine on health outcomes. Example keywords: trial*, study, published
Fertility	Content mentioning concerns on the potential impact of the vaccine on fertility. Example keyword: sterile, pregnan*, menstrua*
Expiration	Content discussing vaccine expiration. Example keywords: shelf life, expired, expiration
Second dose/ Booster	Content discussing the second dose (for vaccines requiring two doses) or boosters. Example keywords: booster*, second, third
Availability and access	Content discussing accessing the vaccine or availability issues. Example keywords: eligib*, administration, equity, donation*

Results

Sample description

Over 300,000 articles and posts about COVID-19 vaccines shared by users or outlets geolocated in the region were tracked during the period December 2020-December 2021. About half of the results tracked were from South African users or outlets, followed by 16% of content geolocated in Kenya, 8% in Uganda and 5% in Zimbabwe (Figure 1). This distribution is partly a reflection of Internet penetration rates, which vary significantly across countries in the region: for example, according to World Bank data, 68% of the population uses the Internet in South Africa, compared to 1% in Eritrea (2019 and 2017 data respectively) (12). About 85% of the content was in English language, followed by Swahili (5%), French (2%), Portuguese (2%), Afrikaans (2%), Amharic (1%) and other languages (3%). [illegible] posts (about 40% of total sample)

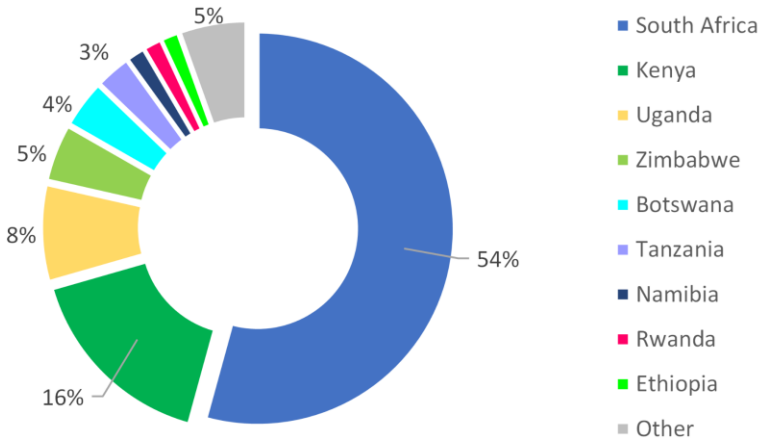

Figure 1. *Share of posts and articles by country of origin (geolocation of user or outlet account)*

These posts and articles generated over 14 million engagements on social media and digital platforms. Seventy-eight percent of engagements were generated by user posts on social media, 20% by digital news articles and 2% by posts on blogs and forums (Figure 2).

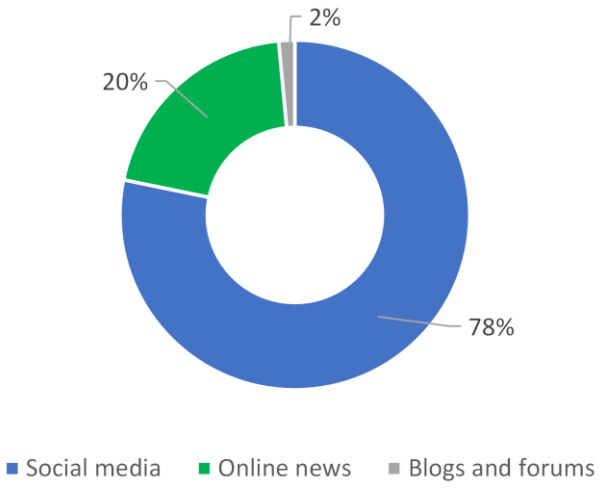

Figure 2. *Share of engagements by channel Subtopics*

The analysis shows how conversations about vaccine access and availability represented the largest share of engagement over the course of the period (28%). Conversations about vaccine

effectiveness and safety represented the second and third largest share of engagement (21% and 16% respectively).

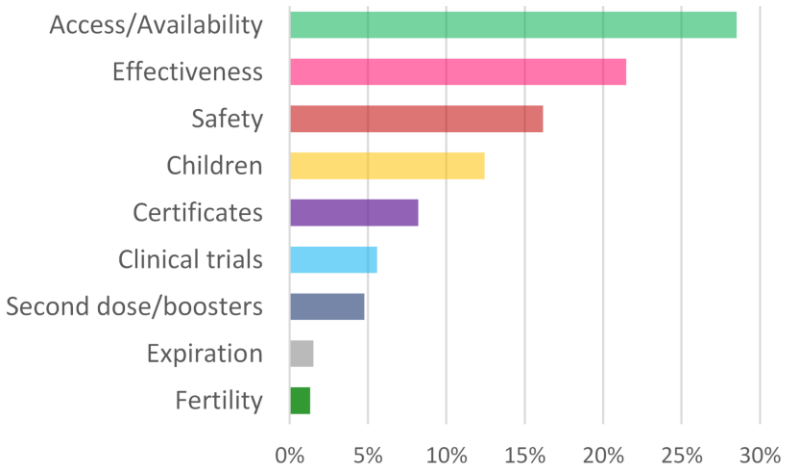

Figure 3. *Share of engagement by subtopic*

Peaks in user engagement about access and availability were tracked in December 2020-January 2021, and through the period June-August 2021 (Figure 4). In January 2021, conversations about this subtopic were in large part driven by the news of a fire in a vaccine manufacturing plant in India, which generated concerns about production capacity[1]. An announcement by South Africa's President reassuring the public that enough vaccines would be made available also generated interest[2], as did a statement by the World Health Organization inviting the population not to panic because everyone willing to get vaccinated would have the opportunity to do so[3]. News that U.S. President Biden intended to join COVAX also generated high engagement[4]. In June-August 2021, interest in vaccine access and availability increased in conjunction with a wave of COVID-19 cases in some of the countries in the region including South Africa, Kenya, Uganda and Zimbabwe. During this time, users were calling for wider vaccine access, particularly for healthcare workers. Search engine queries on how to access services were also tracked in several countries throughout the period.

While access and availability was the topic that generated most engagement overall and for the majority of the period considered, conversations around effectiveness represented the largest share of engagement during December 2021. This peak occurred after the World Health Organization declared the COVID-19 variant B.1.1.529 (Omicron) a variant of concern[5]. The news generated questions about the effectiveness of vaccines against infection with the new variant, as well as intensified the promotion of vaccine uptake to limit the impact on health outcomes and lower the chances of virus mutations. Conversations about vaccine certificates during this period were related to mandates announced or being discussed in several countries in the region, including South Africa, Kenya, Lesotho, and Malawi. Reports of fake certificates being sold were also circulating.

[1] https://www.enca.com/news/fire-worlds-biggest-vaccine-maker-india

[2] https://www.enca.com/news/sa-will-get-enough-vaccines-ramaphosa

[3] https://www.enca.com/news/dont-panic-youll-get-vaccine-says-who

[4] https://www.businessinsider.co.za/biden-join-who-world-health-organization-covax-vaccine-trump-2021-1

[5] https://www.tuko.co.ke/world/africa/435039-omicron-who-designates-new-covid-19-strain-variant-concern/

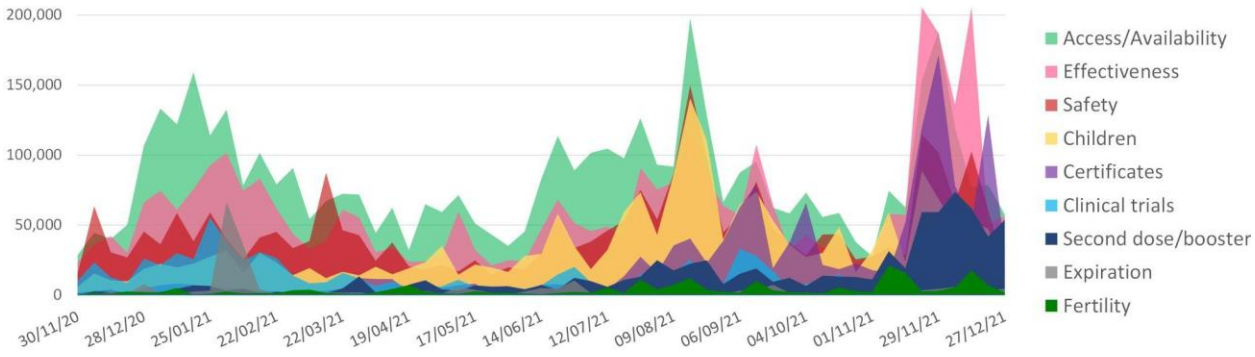

Figure 4. *Engagement over time by subtopic*

The level of interest around vaccine safety remained rather consistent over time, usually representing the third or fourth category of engagement. In August 2021, a video featuring a prominent South African surgeon saying that vaccines are unsafe generated high interest[6]. Concerns about side effects were also tracked, with users reporting their own experience or amplifying reports of Adverse Events Following Immunization (AEFIs). Online interest in childhood vaccination increased over time as vaccine eligibility criteria expanded in some countries in the region, with a peak in August 2021, when discussions around future vaccination of people below 18 were starting in some countries. During this time, some active anti-vaccine accounts in the region started to focus their content on discouraging mass child vaccination. Content around clinical trials was more prominent at the beginning of 2021, when Uganda announced the launch of a clinical study for a locally developed vaccine[7] and South Africa struggled to secure doses despite participating in vaccine trials in 2020[8]. Interest in the administration of second doses and booster shots peaked towards the end of the period, when concerns around the spread of the Omicron variant drove public health officials to encourage healthcare workers in South Africa vaccinated with the Johnson & Johnson jab to get a booster dose[9]. Interest in vaccine expiration saw relatively higher volume in February 2021, when it was found that many of the doses received in South Africa were set to expire in April[10]. Conversations about COVID-19 vaccines and fertility were continuously monitored over the course of the period. Several of the articles and posts identified encouraged pregnant women to get the jab. Concerns tracked included worries about the impact of the vaccine on menstrual periods, and questions on whether the vaccine could cause sterility in men and women.

Discussion

Application of a COVID-19 vaccine taxonomy to filter online content geolocated in Eastern and Southern Africa helped social and behaviour change analysts working on the vaccine rollout to triangulate qualitative insights into the concerns and questions of target populations with a quantitative snapshot of which subtopics were generating most engagement at a given time.

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[6] https://factcheck.afp.com/http%253A%252F%252Fdoc.afp.com%252F9M28YU-1

[7] https://twitter.com/nyamadon/status/1354096406060015616

[8] https://www.news24.com/news24/SouthAfrica/News/ramaphosa-urges-businesses-to-help-fund-africas-vaccine-rollout-20210127

[9] https://www.news24.com/health24/medical/infectious-diseases/coronavirus/covid-19-omicron-fourth-wave-experts-plead-with-health-workers-to-get-their-jj-booster-shots-20211201-2

[10] https://twitter.com/HeidiGiokos/status/1358489679243341824?s=20

This process has allowed to focus the development of operational recommendations on the key subtopics of concern, as well as to monitor the evolution of conversations over time.

Ongoing monitoring of COVID-19 vaccine conversations in the region shows that concerns about equitable access to services and disruptions due to the pandemic were continuously tracked during the period considered. Availability and access challenges are of particular concern as more countries started to implement vaccination requirements at the end of 2021 and into 2022, for example by linking access to public services to full immunization or mandating vaccination as a pre-requisite for employment. While access has been expanded thanks to the relentless work of COVID-19 response stakeholders in the region, analysis of online conversations shows that unequal allocation of vaccines globally and logistical access barriers continue to be a key concern. This social listening insight has guided the development of recommendations for action throughout the course of the year, prioritizing calls to advocate for vaccine equity across regions and within countries, and to not discount logistical barriers to access by ensuring agile vaccine delivery modalities, and continuing to provide clear and localized information on eligibility criteria, vaccine registration and services location. The analysis has also guided recommendations around the tone of vaccine demand campaigns, to acknowledge potential frustration due to access challenges and manage expectations about when vaccines would become available for different population groups.

The taxonomy used in this study has been developed in a short period of time in support of the analysis of social listening insights within the larger efforts of COVID-19 response in the region, thus limiting the ability to further review and test the selected subcategories. Subcategories were selected with the objective to inform the vaccine rollout in a specific geographical area and moment in time, and were not meant to provide a comprehensive representation of all issues that surround vaccine programming. Additional limitations of the analysis are related to the sample of articles and posts selected, which is influenced by accessibility of online content through the social listening tool employed: for some social media platforms (such as Facebook) only a sample of posts was analysed. Moreover, the analysis does not account for content not publicly available such as messages circulating on closed social media groups and messaging apps. Integration with offline mechanisms, not considered in this study, is also recommended to enhance accuracy of social listening findings. Language-related limitations also apply, in part because keyword search strings included a higher percentage of English terms. User gender data were available only for one social media channel and could therefore not be used to further segment the findings. In addition, a regional approach to the analysis of engagement tends to give more prominence to countries and areas with larger populations, higher internet penetration and more pervasive social media use. This can lead to miss relevant conversations happening in smaller countries and in rural contexts.

Results from this analysis of social listening data show that designing interventions that address logistical barriers and improve the convenience of services is important for a successful immunization journey. Tracking of concerns related to safety, particularly users reporting side effects following immunization, also points to the need for increased communication around after service support and raising awareness around vaccine surveillance processes within countries. Future research could benefit from access to disaggregated social listening data, particularly to conduct segmentation of results by gender, age and rural/urban context. Overall, findings from this study show the need to consider concerns, information voids and misinformation around effectiveness and safety of vaccines in a context in which access and availability remain the most prevalent concern. This is fundamental to inform demand for vaccine strategies to effectively address rumours and provide accurate information, without increasing public frustration over vaccine availability challenges and downplaying concerns for vaccine equity.

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