
WHO fourth global infodemic management conference: advances in social listening for public health, May 2021



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Acronyms and abbreviations

AI	artificial intelligence
AIRA	Africa Infodemic Response Alliance
COVID-19	coronavirus disease 2019
EC	European Commission
GOARN	Global Outbreak Alert and Response Network
GPIN	Global Public Health Intelligence Network
IFRC	International Federation of Red Cross and Red Crescent Societies
JHU-CCP	Johns Hopkins Centre for Communications Programs
JRC	European Commission Joint Research Centre
KAP	knowledge, attitudes and practices
M&E	monitoring and evaluation
RCCE	risk communication and community engagement
RMSRS	Rumour and Misinformation Surveillance and Response System
UNICEF	the United Nations Children's Fund
WHO	World Health Organization

Executive summary

The call to action issued after the 3rd WHO infodemic management conference in 2020 galvanized a range of actors across the world who were – and remain – willing to invest time, resources and creativity in the nascent but crucial field of infodemic management. This has resulted in extraordinary diversification of research tools and techniques. Infodemic management is now more and more widely seen by governments and health authorities as a necessary public health intervention, as important in responding to outbreaks as vaccines or therapeutics.

Building on the work of three WHO Infodemic Management Conferences held in 2020, this meeting brought together experts in different areas of research and practice to exchange lessons and experiences and advance social listening for public health. Social listening is an increasingly important tool for understanding the ideas and sentiments that people share online, improving understanding of public opinion so that communication and engagement strategies can better fit people's needs, addressing their concerns before they are amplified or lead to harmful practices and, and helping undecided or confused citizens to adopt public health and social measures – including vaccination – that protect them.

Social listening methods have evolved in recent years, based on services for corporate communication, marketing, and brand management. The techniques and tools that have been developed in this context must be adapted if they are to be applied to health, to serve communities and improve health

emergency preparedness and response. There is a need for more clarity about the best practices and tools to improve social listening and social network analysis for public health.

To address this need, WHO convened experts and participants to share advances in social listening for public health, and to generate further insight and guidance to help create even more focused, adaptable and effective COVID-19 responses. Taken together, the themes of this meeting lay out a vision for how to move public health social listening forward, clarifying users' and communities' needs and providing direction for donors.

The lessons that arose over the course of the conference, laid out in this document, can be grouped into two themes: conducting social listening with accountability at the heart; and committing social listening practice to driving public health and operational impact.

Together, these lessons light a path to maturing social listening practice, integrating with health data sources into rapid infodemic insights and building it into a core aspect of infodemic management and public health systems. This area of work has advanced significantly during the COVID-19 pandemic. There is great opportunity to build on the lessons during the pandemic, so that the capacities, tools, approaches and frameworks of social listening, integrated analysis and infodemic insights will be useful not only as part of broader infodemic management capacities but also in improving and sustaining public health more broadly.

Introduction

The call to action issued after the WHO 3rd infodemic management conference in 2020 assembled a range of actors across the world who were, and are, willing to invest time, resources and creativity in the nascent but crucial field of infodemic management. This has resulted in extraordinary diversification of research tools and techniques. Infodemic management is now more and more widely seen by governments and health authorities as a necessary public health intervention, as important in controlling outbreaks as vaccines or therapeutics.

Public health professionals have been increasingly pushed towards interdisciplinary work, supported by infodemic evidence and toolkits developed by a huge range of different actors even as they grappled with the response.

Building on the work of three WHO Infodemic Management Conferences held in 2020, this meeting was the fourth in an ongoing series, and the first to take a “deep dive” approach into a single technical area of infodemic management. It brought together experts in different areas of research and practice to exchange lessons and experiences and advance social listening for public health.

Social listening is an increasingly important tool for understanding the ideas and sentiments that people share online. Social media data can improve understanding of public opinion, so that communication and engagement strategies can better fit people’s needs, addressing their concerns before they are amplified or lead to harmful practices and, and helping undecided or confused citizens to adopt public health and social

measures – including vaccination – that protect them.

Developing social listening approaches to understand communities’ ever-changing questions, concerns and narratives can make public health emergency response more adaptive and effective. It strengthens health systems by making it possible to detect emerging or resurgent health threats earlier and more accurately. New and better public health applications and tools for social listening can help health authorities respond more quickly to public concerns, enabling revised and improved messaging and more focussed interventions.

Analysis of social networks has shown that opinions and feelings around many important COVID-19 health topics are heavily polarized. This polarization makes it difficult to get credible health information to everyone. Network analysis allows the identification of influential users within social networks and clarifies how – and how closely – they are connected to other such influential users. This can improve understanding of who drives opinion on specific issues, and through which channels. In the pandemic context, analysis of social media data and application of epidemic models can help characterize information trends, the types of information spreading across platforms, the patterns of spread, and the degree of diffusion of particular information.

Social listening methods have evolved in recent years, but that has often happened in the service of corporate communication, marketing, and brand management. The techniques and tools that have been

developed in this context must be adapted to serve communities and improve health emergency preparedness and response. There is a need for more clarity about the best practices and tools to improve social listening and social network analysis for public health.

To address this need, WHO convened experts and participants to share advances in social listening for public health, and to generate further insight and guidance to help create even more focused, adaptable and effective COVID-19 responses. The recordings of the three days of convening are available on the WHO web site: Day 1¹, Day 2², Day 3³.

¹ <https://www.who.int/news-room/events/detail/2021/05/04/default-calendar/4th-virtual-who-infodemic-management-conference-advances-in-social-listening-for-public-health>

² <https://www.who.int/news-room/events/detail/2021/05/11/default-calendar/session-2-4th-virtual-who-infodemic-management-conference>

³ <https://www.who.int/news-room/events/detail/2021/05/12/default-calendar/session-3-4th-virtual-who-infodemic-management-conference>

The social listening landscape: where are we now

The COVID-19 pandemic response caused rapid worldwide growth in the field of social listening. In 2020-2021, it became more commonplace to bridge practices from different professions to improve the translation of insights into action. Practitioners, academics and others developed – and continue to develop – new methods and tools to integrate analysis and action, constantly improving their guidance to health authorities responding to the pandemic.

The history of public health and epidemiology is one of maturation and evolution over time in response to new diseases, health conditions and outbreaks. In relatively recent history, for example, the HIV epidemic forced a re-evaluation of how to work with marginalized communities, while the response to Ebola emphasized the importance of community engagement.

COVID-19 has presented a similarly seismic challenge to social listening and other infodemic management and risk

communication practices. It has precipitated a revolution in health communication and health promotion for pandemic preparedness and response, moving from models of practice delivered from authorities to the public in the hope of compliance, to an intelligent, real-time science that delivers effective communications based on what worries or weakens the population. Social listening complements insights from public health monitoring and health information analysis to make the pandemic response more effective.

At the same time, some components of essential social listening capacities are being used not only to sustain the pandemic response, but also to support pandemic recovery. New, small-scale projects and methods have grown into national and regional learnings and initiatives. This is the start of a recalibrated approach in which infodemic management methods, toolkits and practises are made truly sustainable and integrated with the health system for preparedness and response.

Experiences from WHO regions and countries

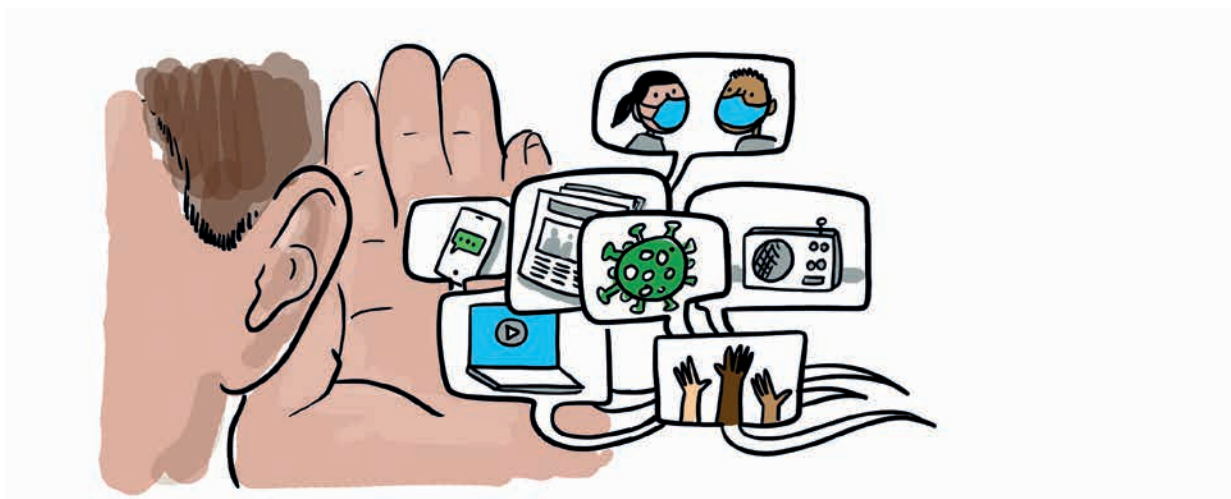
The meeting provided an overview of how WHO regional and country offices around the world have developed and implemented new tools and services for social listening.

The WHO Regional Office for Africa presented a project in **Guinea**, where social listening was an important part of the response to an outbreak of Ebola virus disease in February 2021. The Africa

Infodemic Response Alliance (AIRA) was central to this response. AIRA is a group of 14 member organizations created in December 2020 to limit the spread of harmful health misinformation and disinformation in Africa, and counts the United Nations Children's Fund (UNICEF), Gavi, the Vaccines Alliance, the International Federation of Red Cross and Red Crescent Societies (IFRC), UNESCO and Africa Check among its members. AIRA's

core activities include research, advocacy, production and checking of viral facts,

and coordinating international support to countries' infodemic responses.



Social listening in Guinea includes an important non digital component – Guinea has relatively low internet penetration (at 21.8% in January 2021) and only 15% of population uses social media. This means tireless work by field teams, including a number of socio-anthropologists. In this project, a community feedback management system was set up through which Red Cross workers on the ground collected as much information as possible from sources including local media, interactive sessions, roundtables, seminars and conversations within communities. This information was then submitted to specially created local authority sub-offices, which passed it on to a communication commission workgroup that sorted, classified and analysed it and provided feedback. Social anthropologists in communities worked with citizens to implement the results of that analysis, gaining more and deeper insights as they did so. A weekly Ebola social listening report was produced and shared with field teams to triangulate information and inform decisions, an effort that proved important in fighting rumours – as noted by Kangbe Camara, a resident of Gouecke: “It was said that the vaccine had been brought to kill

people [but] thanks to the Imam, I got the courage to get vaccinated.”

In the **South-East Asia Region**, the WHO Regional Office has implemented two types of digital monitoring and analysis. One works to identify public interests, concerns and questions related to COVID-19, using artificial intelligence (AI) to identify the most engaged questions, topics and trends, deferring to human analysis where necessary. Reports on these trends are shared with UNICEF and other partners in risk communication and community engagement (RCCE). The other is a COVID-19 Rumour and Misinformation Surveillance and Response System (RMSRS) that has run since February 2020, using an AI tool to scan conversations for COVID-19 keywords and detect rumours and misinformation. Once this is done, human factcheckers respond by amplifying facts, crafting simple messages and online Q&A tiles about the science of COVID-19 and disseminating them through WHO regional and national social media, the WHO COVID-19 webpage and a network of influencers. Not all rumours require responses: decisions on which ones merit a response are made following algorithmic

analysis of factors such as engagement, reach and level of harm of the rumour and the identity of the spreader. Responses to rumours with global impact are conducted through WHO headquarters, and regional and country level rumours are managed by the respective offices.

In the **Western Pacific region**, WHO is building both regional and national social listening capacities. The regional process is based on a foundation of manual listening to map global perceptions through worldwide and national surveys, partnering with existing initiatives for localization. A survey for the Western Pacific region has been done and a social listening tool has been set up that can be accessed by WHO country offices, which have been trained in its use. Local partnerships – for example, with local NGOs and social media companies – are being used to sustain social listening systems in countries.

The outputs from this system inform WHO messaging and rumour management strategies. The meeting heard how several regional and country-specific materials have been created and disseminated in this way, including a COVID-19 MythBusters series and a range of technical guidance for public messaging. Social listening has so far proved essential for informing targeted public health messaging, but the long-term goal of this project is not only to use social listening insights for national decision making, but also to make this approach standardized and sustainable for COVID-19 response and beyond.

The WHO regional office for **Europe** has seen unprecedented levels of interest and investment in RCCE and social listening, trends reflected in the countries of the region. The regional office uses a range of unique instruments for collecting and

analysing data and translating it into action. These tools enable functions including early warning; near-real-time analysis of trends and performance across WHO's social media accounts; scanning for coverage of WHO and trending topics in regional media; fast surveys and analysis of trends and information gaps that require additional messaging; formative research in social and behavioural science to inform policy and gathering feedback through social listening as communities are engaged by RCCE programmes.

Along with this, an interdivisional WHO project on infodemic management is supporting country offices and ministries of health in three key areas: strengthening and operationalizing the scientific foundation of infodemic management; reinforcing infodemic management practice and embedding it in existing RCCE systems; and building more regional and country-level capacity for listening, data analysis, and translating data into action. To reinforce these strategies, WHO works with infodemic influencers across the region, including faith leaders, youth networks and healthcare workers – one example of such a project being in Israel, where they translate scientific messaging into religious rulings on vaccine hesitancy and resistance to public health and social measures.

Successes in the European the region so far include the development of good relationships between governments and local NGOs, increased work with communities, improved and increased data and better sharing of insights through new RCCE coordination and reporting mechanisms. Much of this progress was achieved in settings where there was already social listening experience before COVID-19, as well as sufficient human resources, tools and guidance, though the momentum

created by the rollout of COVID-19 vaccines provided a significant boost.

The WHO Regional office for the **Eastern Mediterranean** has begun a new initiative to strengthen social listening and community feedback and provide greater insight to improve infodemic management, RCCE strategies and the overall COVID-19 response. In partnership with UNICEF, the IFRC and the RCCE Interagency Working Group, this project tries to create a shared

understanding of the goals and activities of all humanitarian stakeholders doing social listening and community feedback. The long term aim of the group is to establish shared standards for social listening and its use across the region, assess current practices, hold capacity building workshops and develop an operational model, and then, on the basis of a series of expert consultations, develop a regional social listening roadmap.

Current approaches

These and other examples in the meeting brought to light several themes in how social listening is being used for public health across different countries and social contexts.

Innovation and widespread use of technology are central to social listening

There is a huge choice of unique instruments for data collection, analysis and translation into action. Some produce results that require more work to validate them but are flexible and useful as early warning tools, especially in rapidly changing contexts and emergencies. Others are more robust, yielding more generalizable conclusions, but require more time and financial investment. This mix and the wide availability of different resources allows the selection of particular tools for particular jobs. Notable examples included the following:

- Media and social monitoring and listening tools like CrowdTangle, EIOS and Sprout Social are used to access timely, near-real time trend and performance analysis across social media accounts, and to scan for coverage of trending topics in the media.
- Polling and user data from tools like chatbot web and mobile apps can be used to run fast surveys, analyse trends, and identify information gaps that call for more and better messaging. More robust formative research in social and behavioural science calls for tools like the Behavioural Insights tool, which provide cost-effective and reliable data to inform policy.
- Online intelligence and social listening platforms (for example, the Pulsar Vaccines Dashboard in Brazil) examine audiences and conversations online, gathering data on discussions and topics and providing insights into people's concerns. This allows the segmentation by market of online conversations and audiences, informing strategies for different organizations in those different markets.
- Online data dashboards provide interactive visualizations and data interpretation. Examples include the dashboard produced by the Johns Hopkins Centre for Communications Programs (JHU-CCP) from data generated by a 67-country global knowledge, attitudes and practices (KAP) survey

about COVID-19. This tool can provide different dashboard views tailored to the needs of different stakeholder groups, in a more accessible, story-based approach to providing data for key audiences.

- The use of “big data” – i.e. extremely large data sets that can be analysed by computers to reveal patterns, trends, and associations – can improve understanding of evolving humanitarian and public health contexts by providing new insight into perceptions and misconceptions that can then be used to inform programmes and operations. Big data can also be integrated into programmes’ monitoring and evaluation (M&E) frameworks in such a way as to provide real time reports on how the programmes are affecting people’s lives, so they can be improved even as they are implemented.

Focus is crucially important

No matter which of these approaches are used, and whatever information they generate, data should be presented in ways that provide audience segmentation that is meaningful and useful in context, and which consider users’ interests and goals. Data has to be analysed, turned into insights and provided to responders in a way that transforms information into correct action as smoothly as possible. When data collection and analysis are used as community feedback mechanisms, with two-way communication and co-development of solutions, then their true value really comes to life. For this to happen, social and community listening tools must be locally appropriate. While defaulting to social media often provides good insight, it can miss the voice of communities that are hardest to reach.

The JHU-CCP projects mentioned above provides an example of how this can be done. They developed audience segments that identified two key segments of the population – “the traditional,” classified as generally unreceptive to new ideas or innovations, and “the transitional,” who were more informed and more active on social media – and categorized and analysed data accordingly. Important insights included the fact that members of the transitional audience were often linked to individuals in the traditional segment, and that the two groups had much in common: both populations showed a high level of distrust of politicians and government intervention, both suffered from a lack of accurate health information, and both had a desire for localized information on the health services available in their communities and how to access them. The principle of bounded normative influence was then used to analyse how minority communities impact majority opinion through the location, frequency and persuasiveness of messaging. Based on these findings, a campaign was designed to leverage known channels of influence in the transitional segment to provide accurate, localized health information that could influence sentiment in both audience segments.

Taxonomies can be useful

Taxonomic approaches offer useful ways to understand both local and global conversations. Taxonomies allow relevant categories to be preset for social listening so that risk communications professionals can focus their time and resources on priorities and action rather than analysis. Between March 2020 and May 2021, WHO used this approach to generate a taxonomy framework that analysed over a billion items of social media content – 3% of all publicly

available social media conversation globally, and an average 3.3 million posts a day. A data aggregation provider used keyword detection to collect billions of English and French social media posts and segment them into conceptual areas relevant to public health action: the cause, the illness, the treatment and the interventions. A further category, information, looked at how civil society discusses information about the virus online. Within each taxonomy, specific topics were tracked, including stigma, symptoms, risk to certain individuals, travel, testing, technology and treatment and vaccines. This provided an overview of the most and least popular COVID themes discussed online, and those most likely to re-surface even after appropriate communication has been done. Analysis could detect fluctuations in emotions expressed in social media conversation, using keyword detection of six emotions in particular: denial, sadness, anxiety, fear, anger, and acceptance. This taxonomic structure worked as a large-scale signal detector to track the evolution of online interest in the pandemic, looking at speed of change as well as volume provides in order to provide early warning of difficult topics so that WHO could take a more proactive approach to public health communications.

This methodology was designed to be highly adaptable from a global scope to a local or hyper-local one. Pilot projects have taken place in individual countries,

Gaps, needs and challenges

These examples reveal a number of common challenges for social listening initiatives around the world.

delivering insight based on analysis of digital conversations in Malaysia, Mali, the Philippines and Québec. Localization means examining the social media landscape in the target region and ensuring the data and listening infrastructure reflects that landscape, carrying out preliminary research to allow the integration of phrases or institutions unique to the local context.

Access and equity issues require non-digital approaches too

Social listening does not always have to be based on social media. The digital divide excludes many millions of people with little or no access to online information.

Conversational, rather than digital, approaches to social listening can use community listening, also known as “rumour tracking.” In one example project run by JHU-CCP community focal points are trained to identify and submit rumours via WhatsApp, and hotline workers are trained to input rumours from callers and WhatsApp messages into a database. The outputs of these systems are analysed and synthesized by data managers to produce periodic briefs and social behaviour change recommendations for RCCE working groups. These groups then develop rapid messages to address rumours. This process can be configured in different ways according to local habits, channels, tools, and capacities.

Inequity and the digital divide

- Many communities still cannot access the internet on a regular basis and are overlooked or missed by digital information campaigns – it is hard

to reach the most vulnerable and inaccessible communities, and it requires constant effort.

- The lack of digital access is compounded by another structural inequity: the effect of language barriers, and particularly a severe global lack of guidance, documents and resources in local languages - there is constant demand in all parts of the world for fact-checked information in local languages.
- Countries in the global south are at higher risk of infodemic exposure: the nations in greatest need of resources and infrastructure to combat the virus are also at most risk of being affected by exposure to the infodemic.
- At local levels, the effects of the lack of access and resources are often worsened by a lack of capacity, particularly in resource limited settings. Those community-based projects that do exist often rely on a limited number of overworked field agents.
- Even in contexts where access is less problematic it can still be hard to achieve all communities' full engagement. Coordinating and engaging community members in response efforts is a constant challenge, not least because of general mistrust and a widespread reluctance to share information or work with governments.

Standards and resources for social listening

- A lack of standardized approaches to listening, data analysis and responses hinders efforts at all levels to triangulate data and identify trends/patterns. There is a need to establish shared measurement, evaluation and learning frameworks

in order to standardize, measure and improve the public health impact of social listening.

- Globally, regionally and locally, there is a need for more infodemic managers to carry out the human elements of social listening, inform responses, and to help evaluate interventions.

Political sensitivities and mis- and disinformation

- Governments can be reluctant to promote open communication around health, and in some cases during the pandemic have deliberately politicized the COVID information environment rather than focussing on science and public health. This hinders messaging and endangers citizens.
- There is a huge amount of rumour, incorrect information and deliberate disinformation in circulation. The volume alone is a challenge, but the increasing sophistication of some disinformation campaigns makes it much worse. Technical methods to target and disseminate harmful information include data-led targeting and bot campaigns.
- The effect of bots is to create an artificial perception of popularity (for example, as measured by retweets, reposts, numbers of comments etc.). This is done for two reasons. The first is algorithmic: platforms often reward content that appears popular, further boosting its spread. The second is the human part, wherein psychological benefits are conveyed by the artificial perception of popularity. Humans are more likely to engage with content that already appears popular – meaning the artificial perception of popularity potentially drives real popularity.

- As bots proliferate within a network, the quality of the conversation suffers. Good content is suppressed and poor content becomes predominant.

Lack of coordination

- Lack of coordination between different actors and stakeholders is common,

leading to duplication of efforts, competition and ineffective sharing of community insights. This includes lack of coordination between different social listening systems, different actors in the field, and different levels of national and subnational public health systems. Local authorities are often poorly involved or not at all.

New tools and techniques

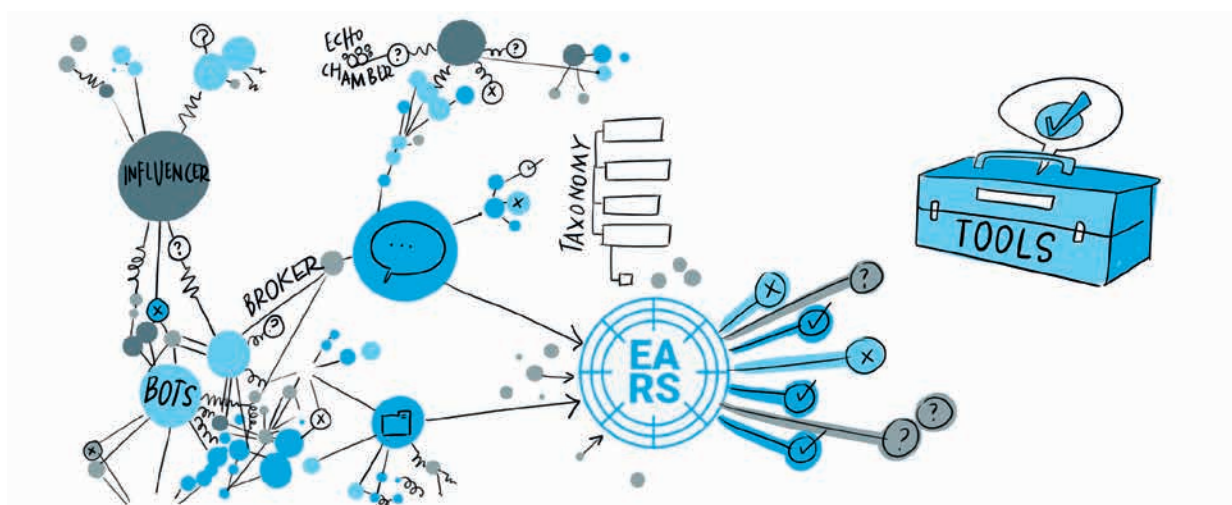
Partly in response to these gaps, the meeting showed how a range of new social listening tools and approaches tools have emerged.

Some examples – not an exhaustive list – are outlined below.

Artificial intelligence and machine learning

Recent refinements in the use of artificial intelligence, and deep learning methods in particular, have improved analysis of online

text conversations like those on social media platforms.



- Older listening tools can be improved using first generation AI tools for natural language processing that understand individual words and infer which have a similar meanings (such as “vaccine” meaning the same as “jab” or “shot”), or which relate to certain hashtags. This makes searches on a given topic more productive.
- More recently, a second generation of AI tools based on so-called “deep transforming networks” have made it possible to understand the meanings of sentences, and therefore to distinguish between contradictory reports using the same keywords. This technology has been shown to reduce caseloads for human analysts, giving them 12 times less data to inspect, and making their jobs more efficient.
- AI and machine learning can also be used to identify bots, inauthentic accounts and artificial amplification of messages. While network analysis approach examines large numbers of graphs representing different types of relationships between online entities, identifying bots by looking at features such as the position of the account within the network and the role it plays (e.g. whether it acts as a bridge between communities, whether it is connected to other accounts that exhibit bot-like behaviour and whether it has a rich, diverse number of connexions to other entities likely to be humans), a machine learning approach looks at

individual accounts – the language they use, their activity, their use of emoticons etc. – and builds deep learning models that identify bot-like activity. These can then be layered with other models to

perform functions such as categorizing misinformation. The outputs can then be analysed for emerging patterns, to examine how these are different from authentic looking networks.

Radio speech-to-text

In partnership with others, UN Global Pulse (an innovation initiative designed to accelerate discovery and adoption of data analytics for sustainable development and humanitarian action) has developed a listening and analysis model that generates insights from local radio stations around the world. Radio is a huge and by and large untapped data resource, largely neglected by social listening: there are about 44 000 stations around the world and they cover around 75% of households on the planet. Analysing their output could generate important insight for early warning, monitoring, case studies and evaluations and more, particularly in settings where resources are limited.

In this project, radio broadcasts are recorded, filtered (mainly to remove music) and stored along with metadata on

station, location, time and date. These are then run through speech-to-text software using proprietary models trained to ensure adequate coverage and representation of key terms, and to avoid neglect of less common words and several known race and gender biases in traditional speech-to-text tools. The results are analysed to detect relevant passages, pinpoint key terms and relationships between terms, and model different topics.

This pilot radio listening project is important not only for its direct outputs, but also for its work in developing a new data source for social listening that has serious potential to enhance our ability to listen to communities and respond to their needs. In an early warning system, qualitative information is as valuable as quantitative, and testimonials expressed on radio are a valuable source.

Analytics

The meeting heard several presentations of different analytics projects. Some examples are outlined below.

WHO and CitiBeats are developing a tool for automatic social listening to provide insights in near real time. **The EARS platform** aims to identify public health information gaps using a single tool that can be scaled across different public health challenges and languages, and used fast and easily in a crisis. It is based on a semi

supervised algorithm developed by CitiBeats for classification tasks. The algorithm can be fed a small number of examples of (for example) discussions about the causes of COVID, then can use machine learning to figure out local references, terms, dialects and slang and assess which other opinions should also be looked at as related to “causes of COVID.” It identifies actionable areas by assessing the nature of questions and complaints (a more complex task than just identifying phrases with inquiry

words and question marks, which are often not genuine questions seeking answers); assesses population segments (for example, to detect gender gaps); shows users how conversation categories interact (for example, how discussion of vaccinations links with faith influences); and allows users to examine the algorithm's original sources, allowing analysis from the big picture all the way down to concrete insights. These abilities means users do not need to build comprehensive dictionaries of each category or worry about overlooking changes in the conversation: once the categories are set up, the scope for analysis is improved. With this in place, social listening can move beyond the "obsession with volume" to analyse the velocity of changes in volume over time and anticipate big issues, allowing proactive communication and inoculation against harmful narratives.

Going beyond sentiment analysis and the use of AI, machine learning and algorithmics to examine key words and sentences, there is a wider need for a **structure and generative models that allow an understanding of wider systems.** Certain common behaviours are evident across the whole digital ecosystem, visible in any digital space where communities form – and in non-digital communities too, such as those that form around radio. Mapping and modelling the relationships between these communities allows insight into how they interconnect, and from there into the workings of the wider information ecosystem, or "multiverse," that incorporates all these platforms and common behaviours. This viewpoint effectively includes more than a billion people, across all languages, countries and

platforms, and highlights things missed by single-platform moderators. It shows which crucial segments of the online ecosystems are being missed and which should be targeted – the key communities that glue the rest of the population together.

In one example of such an initiative, George Washington University did a high level analysis of the detailed machinery of COVID-19 and vaccine online misinformation, showing how examination of network behaviour at a larger scale illuminates how information moves between different groups, platforms and online communities. Observation of patterns in the higher information ecosystem throughout 2020 revealed two key phenomena controlling almost all the misinformation seen across around 100 million people. The first of these was made up of the online "alternative health" communities acting as key conduits between conspiracy communities and other groups. The second is the group of a smaller number of communities, usually quite small but incredibly highly connected – meaning they also function as conduits for misinformation to move across different platforms and between groups.

This type of understanding could be the key to effective national and global public health if it opens the door to modelling that provides insight into people's tipping points with regard to intent. This could indicate when and how to implement interventions that remove misinformation before it becomes endemic.

Anthropological approaches and innovations

Anthropological approaches such as social network analysis (investigation of social structures using network and graph theories) can be applied to good effect in social listening. Used in sociology to understand relationships between communities and groups in different settings, this type of analysis can be applied to social media to identify influential users, key groups that form around topics, and popular information sources. Looking at relationships between different users around a given topic can uncover groups and key users within the network (for example, by using different metrics to identify the most influential people, which users are nodes in the network, which spread information the

most, what key discussions the core group is having, etc.). This information can then be used to group key discussions, highlight popular information sources and follow the information they spread.

Several different tools and software applications allow anyone to tap into this social media data and perform social network analysis on social network data sets. These tools include Gephi, iGraph, UCINET, NodeXL and more; because many tools are available, almost anyone with an internet connexion can produce network graphs. One example of an open-source, free tool is Gaffey.

Human and organizational innovations

Innovation can also be applied to good effect to the ways in which people and organisations work together to pool or combine resources and ideas for more effective social listening and public health action. The meeting heard presentations from around the world that highlighted several ways in which this is being done.

- In September 2017, the WHO Health Emergencies Programme (WHE) accepted leadership of the **Epidemic Intelligence from Open Sources (EIOS) initiative**, in a governance structure involving many other stakeholders. The initiative is a collaboration between public health stakeholders all around the world that brings together new and existing initiatives, networks and systems to create a unified, all-hazards, One Health approach to early detection, verification, assessment and communication of public health threats using publicly available

information. It is intended to create a community of practice for public health intelligence that includes WHO Member States, international organizations, research institutes and other partners and collaborators. The EIOS community of practice is supported by an evolving EIOS system that not only connects other systems and actors – including ProMED, HealthMap and the Global Public Health Intelligence Network (GPHIN) – but which also promotes and catalyses new and innovative collaboration. The system builds on a long-standing collaboration between WHO and the Joint Research Centre (JRC) of the European Commission (EC) to develop a system for public health intelligence.

- The **Vaccination Demand Observatory** is a system of systems designed to provide an integrated pathway for applying pandemic lessons to real world situations.

The Observatory is a multistakeholder global initiative to identify, track and respond to vaccine hesitancy and misinformation, using a global network of infodemiologists supporting national immunization programmes with equitable social listening and partner coordination. This involves deep, substantive connexions into networks of communities, ministries, governments and organizations including UNICEF, the Public Good Project and the Yale Institute of Global Health. Its work covers three main areas:

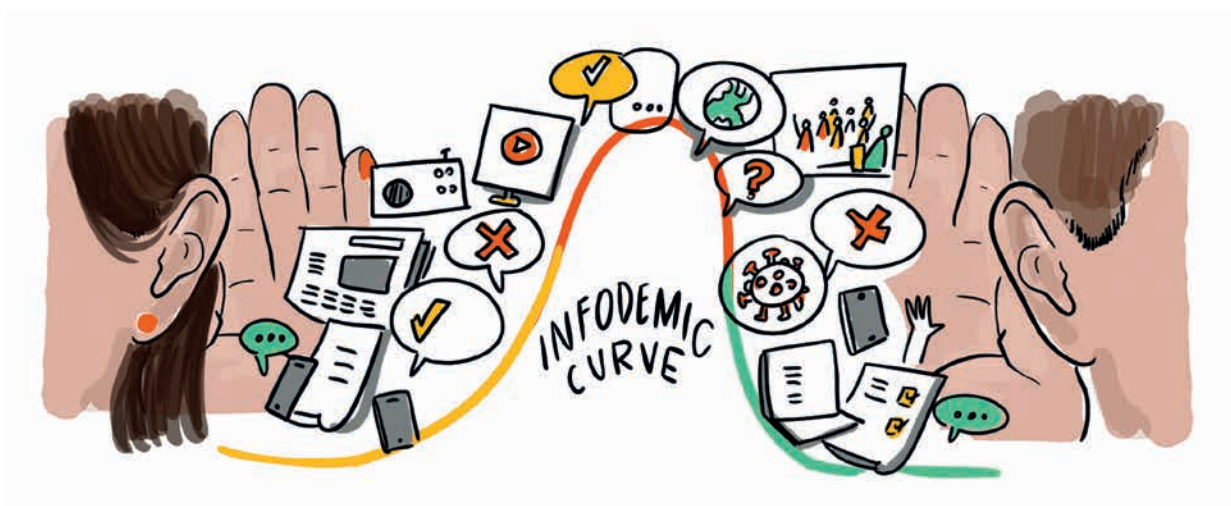
- a social listening and analytics project using a customizable social listening platform and analytical tools to provide technical support to countries tracking and analysing vaccination conversations in digital space and offline;
- the Vaccine Acceptance Interventions Lab, which works on rapid design and testing of messages and narratives for efficacy and safety; and

- a field infodemiologist training programme similar to that run by WHO, focussed on building country capabilities by developing field infodemic managers.
- A recently established global support mechanism, **the Collective Service**, helps countries implement RCCE policies, research and programmes in response to COVID-19 and other emergencies. The Collective Service is a partnership between the IFRC, UNICEF and WHO that leverages active support from the Global Outbreak Alert and Response Network (GOARN) and other key actors in the public health and humanitarian sectors. Its role is to bring together different partners, including organizations and experts from policy, practice and research, to collect, analyse and use social behaviour information quickly and effectively.

How to move forward: opportunities for advancing social listening

Strong systems for social listening and community feedback require human, technical and financial resources and strong, clear interagency coordination with clear roles and responsibilities and standard

operating procedures (SOPs) for systematic approaches. Harmonized capacity is important: roles in the system should not duplicate one another and activities should be complementary.



For this to be possible, there is an as yet unmet need for standardized, systematic approaches to triangulating data and identifying trends and patterns, so that sharing of data and analysis can be done easily and more widely between levels, programmes, countries and contexts, and monitoring, evaluation and continuous improvement can be done more effectively.

There is an obvious need here for global investment and engagement to make this possible, and to support regional and national application of social listening.

Discussions throughout the meeting brought to light a range of lessons and considerations across the following themes.

Social listening: overarching topics

- It is important to have a structured approach to listening, so analysis leads quickly to insight then action before problems become too large and well-established. To this end, the commonplace analytical focus on volume and engagement is insufficient. It is too reactive: with the speed at which information can move and propagate, once narratives reach high volume and engagement, they risk being already dominant.
- Narratives, mis- and disinformation and information voids must also be detected as early as possible to enable the most effective responses.

- A taxonomy of pre-identified topic categories enables horizon scanning by identifying “high velocity” narratives as well as already-established high-volume ones. This allows any information voids that are identified to be correctly prioritized.
- It can be difficult to prioritize what requires a response. There are established methods and frameworks that can be applied – for example, one such method was illustrated during the meeting as a means by which to handle risk analysis of harmful narratives or information gaps:
 1. estimate severity of potential harm of the narrative;
 2. estimate the probability of the harm;
 3. identify potential interventions;
 4. perform a public health impact assessment of considered interventions; and
 5. perform a quick feasibility assessment on what interventions can be done.
- There is a need to integrate analysis of all sources of information with the goal of producing infodemic insights and distilling the issues that matter most to communities. Online analytics should be integrated with other appropriate sources of information, such as routine health information systems, mobility data, focus groups, community listening sessions, surveys, local histories, etc.
- Alongside response strategies, there is a need to build resilience to the infodemic through the use of strategies such as social inoculation.
- Much of online conversation is moving into closed groups, posing difficult challenges in trying to understand communities’ concerns. There is an urgent need for new approaches and tools that address this.
- Too many social media platforms restrict access to their data, rendering it difficult or impossible to understand fully how they operate, how mis- and disinformation moves and propagates, and how best to counter narratives that harm and kill people.
- Adaptability is important. Different tools are required for different purposes. Quick results can be useful to gain rapid anecdotal understanding of topic areas, whereas engaging high profile stakeholders such as national health authorities often calls for more robust data and research. Selecting the right methods for what is needed is a crucially important step.
- A flexible, quick, real-time source of perception and behavioural data is especially valuable in emergencies. Detecting false news is not enough on its own. Pre-emptive measures can be valuable, countering with facts and other interventions before rumours gather momentum.
- Ultimately, however, when resources and capacities are limited, some type – any type – of social listening is better than nothing.

Combining and triangulating online and offline data

- One common problem in the past has been the existence of many different streams of data that are only compared at the results stage. New social listening systems must bring different sources of information together to perform more holistic analyses.
- They also have to make all of the necessary information accessible for those who want it. In most contexts, this must be done without overburdening the end user – typically a time-poor public health professional under severe pressure – with too much unnecessary information.
- It is important to have cross-communication between different sources throughout the stages of data collection and analysis. Triangulating digital social listening data and offline ethnographic data requires going back and forth between different systems for collecting and analysing these data.
- Much of the value of a broader choice of tools and approaches is in the access to evolving data that allows social listening teams to contact colleagues in other areas in real time, rather than waiting until a research endpoint, to discuss what is emerging and what to investigate. To this end, systems and networks for community listening – real people listening and meeting in communities at a human level – can provide keys that unlock data from social media monitoring and surveys, verifying and ensuring that the issues picked up by these systems are real and current.

Community engagement and feedback

- Support for community engagement should be contextualized and localized and the highest priority should be placed on building trust, promoting verified information and informing communities. Audiences should be researched and segmented. Targeted programmes are needed to reach all communities and community categories.
- Responses to social listening findings must go beyond just removing misinformation to addressing its root causes, working in partnership with communities to achieve positive behavioural change. Understanding underlying themes and developing programmes and communications that address underlying narratives is critical to addressing infodemics.
- Community leaders, including religious leaders, should be engaged in this context, along with civil society, local authorities and other local partners, to contextualize analysis of community feedback and then follow through with action. Communication materials should be translated into local languages.
- Strengthening regional networks can build wider ecosystems for social listening at regional, national and sub national levels.

Addressing inequity and assisting vulnerable and offline populations

- There is a need for both online and offline listening: no one should be left behind. Addressing the digital gap is a matter of urgent importance.
- Data should be collected in partnership with communities, ensuring that it is owned by the right stakeholders and translated quickly into actionable recommendations. Data collection must prioritize building trust.
- Religious leaders can be a particularly important line of communication between decision makers and relatively inaccessible communities, and particularly those communities living in hard-to-reach areas.
- Other valuable human resources include community workers, volunteer networks, and civil society. Mapping local civil society and the way it serves communities, identifying the key players and establishing lines of communication are therefore crucial tasks.

Wider perspectives

- It is possible to go beyond the computational methods and really look at the “multiverse,” taking a wider view that clarifies the relationships between different online communities and the movement of information between them and across different platforms. This more macroscopic level of analysis could be the key to effective national and global public health.
- This approach could enable also modelling that provides insight into people’s tipping points with regard to intent – and therefore into when and how to implement interventions that remove misinformation before it becomes endemic.

Ethics frameworks for social listening

- The diversification of techniques and tools for social listening raises many questions about ethics; but no matter the nature of these questions it is abundantly clear that social listening, which is most effective when it works from a strong foundation based on trust, requires strong and transparent ethical frameworks.
- Many of the specific ethical challenges that need to be addressed were noted and discussed throughout the meeting. These included:
 - issues of data stewardship, informed consent etc.;
 - political issues including potential abuse of social listening in non-democratic societies (e.g. surveillance, identification of citizens with “deviant” opinions, predictive modelling as a first step toward controlling).
 - consideration of the role of censorship and the various conflicts between providing information, nudging people towards the desired behaviours,

- “blaming and shaming,” etc.;
 - the particular ethical issues that arise when attempting to listen to closed groups, online or offline;
 - the ethical implications of accidentally “validating” the use of methods that are more often maliciously deployed (e.g. microtargeted advertising for behaviour change) by using them in service of public health; and
 - the risk of propagating bias when preparing information feedback: what seems simple or obvious to who writes the text could be perceived in a different way by users.
- There are many possible models to follow to address these concerns. Ethics, protocols and principles are already established for research, for example, and researchers around the world submit their projects to institutional ethics boards for review. Likewise, The Association of Internet researchers has published ethical guidelines for internet research, which encourage a deliberative process of ethical reflection.
 - From the point of view of duty of care, it is essential to show respect for, and to protect, the vulnerable communities monitored by social listening projects. Social listening is not a playground in which data analytics and Big Data are joyfully smashed together to see what fragments of information fly out: listeners and analysts have a grave responsibility to the communities and people that they work with that includes the obligation to act on what is learnt through listening, applying the lessons to improve lives in communities. Trust is foundational to every aspect of infodemic management, and trust must be earned and painstakingly maintained.
 - Because social listening involves accountability to communities to act effectively on what is learnt, it therefore also requires a commitment to ongoing evaluation, and the responsibility to implement the findings of that evaluation in accordance with its ethical frameworks. Ongoing evaluations of interventions are needed that establish strong feedback loops for adaptive responses that track communities’ changing concerns.

Action points: principles of social listening practice

Taken together the themes of this meeting lay out a vision for how to move public health social listening forward, clarifying users' and communities' needs and providing direction for donors.

The lessons that arose over the course of the conference can be grouped into two themes: conducting social listening with accountability at the heart; and committing social listening practice to driving public health and operational impact.

Together, these lessons light a path to maturing social listening, integrating it with other data sources into infodemic insights, and building it into a core aspect

of infodemic management, emergency and health systems. This area of work has advanced significantly during the COVID-19 pandemic, perhaps one of the pandemic's few positive outcomes. If we take the opportunity to build on what we learnt during the pandemic, then the capacities, tools, approaches and frameworks of social listening will be useful not only as support to risk communication, but also as part of broader infodemic management capacities for improving and sustaining public health more broadly.

In summary, these were the themes of the discussions:

1. Social listening, integrated analysis and infodemic insights must be conducted with accountability

- Those conducting social listening programmes must hold themselves accountable to act on what they learn from communities.
- Policymakers must be held accountable to use the information from social listening to inform and improve policymaking.
- Social listening necessitates participatory engagement and building trust with communities. Trust building must be embedded into community engagement, and complemented by fostering public discourse, informed choice, public participation and literacy.
- Regulation and standardization of data access matters. There is a need for advocacy for regulatory agencies to standardize access to social platform data, to ensure that the available data is comprehensive and regular.
 - With better data access, platforms and other stakeholders can be held accountable for building healthier online information ecosystems.
 - With access to regular and better data/metadata, science and interventions can be designed around it, learning which online interventions work and which do not, and it becomes possible to perform independent analysis of information provided by the platforms.
- Advocacy is needed to ensure that there is no major fragmentation in other regulations (for example, around AI) that are currently in discussion in various

countries. This could prevent a repeat of what previously happened in the field of privacy, where the global community is still trying to clarify concepts of privacy and how it can be governed.

- Communities of practice and research are important and are accountable for supporting countries in need.
- Country-to-country learning platforms will be crucial in ensuring that progress is led by Member States and self-

determined to a large degree, and that global and regional communities are coordinated to support this.

- There is an urgent need for an international code of conduct or ethics guidance for social listening. It was suggested that WHO should explore this through its network of collaborating centres for ethics. Currently, WHO only has ethics guidance for public health surveillance, but this gap can be filled.

2. Social listening, integrated analysis and infodemic insights must be committed to driving public health and operational impact

- Social listening teams should include public health, behavioural science, computational science and other relevant professionals. Such multidisciplinary, multisectoral teams can work on designing end-to-end use cases for social listening, from data collection through to evaluation of impact.
- Integrated data analysis (including data triangulation) can provide the best social listening insights for specific needs. Social media data should be combined with other types of offline community feedback mechanisms and socio-behavioural research to ensure both horizon scanning of potential issues and deep-dive analysis and contextualization of the concerns and questions that communities raise.
- There is a need to expand the use of offline information sources – such as radio conversations and people-driven community listening approaches – as well as relatively little-used resources such as the Internet Archive news section.
- “Pre-bunking” messaging, rather than debunking narratives once they have already taken hold, must become part of regular practice. When it is known or predicted that misinformation narratives will emerge in the evolution of a public health event, strategies should be prepared in advance to ensure that once members of the public encounter the misinformation, they are equipped with action points – for example, where to go to for more information, or how to dismiss the rumour.
- In addition to misinformation correction, a framework for infodemic management and interventions that emphasizes the information environment, not only the circulating content, is needed. To truly address the infodemic and the needs of communities, structural and service barriers must also be addressed, along with the population and individual risk factors and health information inequalities.
- In addition, regular infodemic monitoring and rapid integrated analysis of social listening and other data sources is needed to understand the circulating questions, concerns, information voids, and circulating narratives and misinformation and inform timely public health action.

Further development of systematic, reproducible and evidence based methods for triangulation and integrated

analysis for infodemic insights is needed to better inform infodemic management, emergency and health programmes.

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