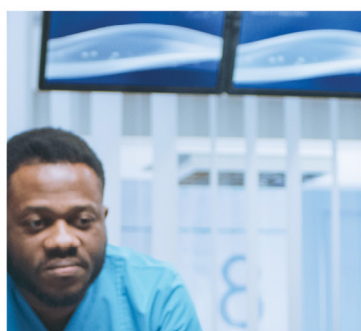


Digital tools and strategies in COVID-19 infodemic response: Case studies and discussion



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1 Introduction

1.1 COVID-19 infodemic

On 11 March 2020 the World Health Organization (WHO) declared COVID-19 a pandemic [1]. By that time, cases of the novel coronavirus had been officially registered in over 100 countries, with the total number of confirmed cases estimated at 37 364 globally [2].

The rapid spread of COVID-19 was accompanied by another worrying phenomenon – an “infodemic” – which has been equally viral in its nature and leading to harm to health, health systems, and society [3].

“Infodemic” refers to the overabundance of information, including false or misleading information, in digital and physical environments during a disease outbreak [4] [5].

The COVID-19 situation report issued by WHO on 2 February 2020 highlighted the need to counter the infodemic and to strengthen country risk communication activities as part of the fight against COVID-19 [5]. Speaking at the Munich Security Conference on 15 February 2020, the WHO Director-General drew attention to the threat of misinformation, which “spreads faster and more easily than this virus and is just as dangerous.”

The COVID-19 infodemic was recognized as a global health issue at the World Health Assembly in May 2020, when WHO Member States passed Resolution WHA73.1 calling on governments to “take measures to counter misinformation and disinformation” and “provide the population with reliable and comprehensive information on COVID-19” [6]. A joint statement released in September of that year by eight United Nations agencies and the International Federation of Red Cross and Red Crescent Societies (IFRC) further emphasized the need for collaboration between governments, the United Nations, social media platforms, researchers and other stakeholders to avert the negative impact of the infodemic [7].

Indeed, the infodemic, despite its intangible nature, can pose a real threat to people's health, wellbeing, and social cohesion. By creating anxiety, distrust and confusion, and by provoking risky, irrational behaviours among the public and in the communities, misinformation and disinformation surrounding disease outbreaks have been responsible for many thousands of deaths worldwide [8].

Infodemics are not new. Since the beginning of recorded history, rumours have accompanied illnesses, particularly outbreaks of infectious disease. Scholars have repeatedly noted the close link between contagion outbreaks and the spread of the mutating rumours that accompany them [9].

Rumours potently combine with viruses in their destructive effect. During the 2003 polio infodemic in Nigeria, rumours proliferated about the alleged dangers of polio vaccines, with claims that they sterilized people, contained HIV, or caused cancer [10][11]. The resulting widespread rejection of vaccines turned into a health-care catastrophe. Polio, which had been under control in Nigeria, spun out of control, with cases quintupling over the course of a few months. The outbreak spread onwards to 19 different countries on three continents. In addition

to its cost in terms of human suffering, bringing the outbreak under control cost around USD 400 million [12].

Similar consequences of misinformation, disinformation and information overload have been observed in the ongoing COVID-19 pandemic. For instance, in early 2020 several countries registered a spike in cases of methanol poisoning, attributed to unfounded rumours that drinking or gargling alcohol could prevent or cure COVID-19 [13][14]. Rumours have also damaged vaccine take-up, even in developed countries: fully 28 per cent of 1 640 United States of America citizens surveyed in May 2020 believed that COVID-19 vaccines would require microchip implants [15][16]. Around the world, 5G installations and telecommunications workers have been attacked by conspiracy theorists who believe in a link between the technology and the spread of COVID-19 [17][18]. In many countries, exposure to misinformation has been linked to reduced adherence to recommended safety measures. A study published by the National Bureau of Economic Research of the United States found that areas of the country exposed to television broadcasts that systematically downplayed the threat of the virus eventually experienced a greater number of cases and deaths within the population [19]. Some researchers have estimated that around 800 deaths that occurred between January and March 2020 can be attributed to COVID-19 misinformation [8].

Growing digital interconnection gives infodemics the potential to spread much more quickly and “virulently” than in the past. The COVID-19 pandemic underscores the central role of digital technology in communicating information, accurate and misleading alike, and demonstrates the need to develop mechanisms and know-how for using digital communication tools to resolve public health crises.

1.2 Role of digital technology

Information and communication technology (ICT) has emerged as an important enabler for an effective COVID-19 response [20][21]. From tracking the spread of the virus to maintaining service continuity amidst lockdowns, ICT has been used in a variety of ways to support people and institutions in mitigating and overcoming the effects of the pandemic.

As a key tool for fast and easy transmission of information, ICT has also played a central role in determining the spread and dynamics of the COVID-19 infodemic across national borders. Digital communication channels and online platforms can serve as a highly cost-effective means of delivery and promotion for public health guidance; but they can also act as a breeding ground for rumours, conspiracy theories and misbeliefs about a novel health threat.

It should therefore be the objective of policy-makers and infodemic managers to leverage ICTs in a way that empowers people so that they can access reliable and useful content, while identifying and avoiding misinformation and disinformation.

The WHO approach to infodemic management is based on four types of key activities [4]:

- listening to community concerns and questions;
- promoting understanding of risk and health expert advice;
- building resilience to misinformation;
- engaging and empowering communities to take positive action.

ICT applications are a powerful tool for supporting and promoting all of these activities, as well as helping to overcome some of the resource constraints that emerge during a pandemic.

Listening to community concerns and questions can be achieved through collection and analysis of data exchanged over the ever-growing number of digital platforms. A range of techniques has emerged that make it possible to aggregate information about recurrent themes and concerns in relation to a particular topic without interfering with user privacy and personal data. Social media listening involves aggregation and analysis of thoughts and ideas expressed in social media posts using big data, natural language processing, and sentiment analysis techniques. Direct collection of feedback from target communities can also be achieved using digital questionnaires disseminated through government websites, smartphone applications, SMS and other messaging services.

Promoting understanding of risk and health expert advice requires that key information be made more accessible to all members of society. Digital technology offers a variety of tools to create and disseminate content that is relevant and appealing to the public. Different digital communication channels can be used to better reach and target specific population groups, choosing the most appropriate content format to improve retention.

Building resilience to misinformation can be facilitated with digital tools and techniques to detect rumours, false claims, and misinformation, and using digital tools as vehicle to deliver inoculation and literacy interventions. These tools and techniques can involve social listening or other data scraping methods to identify and counter misinformation, or using gamification and inoculation approaches in raising people's self-efficacy in dealing with misinformation they come across in their lives. Digital networks and communities of experts can be set up quickly to verify the validity of statements. Collaborations with digital platform owners can be leveraged to remove misinformation, once detected.

Engaging with communities and empowering them to take positive action can involve digital training and behaviour change communication and interventions delivery through digital channels. In addition, people can benefit from resources and tools that they can use to quickly and easily obtain consultation and receive advice. Hotlines, chatbots, and online resources with appropriate self-help content are among the available solutions.

1.3 Making digital solutions matter

The effectiveness of ICT tools in an infodemic response depends on a number of factors.

Digital technology is not in itself a guarantee of effectiveness. If digital solutions are to increase the effectiveness of public health measures (including infodemic management), appropriate design and implementation processes are required.

Aside from specific technical and functional requirements that need to be defined for each particular solution, reflecting the intended use case and local context, there are also more general principles that should be taken into account for any large-scale application in an infodemic response. This is a new field, and expert opinion is still evolving as data and analysis emerge. However, recent experiences from Member States suggest some key elements among those general principles:

- **Needs-based selection of digital services and information:** Digital solutions need to correspond to the needs of the target population to ensure uptake and sustainability. For that reason, identification and monitoring of the population's information and service needs are essential to the success of digital technology as part of the infodemic response. People's information-seeking habits and preferences (where and how they look for

information) have important implications for the prioritization of communication channels and the selection of the communication format. It is unlikely that any one communication tool can provide the reach necessary to extend a given service to all intended end users, so a range of complementary tools and measures is likely to be required. Finally, content must be carefully selected, minimizing irrelevance and redundancy so as to avoid contributing to information overload.

- **A comprehensive, holistic approach to digital technology use:** The digital strategy or infodemic response should aim to support the entire user journey through the information environment, not focus on just one particular stage or aspect. Here, interoperability and a wholistic, human-centred approach to design, implementation, and evaluation can prove instrumental, as stakeholders need to leverage synergies and complementarities between different elements to maximize the positive effect.
- **Amplifying accurate and trustworthy information with digital solutions:** This component involves ensuring the availability of timely and reliable information. The local information environment needs to be shaped so that the information and guidance that users need stand out and are not lost in the flood of content that gets communicated.
- **Making digital solutions universal and accessible:** This component involves improving access to tools needed to interact with the information environment. Availability of relevant content needs to be coupled with the means of access to the digital communication channels through which that content is disseminated. In certain contexts, a simple solution, accessible to more of the population, might be more appropriate than a sophisticated one. Importantly, making services accessible might also involve investment in digital literacy skills, the lack of which can be an important barrier to the use of those tools.
- **Leveraging digital strategies to contain the spread of misinformation:** How misinformation and disinformation is handled is also crucial. Exposure to potentially harmful information online can be reduced through active monitoring, regulation, and collaboration with relevant partners, but it cannot be fully avoided. Users need to be provided with knowledge and tools to cope with misinformation and disinformation, including the ability to cross-check information.
- **Institutional and policy arrangements:** The large-scale use of digital technology in a comprehensive way would typically require structure and regulations to be put in place that can help to overcome challenges and barriers, including those associated with data use and privacy. Important infrastructural requirements need to be met and extensive collaboration needs to occur among a wide range of private and public sector stakeholders. One of the key facilitating factors is the existence of well-defined frameworks and incentives (in the form of policy, for example).

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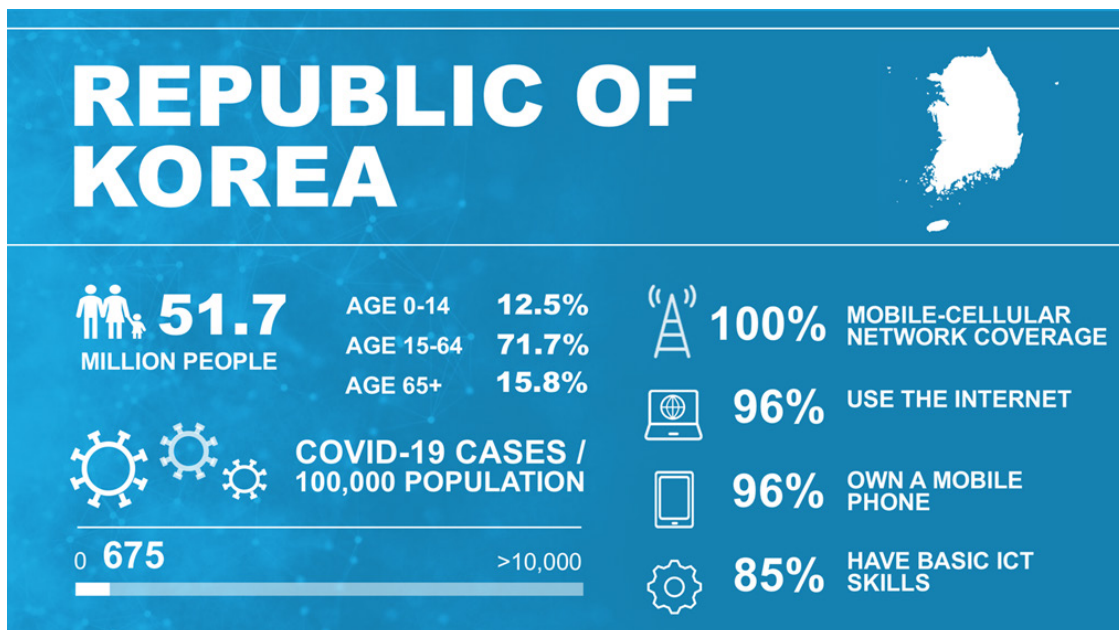
2 Case studies

The present report is based on case studies of the response to the infodemic in Korea (Rep of), Ireland, Niger, and Uruguay.

In addition to being spread across different continents, the selected countries are diverse as regards the economy, culture and language, traditions of governance, and the level of digital connectivity. The analysis of their digital strategies brings to light some of the important aspects of dealing with the infodemic in the information age.

2.1 Korea (Rep. of)

Figure 1: Key demographic, pandemic, and technological preparedness data for Korea (Rep. of)



Sources: WHO [Coronavirus Dashboard](#) (data as of 19 October 2021), UN [World Population Prospects 2019](#), ITU [Digital Development Dashboard](#) (data from 2019 or latest available)

The response of the Republic of Korea to the COVID-19 infodemic involved a coordinated use of a diverse range of digital tools, with emphasis on tailored location-based provision of information and data-driven open communication to deliver accurate and timely guidance while debunking hoaxes and rumours. The national mass communication strategy leveraged the high level of connectivity and involved specific initiatives for groups based on age and other demographic factors so as to maximize engagement and uptake. The strategy was facilitated by a whole-of-government approach, with effective coordination by the Korea Disease Control and Prevention Agency, which assumed the leading role in coordinating the use of different digital tools and strategies mobilized by the government. Existing institutional and policy arrangements combined with partnerships with telecom operators were among the key facilitating factors.

Infodemic situation

Signs of an infodemic began to emerge in the Republic of Korea shortly after the country's first COVID-19 case was registered on 20 January 2020 [1]. In early February journalists and researchers began to draw attention to the rapid spread of false beliefs, rumours, and misconceptions about the new virus and the harmful effects they entailed. Further scientific studies confirmed the spread and the damaging impact of false beliefs.

A cross-sectional online survey conducted with 1 049 adults in April 2020 found that 67.8 per cent were exposed to misinformation [2]. It was observed that prior exposure to COVID-19 misinformation was associated with a greater likelihood that a person would lend credence to an item of misinformation [2]. Those items included claims that infection could be prevented by gargling with saltwater, drinking alcohol, smoking, and taking antibiotics [2]. In March 2020, 46 churchgoers in Gyeonggi Province got infected because they falsely thought they enjoyed protection from the virus after having sprayed saltwater into their mouths [3].

A survey of 1 500 adults revealed that exposure to misinformation was a factor in dissuading individuals from seeking out and thoughtfully processing information on COVID-19 [4]. Still another group of researchers demonstrated a strong correlation between being informed about COVID-19 and adhering to evidence-based preventive practices: a lack of knowledge was found to significantly undermine belief in the efficacy of preventive measures, leading to lower adherence [5]. This indicates that misinformation has had a negative effect on the adoption of preventive behaviours.

Needs-based selection of digital services and information

As a country with a highly developed digital communication infrastructure, the Republic of Korea has a rich information environment and a variety of channels for the delivery of messages, both accurate and misleading. In that context, the key challenge for the government was to ensure that verified information about COVID-19 could reach people and get their attention without getting lost in the increasing din of information.

The country's COVID-19 infodemic response therefore focused on the provision of highly targeted (user-tailored) information, drawing on real-time data collection and close monitoring of the epidemiological situation. The government paid particular attention to communication and information dissemination through social media, which has proven to be highly relevant in the context of the information-seeking behaviours of the population.

Since the country registered its first COVID-19 case, the government dedicated substantial resources to collection and analysis of information about the spread of the virus and the movements of citizens. This was done with the help of a centralized Epidemiological Investigation Support System (EISS) developed by the Ministry of Land, Infrastructure and Transportation. The system has been collecting and processing the following types of data:

- credit card transactions, showing where someone has shopped or eaten, and how they have travelled within a transport network;
- mobile phone location data (obtained from the operators), giving a rough idea of which neighbourhood someone is in as they connect to different phone masts.

This data has been used both to track people who have been infected and to reconstruct their movements prior to detection, making it possible to alert people with whom they may have been in close contact.

The data has also been crucial to capturing, structuring, and visualizing the state of the pandemic to help inform government decisions regarding the location of test centres, the allocation and distribution of pandemic response resources and personnel, and the imposition of lockdowns [6].

The data collected for the purposes of situation monitoring has also served to tailor updates and guidance for people in different regions, cities or even neighbourhoods. This information was made available via specialized smartphone apps, delivered through a cellular broadcasting service in the form of text messages, and posted on the national COVID-19 web portal as well as the websites of municipal authorities and subnational-level institutions.

This approach reduced the information noise and provided targeted COVID-19 information, improving public awareness and promoting adherence to recommended preventive measures [7].

Due attention was given to the provision of information that could facilitate people's daily needs in the context of the pandemic. One example is communication of information about retailers' real-time mask inventories. During the early phase of the pandemic, massive queues were forming to buy masks, which placed buyers in close proximity for hours at a time. With real-time data sharing encouraged by the government through various popular apps, people could check mask stock levels and thus avoid unnecessary queuing, directly reducing the chances of COVID-19 spread [6].

In addition, active communication through social media has proven to be a strategically important measure taken by authorities, since much of the misinformation related to COVID-19 spread through popular online social platforms [2]. According to one study, 46 per cent of the citizens of the Republic of Korea regularly use YouTube as a news platform on COVID-19 [8].

Personal data protection

Provision of targeted location-specific information relied on analysis of large volumes of personal data collected through the COVID-19 Smart Management System. Concerns about personal privacy and user protection have been raised by civil society, journalists, and researchers [9]. A significant investment was made in ensuring advanced security of the digital databases and registries that supported data storage and processing. The safety measures put in place include double firewalling, advanced network login requirements, autonomous record keeping, and limited access to the system (restricted to a minimal number of staff members of the Disease Control and Prevention Agency with no access permissions given to any other government institution) [10].

While these measures have bolstered security, there still have been controversies involving the use of data and indirect disclosure of private information through the messages and alerts sent to people. This has been an important challenge associated with leveraging digital technology to respond to health crises.

The acceptance of personal data use in the Republic of Korea has been facilitated by broad political and public support for conditional data collection in situations of health emergencies [11]. After the 2015 MERS¹ outbreak, an open social debate led to a decision to allow collection and use of personal data to ensure collective well-being during epidemics [11], reflected in the Infectious Disease Control and Prevention Act (IDCPA).

Researchers have also pointed to public trust in the government and strong democratic institutions as additional enabling factors [11]. Importantly, the government took action to address a number of the privacy concerns that emerged. For instance, the government pledged to reduce the amount of publicly disclosed information to protect people's identities, after concerns were raised by members of the LGBTQ community [12]. In addition, to resolve any concerns about violation of privacy, the government agencies made steps to reinforce personal information protection, including through the introduction of personal safety numbers (allocated to each device) to prevent personal information leakage and to simplify the process of consenting to information sharing.²

¹ Middle East respiratory syndrome

² Based on information communicated by national stakeholders.

A comprehensive, holistic approach to digital technology use

The approach of the Republic of Korea to leveraging digital technology to address the COVID-19 infodemic has been comprehensive, with a simultaneous focus on:

- amplifying accurate and trustworthy information with digital solutions
- ensuring accessibility of digital solutions by supporting capacity building within the population
- leveraging digital strategies to remove sources of misinformation.

Amplifying accurate and trustworthy information with digital solutions

From the very start of the pandemic the government prioritized transparent and open communication as an essential component of its response to the crisis [13].

With the intensifying spread of misinformation in March-April 2020 [14], timely communication of accurate and reliable guidance became ever more important. Extensive public communication activities were conducted nationwide, taking the form of briefings, guidelines, website publications, social media campaigns, community-wide text messaging, app alerts, and other resources [13]. The frequency of live official briefings on radio, TV, and online changed depending on the pandemic situation to ensure that more updates were shared with the public at times when the situation worsened.

Text messages and COVID-19 alert apps – such as the [Self-Quarantine Safety Protection App](#) developed by the Ministry of the Interior and Safety (MOIS) – provided essential guidance pertaining to self-quarantine and COVID-19 symptoms as well as contact details of relevant authorities. Alerts by text message have been disseminated by both central and local governments since January 2020.¹

While providing basic curated information to the public, the government apps and text message alerts also encouraged the public to obtain more guidance whenever necessary. In particular, these channels were used to direct people to dedicated websites with detailed practical advice and the 24/7 call centres set up by the Korea Disease Control and Prevention Agency (KDCA) and the Ministry of Health and Welfare (MOHW). Within one month, the call centres went from receiving around 850 calls per day in late January 2020 to handling over 27 000 calls daily. At its peak, the traffic reached 70 154 calls in a single day.²

The use of text messaging was facilitated through decentralization and existing collaborative agreements with the major telecom operators. While communication and message curation was coordinated by the central authorities (including KDCA), provincial and municipal governments were authorized to send alert messages to their local residents without approval from any Ministry. In addition, with support from the mobile telecom carriers, the cellular broadcasting³ service was designed to run on a designated text message delivery channel so as not to cause delivery bottlenecks when an emergency occurs [6].

In addition, the government actively encouraged private stakeholders to disseminate relevant and accurate information.

For example, Naver is the country's largest search engine. Naver swiftly moved to update its user interface in response to the COVID-19 outbreak: Naver Map now has a mask distributor search function and details of test centres. It was also upgraded to provide visitors with up-to-date statistics on the current state of the outbreak.

KakaoMap, another popular online platform, also added a mask distributor search function which helped people to stay informed about mask availability in their neighbourhood/district.

¹ Based on information communicated by national stakeholders

² Based on data communicated by national stakeholders

³ Cellular broadcasting is a form of mobile broadcasting that delivers messages to the people who connect to a network in a particular area (i.e. are serviced by a particular cell tower). It enables geo-targeting and makes it possible to avoid network congestion, which makes it a highly useful and efficient tool for emergency communication.

To promote accurate and reliable information in social media, the government worked directly with international social media platforms (Google, Facebook) as well as major domestic portal sites (Naver, Daum, etc.). The government has also engaged social media influencers by initiating or sponsoring many influencer-led COVID-19 campaigns aimed especially at younger age groups, including children [15]. The inclusion of new informal voices that advocated for responsible behaviours promoted engagement from groups which did not extensively use or rely on government sources, increasing the reach of prevention advice and information.

A range of specialized apps were also developed in partnership with private-sector stakeholders, including exposure tracing applications. Some of these applications quickly became popular, with millions of downloads within weeks of release [16]. While the primary function of these apps has been to warn people about exposure to COVID-19 risks (e.g. when travelling through places where confirmed COVID-19 cases were registered), they have also contributed to containing the infodemic by improving people's awareness and increasing their control of the information.

Making digital solutions universal and accessible

To make the digital services that tackle the COVID-19 infodemic useful to the entire population, the government has intensified its efforts to close the digital divide. This was done in recognition of the fact that digital information must be not merely available but accessible to all in order to have the desired impact.

As a highly digitally developed nation, the Republic of Korea does not have a large digital divide within its population. The divide is not so much technological one, but rather a divide in digital literacy, between those who can operate their devices and can locate information on them and those, generally older, who struggle to do so. The Internet usage rate is 100 per cent among 30-39-year-olds, in contrast with just 38.9 per cent of those 70 and older. A 2019 National Information Society Agency (NIA) survey found that less than 30 per cent of citizens in their 60s and older said they could install and use mobile applications – a skill of high importance if wide usage of government COVID-19 apps is to be achieved [17]. With growing reliance on digital communication since the outbreak of the pandemic, and with the growing threat of misleading posts and websites, this divide became increasingly problematic, and the government stepped up its efforts to mitigate the problem.

In particular, the Ministry of Education and the Ministry of Science and Technology have stepped up long-standing efforts to provide digital literacy training to the population in need. After the pandemic hit, the government began working on a project to establish 1 000 digital education centres [18]. These will ensure accessibility of training and encourage the uptake of digital literacy skills.

Digital literacy development has been supported by loaning devices to people lacking the appropriate technology for digital education. Thus, in the wake of the pandemic the Ministry of Education lent Internet devices and laptops to many of the over 200 000 students who did not have access to the hardware needed for online schooling [18].

Leveraging digital strategies to contain the spread of misinformation

The government has also been working on removing misinformation sources from the digital space.

The Korea Communications Standards Commission (KCSC) took steps to delete disinformation or posts considered to be harmful from the Internet, including social media and other online posts (e.g. blogs) targeting particular ethnicities and inaccurate claims about potential COVID-19 cures [19]. It has encouraged reporting information and complaints about such posts by disseminating contact details of the relevant service and by improving public awareness of the relevant regulations.

When an investigation becomes necessary, the cybercrime divisions of city and provincial police agencies are involved in the response to malicious and organized creation and circulation of fake information online.

Institutional and policy arrangements

The Republic of Korea already had important institutional and policy arrangements in place that have facilitated the implementation of an effective digital response to the COVID-19 infodemic.

1. Prior to the crisis, the government had already prioritized leveraging digital technology to bolster national development and growth. The “Plan for the Fourth Industrial Revolution: I-Korea 4.0” adopted in 2017 encouraged the informatization of services and the improvement of efficiency of the key service sectors, including health. Among the actions identified in the plan were measures aimed at expansion of the electronic health information exchange and creation of systems for health-care big data [20]. National commitment to these actions secured availability of an operational framework and resources for a range of digital interventions enacted during the COVID-19 crisis, including the COVID-19 Smart Management System, as well as a variety of applications used for COVID-19 alerts.
2. The National Strategy for Artificial Intelligence (NSAI) adopted in 2019 established a strong basis for the development and integration of AI and big data technologies. The NSAI identified 100 government-wide tasks under nine strategies in three areas (AI ecosystem, AI utilization, and people-centred AI) to help advance the country’s technological capabilities and the integration of AI-enabled tools and services in the work of the different public and private institutions [21]. It formalized government commitment to support and invest in AI development and adoption, providing national stakeholders with important incentives for action. As part of the strategy, the government encouraged the formation of AI R&D and the implementation of ecosystems and private-public collaborations that later served as an important enabling factor for the use of several innovative solutions against COVID-19 and the infodemic. In particular, one of the tasks identified by the NSAI was the reinforcement of linkages between public and private data and the creation of nationwide and sector-specific data maps to support AI training and decision-making. Data maps played a key role in the provision of location-tailored and needs-based information to citizens which has been at the core of the country’s communication response to the infodemic.
3. The Korean New Deal – a “National Strategy for Great Transformation” – defines a development roadmap for the country to the year 2025. It has two main components: the Green New Deal and the Digital New Deal [22]. The Digital New Deal emphasizes development of the digital economy and digital innovation, acting as a driver for the adoption and promotion of innovative digital technologies, including 5G, big data and AI, which have played key roles in tackling the COVID-19 crisis. Specifically, one of the four main focus areas of the Digital New Deal is “Digitalizing Social Overhead Capital”, which involves investment in digitalizing critical infrastructure and establishing “an efficient disaster prevention and response system to make people’s lives safer and more convenient.” High political commitment to these objectives has facilitated the country’s response to the COVID-19 infodemic and has helped align the efforts made by various public, civil society, and private actors.
4. The regulatory framework for personal data collection combined with privacy protection measures has been instrumental in the Republic of Korea response to the infodemic,

which relied heavily on conditional data collection. The Infectious Disease Control and Prevention Act (IDSPA) was revised following the 2015 MERS outbreak and contains provisions that regulate the collection and use of personal information in national health emergencies. For example, the IDSPA and related enforcement decrees regulated the collection of credit card information used in the EISS. It facilitated the setting up of an operational mechanism between the MOHW, KDCA, the Korea National Police Agency, and credit card companies to streamline the data collection process.

Notably, while providing for partial concession of personal data privacy rights, the Act establishes the conditionality of such measures and limits the mandate for data use to only a few institutions involved in the epidemic response [10]. The IDSPA is further counterbalanced by the Personal Information Protection Act, which regulates the handling of claims for data protection. Since the start of the pandemic, the Personal Information Protection Commission has processed a large number of petitions regarding personal data protection, ensuring that the interests and rights of individuals are respected [10]. The existence of a clear regulatory framework and corresponding institutional arrangements have been important for mitigating the risks of misuse of personal data and for ensuring public acceptance and political backing for conditional data collection to respond to COVID-19 and the infodemic.

5. KDCA, formerly known as the Korean Centres for Disease Control and Prevention, is a specialized body under the MOHW responsible for the monitoring and surveillance of outbreaks of communicable diseases and other health risk factors in the country [23]. During the COVID-19 pandemic, it was given a strong mandate to use digital resources for communication and awareness-raising aimed at prevention. The organization used its experience in the 2015 MERS⁴ outbreak, when it was involved in managing the national health emergency response, to strengthen the risk communication strategy, including through the recruitment of new staff and establishment of an Emergency Operations Centre [24].

The organization became a key coordinating body, working closely with MOHW, MOIS, the Ministry of Land, Infrastructure and Transport (MOLIT), the Ministry of Science and ICT (MSIT), the National Information Society Agency (NIA), the Korea Communications Standards Commission (KCSC) and many other public institutions and private-sector partners. It acted as a data controller for the COVID-19 Smart Management System and therefore had a primary role in reviewing and managing aggregated data that informed COVID-19 communications.

The government gave KDCA the central voice in COVID-19 communication, giving the Agency the lead in the central government briefings by the Central Disease Control Headquarters (CDC HQ) [13]. In September 2020, the body was reformed into a new public institution (and given its current name) with an independent budget, structure and human resources, granting it additional capacities and strengthening the mandate [13].

By working closely with different governmental institutions, KDCA facilitated the roll-out of a variety of emergency communications, contact tracing, epidemiological monitoring and quarantine monitoring interventions enabled through digital technology: a COVID-19 call centre (hotline 1339), a dedicated and comprehensive COVID-19 government website, daily targeted SMS updates (using the cellular broadcasting service), the Epidemiological Investigation Support System (EISS), the Smart Quarantine Information System (SQIS), and self-check apps, among others [13] [6].

The strategic positioning of KDCA and its coordinating role in the deployment of digital solutions for COVID-19 has been one of the key success factors contributing to effective use of different tools and applications in a synergistic way that supported the whole-of-government response to the COVID-19 infodemic and cross-leveraging of data and resources.

⁴ Middle East respiratory syndrome

6. In August 2019, an agreement was made between the government and the three largest mobile operators in the country for the sharing of their designated frequency channels for emergency alerts and phone calls [6]. The agreement was leveraged for SMS alerts disseminated by KDCA and local governorates.

Conclusion

The efforts made by the Republic of Korea to tackle the COVID-19 infodemic have brought results. While it is difficult to establish and confirm a direct causal link, there is indirect evidence that the national infodemic management policy contributed to the high degree of adherence with preventive measures among the population. Studies have shown that compliance with public health guidelines has improved considerably since the health crisis caused by the 2015 MERS outbreak [25].

Importantly, the case of the Republic of Korea demonstrates that the existence of strong and sustainable digital infrastructure contributes to resilience in the face of crises such as global pandemics. It also highlights the value of data-driven communication management which allows for the provision of tailored content depending on user location. Furthermore, the case demonstrates the important role of pre-existing institutional and policy arrangements that establish frameworks for nation-wide integration and use of innovative digital technologies. By creating grounds and incentives for intra-governmental collaboration and public-private partnerships, these instruments act as important enablers of holistic and coordinated action in the area of technology use, which significantly facilitates the process of development and implementation, speeding up reaction time during emergencies and crises.

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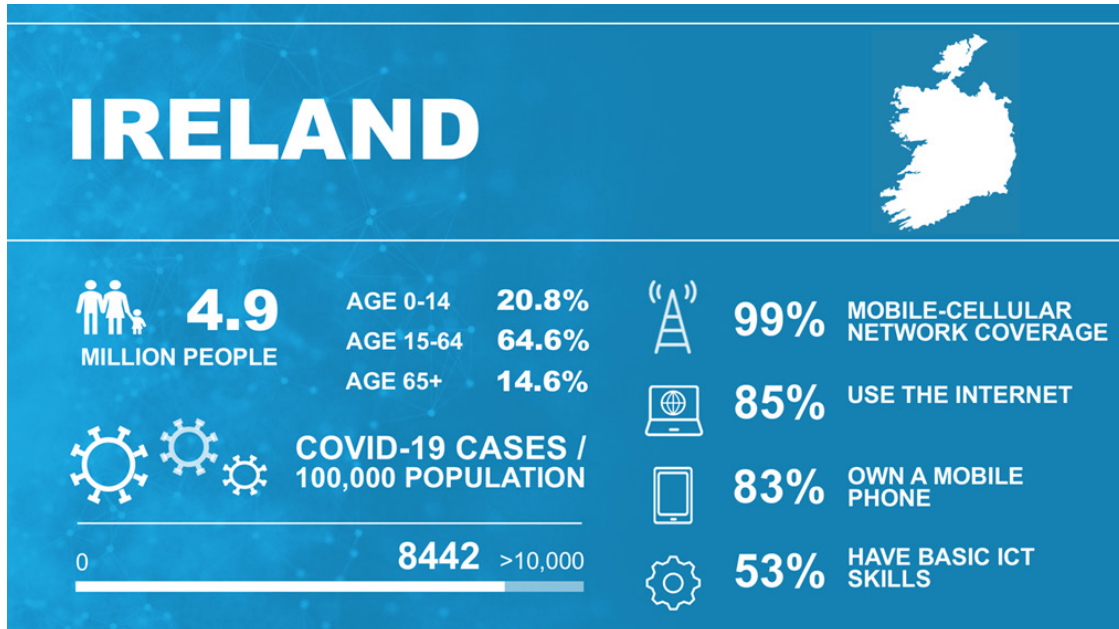
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2.2 Ireland

Figure 2: Key demographic, pandemic, and technological preparedness data for Ireland



Sources: WHO [Coronavirus Dashboard](#) (data as of 19 October 2021), UN [World Population Prospects 2019](#), ITU [Digital Development Dashboard](#) (data from 2019 or latest available)

The response of Ireland to the infodemic has been characterized by active engagement with the public, including a proactive response to emerging questions and concerns and continuous adjustment of communication content to the public's information needs. In particular, a strong emphasis was placed on the use of social media for monitoring common themes and conversations and for disseminating relevant public health guidance and situation updates as well as countering misinformation and rumours. The response also involved regulatory action to ease access to connectivity through collaboration with telecommunication operators. Pre-existing digital policies and strategies, including provisions relating to digital literacy and communication infrastructure, have served as important facilitators of the digital response.

Infodemic situation

The first COVID-19 case was registered in Ireland on 27 Feb 2020. Initial pandemic-related restrictions were introduced in March 2020, including the cancellation of the annual St Patrick's Day celebrations on 17 March. A general lockdown followed on 27 March.

Prior and during the lockdown a variety of false or misleading claims about the pandemic spread on social media, with some messages quickly going viral. For example, shortly after the introduction of the first COVID-19 restrictions, a message widely shared on WhatsApp claimed (falsely) that the Irish army would be deployed on the streets of Dublin to enforce a 'status red' [1]. Later, in April, a false claim was circulated on Twitter [2] about four Irish nurses who had supposedly died due to COVID-19, leading to anxiety and public concerns about health safety in hospitals.

In some instances, statements and claims about COVID-19 featured in the press as opinions were quickly taken online and presented as facts, despite being unverified or inaccurate. For

example, in October 2020, an advertisement was published in the *Irish Times* containing inaccurate claims about how COVID-19 deaths were being counted, along with some selected statistics suggesting that the threat posed by the virus was not as severe as commonly believed. While most of the data in the ad was taken from verified sources, it was presented in a way that was misleading or lacked context [3]. Screenshots of the ad quickly spread on Facebook, sparking controversial reactions.

In April 2020, doctors in Ireland's second-largest city, Cork, published an open letter in a scientific journal to draw attention to the spread of false messages about the novel coronavirus. Citing their experience, they warned of the negative implications of these messages for clinical practice [4], mentioning, for instance, that some patients were unwilling to take Ibuprofen, leaving non-COVID-19 illnesses untreated because of unconfirmed claims about the drug's adverse effects on COVID-19 outcomes that emerged early during the pandemic [5][6].

Needs-based selection of digital services and information

To effectively counter the infodemic, the government and the health authorities have emphasized proactive communication and continuous adaptation of content to the population's information needs. In that context, Ireland's response to misinformation has involved actively monitoring the information environment to rapidly identify questions, claims, and concerns that require a response.

Particular attention was paid to monitoring and reacting to dialogues and messages on social media. This approach took into account people's high reliance on social media for information sourcing and the great influence that social media content had on public perceptions of COVID-19.

According to industry data cited by the Health Service Executive (HSE) of Ireland, the Irish population is one of the most engaged on social media in Europe, with an average of five active social media accounts per person [7]. The Irish actively use messenger apps (Facebook Messenger and WhatsApp), with the majority of users accessing these apps daily.

At the same time, a correlation has been observed between social media information sourcing and vulnerability to COVID-19 misinformation. A comparative cross-national survey between mid-March and early May 2020 that included 700 respondents from Ireland in addition to national samples from Spain, the United States, Mexico and the United Kingdom, found that "being exposed to information about the virus on social media was significantly associated with higher susceptibility to misinformation" in certain countries, the most significant correlation being observed in Ireland [8].

Accordingly, the digital communication strategy of Ireland has placed a strategic emphasis on social media monitoring and communication. HSE, as the main national public agency for health services, has used social media to track online sentiment and conversations about COVID-19 [9][10]. The HSE Digital Team has assigned personnel to regularly monitor social media conversations and questions sent to various HSE social media accounts to identify common issues and/or gaps in online information about COVID-19 [9]. The Team has also leveraged a

private-sector social media listening solution⁵ to detect and track COVID-19-related posts that contained fake claims or misinformation [10].

The real-time monitoring and analysis of social media messages and posts has been used to proactively prepare responses to questions or rumours about COVID-19 and to develop online content that improved public knowledge about the disease, the pandemic, and the government response [9].

A comprehensive, holistic approach to digital technology use: Amplifying accurate and trustworthy information with digital solutions

Transparency and open public communication were identified as key to a successful COVID-19 response and infodemic management. The government and HSE prioritized sharing of accurate information to ensure compliance with COVID-19 restrictions and to combat the spread of rumours and misleading messages among the public.

To ensure easy access to reliable and timely information, HSE leveraged a wide range of digital tools:

Social media

First, recognizing the importance of social media, HSE has substantially stepped up activity across all its social media accounts, particularly on Twitter, Facebook, and Instagram. With around 73 per cent of the Irish population using smartphones [11], social media apps were the easiest (and often preferred) way of accessing information on the go for a major share of the population. Accordingly, HSE took measures to ensure that relevant public health content was visible and quickly accessible to social media users. A wide variety of social media materials were quickly designed and shared with the public through HSE social media accounts, including graphics, posters, pop-up banners, schematic guides, videos, and content adapted to people with special needs (including people with dementia and people with hearing loss). In May 2020, HSE also launched a national COVID-19 awareness-raising and solidarity campaign, [#HoldFirm](#), that ran on all major social media platforms as well as radio and television. Live streaming was initiated for important communication events. For instance, during the pandemic, HSE started to live-stream all of its weekly press briefings on Twitter [9].

In addition to publishing more content, HSE has actively engaged with the public in two-way conversations by communicating updated information and guidance in direct messages to users and in replies to social media comments and posts. HSE reports that the Digital Team replied to 12 164 direct messages and tweets in March 2020, compared to just 105 for the same month in 2019 [9].

HSE has also adjusted the tone and the format of its messages to relieve anxiety and to establish a trusting relationship with its audience [9]. The HSE Digital Team leveraged user feedback and insights from the social media listening tool to continuously improve the content and the timing of its posts [9]. The effort was also facilitated by HSE social audience analysis and pre-existing social media strategy, both of which provided important guidance for content design and adaptation [7].

⁵ Social media listening refers to the use of technology to aggregate and analyse information about social media content and posts to identify and track trends and sentiments and assess their intensity. Typically, such technology involves a combination of big data and artificial intelligence and can provide insights into users' perceptions and thoughts on particular topics.

During the pandemic, HSE social media audience rapidly increased. The number of Twitter followers grew from 42 000 in February 2020 to nearly 161 000 in December 2020 [12], while the number of Instagram followers climbed from 5 000 to 81 000 over the same period [9]. In addition to boosting its social media presence, HSE also collaborated with social media influencers to help disseminate key public health guidance [9].

Digital proximity tracing app

Second, HSE issued a COVID-19 digital proximity tracing app – COVID Tracker Ireland – which was used to regularly share key updates and information on the situation in the country and its regions.

The app was built on the Google and Apple Exposure Notification (GAEN) API and was made available across Google Play and iTunes app stores in early July 2020 [11].

HSE actively worked with private-sector partners [13] to develop a strong promotion and awareness-raising campaign to encourage uptake of the app. A dedicated [website](#) was built to serve as a one-stop resource, with key information about the app, its features, its working principles, and its relevance to the national COVID-19 response. The website also addressed some of the common public concerns about privacy and personal data use, which was important in the context of the media scrutiny that emerged around digital proximity tracing technology in 2020. In addition, a nationwide social media campaign was launched to promote the app, with HSE disseminating posters, videos, and animation across its social media accounts.

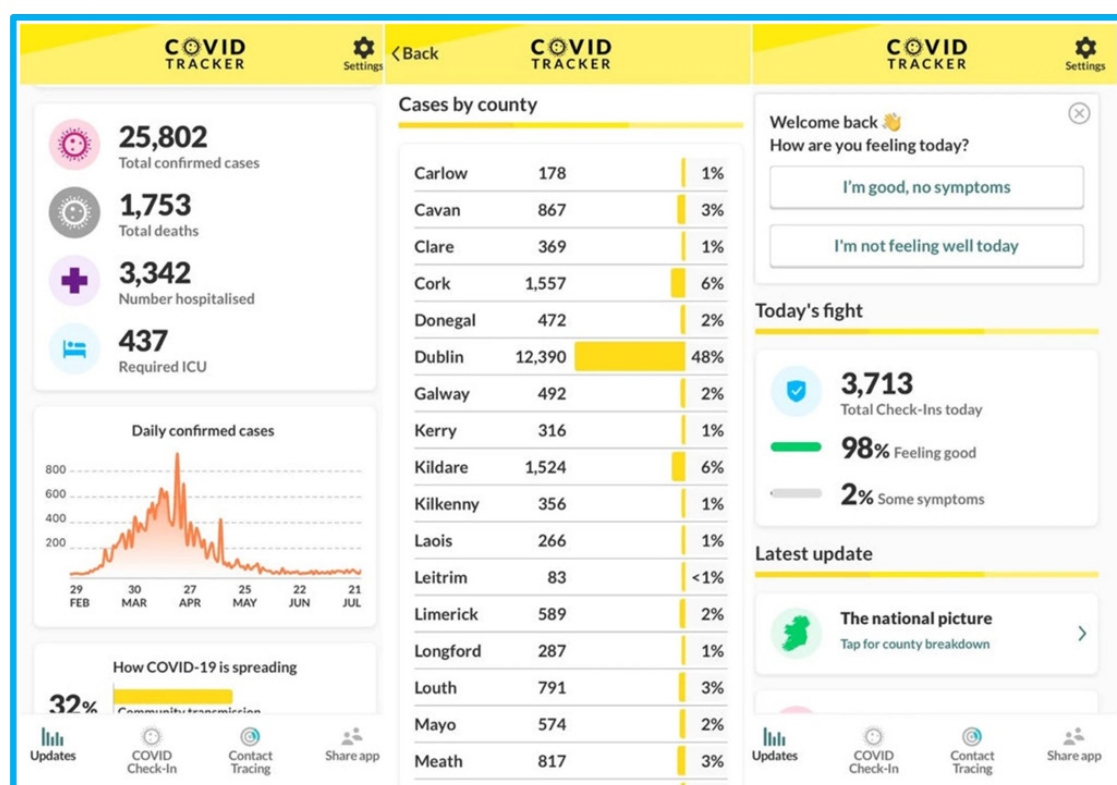
Less than two weeks after the launch, the cumulative app registrations reached 1.3 million – the equivalent of more than one-third of Ireland’s adult population [14]. By March 2021 the total registrations climbed to 2.5 million, with 1.3 million active users [15].

While the primary purpose of the app was to notify users whenever they came into close contact with other individuals who were using the app and who tested positive, it was also used for self-reporting of COVID-19 symptoms and for sharing important information and resources with users.⁶ The information shared included latest news, updates about the number of registered COVID-19 cases (disaggregated by city and region), common modes of transmission, and the share of app users reporting COVID-19 symptoms (Figure 3) [11][16].

In addition, the app linked users to HSE content and services, including the COVID-19 helpline. The app thus contributed to the fight against the COVID-19 infodemic by improving access to accurate information among the public.

⁶ Evaluation of the COVID Tracker app is ongoing. With regards to contact tracing, some observers have suggested that despite popular uptake the benefits of the app might have been limited, pointing to a shortfall in the number of positive cases self-reported by users (as reported, for example, in the Irish Times [article](#) “Concerns raised about Covid-19 tracker app’s ‘limited benefits’”). Nonetheless, the wide user base of the app has likely guaranteed higher exposure of the population to important HSE updates and has contributed to the use of relevant HSE resources.

Figure 3: HSE COVID Tracker App



Source: Screen captures of the HSE Covid Tracker app. [11]

Helpline

HSE furthermore established a COVID-19 helpline with dedicated staff who received calls seven days a week. Both HSE social media posts and the COVID Tracker app informed people about the helpline and advised them to use it in case of questions or doubts for which there was no information online. HSE reports that more than 700 000 calls were taken during 2020 (equivalent to more than 1 900 calls per day) [9].

Website

Lastly, HSE leveraged its website, with significant investment in designing a user-oriented and functional COVID-19 landing page. As in the case of social media communication, the design of the landing page and regular content updates were informed by active feedback collection and sentiment analysis. Nearly all HSE webpages have a feedback collection button, inviting visitors to provide comments on the utility of content and suggest any additions or revision. HSE reports that in-page user feedback has been reviewed on a daily basis since the onset of the pandemic [17], leading to timely adjustments and substantially improving usability of the website. In 2020, the HSE COVID-19 page became its most viewed page, accumulating over 8.5 million views [17].

Making digital solutions universal and accessible

Ireland has a good digital infrastructure, with some 95 per cent of the population enjoying access to at least a 3G mobile network and 85 per cent of households having Internet at home [18].

In the face of COVID-19 restrictions, the Commission for Communications Regulation of Ireland (COMREG) worked together with Ireland's telecommunication industry to further increase capacity and improve affordability of communications.

In particular, COMREG temporarily released extra radio spectrum in the 700 MHz and 2.6 GHz bands to provide additional capacity for mobile phone and broadband services and allowed the use of the 2.1 GHz band for 4G and other technologies, rather than just for 3G [19].

In addition, an agreement was concluded with all major Internet providers in the country, according to which "access to healthcare and educational resource websites identified by the government" was made "zero-rated for all customers where technically feasible" [20]. Under the agreement, service providers have also committed to "engage with any customer that contacts them who is in financial difficulty as a result of COVID-19 and has difficulty paying their bills to agree the best way of keeping them connected to voice and data."

Leveraging digital strategies to contain the spread of misinformation

Responding to the COVID-19 infodemic also involved targeted action against harmful and misleading content that spread among the public. As part of this effort, the government and HSE engaged in active monitoring of the information environment to identify and react to post, messages, or claims that posed any risk in a timely manner.

In particular, the social media monitoring by HSE, while providing important insights into user information needs, was also leveraged to detect harmful content on WhatsApp, Facebook, and Twitter in a timely manner. The HSE Digital Team responded to rumours and misconceptions by creating dedicated social media content to warn the public about misleading claims. In addition, HSE collaborated with social media platforms and other public and private-sector partners to remove harmful content. In February-March 2021, HSE identified and reported 300 harmful posts [10].

There have also been private-sector responses, such as the [thejournal.ie](https://www.thejournal.ie) (Ireland's major online only newspaper) fact-checking pages on COVID-19 claims on social media. The Journal has already addressed more than 75 dubious claims with detailed articles that analyse their content and fact base. Readers are encouraged to send in doubtful reports. Similar work has been done by [Media Literacy Ireland](https://www.media-literacy-ireland.org/) (MLI) - a volunteer network that tries to improve the use of digital sources within Ireland.

Collaboration with social media platforms also involved initiatives to raise awareness about the infodemic to encourage responsible behaviour. Thus, in March 2021 Facebook Ireland ran a campaign called "Together Against COVID-19 Misinformation". Facebook ads directed readers towards HSE and other trusted sites, and encouraged readers to check sources and context.

Institutional and policy arrangements

Several important components have facilitated the use of digital technology for the infodemic response in Ireland:

1. Widespread use of digital communication tools, feedback collection, and monitoring of the information environment would not have been possible without extensive digital and connectivity infrastructure. The government made a strong commitment to advance the country's digital development and digital economy, which resulted in an infrastructure and solutions that formed the backbone of the country's digital response. This commitment also manifested itself in a range of national strategic and policy documents, which have

helped to guide, encourage and coordinate both private and public-sector programmes and initiatives to improve availability and quality of digital infrastructure. Since the early 2000s, over a dozen national and sector-specific strategies, plans, and initiatives were launched [21]. Among the most recent are the [National Broadband Plan](#) and the [Industry 4.0 Strategy \(2020-2025\)](#) as well as regional/municipal plans, such as the [Fingal Digital Strategy 2020-23](#). All of these documents call for improvement of accessibility of digital tools and digitalization of various sectors and services, including health, thereby promoting the development of the digital infrastructure. The National Broadband Plan, in particular, is the government initiative to deliver high speed broadband services to all premises in Ireland leveraging both private-sector and public investment [22].

2. Similarly, the wide uptake of the digital services offered as part of the infodemic response was enabled by important investments in digital literacy and digital skills. In 2013, the Government of Ireland released National Digital Strategy for Ireland titled "[Doing More with Digital](#)" to promote higher digital engagement of the population and to help unlock the opportunities offered by the rapidly expanding digital services sector. Among the key activities identified by the strategy has been provision of digital skills training for citizen as well as broader integration of ICT-related curriculum in education. Today, Irish educational planners, including the National Council for Curriculum and Assessment (NCCA), have a standing commitment to improving the digital literacy of those in full-time education. Ireland's Digital Strategy for Schools made EUR 210 million available from 2015 to 2020. This source of funding goes toward Ireland's Digital Learning Plan and spreads its resources from early childhood through higher education. The government has also been working on the National Strategy for Digital Literacy which will include a 10-year road map for further advancing digital skills among Ireland's adult population.
3. One of the key components of the national effort to promote digitalization has also been the development of e-government services. In 2015, the government adopted a [Public Service ICT Strategy](#) to improve accessibility of government services to citizens through digital means. Over the years, the government has extensively engaged in creation of user-centric websites and platforms, as well as integration and standardization of information systems and data records of different institutions and government departments to boost efficiency and reduce duplication of efforts. These activities have established an important foundation for the services and solutions deployed in response to COVID-19.
4. The HSE success in the use of social media has been facilitated by the fact that a social media strategy already existed [7]. Developed in 2017, the HSE strategy has played an important role in guiding the measures taken by the HSE Digital Team in relation to interacting with the public during the pandemic. The strategy provided HSE audience analysis, thereby facilitating the identification of information needs of different audience groups.

Conclusion

Ireland enacted a strong infodemic response which involved extensive use of social media and user-tailored communication approach, and proactive response to population's information needs through continuous monitoring of the information environment. Data and evidence gathered through monitoring were key to informing content-related decisions and communication strategies. In addition, the public authorities collaborated with a range of private-sector stakeholders, including telecom providers and social media platforms. The response was facilitated by government commitment to the country's digital development, which involved investment in the population's digital literacy and skills. Pre-existing frameworks and guidance, such as HSE social media strategy, have also helped to better harness the potential of novel communication means to effectively address the needs of the population.

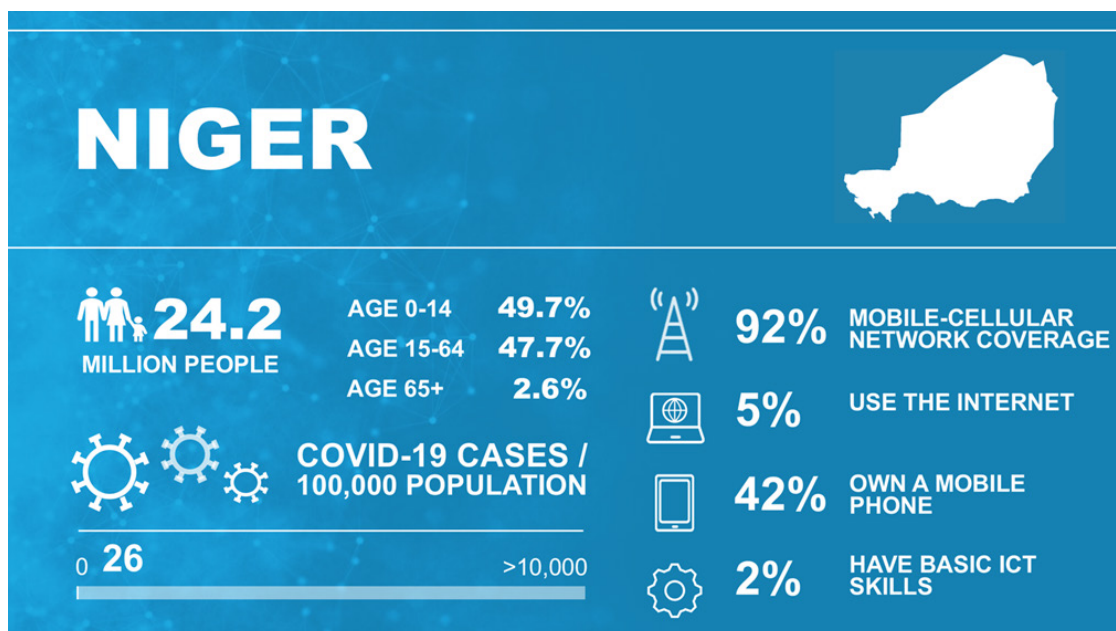
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2.3 Niger

Figure 4: Key demographic, pandemic, and technological preparedness data for Niger



Sources: WHO [Coronavirus Dashboard](#) (data as of 19 October 2021), UN [World Population Prospects 2019](#), ITU [Digital Development Dashboard](#) (data from 2019 or latest available)

Owing to its special demographic, social, and geographic characteristics, Niger had to enact its COVID-19 response under challenging circumstances. As a predominantly rural country with limited ICT infrastructure, it faced many barriers to disseminating important public health messages, including preventive guidance and advice. Due to limited reach of the digital media (e.g. TV, radio, messengers, and social media platforms) and low prevalence of gadgets, the key driver of the infodemic was absence of information rather than its overabundance. Information void gave rise to uncertainty and doubts, which, in turn, served as a breeding ground for rumours and myths. To quickly communicate information to people, the government leveraged the only communication channel with over 90 per cent population reach – mobile-cellular network.

Infodemic situation

The first case of COVID-19 was registered in Niger on 19 March 2020. By mid-June that year, the number of exceeded 1 000 confirmed cases [1].

The spread of the virus occurred slower than in many other countries, partly due to low urbanization rate and limited transport infrastructure in most of the country's regions.

Nonetheless, many communities got exposed to rumours and misinformation about COVID-19 which propagated as a word of mouth threatening to cause mistrust, stigmatization, and health-harming behaviours. The threat of rumours and misinformation was highlighted by UNICEF [2] [3] as well as a local NGO GeoAnalytics Center [4].

Due to the low literacy rate (35 per cent of adult population) [5], low levels of broadband connectivity, and lack of telecommunication devices, the population of Niger had limited access to timely and reliable public health information at the start of the pandemic. Awareness-raising

and public communication efforts were further complicated by high dispersity of the population over the country's large territory.

Absence of timely public guidance and information on the new virus threatened to give rise to a wide range of rumours and misconceptions about the disease, its risk factors, and means of treatment / prevention. In the neighbouring Nigeria, there has been a spike in misinformation and "fake news" shared on social media and through messenger apps [6][7]. Some of the messages promoted conspiracy theories about the origins of the disease, while others proposed "cures" for the virus [7][8]. Similarly, in Niger, the media raised concerns over proliferation of inaccurate and potentially harmful information [9].

Among infodemic-related risk, the United Nations Office for the Coordination of Humanitarian Affairs identified the risk of stigmatization and social tensions. The United Nations has highlighted the importance of awareness-raising at community level to avoid stigmatization of individuals who contract the virus as well as to prevent discrimination against displaced persons and migrants on the basis of misconceptions about the virus [10].

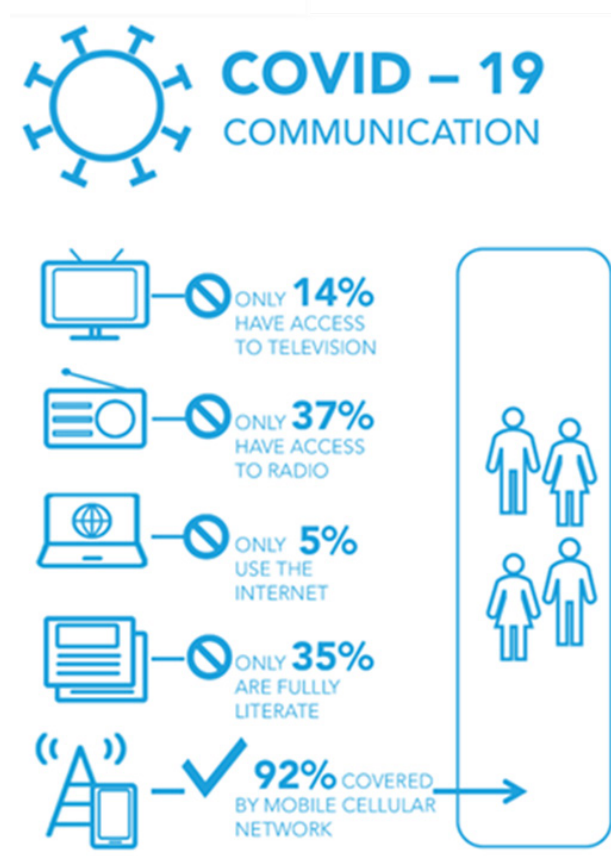
Needs-based selection of digital services and information

With the outbreak of the pandemic, the Government of Niger was confronted with a serious challenge - delivery of timely and accurate health advice to people in the absence of widespread and easily accessible communication channels.

Niger is a country with unique demographic characteristics – over 83 per cent of its population are rural which makes it the least urbanized country on the continent [11].

Most of the Niger population live in regions that lack connectivity and basic ICT infrastructure and therefore have limited access to conventional media channels such as radio or television (see Figure 5). According to the latest available data, only 14.1 per cent of households have TV at home and only 37 per cent have radio [12]. Even fewer people use the Internet – estimated at 5.3 per cent [12]. In addition, the situation is complicated by low literacy rate which impedes the dissemination of information through press or print materials. It is estimated that just over one-third (35 per cent) of Niger’s adult population are literate. Moreover, communities in different regions of the country speak different languages. In addition to French, which is the official language of Niger, there are 10 national languages (including several indigenous languages) making it difficult to quickly convey important COVID-19 announcements to all vulnerable people through a single press release.

Figure 5: Access to information distribution channels in Niger



Source: ITU, “ITU Statistics: Global and Regional ICT Data. Core Household Indicators.” ITU Statistics, 2018. <https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx> (accessed Jan. 22, 2021). UNESCO, “UNESCO Institute for Statistics Data,” UNESCO Institute for Statistics, 2020. <http://uis.unesco.org/> (accessed Aug. 21, 2021).

To respond to the above challenge, the Government of Niger came up with a creative solution: an interactive voice response (IVR) service that can deliver live-saving information in audio format directly on people’s phones.

Mobile phones in Niger are the most widespread digital communication tool, with the majority of households (60 per cent) having access to a at least one device [12]. Furthermore, the use of audio format made it possible to reach people without literacy skills.

A comprehensive, holistic approach to digital technology use

Faced with resource constraints and limitations in terms of information communication channels, the Republic of the Niger had to use every available tool at its disposal to counter the virus and the infodemic. Despite the significant barriers, the country managed to enact a response that addressed the key aspects of digital technology use for infodemic management.

Amplifying accurate and trustworthy information with digital solutions

Figure 6: COVID-19 interactive voice response service in Niger



Leveraging the wider coverage of 2G mobile telephony network, the National Agency for Information Society (ANSI) of Niger and the Ministry of Health, in collaboration with other state agencies, ITU, and private-sector partners, have set up a platform to provide access to pre-recorded voice messages in five national languages to the population.

Any person in the country who has access to a mobile network can dial a short number (701) to listen to voice messages in French, Fulfulde, Hausa, Zarma-Songhai or Kanuri. The messages convey basic information about COVID-19 and the preventive measures recommended by the Ministry of Health. The service is free and can be accessed multiple times without any charges. After calling the short number, a person can choose the language and listen to the advice and guidance provided by the Ministry of Health (Figure 6).

Source: ITU, "Interactive Voice Response: Delivering life-saving information amid COVID-19 in Niger," ITU News, Jan. 19, 2021. <https://www.itu.int:443/en/myitu/News/2021/01/19/08/29/Interactive-Voice-Response-life-saving-information-COVID-19-Niger> (accessed Aug. 21, 2021).

The service was launched in April 2020, within one month after the first COVID-19 country was registered in the country. As of January 2021, the service has been accessed by around 100 000 people.⁷

⁷ Based on data communicated by national stakeholders.

What did people say?

Interviews conducted with some of the IVR service users in September-October 2020 demonstrated the value of the service to the population, especially those living in remote rural areas.

One beneficiary said: “We are very delighted to hear these awareness messages in the Fulfulde language and are convinced that this 701 hotline has helped many Fulani living in rural areas to understand the messages and respect the measures against the COVID-19 pandemic.”

Another beneficiary, a speaker of Hausa, confirmed: “Voicemail messages about COVID-19 have helped me a lot to respect the [preventive] measures and have urged me to take the necessary precautions. They are in my mother tongue and therefore I better understand the challenges of the pandemic for myself and my community.”

More comments and remarks by community members and state workers can be found in a [web story](#) about Niger’s COVID-19 IVR service published on the ITU website [13].

Remote consultation solution

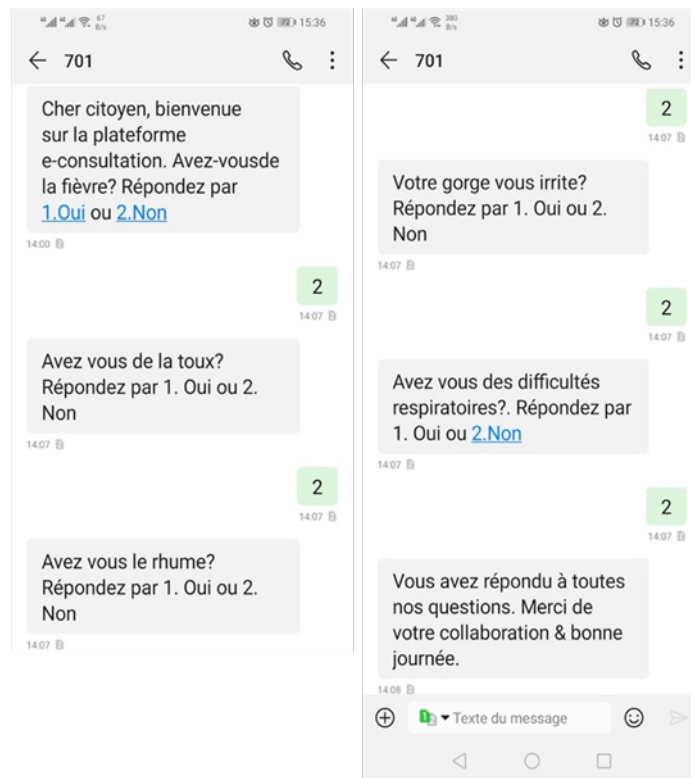
In addition to the IVR service, ANSI has established a free remote consultation solution that has been used to support remote diagnosis of people who suspect to have contracted COVID-19.

An automated messaging service was set up to enable users to report on their health status and symptoms by responding to a series of five questions asked periodically over the course of several days. The five basic questions are: (1) Do you have fever? (2) Do you have a cough? (3) Do you have a cold? (4) Is your throat irritating? (5) Are you having difficulty breathing? (Figure 7). The responses provided helped medical committees to take decision on medical visits and referrals, while the users were able to receive initial consultation from home, without going to health care posts and hospitals where they could have been more exposed to the risk of infection.

It has also helped to reduce the risk of stigmatization, as people are able to consult medical committees anonymously. The remote consultation service has been used by around 4 000 people as of January 2021 and has helped detect at least 100 COVID-19 cases.⁸

⁸ Based on data communicated by national stakeholders.

Figure 7: COVID-19 remote consultation solution



Source: ANSI

Making digital solutions universal and accessible

To deploy the services, ANSI and the Ministry of Health cooperated with the main telecom operators in the country (Airtel, Moov, Niger Telecoms, and Orange), who agreed to provide communication service for accessing the 701 IVR and remote consultation platforms for free, following a special request by the Ministry of Health.

Leveraging digital strategies to contain the spread of misinformation

ANSI (the National Agency for Information Society) has run digital literacy campaigns. As in much of the developing world, NGOs and international organizations have also proved important players. In mid-2020 the Niger Community Cohesion Initiative (NCCI) of the International Organization for Migration (IOM) together with the NGO GeoAnalytics Center ran a campaign entitled 'Fake News' to fight the spread of misinformation and disinformation [14]. Though the campaign was not directed solely at the infodemic, the organizers understood the potential of their project for improving the quality of COVID information. In the words of an NCCI manager: "We hope through the launch of this online nationwide campaign to promote critical thinking around the consumption of fake news" [14]. In 2020 the NCCI also taught a hundred young civil society leaders from Tillabéri "in the use of social media, as well as in critical thinking and the detection of fake news" [14].

UNESCO has been running the [#DONTGOVIRAL](#) campaign in Niger and elsewhere in Africa. The campaign united many young artists and performers to mobilize awareness resulting in

production of art and songs (translated in four of the country's languages) to draw attention to the virus and to debunk some of the rumours and misinformation.

Institutional and policy arrangements

The initiative leveraged a public-private partnership model that was earlier used in another project supported by the ITU – the Niger [Smart Villages](#) project – where telecom operators are helping to deliver voice messages to farmers with timely information and advice related to agricultural activity, livestock management, and crops to boost productivity and avert losses from adverse weather conditions and fluctuations in market prices.

Dedicated digital platforms were developed and deployed to manage and monitor both the IVR and the remote consultation services. To do that, ANSI partnered with three local digital technology companies (Dev4Smart, Novatech, and Visicom). The platforms were developed using open-source software RapidPro.

Collaboration between the government, the private sector and the development aid partners has been facilitated by the successful experience of the Smart Villages project which is now being scaled up throughout the country. In addition to establishing a collaboration framework, the project has also showcased the feasibility of application of digitally-enabled solutions even in some of the most resource-constrained settings in rural Niger.

Another important factor has been the existence of the [Niger 2.0 plan](#) – a strategic document that emphasizes the need to close the digital divide in the country and voices government commitment to development of digital infrastructure and improvement of digital literacy. The plan promotes a holistic and cross-sectoral approach to employing digital technologies to achieve the SDGs, with a particular emphasis on reducing inequalities and addressing the needs of rural communities [15]. This approach is instrumental to achieving sustainable long-term impact and has played an important role in the measures taken by Niger in its response to COVID-19 infodemic.

Conclusion

Niger is a low-income country with one of the lowest rates of literacy and one of the lowest Internet use rates in the world. For this reason the infodemic in Niger has been one of oral transmission to a greater extent than in the other countries studied: while there have been online rumours, word of mouth has been far more important in spreading good and bad information during the pandemic. The government of Niger and NGOs have used digital strategies to reach the small number of digital natives. But ANSI has also leveraged the large number of feature mobile phones in the country. They have employed IVR to provide reliable information and even consultancy services on COVID through a toll-free number, Stop Corona Niger IVR. The case of Niger illustrates that even in a resource-constrained setting the use of digital tools is possible, as long as they are appropriate to local context. In particular, more sophisticated solutions are not necessarily more effective; the choice needs to be made based on the population's needs.

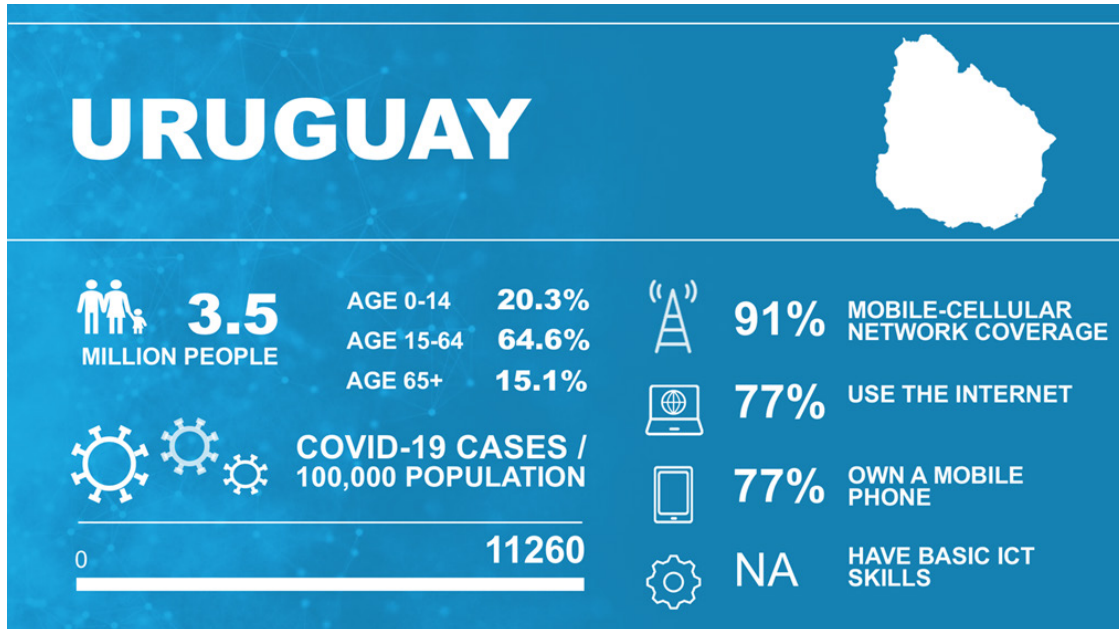
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2.4 Uruguay

Figure 8: Key demographic, pandemic, and technological preparedness data for Uruguay



Sources: WHO [Coronavirus Dashboard](#) (data as of 19 October 2021), UN [World Population Prospects 2019](#), ITU [Digital Development Dashboard](#) (data from 2019 or latest available)

Uruguay moved rapidly to enact its digital response to COVID-19, launching its Coronavirus UY plan on the day it registered its first COVID-19 case. The plan involved the extensive use of digital solutions, which was greatly facilitated by the existing institutional and policy framework for digital health and government services. Prior to the pandemic, Uruguay had already taken strategic steps to integrate digital solutions in its public health and development strategy, which contributed to implementation of a broad range of tools to counter both the pandemic and the infodemic. Among the key features of the country’s approach has been the deployment of multichannel solutions consisting of a range of interoperable elements that provided a variety of access points to critical information and support and facilitated the work of public institutions while also serving as a single system for situation monitoring and data collection. The success of Uruguay in leveraging digital tools in the fight against COVID-19 has been widely acclaimed and has produced significant benefits in the first phase of the pandemic. Unfortunately, the early successes led to an easing of measures later in 2020, resulting in the resurgence of the pandemic.

Infodemic situation

The Uruguay registered its first COVID-19 cases on 13 March 2020 [1]. Misinformation began to spread quickly and coincided with an upsurge in political communication and messaging online and in the media, in the context of municipal elections scheduled for May [2].

South America is among the regions most heavily impacted by the COVID-19 infodemic. A study in which 2 704 respondents were surveyed in three regions - Central and South America, the Middle East and North Africa, and Western Europe - found that both exposure to and belief in false COVID-19 statements were, on average, higher in Central and South America than in the other two regions [3]. Cross-country data collected by the Bruno Kessler Foundation [COVID-19](#)

[Infodemic Observatory](#) in October 2020 showed that only 59 per cent of COVID-19 news shared on Twitter in Latin American and Caribbean countries were considered reliable [4]. In Uruguay that estimate was 75 per cent, slightly better than the regional average. Nonetheless, this suggests that one in four COVID-19 news items shared and viewed on Twitter by Uruguayan users was false or misleading.

A study commissioned by the Pan American Health Organization (PAHO) analysed how patterns in the use of social media for COVID-19 information related to COVID-19 mortality in six South American countries. It found that there was a negative correlation between the level of reliance on social media content and the level of COVID-19 mortality [5].

Needs-based selection of digital services and information

At the onset of the pandemic, the Government of Uruguay conducted an epidemiological survey using a variety of channels that were deployed in response to COVID-19: the Coronavirus UY digital proximity tracing app, a website, and social media messengers (see section 3). Information collected from the questionnaire was aggregated in a central database and was used to inform strategic and technical decision-making as well as to develop timely situation updates for communication [6].

Subsequently, an [online social monitoring tool](#) was deployed with the help of the United Nations Development Programme Uruguay to analyse Twitter posts advocating for or against COVID-19 vaccine [7].

Uruguay has also made efforts to ensure availability of timely information online. This approach proved valuable given the population's reliance on the Internet for information. Another study found that South American and Caribbean countries (including Uruguay) had high online search interest in COVID-19, peaking when important national or international news or announcements were released about the pandemic [8].

A comprehensive, holistic approach to digital technology use

In view of the scale of the problem, Uruguay responded with integrated, comprehensive measures. A sophisticated government website with an embedded chatbot to ease navigation was cross-linked to WhatsApp, Facebook Messenger, and web chats. A telephone helpline was set up and an app was published that provides factual information and links to relevant resources and tools. Fact-checking platforms and initiatives were launched to contain the spread of misleading information. All the above steps secured a comprehensive approach to digital technology use (Figure 9).

Figure 9: Digital Ecosystem for COVID-19 Response in Uruguay



Source: UNGA event presentation 'Infodemic Management: promoting healthy behaviours in the time of COVID-19 and mitigating harm from misinformation and disinformation' [9]

Amplifying accurate and trustworthy information with digital solutions

Understanding the importance of communication channels for dealing with the pandemic, the Government of Uruguay has worked on maximizing the number of easy access points for the population to receive information on COVID-19. A comprehensive multichannel solution was developed that involved a range of elements which, nonetheless, acted as a single system for providing support and guidance to people.

The system includes: native mobile apps for Android and iOS, a dedicated web application, a form to be used by call centres, chatbots integrated in several conversational channels (WhatsApp, Facebook Messenger), and web chats (also embedded in the government webpages) [10]. The entire system serves as one tool that supports a number of critical infodemic management functions, including: distributing public health information and guidance, collection of information from the public, data handling and analysis, response to inquiries and follow up [10].

Digital proximity tracing app

Uruguay's Coronavirus UY digital proximity tracing app is based on the GAEN API. The app emerged from a collaboration between the Ministry of Public Health and the private sector, with several local tech firms that voluntarily joined the public pandemic response [11]. The voluntary support of private-sector partners made it possible to create the app at no additional cost to the government; the only public resources used were the civil servants who worked on implementation and maintenance of the system [11]. The system is operated and managed by the Electronic Government Agency and the Information and Knowledge Society (Agasic).

The app was originally designed to distribute information, to enable self-assessment and symptom reporting, and to arrange testing, with the potential also to move towards provision of telephone consultations. By mid-2020, the app had been downloaded by over half a million people - an uptake of close to 15 per cent in less than four months [10].

The agency for e-government provided a Uruguay-based cloud hosting service to enable data processing and wider operation of the app, and the national privacy regulator issued an exemption to allow for the handling of personal data in the fight against the pandemic while also safeguarding the principles enshrined in Uruguayan law. This approach, focusing on health services and telemedicine, was different from that of many other countries in the region, which tended to focus on restricting freedom of movement.

Call centre

A call centre was set up to provide a rapid response to inquiries from the population. It was inter-linked with the virtual assistant developed on the dedicated website (also accessible through chatbots).

The government invested in the capacity of the call centre to deal with a large volume of traffic, up to 3 000 calls per hour, in collaboration with the state-owned telecommunication company Antel, which has supported many of the government measures throughout the pandemic [12].

Website

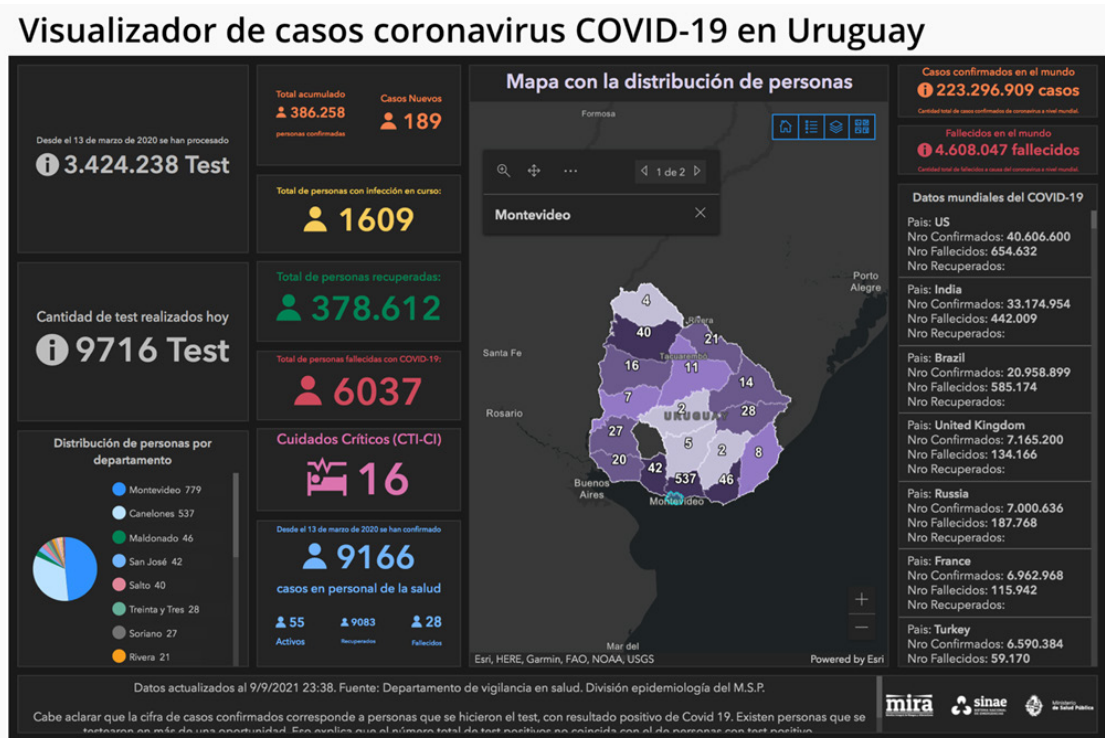
The information on the government [website](#) is intended to provide a high degree of clarity and transparency. The health map (Figure 10), for example, captures many useful statistics on the pandemic situation in Uruguay, including the number of cases, deaths and tests. These are broken down by geographical region, with the intuitive visuals of a map and a pie chart, which can be expanded for greater detail. In addition to allowing Uruguayans to grasp the national and departmental situation, the map and the table on the right inform users about the worldwide status of the pandemic.

Daily bulletins on COVID-19 published on the website include case, death and test statistics for the past 24 hours. In order to maintain transparency, they also include clarifications whenever discrepancies have been found and corrected.

A notable feature of the government response has been the speed with which the dedicated COVID-19 landing page was rolled out. According to a review of 193 national portals by the United Nations Department of Economic and Social Affairs, on 25 March 2020 – almost two weeks after COVID-19 pandemic was announced by WHO – only 57 per cent of countries had put in place some kind of information on COVID-19 [13]. The Government of Uruguay launched its COVID-19 landing page on 13 March, the day the first COVID-19 case was registered [12].

It is noteworthy that the COVID-19 web portal and other official websites not only provide easy-to-understand resources directly to the public, but also provide specialized information for experts and journalists. This has allowed public institutions to distribute reports on epidemiology, regulations and recommendations for doctors, for example. This information can then be relayed onwards, adapted as necessary by the specialists, and acts to complement the public information provided by the government directly.

Figure 10: COVID-19 dashboard for Uruguay



Source: Government website www.gub.uy. Accessed on 10.09.2021.

Chatbots

Disseminating information through services like WhatsApp, Facebook Messenger, and web chats has helped share updates promptly and sustain engagement. It complements the reactive services which respond to queries for information. Integrating or partnering with messaging apps in this way capitalizes on the existing digital engagement, connecting with people on the services they already use. The chatbot services generally respond to messages by sharing links to the relevant part of the website.

Making digital solutions universal and accessible

To ensure access to the tools is available to the public, the Government of Uruguay took steps to increase network capacity and offer free data. For example, in March 2020 national telecommunications company ANTEL offered 50 GB of free Internet data as part of its Households Universal Plan (*Plan Universal Hogares*), the basic Internet service for residential customers [14].

Educational authorities, in collaboration with Antel, have also reduced or removed data charges for access to a range of platforms and resources for children and learners [15].

Leveraging digital strategies to contain the spread of misinformation

When the pandemic broke out, Uruguay already had a functioning fact-checking platform in operation: Verificado.uy. The outcome of a collaboration between media, academia, and civil society, the platform was originally designed to improve information quality and prevent circulation of misleading and false news during the 2020 election [16].

With the support of United Nations organizations (UNESCO, UNDP, WHO), online courses were held for journalists to enhance capacity and improve the quality of news coverage of COVID-19 topics, including vaccines [7].

In addition, with the support of UNDP Uruguay, an online Q&A initiative was launched in March 2021 to help improve the exchange of information between the public and health specialists, and to respond to rumours and doubts in relation to COVID-19 as they emerged. The initiative consisted of an online platform where visitors (health-care workers, journalists, and members of the general public) considered which questions were the most pressing. These were then addressed in short YouTube videos by qualified local doctors and scientists (posted on UNDP Uruguay official YouTube channel) [7].

Institutional and policy arrangements

The Ministry of Health has published a *Plan Nacional Coronavirus* (National Coronavirus Plan), and has been collaborating closely with other ministries to ensure a cohesive approach to the pandemic and the infodemic.

The National Coronavirus Plan involves extensive use of digital technology [10]. The efforts previously made by Uruguay in digital development have been an important enabler of successful and timely implementation.

Over the past two decades, ensuring the population's access to digital technologies and facilitating the provision of digitally enabled services have been among the priorities of many national initiatives and policies [17].

1. In 2005 the national Agency for e-Government and Information Society at the President's Office (AGESIC) was set up and began to lead efforts on the digitalization of public services [17]. Plans were made for a national Digital Platform, comprised of a government cloud and an interoperability infrastructure to act as a single channel for the collection and sharing of decentralized data from different registries and institutions [17]. The Digital Platform was launched in 2008 and entered wide usage by 2016. Today, it handles over 10 million transactions per month, with over 100 entities connected, and enables a range of public services, including the health sector [17]. It provides a standard for data exchange between public agencies and has a security layer that includes authentication and authorization procedures based on advanced security protocols [17].
2. The digital infrastructure of the country is further supported by a legal framework that regulates the exchange of information and the use of data. Compliance is mandatory for all public entities [17]. In 2008, Uruguay adopted law No. 18.331, "Protection of Personal Data and Habeas Data Action." The law and related decrees address issues of data protection, privacy, and access regulation, making the system more robust, transparent, and reliable.
3. The use of data for proactive action and coordinated efforts in implementation of innovative data-driven solutions has also been facilitated by relevant national strategies. A "Data Policy and Strategy for Digital Transformation" was adopted in 2019 and has been used to provide guidance for the creation of a functional national ecosystem for data-driven services and projects, with particular emphasis on a user-centric and user-driven approach towards data use and regulation [17]. The Artificial Intelligence Strategy for the Digital Government of 2019 provides a framework for the integration of AI within the public administration, including for the use of predictive analytics and decision-making support [18].
4. Uruguay has developed considerable expertise in digital governance, thanks to its active participation in a range of international initiatives and projects. The country has actively engaged in international dialogue on the use of the Internet and data and has hosted

dedicated high-level conferences and events, with important high-level outcomes such as the Montevideo Statement on the Future of Internet Cooperation.

5. The national efforts to tackle COVID-19 misinformation have benefited from existing commitments to combat misinformation and disinformation, which led to the Ethical Pact Against Misinformation in 2019. Initially promoted by the Uruguayan Press Association with the support of several UN agencies in anticipation of country's presidential elections, the pact received the endorsement of the parliament. It acted as the foundation for the country's efforts to respond to the COVID-19 infodemic. The pact includes a code of ethics, endorsed by the major political actors of Uruguay, for dealing with misinformation and disinformation [2]. Recognizing that false or misleading information cannot be avoided altogether, the pact seeks to secure stakeholders' commitment to neither produce nor promote it, thereby creating common principles for dealing with misinformation and disinformation which have been used later during the COVID-19 infodemic response.

Conclusion

The case of Uruguay illustrates that having a digital infrastructure and strategies already in place allows a quicker and stronger response when confronted with an infodemic or a public health crisis. Increasing capacity and reducing data costs are the key for improving Internet access and connectivity. Next, effective information dissemination strategies are needed. These include clear and accessible messaging on popular platforms and more detailed information for specialist audiences. This combination of measures is conducive to voluntary compliance with safety measures and may obviate the need for mandatory measures such as lockdowns. Though Uruguay faced a difficult pandemic situation in 2021, the infodemic strategies discussed in this case study were a key component of its success throughout 2020 and continue to mitigate the severity of the pandemic situation today.

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3 Review of ICT tools and strategies

The case studies discussed above demonstrate the utility and applicability of digital technology in a range of contexts for tackling infodemics. Thanks to continuous innovation, the arsenal of solutions at the disposal of both public and private actors is constantly growing.

This section provides a non-exhaustive high-level review of available and tested tools, resources, and strategies that can be leveraged in an infodemic response.

3.1 Monitoring the information environment

In any major public-health crisis, governments and health ministries have to ensure the timely and accurate delivery of health-related information to their citizens. The capability to monitor the information environment is a prerequisite. While the digital information environment is increasingly complex, sophisticated tools exist to help governments successfully interact with this environment.

Since the influenza A (H1N1) epidemic (2009) and the Zika outbreaks (2015), public bodies have come to appreciate the importance of the Internet, and particularly social media, for checking the general digital “temperature”. The massive quantity of information found online in Twitter dumps (via services like rtweet and Twint) and Facebook chats provides raw data that can be used to provide close to real-time insights into changing attitudes within the national community.

In the COVID-19 infodemic, social media has proved vital, with most online citizens getting their information from large platforms: for instance, 78 per cent of people in Argentina reported that they received their COVID-19 news from social media [1]. There are now special tools to follow the spread of information, misinformation and disinformation. [Buzz-sumo](#), for instance, is a commercial program which allows researchers to track the digital spread of information, particularly on social media.

A simpler (and free) tool is [Google Trends \(GT\)](#), which traces search terms in Google. It provides frequency graphs plotted over time for a given term. For example, submitting the query “Vaccination Dangerous” to GT can show how, in a given country, this search phrase rose or fell during vaccine rollout. GT has already been used in pandemic settings, for instance, in attempting to anticipate COVID-19 outbreaks in the United States [2]. Similar work has been carried out using Twitter tweets and Instagram posts [3].

The [Early AI-supported Response with Social Listening](#) platform (EARS) sponsored by the World Health Organization is a powerful tool for public bodies [4]. It allows governments to monitor their communities’ real-time concerns and questions about COVID-19, broken down by country and subject.

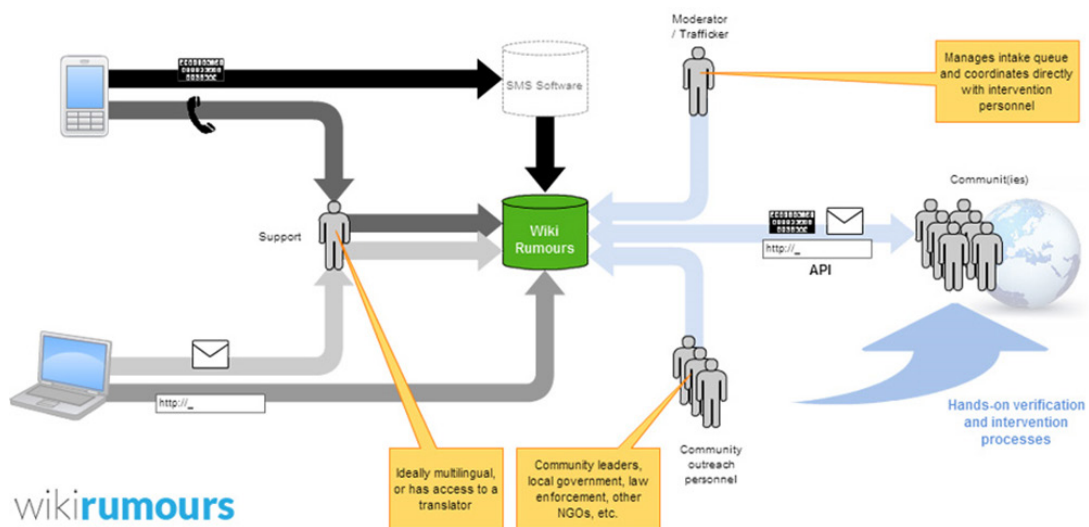
The digital private sector includes mobile network operators (MNOs) and digital platform organizations such as Google, Twitter and Facebook, who can also support monitoring activities.

Monitoring blogs and social media pages makes sense in an infodemic, particularly if there is a lack of monitoring capacity on the ground. For instance, NGOs checked blogs written in

Rohingya (a Burmese minority language) to track rumours in refugee communities in Bangladesh. Researchers in Wuhan (China) have shown how social media can be used to identify the needs of different parts of the population during a pandemic. By analysing data from Sina Weibo (a major Chinese microblogging social media site) in early February 2020, the researchers were able to identify patients, including the elderly, who were in need of early attention during the lockdowns in the city of Wuhan [5].

Another key point in monitoring is the establishment of a working list of dangerous infodemic rumours. This is a common problem. As of the end of April 2020 two-thirds of adults in the Republic of Korea had reported COVID-19 misinformation exposure, most of which had come digitally [6]. Misinformation leads to medically dangerous behaviour and is associated with higher anxiety. The Sentinel Project, which focuses on assisting communities threatened by mass atrocities, has pioneered the use of free WikiRumours software that can be used to collate and combat misinformation and disinformation [7]. [WikiRumours](#) is free of charge and uses open-source software. It acts as a receptacle for different rumours to be collected, collated and updated by a team of community members and editors. Its rumour collection template could be readily applied to public health settings.

Figure 11: WikiRumours system for tracking and responding to rumours



Source: WikiRumours.org

Internews has created a best practice wheel when dealing with rumours in a public emergency: set up a rumour database; collect daily community feedback via digital sources (simple tablets or SMS-enabled phones are supplied); enter data into a master database; research answers to rumours; create weekly rumour bulletins; share digitally with the press and influencers in the country [8].

Figure 12: Internews practice wheel for dealing with rumours in public emergency



Source: Internews.org

An early successful example of this approach was SMS rumour collection during the Ebola infodemic in 2015 in Liberia [9][10]. Collection enabled NGOs to monitor and address rumours more effectively. When establishing the catalogue, it is important to describe the rumour, however briefly (e.g. “coca cola cures Ebola”); locate the rumour geographically (e.g. “Grand Bassa county”); date it (“June 2015”); and if possible characterize the contributor (e.g. “male, 50s”). In this way patterns can be assessed and, crucially, the success of the rumour (and counter-measures) can be judged.

3.2 Verifying information

Information bureaus and health lines have been set up, as in past health crisis. But in the COVID-19 pandemic digital technology has proved to be decisive. There has been a proliferation of official health sites, which have been shared widely on social media in high trust societies. There have also been innovations in how information is communicated.

Many governments have worked with scientists to get their message across during the infodemic. Health advice from scientists gets through better than advice given by politicians or celebrities, and such clips are now ubiquitous on social media platforms. The United Nations has sponsored an international scientific cooperative, [Team Halo](#), where experts in vaccinology, immunology and other branches of health research give reliable and accurate COVID-related sound-bites for social media [11].

Online discussions and mailing lists facilitate peer reviewing and collaboration within expert communities – in some cases via blockchain – and crowd-sourcing new ideas and evidence.

For instance, [Internews](#) worked on connecting journalists, scientists, and health professionals and has contributed to the production of COVID-19-related information material in over 150 languages [12]. The more discussions of these types can cross borders and contribute to the comparison of different countries' practices, the more good practices are likely to emerge. One particularly successful method for getting out information has been the #FOAMed hashtag (Free open access medical education) "to share best practices at a rate faster than large international organisations" [13][14].

Understanding has grown, in 2020 and 2021, of the crucial importance of journalists in the fight against misinformation. States and NGOs have set up special digital courses for journalists to educate them in COVID-19 facts. Special sites have been created including the [COVID-19 Vaccine Media Hub](#), "a global resource for journalists and fact-checkers."

Journalists in developing countries have been supported. For instance, in 2020, UNESCO and Africa Women in Media gave digital COVID-19 training to some 283 women journalists from Burundi, Ethiopia, Kenya, Rwanda, Somalia, Tanzania and Uganda [15]. There were 10 online modules per course with videos, online quizzes and assignments; there were then weekly live mentoring sessions. The course also included Wikimedia training. The [International Center for Journalists](#) has also run free online COVID-19 courses for journalists from developing countries.

Though they operate with varying degrees of effectiveness, there are private bodies in most industrialized countries that counter rumours and uncertainty in the population and that follow the fact-checking model. Perhaps the most celebrated example internationally is [Snopes](#); there is also [PolitiFact](#), a private online site in English that deals with misinformation and fact-checking; and the media conglomerate AFP has a dedicated [fact-checking page](#) for COVID-19. There are also many open-source activities on the Internet for helping teachers and parents instruct, detect and deal with fallacies. Take, for instance, the [Fake News Immunity Chatbot](#), a game which uses Socratic and Aristotelian approaches to identifying truth [16].

3.3 Sharing information

Interactive voice response, short message services (SMS, see next section), AI chatbots and apps technology, and social media platforms have the potential to be crucial tools in an infodemic, particularly in the lower-middle-income countries (LMICs).

Interactive voice response technology

Whereas apps need a smartphone to operate, IVR can operate on a landline or a feature (mobile) phone, and SMS on a feature phone. IVR was actively used in humanitarian health interventions in the 2010s. IVR was used in tuberculosis and HIV interventions in support of medication adherence [17][18]. There were also some early surveys carried out with IVR during the 2014 Ebola outbreak in Sierra Leone. In a desperate situation, IVR allowed entities such as the World Bank to measure the spread of the disease and reactions to it, at a distance. IVR polls are cheaper to organize than polls conducted by telephone interviews, give a greater sense of anonymity to respondents, and don't require literacy.

In April 2020 IOM collaborated with the Government of Bangladesh and local actors to share vital COVID-19 information via IVR. Their effort, which was named the COVID Info Line, implemented phone networks to distribute messages to both locals and refugees in camps [19].

Another approach for spreading useful information during a pandemic is the chatbot. For instance, in Thailand the Department of Disease Control experimented with “COVID-19 Preventable”, an AI natural language chatbot [20]. Championing this approach, the Government of Thailand was successful in tailoring and delivering valuable information to a populace in need of facts.

There have also been many examples of private companies and NGOs using IVR for information distribution, training, and behaviour change. In August 2020, Viamo concluded an IVR project in Guinea under USAID Breakthrough-ACTION to deliver information on common COVID-19-related questions. The project reached 49 585 unique phone numbers, and received positive feedback from users [21]. Later in October, Viamo ran IVR-supported COVID-19 remote training courses in Sierra Leone, targeting around 4 000 health workers [21]. An online platform, [Compass for SBC](#), features a collection of free social and behaviour change resources, including IVR libraries, which can be quickly adapted by implementors. During the pandemic, the platform made available a script created for an IVR COVID-19 game by Johns Hopkins Center for Communication Programs to promote awareness and uptake of preventive behaviours in Cambodia. The game features different COVID-19-related social scenarios to test the participants’ active COVID-19 awareness. Each scenario presents a question to callers. The callers receive several options to respond to the question (by pressing numbers on the phone) and thus can test their knowledge [22].

SMS messaging

SMS messages, too, have useful health applications in an infodemic. Even in the early phases of the pandemic in Asia, telecom companies sent messages via SMS on behalf of governments. Famously, Taiwan gave citizens SMS passports (“health declaration passes”) as part of its “test and trace” campaign [23]. Recognizing the high outreach potential of SMS messages, WHO and ITU launched a joint initiative in the spring of 2020 to encourage willing mobile network operators to collaborate with the ministries responsible for health and telecommunications for the purpose of sending users SMS messages with potentially life-saving information on preventive COVID-19 measures [24]. A curated SMS library (in English) was created and shared with governments and international players to adapt to local realities [25].

Among the governments that have been actively leveraging SMS technology for infodemic response is the Government of Viet Nam [26]. As part of its COVID-19 management efforts, SMS messages with alerts were delivered to all citizens. In addition, the callers’ waiting ringtones were changed to a voice message with reminders about COVID-19 protection measures. A similar measure was implemented in India [27].

Sierra Leone rolled out an SMS mobile application (468 SMS Service) to provide updates on the COVID-19 situation and to disseminate prevention tips, leveraging its Government Unstructured Supplementary Service Data (USSD) platform [28].

In Tunisia, an SMS communication solution developed as part of the joint [WHO-ITU Be Healthy Be Mobile](#) programme was used during the pandemic to warn the population about COVID-19 risks, reaching nearly 10 million people in the first half of 2021. The service was also leveraged for self-screening and used as a monitoring service for Tunisian and foreign travellers in the country; this involved daily transmission of an SMS with four key questions (in Arabic, French and English) to monitor recipients’ health conditions during their compulsory medical quarantine of 14 days.

SMS messages have been used for health information in the past. In a particularly successful example from Mbarara (Uganda), an NGO, [Text to Change](#), worked with multiple-choice quizzes on HIV/Aids by SMS. Participants answered questions and were encouraged to come in for testing. Telephone users were encouraged to take part in the quizzes by the chance of winning credit on their phones.

Particularly in developing countries in Asia and Africa, SMS can also be an important route for reporting misinformation to allow for timely response. An instance of this was the 2015 DeSay (“they say”) SMS campaign, where health workers fighting the Ebola infodemic in Liberia texted any rumours they heard to a central coordination centre. The information was then “collected, analysed for trends, and disseminated to local media partners in the field with details about the rumour so they can stop its spread” [10]. [Una Hakika](#) in Kenya is based on a similar model.

In using SMS for gathering information, easily remembered short codes can be used: e.g. 334 in Sierra Leone during the Ebola crisis in 2014-2016. Unfortunately, these can be expensive, and regulations differ greatly from country to country. Information gathered can be [usefully managed](#) and stored with systems like Frontline SMS or Echo Mobile.

Chatbots and apps

Among the most common types of COVID-19 apps have been digital proximity tracing apps. These apps allow individuals to receive an exposure notification if they get into close and prolonged proximity to another app user who later tested positive for COVID-19 and registered their status in the app. Timely identification and breaking of the chains of human-to-human transmission can ensure that the number of new cases generated by each confirmed case is minimized. The WHO developed a technical Annex on [Digital Tools for COVID-19 contact tracing](#) as well as an [Indicator framework](#) for the evaluation of the public health effectiveness of digital proximity tracing solutions.

A digital proximity tracing app works best when: i) smartphones are widely used; and ii) the app is widely or universally used by smartphone owners (in some countries app downloading has been a legal requirement).

Of course, these two conditions are not always fulfilled, particularly not in LMICs. It can make sense to use the app nonetheless, for example in an urban area where smartphone take-up is higher. Countries with high levels of smartphone use did not always have success with digital test and trace, frequently because of privacy concerns (on the part of both the state and citizens) [29].

Viet Nam was unusual in being successful despite relatively low levels of smartphone use (only about 40 per cent, compared with about 80 per cent in the United States). The approach chosen by the authorities combined measures that relied on mobile phones with more conventional paper and people-based methods. This was done both for contact tracing and in combating the infodemic. The Viet Nam test and trace app is named Bluezone and had been downloaded some 20 million times as of late August 2020. Foreign nationals coming to Viet Nam are even required to download the app for the duration of their stay. But on its own this would not have been enough to ensure Viet Nam’s remarkably low levels of COVID-19. That success depended, in the words of Todd Pollack, a specialist at the Partnership for Health Advancement, on “boots on the ground”. Digital proximity tracing was combined with rigorous traditional test and tracing methods: face-to-face interviews, long lists of contacts and designated quarantine facilities.

Thailand, meanwhile, pioneered self-screening and self-health check apps. All air travellers arriving in Thailand were asked (through their airline) to download a self-health check application: the app was offered in English, Mandarin and Thai. The app obliged new arrivals to report on their health for fourteen days, so anyone with COVID-19 symptoms could be quickly examined and treated.

Other COVID apps show the originality of program developers faced with an unprecedented health crisis and the accompanying infodemic. Thus, Google Maps introduced a “COVID layer”, which makes it possible to assess the danger of infection during travel [30]. Also, there are social distancing apps (e.g. [mContain](#) by the MD2K Center of Excellence at The University of Memphis) that help you keep the correct distance from other people when in public.

Social media platforms

The importance of social media varies from country to country. Users in the Philippines spend almost four hours per day online, which contrasts with less than an hour in Japan [31]. But the trend is generally upwards. Indeed, in many countries, e.g. Brazil, social media use has now overtaken television. In a pandemic, with social distancing and lockdowns, people use social media even more than in normal circumstances.

The quality of information varies drastically from platform to platform but can often be low, especially in a situation of emergency or crisis. It has been estimated, for instance, that some 27.5 per cent of the most viewed English-language videos about COVID-19 on YouTube contain “non-factual information” [32]. More informative and reliable videos from professional and government organizations, on the other hand, are often greatly under-represented in terms of viewership, which indicates the need for better communication and content promotion strategies [32].

With the COVID-19 infodemic, public-health campaigns for the first time have had to take social media influencers into account. The President of the Royal Australian College of General Practitioners asked digital influencers to remain “silent on the topic” of COVID-19 [33]. In other countries influencers were, on the contrary, enlisted to help get the message out. The British government engaged a number of bloggers and vloggers to “help spread accurate health information and reach younger online audiences” as part of its Humanitarian-to-Humanitarian (H2H) Network project, which has been providing technical and operational support to developing countries during disease outbreaks and other humanitarian crises [34]. The Finnish government, meanwhile, classed influencers as “critical actors” alongside doctors, bus, drivers and grocery workers in the context of COVID-19 social response [33].

Social media thus has the potential to get good information through to millions. Facebook has remarkable capabilities for targeted advertising that reaches precise demographics (by location, gender, age and interests). Advertising tends to be cheap on social media, particularly in the developing world, and particularly on Google and Facebook (where payment is only made if a click goes through).[38] In the context of a health emergency these platforms might be approached to reduce or eliminate fees altogether.

If a message can be put in a striking, attractive or witty format then Public Service Announcements (PSAs), infomercials, graphics and the like will be shared widely. Typically, graphics and videos get traction “upstream” on newer platforms like TikTok, Instagram and Twitter and then get drawn into the older demographic downstream on Facebook and in social and family WhatsApp groups [35]. The celebrated Vietnamese hand-washing video song, for instance, went viral even

where Vietnamese was not understood. The Republic of Korea Government partnered with animation companies and child influencers such as Awesome Haeun (YouTuber) to produce attractive content for COVID-19 education [32].

3.4 Removing misinformation

Governments directly intervene, in any infodemic, through censorship and/or rebuttal. In some circumstances censorship can be counterproductive. Particularly if it is used to eliminate minority opinions (as opposed to incorrect information), it hampers the transparent discussions necessary for progress in a health crisis [36].

The most effective strategies to combat digital misinformation have revolved around rebuttal units: the previously fashionable idea that rumours should be ignored (so as not to give them more attention) has been widely contested during the COVID-19 pandemic, particularly in a digital setting [36]. These rebuttal units tend to break down into two different types. First, there are the “myth-busters”: organizations dedicated to dealing with simple misinformation, e.g. “garlic prevents COVID-19”. Second, there are the “fact checkers”, organizations that deal with more complex nuanced claims, e.g. the arguments for vaccines or in favour of lockdowns.

A powerful example of myth-busting is the WHO [Mythbusters](#) series offering COVID-19 advice for the public. An instance from the developing world is the pioneering Nigerian campaign on WhatsApp against Ebola rumours during the 2014 outbreak [37]. In the digital age, rebuttal units need their own Internet pages with visible government endorsement, in places where there is a high level of trust in the government, or scientific backing, where there is low governmental trust. Often, as in the case of the WHO Mythbusters, these units are an outgrowth of the monitoring services set up during an infodemic. The best rebuttal units are not passive. They wade constantly into the digital stream. They circulate their information to traditional news sites and dedicate their energies to producing material that can penetrate social media and be easily shared: short videos, witty images and “simple but impactful infographics” [6].

Governments can also help citizens to better assess information in an infodemic and filter the good from the bad. This is particularly important digitally or online, where health information can proliferate and distort very quickly. Here citizens need “health literacy”, the ability to assess the reputability of the source: is this from WHO or the government; or is this an unfounded rumour? Internet users need also to be able to distinguish between facts and opinions: the number of hospitalizations, say, versus a discussion of the likelihood of a third wave. Consumers of digital information also should be able to pick up on whether they are dealing with rumours or actual falsehoods: e.g. unreferenced opinions, unnamed sources, or “news” reports with unnamed protagonists. A survey of Portuguese media consumers in the early weeks of the COVID-19 pandemic showed low trust in social media and much higher trust in digital newspaper sites [38]. The young are particularly important here. Men and women under thirty are far more likely to use the Internet. Almost 70 per cent of the world’s youth are online regularly, numbers that rise close to 100 per cent in developed countries [39].

An effective example of this sort of intervention is the [UNESCO #ThinkBeforeSharing](#) campaign. Through the use of visuals and graphics, UNESCO wants to enable citizens of lower-middle-income countries (LMICs) to distinguish between good and bad COVID-19 information. The clever hashtag is the updated equivalent of posters from an earlier age (not least the world wars) warning citizens against spreading or listening to rumours. Here the key is “nudging”; when digital users are reminded of the potential unreliability of a news story, critical thinking kicks

in, as studies have shown [40]. In an infodemic rumours arise along the existing fault lines in a country; for instance, around long-standing ethnic tensions. Local prejudices therefore need to be taken into account.

Participation is also a powerful weapon in a health crisis. When the problem of rumours is shared with the population at large, there will be greater awareness of the division between good and bad news, and between invention and fact. Initiatives such as government-sponsored hackathons (e.g. [India's Coronathon](#)), innovation challenges and online brainstorms are excellent ways to crowdsource solutions and involve the community. Likewise, the population can be enlisted by myth-busting units to report rumours. The simple act of appealing for help against rumours has an important cognitive consequence: members of the public begin to ask themselves, "Is this a rumour?" when considering whether or not to report.

Social media platforms have reacted to the infodemic proactively. Facebook, for example, justified its decision to remove misleading claims on COVID as "another way that we are applying our policy to remove misinformation about the virus that could lead to imminent physical harm" [41].

There are numerous examples of information filtering. For instance, YouTube removed clips offering "alternative" cures for COVID-19 [42]. Facebook employed popups to inform their users of approved COVID advice from doctors, while taking down COVID conspiracy posts [43]. Most social media sites remove fake accounts that are repeatedly associated with disinformation. Occasional offenders are suspended for varying durations of time.

3.5 ICT access

In the context of a lockdown in which citizens were isolated, connectivity to digital networks became absolutely vital: these connections became essential to earn money and to provide remote schooling to children. Governments worked hard during the pandemic, often with the private sector, to provide or to improve access to phones and the Internet. Countries with robust digital structures were better able to ride out the economic effects of pandemics [44].

During the COVID-19 pandemic many governments handed out devices at reduced prices or free of charge to people who would otherwise not have access. In May 2020 the provincial government in British Columbia, Canada partnered with the 7-Eleven chain to hand out 3 500 smartphones to the poor in the province, particularly the homeless, "to help ensure everyone is informed about proper health guidelines during the COVID-19 pandemic". Phones were Wi-Fi enabled and the accounts credited 10 dollars for data [45].

Governments in many countries have been particularly anxious to provide digital devices to children in poor families. During lockdown, remote schooling effectively excluded children without a computer. Chile therefore distributed 125 000 computers, with connections paid for eleven months. In September 2020 the Ministry of Education went on to distribute 16 500 tablets to under-privileged students in technical schools. Both these initiatives were implemented with agreements with MNOs (including Movistar and Entel) to assure connectivity [46].

Governments can also benefit from educating their citizens in media and information literacy (MIL) skills. With individually shared digital news, which is often viral (such as memes and click bait), understanding the sharing mechanism can become a matter of life and death in an

infodemic. Units and lessons for the classroom are needed that emphasize critical thinking and ICT skills [37].

Other examples of government initiatives for improving ICT access include measures by regulatory authorities to facilitate service provision by telecommunication companies. For example, the Federal Communications Commission (FCC) in the United States granted temporary authority to major wireless companies to use additional spectrum to ensure that they are able to meet their customers' needs during the coronavirus pandemic [47]. It also launched a nationwide initiative aimed at encouraging national operators to ease the conditions for service utilization, by:

- not terminating service to customers because of their inability to pay;
- waiving any late fees;
- opening and maintaining Wi-Fi hotspots for public.

The private sector also responded to access issues during the COVID-19 pandemic. In Italy, special education offers from companies were collected by the Government of Italy in its [Digital Solidarity](#) project [48].

Tariffs for connection to the Internet naturally became an issue, with the increase in remote working and distance learning. Many companies, often following talks with national governments, offered reduced fees or waived them altogether. In the United Kingdom, Virgin Media in November 2020 [offered](#) discounts to allow poorer families to remain connected. BT, meanwhile, offered unlimited free access for children from poorer British families studying at home, with its Lockdown Learning support package whereby free vouchers were distributed in schools. Tinkoff Mobile in Russia [offered](#) major discounts on a range of online services and subscriptions (including fitness programmes, books, and language courses) and used its mobile app and online webinars to inform users of available support measures and subsidies during the lockdowns in 2020.

Private firms and charities were also involved in distributing devices free of charge. In the United Kingdom, again, a notable example was the Great British Tech Appeal of May 2020, from Vodafone and [Barnardo's](#). Barnardo's is a children's charity, and the drive for phones was part of its fight against digital poverty in Britain, something that had particularly come to the fore in lockdown. Barnardo's provided recycled devices and Vodafone covered postage costs and gave three months' free connectivity for each device.

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4 Conclusion

The phenomenon of the infodemic has emerged as a particularly complex challenge to the COVID-19 health response in an increasingly digital and interconnected age.

Digital technology, while an important enabler of many COVID-19 mitigation measures, has also contributed to the rise of misinformation and disinformation surrounding the pandemic. The circulation of rumours, conspiracy theories, false claims and misconceptions about the novel coronavirus has had a pronounced impact on the world.

Leveraging digital tools to facilitate access to reliable (and potentially life-saving) information and reduce exposure to misinformation and disinformation is a new skill that policy makers and communities at large need to master in the context of the events of the past two years.

Some efforts have been successful, while others have faced challenges and stalled.

While the situation remains globally fluid and continues to evolve, it is possible to conclude that there is a wealth of innovative applications of ICT for infodemic management. The choice, design and implementation of any given solution or strategy need to be supported through a number of steps that should be coordinated and comprehensive in scope.

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