# Infodemic management in Catalonia during the first year of the COVID-19 pandemic

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### Abstract

*During the spring of 2022, we interviewed different public workers responsible for managing the Covid-19 infodemic, with the aim of documenting and studying how several units of the Generalitat de Catalunya (Government of Catalonia) acted to mitigate the effects of the infodemic. We then met with representatives of the two main fact-checking organisations in Catalonia to identify how they had responded to the infodemic and what we could learn. This local study allows us to understand the behaviour of the Catalan community and to adapt interventions, as most previous studies are based on the English-speaking community.*

### Keywords

Infodemic, Disinformation, Fact-checking, Crisis Communication, Institutional Communication, Covid-19.

### Resum

*Durant la primavera del 2022 ens vam entrevistar amb diferents treballadors públics responsables de la gestió de la infodèmia de la Covid-19, amb l'objectiu de documentar i estudiar com diferents unitats de la Generalitat van actuar per mitigar els efectes de la infodèmia. Tot seguit, vam reunir-nos amb representats de les dues principals organitzacions de fact-checking a Catalunya per identificar com havien respost a la infodèmia i què en podíem aprendre. Aquest estudi local permet conèixer el comportament de la comunitat catalana i adaptar-ne les intervencions, ja que la majoria d'estudis previs es basen en la comunitat de parla anglesa.*

### Paraules clau

Infodèmia, desinformació, verificació, comunicació de crisi, comunicació institucional, Covid-19.

## Introduction

In 2020, the global COVID-19 pandemic impacted everyone regardless of demographic or economic characteristics. While we were confined in our homes, deprived of freedoms such as never hitherto imagined, social media and instant messaging became our only way to socialise. At those times of uncertainty and bewilderment, we all tried to form an idea of what was happening. Because the virus was so recent, little information could be considered truthful, and sometimes "the truth" would change overnight. Some took advantage of the situation to generate and promote the emergence of alternative accounts, resulting in untrue or conflicting information. Almost overnight, governments and public health officials were faced with the unique and far-reaching challenge of having to mitigate the catastrophic effects of misinformation.[1] The problem was so great that the World Health Organization (WHO) warned about it and popularised the term *infodemic*.

This cyber threat was unlike any previously identified by public security agencies, such as hacking or system failure, as its main component was the taking advantage of digital channels through social exchanges. Because of this, combating misinformation fell to communication and citizen monitoring units rather than units concerned with technology. For this article, we interviewed the most relevant infodemic managers, mainly those in charge of communication monitoring units, in addition to cyber security units. We agree with other authors that misinformation is a threat that needs to be tackled through diverse approaches.

We carried out this study based on seven semi-structured interviews during March and April 2021, the twelve months following the outbreak of the COVID-19 pandemic. Our criteria for selecting interviewees were job responsibilities and their teams' areas of action. To complement our overview of infodemic management in Catalonia, we also interviewed people external to institutional management, including representatives of the two main fact-checking organizations of Catalonia, Maldita and Verificat, who played a relevant role in identifying and verifying infodemic related information.

With this article, we contribute to documenting how the infodemic was managed in Catalonia during the first year of the pandemic. We explain how the institutional teams of the Government of Catalonia operated, what procedures they used

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to identify and contrast misinformation, and how mitigation responses and interventions were coordinated and evaluated. In addition, we provide the complementary view of fact-checking organizations, their collection and validation processes, and their response to the community. In the conclusion section, we address the misinformation debate in Catalonia as well as possible paths for exploration to help us face this challenge. This case study can help public and private institutions be more efficiently prepared to mitigate the effects of alternative narratives, providing additional resources to combat future infodemic occurrences.

## Theoretical framework

The term *infodemic*[2] gained great popularity following the 2020 COVID-19 pandemic. However, it is not a new term, as it can be found in the literature of 20 years ago (Eysenbach, 2002), though different tactics and means were available at the time, when digital messages were circulated through personal websites. With technological progress and the explosion of the social web, also known as Web 2.0, internet content publication became democratised. Special computer skills were no longer required to create a channel, broadcast information, and even be influential (Bakshy et al., 2011). With the emergence of the social web, governments and public institutions have been adopting new tools to communicate with citizens. We are beginning to see the usefulness of digital channels, especially social media, as tools to manage and study emergencies (Palen & Anderson, 2016), when the need arises for truthful information to reach the greatest number of people as quickly as possible. These platforms are appreciated for the great ease and speed with which users share information. A new scientific field of *computer crises* (Palen et al., 2020) now studies emergency management based on social media activity.

The massive use of digital platforms led to a massive change in information consumption. While not replacing mass media (Nielsen et al., 2020), social media became an environment where people and institutions would go to obtain information. At the same time, the expansion of the number of broadcasting channels also meant that more people could be reached by channels sharing untruthful information. As the problem grew larger and its effect on social behaviour was observed – the 2016 US elections marking a turning point in this sense – there grew an awareness of *information disorder* (Wardle & Derakhsan, 2017).

Moreover, we should point out the impact of digital channels on public security. The classic view of cyber security involves people with technical capabilities studying threats and coming up with solutions based on their skills. As argued, the nature of an infodemic is social, where communication has a direct impact on the well-being, safety, and health of ordinary people (Cotter, DeCook, & Kanthawala 2022). Although digital channels are involved, an infodemic cannot be solved solely by technological

means. The literature shows that a multidisciplinary approach is needed (Briand et al., 2021), along with specific information operations (Francois & Lin, 2021).

Considering that an infodemic is primarily a social phenomenon, different dynamics and behaviours exist in each local community, which is why more effective interventions require that each case be studied on an individual basis (Calo et al., 2021). Currently, most of the academic literature on infodemic and misinformation is focused on the English-speaking communities in the United States and the United Kingdom. Some internationally renowned authors (Tucker et al., 2018) and institutions (World Health Organization, 2021) have pointed to the necessity of studying behaviour in other languages and areas of the world, so that knowledge of the phenomenon may be expanded and its effects better mitigated. The references made in this article alone clearly show that there is a dearth of literature on this phenomenon in non-English speaking communities.

As far as the Spanish language is concerned, some studies have indeed dealt with the infodemic phenomenon, focusing particularly on Spain. Some dealt with the analysis of content identified as *untrue* (Salaverría et al., 2020), while others took a qualitative perspective based on the experience and perceptions of locally established verifiers (López-García, Costa-Sánchez, & Vizoso, 2021).

As for Catalonia, emergency management and misinformation in digital channels have been studied on few occasions (Espinet, Garcia-Alsina, & Canals, 2015; Xaudiera & Cardenal, 2020). In our opinion, we need to explore in more detail the effects that the infodemic has on our community in order to improve our ability to respond. Based on the need to know what the infodemic phenomenon is like in Catalonia, we asked **(Q1) how public institutions, especially the Generalitat de Catalunya, i.e. the Government of Catalonia, went about fighting the infodemic during the first 12 months of the pandemic.** With this intention, we interviewed people involved in different areas, to document and understand the Administration's response. To get a more general picture of the situation, we also interviewed managers of the two main fact-checking organizations in Catalonia. The purpose of the meetings was **(Q2) to identify the workflow aspects of the fact-checking organizations that can help the public sector in dealing with the infodemic.** We have structured the information we gathered from our interviews according to the 4 main phases recommended by the WHO to combat the infodemic: detection, verification, response, and evaluation (World Health Organization, 2021).

There are several proposals made to combat the infodemic and mitigate its effects. In this paper, we focus on the potential of social media platforms to reach large audiences easily and effectively thanks to their amplifying capacity (Houston et al., 2015). Sets of general proposals have been suggested to manage the infodemic in other areas of the world (Eysenbach 2020), especially to cover information gaps efficiently when it comes to information that cannot yet be verified (Gorman

& Scales, 2022). Several techniques have been proposed for application on a global scale, which may be as diverse as creating a common knowledge bank (Watts, Rothschild, & Mobius, 2021), getting help from the media (Marx, Mirbabaie, & Ehnis 2018), and studying the demographic and psychological traits that make content go viral (Pennycook et al., 2020). As mentioned, given that an infodemic is a social phenomenon, it is necessary to study how it behaves in each region and community. In conclusion, we offer a series of answers to the question **(Q3): how can we prepare to face the next infodemic in better conditions?**

## Methodology

Between 18 March and 18 May 2021, we conducted a qualitative research study based on semi-structured interviews with managers of different areas impacted by misinformation during the management of the pandemic. These interviews allowed us to obtain first-hand information on how the infodemic was dealt with in Catalonia, especially during the first 12 months of the pandemic. As a result, we documented the management of misinformation and were able to establish its major patterns for a more effective mitigation of infodemic effects in the future.

We divided each of the semi-structured interviews into four parts, one for each phase of the operation to combat infodemic effects, which are, as stated, detection, verification, response, and evaluation. Each part included different questions and topics depending on interviewee type. In the detection phase, we investigated how the networks monitored public-private collaborations and if they had specific software to carry out the task. As for the verification phase, we wanted to discover the internal procedures of the Catalonian Government and external procedures of the verifiers which were used to check content information validity. In the third phase, response, we looked into how the channels were coordinated to ensure that the community would obtain truthful information by taking advantage of all available channels, what means were used, and how the verified information was collected. In the fourth and last evaluation phase, we focused our questions on what indicators and methods were used to measure the impact and influence of the operations carried out.

To begin with, we interviewed workers at the Generalitat de Catalunya (Government of Catalonia) of the following pandemic communication management units: General Directorate of Citizen Attention, Ministry of Home Affairs, Ministry of Health, Civil Protection and Emergencies, and Cybersecurity Agency of Catalonia. We selected these areas for their direct relationship with the problem to be studied, that is, misinformation during the coronavirus pandemic and the government's response in order to guarantee the safety of citizens. These interviews allowed us to delve deeper into the management of the crisis and its associated risks from different points of view internal to the Public Administration.

**Table 1. Interviewees and related positions at interview time**

| Organisation | Interviewee | Position |
|---|---|---|
| **Ministry of Home Affairs (Government of Catalonia)** | Marc Homedes | Director of Communication |
| **Ministry of Health (Government of Catalonia)** | Rosa Romà | Director of Innovation |
| **Civil Protection and Emergencies** | Sergi Delgado | Deputy Director General |
| **GD of Citizen Attention** | Jordi Graells | General Director |
| **Cybersecurity Agency of Catalonia** | Xavier Panadero | Operations Manager |
| **Maldita** | Pablo Hernández | Academic Manager |
| **Verificat** | Alba Tobella and Lorenzo Marini | Founders |

Source: Author.

Next, we interviewed people who were fighting the infodemic from outside the public sector, belonging to Maldita and Verificat, the two main Catalan fact-checking organizations. Such an external point of view provided us with a complementary picture more focused on identifying and verifying information and allowed us to analyse how public and private entities collaborated in the mission to ensure a healthy information ecosystem.

Finally, we analysed the information obtained and grouped it into the 4 aforementioned phases of infodemic management: detection, verification, response, and evaluation. This synthesis allowed us to get a clear idea of how information management was conducted during the first 12 months of the pandemic. These experiences and structured ideas allowed us to come up with possible roadmaps and interventions for dealing more effectively with future infodemics.

We would also like to point out that, in this article, we are using the term *misinformation* – as opposed to *disinformation* – because we are specifically referring to instances where content is published without verifying its veracity, not with the express purpose of disseminating false information.

## Discoveries

### Detection

The first aspect on which we focused our research was how different public units detect and identify misinformation. Institutions engage in active digital listening to learn about relations between citizens and organizations. Despite working in different units and departments, our participants reported similar issues and pointed to a lack of tools and internal

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coordination when it comes to identifying alternative narratives that appear on digital platforms. Each unit performed basic reactive monitoring of conversations in digital environments as just another task, without a specific tool or person responsible for the monitoring. This means that the same narrative could be identified and studied by different areas of the same organization.

One of the interviewees pointed out a common practice among his team members: "as a result of not having enough resources, we often detect alternative accounts when the media ask us if they are truthful". Personal circles sometimes also act as a source of information: "sometimes an acquaintance will send me a WhatsApp message to ask me about the authenticity of some content that has been forwarded to them". Therefore, the work of detecting and identifying online relations and narratives is mostly reactive, as warning signals often come from external factors. One such external factor is VOST, Virtual Operations Support Teams. "These teams, in which we actively participate, act as amplified social sensors. They allow us to have more ears in different groups".

On the other hand, the workflow of local fact-checkers is very different. In the case of Maldita, while they have staff trained to detect and identify misinformation, they are also part of a user community in which each user acts as a social sensor to detect misinformation in their social circles. "Crowdsourcing is the key to Maldita's success" in identifying large volumes of content to be verified. "They send us the content they have received by using our WhatsApp and Telegram bots, so we can check for credibility. This allows us to identify many of the main narratives that emerge during an emergency". The WhatsApp bot works very well for them as a channel to receive content likely to be untruthful: "the WhatsApp bot is our main source for detecting content to be verified". Verificat told us that they also have a chatbot, which sees less activity than Maldita's but amounts to 80% of the content input to be verified.

Maldita told us that they had recently established a collaboration agreement with Facebook.[3] "When its users report content as misinformation, Facebook sends it to Maldita for verification, and, if it turns out to be untrue, their algorithm penalises the content by reducing exposure and amplification". Even if it is a complementary channel – the WhatsApp bot being their main detection channel, "this channel sees a much lower volume of input, but it is a way to do active listening", in addition to having direct impact on content dissemination. Moreover, they commented on how there is still work to be done to improve the process and make it more efficient, with more immediate impact on content distribution.

## Verification

The second phase of the infodemic emergency management cycle is content verification. The speed with which detected content can be deemed truthful or classified as misinformation is very important in this phase. Again, we found that each unit

works independently, although the Government has operatives who will verify every piece of narrative: "we have the ability to verify all the content we receive, but we have to pick and choose which narratives we do verify". Once the information has been validated, each unit gives the response it thinks is most appropriate. "A problem arises when the information cannot be verified by our team, for example, when it pertains to another department. In such a case, the verification process is slower. Our vertical work organization makes the transmission of internal communication more complicated". In the case of the COVID-19 pandemic, the truth kept changing every day, so having no consolidated information was an aggravating factor. What we reported as true one week could be denied the next." This aspect made it even more complicated to monitor the alternative accounts that appeared. "Especially during the first weeks, there was great confusion, the information provided by experts on masks kept changing a lot".

When asked about the use of a verification data bank, a practice in force with public bodies such as the UK Government, all interviewees agreed that it would be useful. "We have found ourselves in situations where, despite working in the same unit, the operators of each channel – social networks, media, telephone support – had to search and many times verify the validity of the information for themselves". Besides being inefficient, this process "can also harm the coherence of institutional messages, which sometimes released different information about the same content".

Research participants also noted the recurrence of alternative accounts: "we have identified similar false stories in different crises. Sometimes the same story appears in different waves during the same crisis. There are also narratives that repeat for every emergency, and some have even emerged during crises in different years". If they had a data bank, operatives could respond quickly by looking up the response given to a narrative that had already appeared during other emergencies. This would facilitate the cohesion of institutional response. Furthermore, if ordinary citizens could search the data bank on their own and carry out their own verifications, this could help reduce the number of inquiries and optimise our resources."

As for the external fact-checking organizations, their representatives agreed that there is a lack of direct communication with public institutions when carrying out verifications and that "a treatment like that reserved to the media or a chat channel with a direct contact would be very useful". There is currently no contact person to verify the alternative accounts detected, which means that the entire verification process has to be undertaken independently, in parallel with what the public institutions are doing. This double verification process can add value in some cases, but in most cases, it is an inefficient format that duplicates efforts across multiple channels. Maldita has a network of experts on different subjects who verify information.

## Response

The next step, once the information from the alternative accounts has been detected and verified, is to respond and carry out a series of interventions. In this phase, once again, we found a lack of coordination between the different units. Just as they identified and verified stories independently, there was no cross-cutting strategy in responding to misinformation during crises. This means that different responses may have been provided for the same narrative depending on the responder and the information available to the unit.

Response is usually implemented by directly informing those who reported the information. If the information is deemed relevant, public messages are also posted to reach the entire audience. Some units launch targeted advertising campaigns to get the message to the most sensitive communities, but not to directly respond to an alternative narrative. The interviewees mentioned a number of techniques: "we publish a message when we detect that a story is gaining popularity", "we inform the media when we identify untrue published information"; but they all agree that "there is a lack of resources to respond to all the messages and follow up on all the narratives. Twitter is a useful tool for quickly informing audiences, but not for resolving individual queries during the early stages of an emergency. We simply do not have the necessary human resources." Regarding messages, many emphasised the importance of creating "visual pieces, infographics with the key ideas. Often, messages were plain and came straight from the FAQs received through citizen attention channels, such as digital, face-to-face, and phone calls. There was a risk that this content would be circulated when the information was no longer valid; "we even found pieces that imitated our format with untrue information".

In the following case, collaborating with the traditional media has been profitable: "when we can verify an alternative story that has reached us through the media, we help them debunk the message and amplify the resulting content." There are institutional channels with wider audiences than the media. Attempts have also been made to coordinate an institutional response: "on some occasions, we have tried to take advantage of the accumulated organic audience, the sum of followers, to amplify messages in a coordinated way". Collaborations were also established with innovative traditional media: "we went to the most listened to radio programme in Catalonia to answer questions from the audience. These interventions were very useful."

The government also worked with internal advisors. "The Ministry of Health trained internal audiences to become advisors on official messages." Since it was a health-related crisis, doctors became referents and amplifiers of official messages. "We held regular meetings; we promoted messages and contents for them to share among their contacts and on their public channels." The Ministry also collaborated with professional associations, influencers, and journalists: "we created a WhatsApp group through which we answered questions and provided information in a matter of minutes. We could not afford to let the media have any doubts about the information they published." Another very relevant aspect of infodemic mitigation was reaching the most sensitive audiences. This aspect was twofold: dealing with those most sensitive due to the disease and those less digitally able to discern false information. A massive information campaign was carried out with the elderly through texting and graphic material in health centres, pharmacies, and any other location where they could be reached.

People coming from other areas and speaking other languages were also identified as a key audience. "These people have channels of information far different from those with which we collaborate more closely." In order to get the messages across to them, different community opinion leaders were contacted to explain the situation as it evolved. "We wanted them to have the latest truthful information and to be able to share it with their contacts."

As for fact-checkers, their response was independent from that of public institutions. It had a great impact within their own communities, complementary to the audiences of the institutional channels. However, they have much fewer resources than public institutions to reach diverse audiences.

## Evaluation

The last phase is about evaluating how the infodemic was managed and proposed actions. This phase is not properly part of emergency management, but it is important for institutions to better prepare to handle the infodemic challenge. In this regard, the following was pointed out: "we need greater analysis of the narratives that appear on networks. There is no doubt that knowing how misinformation spreads would help us prepare for future emergencies", "understanding the dynamics of a viral story on digital platforms would be very useful to improve our operations", "it would certainly help us to be better prepared". An interviewee commented that "having previously identified channels that spread untruthful information would make it easier for us to monitor them in future news peaks".

A constant aspect is not having enough human resources to combat the infodemic. As a result, maximum resources are allocated to verification and response, while other phases such as identification and evaluation are left uncovered. Moreover, all the interviewees agreed there was a lack of staff with specialized digital skills in this field. Even operators of the Cybersecurity Agency of Catalonia admitted that better digital training would be helpful in all mitigation phases: "we understand the threat of misinformation but dealing with responses during the emergency consumes all our resources". Cybersecurity Agency of Catalonia's work "focused on acting as a firewall, especially in cases of phishing. We identified a good number of channels that tried to collect personal data through digital platforms".

Among those interviewed, only the Cybersecurity Agency of Catalonia and Maldita have staff with technical programming skills. One interviewee admitted that "it would be great to have staff with technological skills to help us improve our response". The interviewees voiced a unanimous opinion on the great

potential usefulness of professionals able to analyse and work with information from digital platforms, that is, experts of computational social sciences, as they are referred to in the academic world.

## Conclusion and discussion

Misinformation during emergency situations poses a big threat. Although the infodemic phenomenon is not new, technologies that are now widely available have multiplied its impact exponentially. Furthermore, since digital tools constantly introduce new information, mitigating the impact of misinformation and the infodemic requires up-to-date knowledge of platforms and methods, which is a complicated matter. Our first conclusion is that this is a major challenge because it keeps on changing. The infodemic tactics and interventions documented in this article bear little resemblance to those that were carried out for the 2016 US elections.

As reported, public institutions are not prepared to efficiently combat this challenge. Despite management improvements and the experience gained from each case, those who are in charge admit that resources and capabilities to handle the infodemic in the most efficient way are lacking. It would be good to consider the creation of new spaces and profiles throughout the organization to work with computational social methods in real time, as information comes in from social platforms. Fact-checking organizations could provide training and share their knowledge, especially in the information identification and verification phases.

Public institutions and fact-checking organizations increasing their collaboration would create an opportunity for improvement, involving the mobilization of audiences and technical resources. Indeed, some platforms have already signed collaboration agreements with verifiers because of their agility when checking the truth of information. We think that society would gain incalculably from encouraging collaborative work synergies.

On a practical level, a data bank that collects verified contents could prove quite useful. Considering that we observed almost non-existent coordination between internal and external agencies, we believe that gathering all the relevant information in one easily accessible place would be simple to implement and a resource with a big impact. Ordinary citizens could also have access to such a data bank and verify information for themselves. As for the Catalonian Government, it would be very useful for coordinating its units' efforts.

In terms of detecting and identifying alternative accounts, the Administration could replicate the tactics used by fact-checkers, such as providing chatbots and emails for the public to send content to question its veracity and improving the monitoring system to proactively detect narratives as they begin to gain popularity. It has been shown that response speed is a relevant factor in altering the path of unverified content. Finally, we should keep in mind that knowledge and verified information keep changing during an emergency. A message deemed untrue one day may become true another day, as the initial judgment may be proven wrong.

During emergencies, this becomes a major challenge which can lead to a loss of confidence in official sources. It was especially so with the management of COVID-19. To deal with this issue, maximum transparency is recommended, both to explain the Administration's knowledge management processes and to publish the content as soon as it becomes available. A constant flow of information should be maintained, even just to say that no information is available, because this approach contributes to establishing a bond of trust with the public.

There is no single solution to the infodemic challenge, especially from the perspective of ever-changing digital environments. Consequently, public institutions should be determined and take actions to adapt to the challenge, as independent fact-checkers and social platforms have been doing for some time. In the specific case of the Generalitat de Catalunya, unit leadership should be established, especially in the more technical phases of monitoring, evaluation, and report analysis. A central unit should be in place, with a team of qualified personnel who can support specialized management units.

## Notes

1.  *Obama: Misinformation is killing people.* https://www.axios.com/2022/04/21/barack-obama-disinformation-social-media

2.  'Rapid dissemination of rumours, inaccurate information and misleading news relating to an infectious disease or public health problem as it spreads or evolves.' Termcat

3.  This organization is currently known as Meta, the parent company of Facebook, Instagram, and WhatsApp.

## References

Bakshy, E., Hofman, J. M., Mason, W. A., & Watts, D. J. (2011). Everyone's an influencer. *Proceedings of the fourth ACM international conference on Web search and data mining - WSDM '11.* https://doi.org/10.1145/1935826.1935845

Briand, S. C., Cinelli, M., Nguyen, T., Lewis, R., Prybylski, D., Valensise, C. M., Colizza, V., Tozzi, A. E., Perra, N., Baronchelli, A., Tizzoni, M., Zollo, F., Scala, A., Purnat, T., Czerniak, C., Kucharski, A. J., Tshangela, A., Zhou, L., & Quattrociocchi, W. (2021). Infodemics: A new challenge for public health. *Cell*, *184*(25), 6010-6014. https://doi.org/10.1016/j.cell.2021.10.031

Calo, R., Coward, C., Spiro, E. S., Starbird, K., & West, J. D. (2021). How do you solve a problem like misinformation? *Science Advances*, 7(50). https://doi.org/10.1126/sciadv.abn0481

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Cotter, K., DeCook, J. R., & Kanthawala, S. (2022). Fact-Checking the Crisis: COVID-19, Infodemics, and the Platformization of Truth. *Social Media + Society*, *8*(1), 205630512110690. https://doi.org/10.1177/20563051211069048

Ortoll Espinet, E, Garcia Alsina, M., & Canals, A.(2015). Gestionar dades en situacions d'emergència. Estudi del cas dels focs de l'Alt Empordà a Catalunya. *BiD: textos universitaris de biblioteconomia i documentació*, 34. https://bit.ly/3RNEayt

Eysenbach, G. (2002). Infodemiology: the epidemiology of (mis)information. *The American Journal of Medicine*, *113*(9), 763-765. https://doi.org/10.1016/s0002-9343(02)01473-0

Eysenbach, G. (2020). How to Fight an Infodemic: The Four Pillars of Infodemic Management. *Journal of Medical Internet Research*, *22*(6), e21820. https://doi.org/10.2196/21820

Francois, C., & Lin, H. (2021). The strategic surprise of Russian information operations on social media in 2016 in the United States: mapping a blind spot. *Journal of Cyber Policy*, *6*(1), 9-30. https://doi.org/10.1080/23738871.2021.1950196

Gorman, J. M., & Scales, D. A. (2022,). Leveraging infodemiologists to counteract online misinformation: Experience with COVID-19 vaccines. *Harvard Kennedy School Misinformation Review*. https://doi.org/10.37016/mr-2020-92

Houston, J. B., Hawthorne, J., Perreault, M. F., Park, E. H., Goldstein Hode, M., Halliwell, M. R., Turner McGowen, S. E., Davis, R., Vaid, S., McElderry, J. A., & Griffith, S. A. (2014). Social media and disasters: a functional framework for social media use in disaster planning, response, and research. *Disasters*, *39*(1), 1-22. https://doi.org/10.1111/disa.12092

López-García, X., Costa-Sánchez, C., & Vizoso, N. (2021). Journalistic Fact-Checking of Information in Pandemic: Stakeholders, Hoaxes, and Strategies to Fight Disinformation during the COVID-19 Crisis in Spain. *International Journal of Environmental Research and Public Health*, *18*(3), 1227. https://doi.org/10.3390/ijerph18031227

Marx, J., Mirbabaie, M., & Ehnis. C. (2018). Sense-Giving Strategies of Media Organisations in Social Media Disaster Communication : Findings from Hurricane Harvey. *Australasian Conference on Information Systems*, 1–12. https://bit.ly/3dndWUr

Nielsen, R. K., Fletcher, R., Newman, N., Brennen, J.S., & Howard, P. N. (2020). *Navigating the 'Infodemic': How People in Six Countries Access and Rate News and Information about Coronavirus*. Reuters Institute for the Study of Journalism. https://bit.ly/3Ltd6Cq

Palen, L., Anderson, J., Bica, M., Castillos, C., Crowley, J., Díaz, P., Finn, M. et al. (2020). Crisis Informatics: Human-Centered Research on Tech & Crises: A guided bibliography developed by crisis informatics researchers. https://tinyurl.com/crisisinformatics

Palen, L., & Anderson, K. M. (2016). Crisis Informatics—New Data for Extraordinary Times. *Science*, *353*(6296), 224–225. https://doi.org/10.1126/science.aag2579.

Pennycook, G., McPhetres, J., Zhang, Y., Lu, J. G., & Rand, D. G. (2020). Fighting COVID-19 Misinformation on Social Media: Experimental Evidence for a Scalable Accuracy-Nudge Intervention. *Psychological Science*, *31*(7), 770-780. https://doi.org/10.1177/0956797620939054

Salaverría, R., Buslón, N., López-Pan, F., León, B., López-Goñi, I., & Erviti, M. C. (2020, 22 May). Desinformación en tiempos de pandemia: tipología de los bulos sobre la Covid-19. *El Profesional de la Información*, *29*(3). https://doi.org/10.3145/epi.2020.may.15

Tucker, J., Guess, A., Barbera, P., Vaccari, C., Siegel, A., Sanovich, S., Stukal, D., & Nyhan, B. (2018). Social Media, Political Polarization, and Political Disinformation: A Review of the Scientific Literature. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3144139

Wardle, C., & Derakhsan, H. (2017). Information Disorder: Toward an Interdisciplinary Framework for Research and Policy Making. 162317GBR. Council of Europe. https://bit.ly/3S5fm4O.

Watts, D. J., Rothschild, D. M., & Mobius, M. (2021, 9 April). Measuring the news and its impact on democracy. *Proceedings of the National Academy of Sciences*, *118*(15). https://doi.org/10.1073/pnas.1912443118

World Health Organization (2021). *WHO Competency Framework: Building a Response Workforce to Manage Infodemics*. World Health Organization.

https://bit.ly/3LrBgwV

Xaudiera, S. (2018). Crisis Management through Twitter: The Case of the Barcelona Attacks, 1–12. https://bit.ly/3Bpsj2M

Xaudiera, S., & Cardenal, A. S. (2020). Ibuprofen Narratives in Five European Countries during the COVID-19 Pandemic. *Harvard Kennedy School Misinformation Review*. https://doi.org/10.37016/mr-2020-029.