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OECD Global Science Forum

Responsible communication of science to the public

Workshop summary report

Held on 21 April 2023 at OECD Headquarters, Paris.

This document is the summary report of the Global Science Forum's Workshop held on 21 April 2023 in OECD Headquarters, Paris, which was organised as part of the 48th GSF Meeting. The report includes ten case studies as an annex. These provide examples of science communication initiatives from a variety of countries and organisations.

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Responsible communication of science to the public

Summary report of a Global Science Forum (GSF) workshop held on 21 April 2023 at OECD La Muette, Paris

This document contains the summary report of the Global Science Forum's Workshop held on 21 April 2023 in OECD La Muette, Paris, which was organised as part of the 48th GSF Meeting. The workshop summary report is followed by ten case studies. These are examples of science communication initiatives from a variety of countries and organisations. The first nine case studies were referred to in the Workshop, while the last case study was presented in an earlier GSF event[1] and is included as it relates to the important role that social media play in science communication.

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[1] In April 2022 GSF convened a workshop on *Public communication and engagement in science: lessons learned from COVID-19.*

Part I – Summary report of GSF48 Workshop

Background

1. Far from being a new issue, responsible science communication has long historical roots. Principles and good practices for conducting scientific research and communicating it responsibly existed well before the 21st century. However, the digital transformation and COVID-19 pandemic have created a new context for science communication that is global, rapidly evolving, and uncertain.

2. The COVID-19 pandemic has highlighted how much science and evidence-based public health measures can affect people's lives on a daily basis. On an unprecedented scale, scientists were asked to transparently communicate scientific evidence about the virus to both policymakers and the public. As the pandemic and scientific evidence evolved, response measures and recommendations changed. In this dynamic scenario, marked by considerable scientific uncertainty, effective science communication was difficult to attain and maintain.

3. The rise of social media and digital platforms has radically altered the science communication landscape, paving the way for the rapid and large-scale dissemination of mis- and disinformation. A shift from traditional information intermediaries, such as journals and newspapers, to new online media has made it possible for anyone with an internet connection to create and share 'scientific' content. Both scientists and non-experts can intentionally or inadvertently spread confusing and misleading messages.

4. Effective science communication is critical for building public trust in science. A lack of public trust can have negative ramifications for scientific progress, societal values, and individual behaviour. Public trust and understanding of scientific knowledge play a vital role in politics and policymaking with better-informed citizens being generally more likely to trust science-based policies.

5. Although communicating science to the public was historically viewed as a one-way process, it is generally recognised as being more complex today and often involves a multitude of different actors. Scientists and scientific institutions often communicate via intermediaries (journalists and policymakers) but can also engage with the public directly through digital platforms. In an era of increasing public interest in science, citizens have become science communicators as well.

6. While many research institutions and governments have developed codes of conduct and guidelines regarding responsible scientific research and communication, there is no systematic or globally agreed-upon set of guiding principles. In many situations, it is unclear whether responsibilities for communication should fall on individual scientists or the research institutions representing those scientists.

7. Guidelines on communication by scientists usually respect a balance between academic freedom of expression and inquiry and assign responsibility to the individual for the transparency and reliability of the information they communicate. However, outwith the formal science publication process, there are limited mechanisms for ensuring the accuracy and accountability of public communications from scientists.

8. Communicating legitimate dissenting scientific views is a challenge, especially during crises. This raises important questions about the extent to which scientists should be free to communicate their findings or opinions, whatever the situation.

Workshop description

9. This workshop was organised as part of the 48th meeting of the OECD Global Science Forum (GSF). It was a follow-up to a broader project on *Mobilising science in response to COVID-19: lessons learned from COVID-19*, which underlined the importance of effective scientific communication to the public during crises. A detailed background document was developed by GSF secretariat to support this workshop DSTI/STP/GSF(2023)10.

10. The workshop explored the challenges scientists face in their communications to the general public. It considered the role and responsibilities of individual scientists as well as scientific societies, research institutions, funding agencies and policymakers. It explored guidelines and practices that have been developed by various stakeholders to improve scientific communication and build public trust.

Workshop introduction

- Amanda Collis, Chair of Global Science Forum
- Carthage Smith, Lead Coordinator, OECD Global Science Forum
- Carlotta Alfonsi, Policy Analyst, OECD Open Government and Civic Space Division

11. Amanda Collis introduced the theme of the workshop. Opening remarks were followed by an introduction by Carthage Smith, who presented the aim and purpose of the workshop and thanked Canada for its financial support for the event.

12. Carlotta Alfonsi presented the work within the OECD Public Governance Directorate on defining good practice principles to support governments for public communication responses to mis- and disinformation. The 9 key principles are: institutionalisation; public interest driven; future-proofing; transparency; timeliness; prevention; evidence-based; inclusiveness; and, whole-of-society collaboration (OECD, 2022[1]).

13. Carlotta Alfonsi highlighted the following key points:

- Scientists can be key communication allies and can help public institutions achieve positive outcomes for citizens.
- Scientists are powerful messengers. They are generally trusted more than the media and political actors.
- Strategic communication is a science. It should be based on evidence.
- Different audiences need different communications. For example, the general public needs different information and delivery compared to policymakers.
- Effective communication during the COVID-19 pandemic had three main attributes: inclusive, responsive, and compelling. Communication should be targeted and should answer a specified need.
- Public institutions should communicate as institutions rather than as different individuals with conflicting views.
- ChatGPT represents a threat to how we traditionally deal with communication, especially with regard to ensuring transparency and accountability.

Session 1: Emerging challenges for scientific communication to the public

- Valérie Masson-Delmotte, Co-chair, International Panel on Climate Change WG1, France
- Mikihito Tanaka, Professor, Graduate School of Political Science, Waseda University, Japan
- Fabiana Zollo, Assistant Professor, Computer Science at Ca' Foscari University of Venice, Italy
- Moderator: Frédéric Sgard, Policy Analyst, OECD Global Science Forum

14. Frédéric Sgard introduced the topic and the three speakers. He highlighted that science communication is not new per se, but the context has changed considerably over the past decade. In particular, social media has changed the way in which scientists and the public can interact.

IPCC and climate change communication

15. The session opened with a recorded intervention by Valérie Masson-Delmotte. She addressed several of her experiences in different capacities, as: a climate scientist active in public engagement; co-Chair of the International Panel on Climate Change (IPCC); researcher in the Labos1point5 initiative to reduce the carbon footprint of research; member of the French Climate Change Committee.

16. Throughout her career, she has witnessed a "propaganda approach" to climate-related disinformation, including climate change denial. She stressed the gap between the state of current knowledge on climate change and climate literacy. In this context, it is crucial to ensure rigour in both producing and assessing knowledge on climate change: scientists should be trained and incentivised to adopt rigorous methodologies, fact-based research, and critical evaluation of evidence - both qualitative and quantitative.

17. Valérie Masson-Delmotte's own reputation has been challenged by the media, and her employer has not always provided the support that she expected to cope with this situation. Hence, she highlighted the need for more institutional support for scientists, including more training in public engagement and media communication, especially at doctoral schools. Such training should emphasise the new role of scientists, which is not only to produce knowledge but also to engage with society.

18. The IPCC processes and report provide an example of how science can be communicated to different audiences. For instance, there is a "summary for all" in plain language designed for citizens and a summary for decision-makers. Specialists produced tailored figures to enhance visual communication. The IPCC also provided media training to scientists to better engage with media, policymakers, and civil society.

19. Part of the ethical responsibility of scientists and research institutions is to reduce the environmental footprint of new knowledge created. The Labos1point5 initiative, which aims to reduce the carbon footprint of research activities, is grounded in scientific integrity principles, is peer-reviewed, and has a transparent methodology.

20. Science-based organisations should act as "watchdogs" to provide evidence-based information in a transparent way to monitor and evaluate climate action and efficiency. For example, the French Climate Change Committee uses scientific evidence to assess climate policy goals and implementation.

21. In her concluding comments, she highlighted three issues:

- The importance of academic freedom. Scientists should be free to engage with local communities and communicate via social media, provided they do so responsibly.
- The potential dangers of artificial intelligence and large language models, which can mimic scientific information but are unable to discriminate between robust evidence and misinformation.
- The potential of new collective organisations that can help transfer science knowledge to society. For example:
    - Utrecht University has a facility that responds to climate-related questions from the general public, providing rigorous answers that are peer-reviewed (see case study 8). This type of feedback and fact-checking can empower citizens who are interested in knowing more about an issue.
    - The World Weather Attribution initiative quickly assesses when a high-impact climate event has occurred and if it has been made more intense due to human-driven climate change. This initiative is important as it provides a reality check based on the current state of scientific knowledge.

COVID-19 and science communication in Japan

22. In an online presentation, Mikihito Tanaka addressed the challenges of scientific communication under conditions of high uncertainty. He presented four science communication initiatives that were implemented in Japan during COVID-19:

1. *Simple scientific messages and openness* – the Ministry of Health, Labour and Welfare of Japan disseminated posters featuring an "Avoid the Three Cs!" message, namely: closed spaces, crowded places, and close-contact settings (see case study 9). This message was simple but effective: it indicated what behaviour people should adopt during the early stage of the pandemic. In addition, the Tokyo Metropolitan Government improved communications related to risk on the official COVID-19 information website by ameliorating the user interface. Openness was key, and all Tokyo citizens were able to access the underlying data that was used in risk assessments.
2. *An online introduction to the "reproductive number (Rt)"* – a live-stream video was created by experts to demonstrate in front of the Japanese public how to calculate the Rt number (an important indicator in predicting the spread of COVID-19 infection). The programme restored public trust and helped diminish the threats that experts had been receiving from from the public (see case study 7).
3. *Mitigating polarisation on social media* – Mikihito Tanaka and colleagues used network analysis to explore polarisation of views on social media regarding COVID-19 vaccines in Japan (Lim, Toriumi and Tanaka, 2022[2]). The study found an underlying political aspect to vaccine hesitancy, with the "debunker" group (e.g., doctors and scientists) being composed of people with relatively more conservative views compared with the "vax-hesitant group". Importantly, the authors identified "interactive experts" (e.g., journalists and medical experts) with whom government experts can interact to foster dialogue and mitigate polarisation.
4. *Leaflets about vaccination* – the Ministry of Health, Labour and Welfare of Japan and the Tokyo Metropolitan Government distributed leaflets to citizens and parents to carefully explain the advantages and disadvantages of vaccination. Mikihito Tanaka's focus group interviews concluded that classical media is an effective communication tool that citizens in Japan will utilise, even in a digital age.

Social media and polarisation

23. Fabiana Zollo presented some of the main characteristics and challenges of communication on social media. Characteristics of digital platforms include: i) structural properties ii) content production, and iii) content consumption. Firstly, due to the internet and social media, there is a more heterogeneous set of communication sources that generate information of variable quality. Secondly, users increasingly produce their own content. Thirdly, when users consume content, they often demonstrate cognitive bias. Users tend to select and interpret information that is coherent with their own set of beliefs, and this bias is transmitted when they interpret or share information with their peers.

24. Online communication provides fertile ground for echo chambers and polarisation. Echo chambers are created when groups of like-minded individuals enforce their own narratives and have limited interaction with other individuals outside their group. This process can lead to polarisation, which can lead to heated, even abusive, debates around an issue between different groups.

25. Polarisation often aligns with political views. For example, two distinct groups were observed in COP26 regarding attitudes to climate change (Falkenberg et al., 2022[3]). The minority, climate change denial, group was dominated by USA Republicans and former UK Brexit /UK Independence Party politicians, whereas the majority group included most other mainstream political parties.

26. Polarisation is increasing around some issues. For instance, polarisation around climate change has increased since 2016 (Falkenberg et al., 2022[3]). Online content denying climate change was shared during COP26 with a frequency four times higher than during COP21.

27. Polarisation is intertwined with hate speech. The more users are polarised, the more likely they are to use aggressive messaging, especially when commenting on opponents' communities.

28. When tackling mis- and disinformation in a highly polarised environment, debunking and fact-checking approaches have limitations. Such measures may not operate effectively because of the polarised nature and structure of the debate itself.

29. Science journalists, scientists, and recognised experts attract higher engagement from citizens in comparison to other messengers. At least this was the conclusion of the European Union project QUEST (2019-2021), which quantitatively analysed data from social media accounts on three controversial topics (vaccines, artificial intelligence, and climate change) (see case study 1). Hence, it is important to provide science communication training to scientists and experts. To this end, the QUEST project produced toolkits and practical recommendations to ameliorate communication.

Key lessons from the discussion

- In conditions of high scientific uncertainty, public responses should be citizen-centred. Conveying simple and targeted messages, as well as creating spaces where citizens can directly engage and understand how science-based decisions are made, is crucial to building trust in science authorities and policymakers.
- Knowledge production and communication to, and with, society require external "quality control". Science-based organisations can act as "watchdogs" to provide

evidence-based information in a transparent way, and to monitor and evaluate scientific communications.

- It is not possible to eliminate polarisation on social media. Strong polarisation makes it harder for debunking and fact-checking approaches to tackle mis- and disinformation effectively. However, the debates can be improved by fostering civil dialogue between disparate parties.
- Scientists and scientific institutions hold an important responsibility when communicating science. Scientists should not only be trained to ensure research integrity and rigour, but they should also receive training in media communication.

Session 2: Frameworks and guidelines for individual researchers

- Kei Koizumi, Principal Deputy Director for Policy, Office of Science and Technology Policy (OSTP), USA
- Kjetil Berg Veire, Assistant Director for Communication, Norwegian Institute of Public Health, Norway
- Anne Dijkstra, Assistant Professor, University of Twente, Netherlands
- Moderator: Carthage Smith, Lead Coordinator, OECD Global Science Forum

30. Carthage Smith introduced the speakers and the topic of the session, which focused on what can be done to support individual researchers in terms of communication frameworks and guidelines.

Scientific integrity and autonomy

31. Kei Koizumi presented the work of the USA Office of Science and Technology Policy (OSTP) on scientific integrity. Concerns about scientific integrity arose in the 2000s when government decision-makers in the USA and Canada were accused of misusing science or miscommunicating about science. With the issuing of memorandums in 2009 and 2010, President Obama gave the direction to develop a government-wide scientific integrity policy. This policy is still guiding executive departments and federal agency processes for ensuring scientific integrity and is articulated in the 2023 Framework for Federal Scientific Integrity Policy and Practice (see case study 2) (National Science and Technology Council, 2023[4]).

32. "Scientific integrity" is different from "research integrity" and "research security". Research integrity is the adherence to values and principles that govern the scientific community to ensure the rigour and honesty of research. Research security is the protection of the means, know-how and products of scientific research. Distinct from these two concepts, scientific integrity means: i) protecting the ability of researchers to communicate freely and transparently to the public and ii) ensuring that scientific information is used accurately, without political interference in decision-making. Scientific integrity is about the use and communication aspects of scientific research.

33. There are two key principles to the 2023 Framework for Federal Scientific Integrity Policy and Practice. Firstly, a culture of scientific integrity should be promoted by making sure that scientific findings are not suppressed or altered to accommodate political agendas. Secondly, inappropriate influence or political interference in the funding, design and conduct of scientific activities should be avoided.

34. Both agency scientists and agency officials hold responsibilities to ensure scientific integrity.

- Agency employees should represent their contributions to scientific work fairly and accurately and not take credit for another's accomplishment.
- Agency scientists should communicate their scientific activities objectively without political interference.
- Agency scientists should be encouraged to participate in communications with the media regarding their scientific activities. They should be allowed to report their scientific findings to the media or the public in their official or personal capacities.
- The work and conclusions of agency scientists should be accurately represented in agency communications.
- Agency officials shall not direct an agency scientist or technology expert to alter a presentation of their scientific findings in a way that would compromise their accuracy.
- Agency officials should ensure the quality, accuracy and transparency of scientific information used to support policy and decision-making.

35. Whilst this guidance has been developed for government scientists, it can equally be applied to university researchers.

Openness and conflicting scientific views

36. Kjetil Berg Veire presented the guiding media principles, dilemmas and pitfalls in communicating science at the Norwegian Institute of Public Health (NIPH), which is responsible for providing scientific advice to the government of Norway.

37. It is crucial to clarify in which capacity or role employees give statements to the media. Statements can be either on behalf of the Institute or on behalf of individual employees, including researchers.

38. Other principles include encouraging all employees to participate in the public debate, fostering open and understandable communication, and being transparent about the working processes, methods, and financing of scientific research.

39. Difficulties in communicating science arise when:

1. Publics think that individual scientists' views reflect the advice from the Institute. Sometimes, the role of the Institute is to produce knowledge without providing advice.
2. Researchers disagree, both internally and externally. For example, a debate in the newspaper Aftenposten (2021) between a senior researcher and an outbreak group (both from NIPH) questioned the effectiveness of mass testing in schools to reduce COVID-19 transmissions, and the two parties drew opposite conclusions.
3. Advice is given under conditions of uncertainty. In new or changing situations, some scientific results should be considered as one might consider a weather forecast: in crisis situations, scientific evidence is often uncertain and must be interpreted with caution. Modelling can help, and as more evidence becomes available, models can be refined.

40. Guidelines to deal with social media criticisms, insults and threats to experts include: responding quickly (after first taking a step back); trying to de-escalate the debate; fostering dialogue; and asking for help from official services or social media owners.

41. Despite controversial issues attracting considerable attention on social media, public trust in Norwegian health authorities remained high during the pandemic. Openness and transparency were critical in this regard.

Promoting science communication in the Netherlands

42. Anne Dijkstra presented work in the Netherlands around science communication. For instance, the Public Communication of Science and Technology Conference was organised in April 2023 in Rotterdam. In this context, the National Centre of Expertise on Science and Society produced an Action Plan that was handed over to the Dutch Minister of Education, Culture and Science to foster better science communication.

43. The science-society relationship is changing. The public is more critical of the objectivity of science, and acceptance of science and technology is no longer self-evident. The media landscape is also changing rapidly, and different population groups and cultures have more or less trust in different information sources.

44. Scientific researchers are witnessing a change in their role. Scientists are not only experts generating evidence: they are increasingly called to take on advisory or public commentator roles, and they are generally not trained to perform these functions.

45. If we want scientists to communicate, we must reward them for doing this. An example comes from the Dutch recognition and reward programme called *Science Communication by Scientists: Rewarded!* by the Royal Netherlands Academy of Arts and Sciences in 2022 (see case study 6).

46. Other examples to support the changing role of researchers, taking Twente University as an example, include: introductory courses in academic integrity; a research Honours module to teach students the different tasks that are expected of them as future researchers; a consultancy programme for researchers to help them disseminate scientific knowledge.

Key lessons from the discussion

- Science communication should be adapted to the social context of different countries. The success rate of specific communication methods depends on country-specific factors, including the country's history, the level of scientific literacy, etc. For further reading about the history of science communication in 39 countries, see (Gascoigne, 2020[5]).
- Scientists should be autonomous and able to speak freely in the media, even if they have dissenting views, as long as the capacity in which they are speaking is clear. Governments should not limit the communication of scientists, including government scientists.
- Intermediaries play an important role in science communication. Communication is not the strength of many researchers, so they should be encouraged to work with communication professionals to refine their messages. Although media training should not be imposed on scientists, it is important to make it readily available and encourage participation.

- It is important to empower citizens by giving them adequate information and granting them the freedom to navigate scientific knowledge to draw their own informed conclusions. However, certain social groups might have difficulties in accessing balanced information and evaluating it in an unbiased way.
- Scientific literacy includes being aware of the limitations of scientific knowledge and being able to deal with uncertainty.

Session 3: Role and responsibilities of research institutions and policymakers

- Carine Delrieu, Director of Communication, National Institute for Health and Medical Research (INSERM), France
- Christophe Giovannini, Head of Communication, Swiss National Science Foundation (SNSF), Switzerland
- Marie-Eve Carignan, Associate Professor, Université de Sherbrooke, Canada
- Moderator: Frédéric Sgard, Policy Analyst, OECD Global Science Forum

47. Frédéric Sgard introduced the three speakers, each from different types of research institutions, who were invited to shed light on the responsibility that these institutions might have in science communication.

The role of the French National Medical Research Agency (INSERM)

48. Carine Delrieu introduced the work of INSERM, a national medical research provider and funding agency that covers a continuum from fundamental and clinical research to population health.

49. INSERM has implemented several initiatives to enable it to be identified as a credible information source by citizens and to enhance its visibility. Building citizen trust is a crucial first step in effective communication. Leveraging this, *Canal Detox* was launched as a social media broadcast during COVID-19 to tackle misinformation and promote the Institute's scientific views on topics like face masks (see case study 5). Advertising campaigns were sponsored in underground train stations all over France. In addition, a TV broadcast and book to debunk common fallacies relating to COVID-19 were produced.

50. The main problem when communicating science is the rhythm and tempo, which is often too slow to respond in a timely manner in a crisis. During the pandemic, the dedicated INSERM "fight back" unit was created to give the media quick and reliable answers to scientific questions on TV, radio, and the mainstream media.

51. INSERM is also working on a "public expression charter", which provides guidelines to researchers to express themselves effectively and in a trustworthy way in the media.

52. The INSERM position is that scientists they employ should not express themselves as individuals but rather on behalf of INSERM when they communicate in the media. The emphasis on having a collective voice is part of the strategy for the Institute to be seen as a trustworthy source. [NB: This is different to the stance taken by the NIPH, Norway, as discussed above.]

Science communication guidelines in Switzerland

53. Christophe Giovannini presented communication guidelines from the Swiss National Science Foundation (SNSF), the main research funder in Swiss universities:

- Researchers should say and explain as clearly and comprehensively as they can what they know and what they do not know, showing humility.
- Communicators should make their roles clear by declaring their hat (e.g., speaking as an individual scientist or as a member of the national task force?). Nevertheless, it is important to be conscious that declaring one's hat may not make much difference for the media since the media can pick the hat they prefer.
- Competencies should be made clear. Before communicating, researchers should ask themselves whether they have the expertise or just an educated opinion and if they have the appropriate skills to communicate. SNSF provides media courses for this purpose.
- Even if scientists do not like to communicate, it is part of their responsibility to do so, if funded publicly.
- Dissident voices should not be allowed to emerge from a task force: individual scientists should represent the view of the task force. This recommendation stems from the SNSF opinion on the Swiss National COVID-19 Science Task Force.

54. News and press releases are still the benchmarks despite the growth of social media, but it is important to learn how to manage different channels and platforms.

55. SNSF, as an organisation, holds responsibilities for good communication. It should: i) inform the public about the research it funds by regularly updating the website and ii) push for open access by removing paywalls on scientific publications, especially during crises.

Countering scientific misinformation in Canada

56. Marie-Eve Carignan presented the work of the UNESCO-Prevention Chair mission. The Chair promotes research to prevent violent radicalisation and extremism, provides training to counter misinformation, transfers knowledge to the public and the media, and fosters links between researchers and communities of practice.

57. In the context of an "infodemic disorder" (World Health Organisation), too much information, including misleading or false information, can cause confusion and encourage risk-taking behaviour that can harm health.

58. The impacts of misinformation have been studied by the Council of Canadian Academies in the Fault Lines report (see case study 3) (Council of Canadian Academies, 2023[6]). This identifies three categories of impact: societal impacts (e.g., political polarisation, diminished public trust); community impacts (e.g., lower compliance with public health advice); and individual impacts (e.g., illness and death from preventable diseases). Polarisation can lead to radicalisation, which can lead, in turn, to violence.

59. In the context of the pandemic, the institutional response from the research sector in Canada saw few concerted statements and more individual comments from researchers. It is important that responsibility remains at the individual level.

60. Institutional support for researchers in Canada is present but not sufficient to really promote public communication. There is a need for more training in communication and scientific vulgarisation.

61. The initiative *ScienceUpFirst* by the Canadian Association of Science Centres aims to tackle misinformation online. *ScienceUpFirst* shares the best available science in clear and creative ways (through social media posts, public events, etc.) as a counterforce to the spread of misinformation (see case study 4).

Key lessons from the discussion

- Different institutions assume different responsibilities for themselves and their scientists: some argue that researchers should be free to communicate their views individually, while others argue their researchers should communicate the scientific views of the institution. In any case, researchers should be helped to make sure that what they say is consistent with the wording of the institution and that the capacity in which they are communicating is clear.
- It is the responsibility of scientists to communicate, especially when funded publicly.
- There is an increase in public interest and engagement in science (e.g., the public asks more questions) but about personal issues (e.g., about health). Science institutions and organisations need to provide clear and timely answers to meet such needs.
- The visibility and image of scientific institutions are crucial in determining public trust.

Further reading

Council of Canadian Academies (2023), *Fault Lines: Expert Panel on the Socioeconomic Impacts of Science and Health Misinformation*, https://cca-reports.ca/wp-content/uploads/2023/02/Report-Fault-Lines-digital.pdf. [6]

Falkenberg, M. et al. (2022), "Growing polarization around climate change on social media", *Nature Climate Change*, Vol. 12, pp. 1114-1121, https://doi.org/10.1038/s41558-022-01527-x. [3]

Gascoigne, T. (2020), *Communicating science: a global perspective*, Australian National University Press, https://doi.org/10.22459/CS.2020. [5]

Lim, D., F. Toriumi and M. Tanaka (2022), *Exposing misinformation structures about the "COVID-19 vaccine infertility" myth: An empirical study on Japanese Twitter*. [2]

National Science and Technology Council (2023), *A Framework for Federal Scientific Integrity Policy and Practice*, https://www.whitehouse.gov/wp-content/uploads/2023/01/01-2023-Framework-for-Federal-Scientific-Integrity-Policy-and-Practice.pdf. [4]

OECD (2022), *Good practice principles for public communication resonses to mis- and disinformation*, https://www.oecd-ilibrary.org/docserver/6d141b44-en.pdf?expires=1684939492&id=id&accname=guest&checksum=75EEDD7B10C63F852610AEA0FDF65178. [1]

Part II – Case studies

Table 1. Case studies overview

Name	Initiating Organisation(s)	Country	In a nutshell	Timeline
QUEST – QUality and Effectiveness in Science and Technology communication	European Commission	European Union	Research and toolkits for effective and quality science communication	2019-2021
Scientific integrity policy	Office of Science and Technology Policy (OSTP)	United States	National scientific integrity policy for government researchers	2009-2023
Fault Lines report	Council of Canadian Academies (CCA)	Canada	A report about science and health misinformation	2021-2023
ScienceUpFirst initiative	Canadian Association of Science Centres (CASC)	Canada	Addressing online misinformation through social media posts	2021-ongoing
Canal Detox	National Institute for Health and Medical Research (INSERM)	France	A YouTube channel and other text to debunk scientific and health misinformation	2018-ongoing
Science Communication by Scientists: Rewarded! Programme	Royal Netherlands Academy of Arts and Sciences (KNAW)	Netherlands	A pilot fund, enrichment programme and guide to recognise and reward scientists involved in science communication	2020-2022
Online programme about "effective reproductive number (Rt)"	Dr Hiroshi Nishiura, Science and Technology Journalists Conference	Japan	An online broadcast to explain in real time how to make mathematical calculations to predict the Rt number to simulate the spread of COVID-19	05/2020
Climate Helpdesk	Scientists4Future NL and Utrecht Young Academy (UYA)	Netherlands	An online helpdesk where experts provide peer-reviewed answers related to climate change to the general public	2020-ongoing
"Avoid the three Cs!" campaign during COVID-19	Ministry of Health, Labour and Welfare of Japan	Japan	A poster campaign encouraging the Japanese population to avoid three conditions that facilitate the spread of COVID-19	02/2020-04/2020
Facebook public health promotion and communication strategy during COVID-19	Facebook (now Meta)	United States and worldwide	A communication strategy to combat COVID-19 misinformation on social media and a guide to help governments keep citizens informed accurately	08/2020-2022

1. QUEST Project, European Union

Basic metadata:

- Name: QUEST – QUality and Effectiveness in Science and Technology communication
- Country: European Union
- Initiating organisation(s): European Commission
- Collaboration(s): Venice International University (VIU) (lead partner), Norwegian University of Science and Technology (NTNU), City University of London (CITY), Ca' Foscari University of Venice (UNIVE), Tallinn University (TLU), World Association of News Publishers (WAN-IFRA), Trinity College Dublin-Science Gallery (TCD), Agency for the Promotion of European Research (APRE).
- Timeline: 1 February 2019 - 31 July 2021
- Funding sources: Funded by the European Commission under the European Union Horizon 2020 research and innovation funding programme. Total cost of QUEST project specifically: €1 194 227,50.
- In a nutshell: Research and toolkits for effective and high quality science communication

Summary and objectives:

QUEST supported, measured and defined quality in science communication. The project aimed to improve the knowledge of the science communication landscape and its dynamics, with the intention to design quality tools to support it. Its main objective was to create a community of science communication stakeholders (including journalists, museum facilitators, social media managers, etc.) and to enhance their communication through targeted tools and guidelines. The goal was to offer citizens reliable communication on scientific topics that have a significant impact on their lives, including artificial intelligence, climate change, and vaccines. Ultimately, QUEST sought to improve the effectiveness and quality of interactions between scientists, the media and the public.

Methodology and Activities:

The QUEST project comprised 7 Work Packages. Each of them had different aims and objectives (e.g., investigate science communication, measure and assess its quality through indicators, develop a dissemination plan for the project, etc.). Each work package produced an output. For example, QUEST started by analysing the landscape of European science communication in the Report on European Science Communication Today (Work Package 1 output). This report drew key analyses and conclusions (e.g., how social media platforms are used for science communication, communication challenges for science museums, etc.). For the Work Package 2 report, QUEST created 12 quality indicators for science communication to guide journalists, social media and museums. The methodology and outcomes of QUEST's research were published in a series of publications for all work packages. These publications were developed through a co-creation approach, which included a series of workshops and focus groups with science communication stakeholders.

The findings from the publications fed into the design of four toolkits for scientists, journalists, museums and galleries, and social media users. These toolkits include, among others:

- JECT.AI – a digital and AI-powered support tool for journalists writing about science (e.g., including metaphors to explain complex science more easily)
- A checklist for scientists to help them deliver targeted messages to the public
- A podcast with six episodes on how to use social media for science communication on a variety of science topics
- A handbook on academic writing for museum curators

- Explainers covering statistical concepts for journalists

QUEST also developed 30 recommendations for policymakers that are gathered in five factsheets. It notably created an MA curriculum on science journalism to develop the professional journalistic skills required to work on science topics. The overall results from the QUEST project were shared through activities like webinars and training sessions held at key conferences.

Key takeaways:

- To ensure that science communication effectively addresses societal challenges, it is crucial to target a multitude of actors, including scientists, policymakers, journalists, other communication actors, and citizens.
- QUEST used a holistic and multi-step approach. The project first collected and disseminated knowledge of the science communication landscape. It then developed 12 indicators to assess the quality of science communication and used these indicators to create toolkits.
- The tools were co-designed through a collaborative and replicable methodology, which involved stakeholders across different communication modes (journalism, science museums, and social media).
- QUEST produced targeted and exploitable tools for promoting quality and effectiveness in science communication. Toolkits are both printable and available in a digital version and were designed in a user-friendly format.
- QUEST disseminated its findings and good practices around the world through a podcast, social media presence, an online website and a network.
- The project supported the engagement of citizens in the scientific debate by fostering dialogues between scientists, the media, and the public. It made citizens more aware of the role of science communication, particularly when dealing with major societal challenges.

Links:

- QUEST – QUality and Effectiveness in Science and Technology communication (questproject.eu)
- QUality and Effectiveness in Science and Technology communication | QUEST Project | Fact Sheet | H2020 | CORDIS | European Commission (europa.eu)

2. Scientific integrity (including communication) policy at OSTP, United States

Basic metadata:

- Name: Scientific integrity policy
- Country: United States
- Initiating organisation(s): Office of Science and Technology Policy (OSTP)
- Timeline: 2009-2023
- Funding sources: Office of Science and Technology Policy (OSTP) and Office of Management and Budget (OMB)
- In a nutshell: Scientific integrity policy for government researchers and officials

Summary and objectives:

With the issuing of the 2009 Memorandum for the Heads of Executive Departments and Agencies, President Obama gave the direction to produce a government-wide scientific integrity policy. This national policy aims to ensure the adherence of government researchers to professional practices, principles of honesty and objectivity, and ethical behaviour when conducting and communicating about science activities. The policy, managed by the Office of Science and Technology Policy (OSTP) and, more specifically, by the National Science and Technology Council (NSTC), assessed scientific integrity and produced guidelines for implementing it at a federal level.

Methodology and activities:

Further clarification regarding the policy's implementation was given in a 2010 OSTP Memorandum and, more recently in a 2021 Memorandum by President Biden. In 2021, a Scientific Integrity Task Force was created to assess and strengthen the effectiveness of scientific integrity efforts, and the findings and recommendations were published in two reports (in 2021 and 2022).

The reports identify practices and principles for improving scientific integrity in specific areas (e.g., communication of scientific activities, training and transparency in scientific integrity, etc.). The 2022 report draws on the 2021 report to include five additional principles of scientific integrity (e.g., accountability of scientists, ability to speak freely about research, etc.). Notably, one of the sections in the latest report identifies good practices for communicating scientific information with integrity (e.g., encouraging openness and transparency with the media, clearing talking points and written communications, building trust between scientists and communication professionals, providing social media training to scientists, etc.).

The scientific integrity policy is further articulated in the 2023 Framework for Federal Scientific Integrity Policy and Practice, which includes the Federal definition of scientific integrity, a model scientific integrity policy, and metrics for assessment and improvement of the policy. It also sets responsibilities for agency scientists and agency officials. Key principles of the Framework include, among others: the promotion of a culture of scientific integrity (e.g., making sure that scientific findings are not suppressed or altered to accommodate political agendas); the avoidance of inappropriate influences or political interference in the funding, design, proposal and reporting of scientific activities; the participation of scientists in communications with the media; the ability of scientists to report their scientific findings to the media in their personal and official capacities.

Key takeaways:

- The national policy sets the baseline definition, assessment and guidelines for scientific integrity. It provides a blueprint to guide executive departments and federal agencies in creating or updating scientific integrity policies.
- The scientific integrity policy protects the ability of government researchers to communicate freely, publicly, and transparently about their work, and provides guidance so that scientific information is used accurately and without political interference in decision-making.
- The 2023 Framework for Federal Scientific Integrity Policy and Practice has a wide scope of potential applications. It can be applied to academic scientists in universities as well as government scientists.
- The Scientific Integrity Task Force (2021-2022) released the first-ever comprehensive assessment of scientific integrity policy in the US government. It underlined the importance of consequences for violations to reinforce a culture of integrity across the government.
- The 2022 report provides clear and detailed good practices and operational principles to strengthen scientific integrity, notably in the field of science communication.
- The national policy promotes scientifically informed and evidence-based decision-making at the federal level.
- Good practices in science communication are based on collaborative relationships between agency scientists and communications staff.

Links:

- 2009 Presidential Memorandum: Memorandum for the Heads of Executive Departments and Agencies 3-9-09 | whitehouse.gov (archives.gov)
- 2010 Memorandum by OSTP Director: Ecopy (archives.gov)
- 2021 Presidential Memorandum: Memorandum on Restoring Trust in Government Through Scientific Integrity and Evidence-Based Policymaking | The White House
- 2021 Creation of Scientific Integrity Task Force: Scientific Integrity Task Force | OSTP | The White House
- 2022 Editorial announcing the new Scientific Integrity Task Force: Strengthening scientific integrity | Science
- 2022 Report on Protecting the Integrity of Government Science: 01-22-Protecting_the_Integrity_of_Government_Science.pdf (whitehouse.gov)
- 2023 Framework for Federal Scientific Integrity Policy and Practice: A Framework for Federal Scientific Integrity Policy and Practice (whitehouse.gov)

3. Fault Lines report, Canada

Basic metadata:

- Name: Fault Lines
- Country: Canada
- Initiating organisation(s): Council of Canadian Academies (CCA)
- Timeline: 2021-2023
- Funding sources: Sponsored by Innovation, Science and Economic Development Canada (ISED)
- In a nutshell: A report about science and health misinformation

Summary and objectives:

The Fault Lines report provides a state-of-the-art assessment of science and health misinformation and its impacts on citizens and public policy in Canada. It details how misinformation can proliferate and what makes people susceptible to it. The report includes original modelling work to estimate the impacts of misinformation on vaccine hesitancy and vaccination rates during COVID-19 in Canada. It also reviews common practices for assessing and responding to misinformation. Ultimately, the aim is to promote actions that reduce susceptibility and improve societal resilience to misinformation.

Methodology and activities:

The report was informed by the work of a panel of 13 experts – the Expert Panel on the Socioeconomic Impacts of Science and Health Misinformation – that was assembled by the CCA. The experts came from different disciplines, ranging from science communication to healthcare, economics and policy analysis. They met eight times to review and assess the evidence about the impacts of science and health misinformation and deliberate on its charge. The assessment was based on diverse sources of evidence, including grey literature, media reports, peer-reviewed publications, and government information and statistics. The focus was on three areas: vaccine hesitancy, climate change, and health and wellness (e.g., nutrition, genetically modified food, alternative medicine).

The report sets the scene by defining the nature of misinformation and how it is created and spread. It proceeds to analyse the impacts of misinformation at three levels: on individuals (e.g., illness and death from preventable diseases), on communities (e.g., lower compliance with public health advice, increased healthcare costs), and on societies (e.g., political polarisation, diminished public trust). By eroding public trust in institutions and expert advice, misinformation distorts policy priorities. It also amplifies social divisions in racialised communities, exacerbating existing inequalities. More specifically, the report's model estimates that misinformation about COVID-19 cost the Canadian healthcare system at least $300 million in 2021 and contributed to vaccine hesitancy for over 2.3 million people in Canada.

Good practices for responding to misinformation are also proposed. They include: identifying and labelling inaccurate information; seeking out trusted messengers; debunking falsehoods with evidence; and, fostering education and media literacy. More detailed suggestions include specific guidelines for journalists (e.g., avoid hyperboles), the use of tags to indicate the presence of misinformation online, support for fact-checking organisations (e.g., PolitiFact), and partnerships with social media companies (e.g., Facebook).

Key takeaways:

- The CCA Expert Panel assessed the best available evidence on a complex scientific issue to provide key decision-makers with high-quality information to develop informed public policy.
- The panel of experts relied on their multidisciplinary expertise to better evaluate the complexity of the issue of misinformation. They did so in a holistic and comprehensive manner: they explored

a diverse range of socio-economic impacts and focused on three different levels (individual, community, society).

- Understanding the sources and consequences of misinformation is critical to develop strategies to combat it and reduce its harmful impacts.
- Addressing misinformation is a complex and multidimensional undertaking. However, identifying misinformation, increasing the availability of trusted and reliable information, and providing evidence in an accessible and clear way can reduce the spread and influence of misinformation.

Links:

- Report-Fault-Lines-digital.pdf (cca-reports.ca)
- Council of Canadian Academies | CCA | Fault Lines (cca-reports.ca)

4. ScienceUpFirst initiative, Canada

Basic metadata:

- Name: ScienceUpFirst
- Country: Canada
- Initiating organisation(s): Canadian Association of Science Centres (CASC)
- Collaboration(s): In partnership with the Health Law Institute at the University of Alberta
- Timeline: 2021-ongoing
- Funding sources: In 2021, the Government of Canada announced an investment of $2.25 million through the Immunization Partnership Fund (IPF) for two projects to support vaccination efforts. ScienceUpFirst initially received $1,845,682 and, in 2022, an additional funding of $745,000. Funding support was provided by the Canadian Institutes of Health Research (2022-23), Public Health Agency of Canada (2020-23), and Environment Climate Change Canada (2022-23).
- In a nutshell: Tackling online misinformation through social media posts.

Summary and objectives:

ScienceUpFirst is a national initiative led by the Canadian Association of Science Centres that aims to tackle science misinformation online. It works with experts to create, distribute and amplify science-based content and social media posts that the public can trust. It was born to combat misinformation related to COVID-19 and the COVID-19 vaccines, but it has expanded to cover a wide range of science and health topics. The goal is to put "science up first" and make accurate and clear science go "viral" by creating content that is useful, accessible, and shareable. The initiative aims not only to share accurate information but also to empower people to make evidence-based decisions about their lives. By April 2023, the project had attracted 64,000 followers on social media channels, created over 300 pieces of original content, which has been shared to a combined audience of 841 million, and has generated over 960,000 unique engagements (likes, shares, comments).

Methodology and activities:

A coalition of experts comes together to suggest relevant topics and vet content produced by an in-house team of designers and science communicators. Experts span from scientists and researchers to public health officials, healthcare providers, and science communicators. Posts are examined carefully and critically by experts and are then shared on social media. ScienceUpFirst is present on Twitter (X), Instagram, Facebook, TikTok, and YouTube. Posts are either proactive, emphasising accurate and clear science and public health messages or building awareness about tactics that are used to spread misinformation; or reactive, addressing a specific falsehood or myth spreading online. Examples of posts include, "5 facts about schizophrenia", "gluten-free is not for everybody", and "4 myths about abortion". Apart from English and French, shareable content is also made available in South Asian languages (Hindi, Farsi, etc.).

The initiative is open to anyone who has an internet connection and a social media account. Users can read through the posts on the ScienceUpFirst website or social media accounts and share them by clicking on the sharing buttons. This enables users to post on their own tweet, Instagram or Facebook account, or share the content via email and even WhatsApp messages. The initiative invites users to use the hashtag #ScienceUpFirst when sharing clear and accurate science. ScienceUpFirst also welcomes feedback, comments and questions on their posts.

ScienceUpFirst collaborates with partners in the public, private, non-profit, and community sectors. National partners include, among others, the American Association for the Advancement of Science (AAAS) and the Royal Canadian Institute for Science, along with community partners such as Masks 4 Canada. The partners amplify the clear and accurate science messages.

Apart from social media posts, ScienceUpFirst organises public events. For example, a national campaign promoted COVID-19 vaccines for 5–11-year-old kids. A roundtable in partnership with the community partner Ma Mawi Wi Chi Itata Centre was organised to reach urban Indigenous communities in Winnipeg and across Manitoba. The initiative also produces social behaviour data, which supports researchers across Canada at the University of Alberta, University of British Columbia, and Simon Fraser University.

Key takeaways:

- The initiative empowers people in Canada and other online users by giving them the tools to spread clear and accurate science-based information.
- The initiative fosters the spread of evidence-based and accurate science by creating content that is useful, accessible, and shareable.
- The initiative counters misinformation by targeting social media. In fact, social media provides a venue for the rapid spread of false and misleading information by any type of user.
- ScienceUpFirst is proactive and acts in a timely manner. It is well-informed about science news stories through its network of experts, tracks trends in misinformation, and replies to people's questions online.
- The posts are user-centred: they are designed in a creative way, made accessible in a variety of languages, and target topical issues about science and health.
- Sharing the best available scientific evidence can help people make appropriate decisions on an individual and community level.

Links:

- ScienceUpFirst - Together Against Misinformation
- Government of Canada funds two new projects to encourage vaccine uptake in Canada - Canada.ca
- Backgrounder: Government of Canada announces additional funding for nine projects through the Immunization Partnership Fund - Canada.ca

5. Canal Detox, France

Basic metadata:

- Name: Canal Detox
- Country: France
- Initiating organisation(s): National Institute for Health and Medical Research (INSERM)
- Collaboration(s): YA+K, La Cherche-Midi
- Timeline: 2018-ongoing
- Funding sources: INSERM
- In a nutshell: A YouTube channel and other text to debunk scientific and health misinformation

Summary and objectives:

Canal Detox is a social media broadcast launched in 2018 by INSERM to tackle misinformation and debunk fake news. INSERM is a medical research institution and funding agency that covers a continuum from fundamental and clinical research to population health. Through Canal Detox, INSERM aims to decode current events and verify information circulating in the field of science and health. Topics are chosen so that they are of interest to people, evoke curiosity, or counter misinformation that has gone viral. The initiative is designed to promote good and reliable science that the French public can trust.

Methodology and activities:

Canal Detox takes the form of short videos and text. Videos are under 5 minutes each and are published on a dedicated channel on YouTube. There are 24 videos on YouTube, with a total of more than 45,000 views. Following COVID-19, the initiative includes the publication of informative narratives in rapid response to misinformation. These texts are made available on a dedicated Canal Detox section in the INSERM Press Room website in the form of mini articles in both French and English.

The content is created in collaboration with researchers and directors from INSERM who have affiliations with universities all over France and draws on a rigorous analysis of scientific discourse and data. Each theme is tackled by a respected expert in the field. Science and health topics range from “losing hair” to “a life without sugar” or “four coffees per day”. The short videos use attractive graphics, music and humour to make them appealing to the public. The videos were featured in the national “InScience” campaign organised by INSERM over a one-month period in 2021 to raise public awareness around a variety of scientific topics.

To reach a wider public, INSERM has also published the advice of Canal Detox in the form of a book. With the aim of deconstructing fake news, the book dissects nearly 80 pieces of misinformation regarding human health (e.g., diet, mental health, HIV, etc.). More than 5,000 copies were sold in the first print run, and it is being re-printed to meet continuing demand.

Key takeaways:

- Canal Detox promotes robust scientific information on science and health topics that can be useful to people in everyday life and that is of concern to citizens.
- Through publishing the content in videos, mini-articles and book forms, INSERM tries to open up science to as many people as possible.
- This approach can be applied to other research institutions and funding agencies that aim to be reognised as reliable, trustworthy sources of scientific information. It can help promote public trust in science and in scientific institutions.

Links:

- Detox Channel - Inserm press room
- Canal détox - YouTube

6. Science Communication by Scientists: Rewarded! Programme, Netherlands

Basic metadata:

- Name: Science Communication by Scientists: Rewarded!
- Country: Netherlands
- Initiating organisation(s): Royal Netherlands Academy of Arts and Sciences (KNAW)
- Timeline: 2020-2022
- Funding source: Ministry of Education, Culture and Science
- In a nutshell: A pilot fund, enrichment programme and guide to recognise and reward scientists involved in science communication

Summary and objectives:

Science Communication by Scientists: Rewarded! is a recognition and appreciation programme that rewards scientists for their commitment to science communication. The programme was initiated by the Royal Netherlands Academy of Arts and Sciences (KNAW), which is composed of several research institutes and serves as a forum for the exchange of scientific information. Although scientists are increasingly expected to engage with the public, communication activities are not yet considered an inherent part of the duties of Dutch academics. Generally, there is a lack of support from knowledge institutions and a lack of time and resources. Through a pilot fund, an enrichment programme and the Rewarded! guide, the initiative aimed to help knowledge institutions to recognise and reward scientists who are structurally involved in scientific communication and public engagement activities.

Methodology and activities:

The initiative started with a pilot fund from which 91 research groups in the Netherlands received a one-off financial contribution of €10,000 in appreciation of their efforts in science communication. The reward recognised researchers' time, resources and effort in communicating their scientific research and encouraged the continuation of such activities. The list of projects is available on the Rewarded! website. An example is a project by researchers at Delft University of Technology, who provided lectures (including for children), public events and exhibitions to make planetary research more comprehensible. The grant to this group was used to purchase new material and equipment, including new telescopes for sidewalk astronomy, planetary globes and scale models.

An enrichment programme focusing on knowledge sharing and networking was introduced in parallel to the financial incentives. A new series of free and tailor-made workshops were developed for researchers – especially for those who received an award from the pilot fund – to expand their knowledge of science communication, exchange practices, and learn from expert-based panel discussions. Workshops explored "vlogging and science", "making science podcasts", "measuring impact", etc. The initiative also worked on building a network of scientists engaged in science communication via the Rewarded! website and social media channels. The network serves as a source of inspiration, where tools for public engagement can be shared.

A fundamental component of the programme was a study by researchers from the Athena Institute in VU University Amsterdam, who investigated how science communication by researchers at knowledge institutions can be better incorporated into scientific practice. The study explored what researchers need in terms of skills and structure to conduct effective science communication and concluded that there are several barriers to its effective practice. For instance, science communication is an activity that researchers do "on the side", there are no formal frameworks to carry it out, and many researchers are on temporary contracts, which discourages them from putting their time and effort into building contacts with

communication professionals and the media.

The findings of the research formed the basis of the *Rewarded!* guide that was published in 2022. This advisory report includes guidelines for research institutes, universities and the Dutch Ministry of Education, Culture and Science to facilitate and value scientists who work on science communication. The guide provides four key recommendations:

1. Have science communication link up with policy on open science
2. Make science communication a fully-fledged part of the duties of Dutch academics, along the lines of the impact element of Recognition and Rewards
3. Integrate science communication into all phases of scientific practice
4. Approach science communication as an actual discipline, with associated expertise and collaboration with communication professionals and their networks.

The guide was presented to Robbert Dijkgraaf, the Dutch Minister of Education, Culture and Science on 31 October 2022.

Key takeaways:

- A dedicated initiative and funding can be a useful tool to incentivise scientists to communicate and engage with the public. It emphasises the importance of involving public groups in scientific activities during an academic career.
- The one-off financial incentive was complemented by an enrichment programme, including tailored workshops and networking opportunities, thereby increasing its benefits.
- Workshops made good practices around science communication available and trained researchers in public engagement.
- The *Rewarded!* guide includes key recommendations about science communication available and can be used by knowledge institutions beyond the Netherlands.

Links:

- Science Communication by Scientists: Rewarded! - KNAW
- Science Communication Rewarded! – Samenweten (verrijkinggewaardeerd.nl)

7. Public understanding of the "effective reproductive number (Rt)" during the COVID-19 pandemic, Japan

Basic metadata:

- Name: Online programme about "effective reproductive number (Rt)"
- Country: Japan
- Initiating organisation(s): Dr Hiroshi Nishiura, hosted by the Science and Technology Journalists Conference on Nico Nico Live
- Timeline: Started 05/2020
- Funding sources: Not applicable
- In a nutshell: An online broadcast to explain in real time how to make mathematical calculations to predict the Rt number to simulate the spread of COVID-19

Summary and objectives:

At the outset of the COVID-19 pandemic, Dr Hiroshi Nishiura – a theoretical epidemiologist and Professor of Hygiene at Kyoto University – estimated that the outdoor activity of ordinary Japanese people had to be reduced by 80% to diminish the opportunities for contact and the consequent spread of the virus. Dr Nishiura used a mathematical model for infectious diseases and suggested that 420,000 people would die if the government did not control people's mobilisation through lockdown measures. His findings were later published in the International Journal of Infectious Diseases and guided policies by the Ministry of Health, Labour and Welfare. Despite being a renowned expert in the field, Dr Nishiura attracted considerable criticism for his scientific advice from the public, including threats to his physical well-being. With the aim of restoring public trust and credibility of the expert voice, a live-streaming programme was created on a Japanese television channel. This explained, in lay-person terms, the basis behind calculations of the effective reproductive number Rt – an important indicator in detecting changes in COVID-19 transmission. Dr Nishiura explained the mathematics and coding behind models for the estimation of the Rt number to the general public and lay experts.

Methodology and activities:

The online lecture was broadcast on the Japanese channel Nico Nico Live and was hosted by the Science and Technology Journalists Conference. In the live video, Dr Nishiura and a colleague opened raw data and the R programme through GitHub, a platform that permits the storage and editing of code. Using an open software model, Dr Nishiura estimated the effective reproductive number, Rt, of COVID-19 in Japan. The data used for the simulation is publicly available in a folder on GitHub, as well as the code scripts and results, including graphs showing the progression of the epidemic in different scenarios.

The programme demonstrated mathematical calculations in front of more than 15,000 viewers. Importantly, the audience could ask live questions and more than 9,000 comments were received. Some lay expert viewers tried the Rt calculations and simulations themselves and published blog posts about their results.

After the live-streaming programme, the attacks from the public drastically diminished, and the open and transparent communication helped restore public trust.

Key takeaways:

- The online lecture was interactive: it encouraged instant reactions and participation from the public, provided a space for comments, and answered questions on the spot.
- The explanation was based on transparent and open data that can be easily peer-reviewed. It showed clearly how mathematical and scientific procedures in the field of public health work.

- The initiative fostered public trust and autonomy: the ordinary public and lay experts could verify the science themselves by reproducing the code and mathematical calculations, and by so doing, they could conclude that trusting public experts can be important.

Links:

- Article: Japan's Leading Voices on COVID-19 – Sponsored (foreignpolicy.com)
- GitHub: GitHub - contactmodel/COVID19-Japan-Reff

8. Climate Helpdesk, Netherlands

Basic metadata:

- Name: Climate Helpdesk
- Country: Netherlands
- Hosting organisation: Utrecht University
- Initiating organisation(s): Scientists4Future NL and Utrecht Young Academy (UYA)
- Collaboration(s): Biodiversity Helpdesk and Brain Helpdesk
- Timeline: 2020-ongoing
- Funding sources: The initiative is non-profit and exists thanks to donations, sponsorships, and gifts. The main sponsor is The Young Academy.
- In a nutshell: An online helpdesk where experts provide peer-reviewed answers to questions related to climate change to the general public

Summary and objectives:

The Climate Helpdesk is an online platform hosted by Utrecht University where experts provide answers to climate-related questions from the general public. In an era of continuous misunderstanding and disinformation around climate change, the initiative aims to provide reliable information that is easy to understand. The public can ask questions about climate change through a Q&A platform, and a group of scientific experts provide peer-reviewed answers without jargon or difficult scientific terms. By creating an easily accessible knowledge repository, the Climate Helpdesk fosters dialogue and understanding between scientists and citizens.

Methodology and activities:

The Q&A platform is open to anyone who wants to make sense of climate change information and its implications. Questions are submitted through the Climate Helpdesk website. Examples of questions include: “Which world cuisine is the most sustainable?”, “Is it possible to restore the ozone layer in an artificial way?”. Fields range from climate scenarios, the energy transition and the greenhouse effect to social consequences and international approaches.

Once a question is received, a network of more than 250 experts is scanned to find the best-suited person(s) to answer it. Due to the complexity of climate change, the designated experts come from a diversity of disciplines – from biology, physics, psychology to law, economics, history and geography. The experts work in the Netherlands at knowledge institutions and/or as researchers at institutes or universities.

A reviewer then checks the expert answer and edits it, if needed, to provide an insightful and readable answer. Once this crucial step is undertaken, the answer is shared publicly. Over the past two years, more than 350 questions have been answered by more than 40 experts and a team of 180 editors.

The Climate Helpdesk is run by volunteers, mostly PhD candidates, who include both the editors and the experts. It also depends on a number of paid coordinators, including the editor-in-chief, to oversee the work of the volunteers. The website Klimaathelpdesk.org is managed by the Climate Helpdesk Foundation (consisting of two presidents, a secretary, and a treasurer) and an Advisory Board.

The Climate Helpdesk won a Communication Initiative Award of €10,000 from the Dutch Research Council, NWO, in 2021. It was also involved in a series of live events on social media, developed a Climate Casino game, and appeared several times in the national mainstream media.

Key takeaways:

- The Climate Helpdesk encourages the involvement of early-career researchers and helps them gain experience in science communication.
- Providing the public with accessible scientific feedback and a fact-checking service empowers those who are interested in knowing more about an issue to ask their own questions.
- The initiative fosters an exchange between citizens and experts. At the end of each expert answer, there is a section that allows the citizen to write what he/she thinks about the answer.
- The Climate Helpdesk makes reliable scientific knowledge about climate change more accessible to a broad audience. The design of the online platform is simple and easy to use by anyone with an internet connection.
- By publishing answers online, the experts are building a repository of accurate and reliable information about climate change that responds to questions from the public.

Links:

- Climate Help Desk (klimaathelpdesk.org)
- The climate helpdesk - Background - Utrecht University (uu.nl)

9. "Avoid the three Cs!" campaign during COVID-19, Japan

Basic metadata:

- Name: "Avoid the three Cs!"
- Country: Japan
- Initiating organisation(s): Ministry of Health, Labour and Welfare of Japan
- Collaboration(s): Prime Minister's Office of Japan
- Timeline: 02/2020-04/2020
- Funding sources: Ministry of Health, Labour and Welfare of Japan
- In a nutshell: A poster campaign encouraging the Japanese population to avoid three conditions that facilitate the spread of COVID-19

Summary and objectives:

In the context of the COVID-19 pandemic, the Ministry of Health, Labour and Welfare of Japan developed a communication campaign around the "Avoid the three Cs" message. The aim was to communicate in a simple but effective way what behaviour people should adopt during the early stage of the pandemic in order to prevent COVID-19 outbreaks. Using posters and other media, the Japanese government successfully encouraged the wider public to avoid the three Cs: closed spaces, crowded places, and close-contact settings.

Methodology and activities:

In the early stages of the COVID-19 pandemic in 2020, the Japanese Ministry of Health, Labour and Welfare established a "cluster response taskforce" to find the source of infection clusters (outbreaks) and prevent their spread. The cluster-based approach was adopted after the task force experts analysed the characteristics of secondary transmission of the virus in Japan, which occurred via a small proportion of cases and often had common sources of infections. The experts gathered and analysed data from local governments on where clusters had arisen and identified the close contacts of patients through interviews. This investigation revealed the common environmental and behavioural characteristics of clusters. The three major risk factors were named the "three Cs": i) closed spaces with poor ventilation, ii) crowded spaces with many people, and iii) close contact, such as close-range conversations.

On the advice of the task force, public health measures were introduced to promote behavioural change and reduce the formation of future clusters. The main measure was the creation and wide dissemination of a poster that indicated the need for physical distancing and suggested that people avoid environments related to the three Cs. The design of the poster was simple and easy to grasp, with different colours for every C and related images. A longer, 4-page flyer was also widely distributed with more details on how to avoid the three Cs. This included instructions on how to improve ventilation in rooms and when driving and advice on the safe distance to maintain between people dining in restaurants.

Following the initial campaign, the Japanese public was repeatedly reminded to avoid situations and places where the three Cs overlap. Subsequently, the World Health Organisation (WHO) started circulating a message globally through social media encouraging individuals to avoid the same three Cs.

Key takeaways:

- With its simple and clear message, the poster campaign proved to be an effective tool for communicating public health advice to citizens, even in the digital age.

- The three Cs poster provided a blueprint for other posters that were used worldwide (e.g., a similar poster by the World Health Organisation). The simple message and format could easily be adopted in different national country contexts.
- Simple and consistent science-based messages, developed by experts, were combined with a widespread poster campaign to successfully promote a change in public behaviour.
- The task force facilitated collaboration between non-governmental public health experts and government officials in Japan, and by doing so, it helped prevent transmission in clusters and large-scale COVID-19 outbreaks.

Links:

- Article and poster: Avoiding the Three Cs: A Key to Preventing the Spread of COVID-19 | The Government of Japan - JapanGov –
- Longer flyer: PROffice3CGuide_en.pdf (kantei.go.jp)
- Paper: Hitoshi Oshitani (2020) "Cluster-based approach to coronavirus disease 2019 (COVID-19) response in Japan, from February to April 2020", Laboratory and Epidemiology Communications, *Japan Journal of Infectious Diseases*, 73, p. 491-493, Available at: LEC1-2020-363.indd (jst.go.jp).

10. Facebook public health promotion and communication strategy during COVID-19

Basic metadata:

- Name: Facebook public health promotion and communication strategy during COVID-19
- Country: USA and globally
- Initiating organisation(s): Facebook (now Meta)
- Timeline: 08/2020-2022
- Funding sources: Facebook (now Meta)
- In a nutshell: A communication strategy to combat COVID-19 misinformation on social media and a guide to help governments keep citizens informed accurately

Summary and objectives:

With the onset of the COVID-19 pandemic, Facebook (now META) devised a strategy to promote inclusive access to accurate health information. The social networking company aimed to promote vaccine confidence by: combatting misinformation on social media; amplifying campaigns that reported accurate information; and setting up partnerships with international organisations. It also published a Crisis Communication Guide designed for governments to help keep citizens informed in times of crisis by using Facebook's apps and services.

Methodology and activities:

Facebook started combatting misinformation about COVID-19 vaccines by removing false claims that could lead to physical harm. It partnered with 80 fact-checking organisations with public health expertise. It also amplified accurate information by providing 120 million dollars in advertising credits to governments for information campaigns promoting positive social behaviour changes. Partnerships were set up with the World Health Organisation (WHO), UNICEF Indonesia and Gavi - The Vaccine Alliance - to improve the perception of the safety of vaccines. Through partnerships with a range of governments, Facebook enabled the use of WhatsApp and Messenger chatbots to facilitate communication on vaccine requirements.

The company also created a campaign measurement tool to understand why some vaccine promotion campaigns were successful or unsuccessful. This approach allowed Facebook to scale up successful campaigns and amplify the dissemination of reliable and accurate information.

The guide "Communicating During a Crisis", published by Facebook in August 2020, provides governments with social media tools and good practices to reach citizens with real-time and reliable information during a crisis. The guide comprises:

- Ten key recommendations to help government officials communicate effectively. These include: keep messages simple; be consistent with language and visuals; present facts; provide barrier-free access by using captions and language translations; engage celebrities and influencers; empower people to tell their personal stories by promoting stickers and hashtags; and, set-up one-to-one communication channels.
- Content publishing guidelines. These include technical specifications, such as: the dimension and format of images and videos to use on both Facebook and Instagram feeds; how to insert links to trusted sources on social media posts; how to create stories; how to use interactive features.
- Advanced moderation tips. These include: how to deal with inappropriate comments; how to report problematic comments; how to use profanity filters; how to moderate messages; and, how to restrict or ban offenders.

Key takeaways:

- Social media can play a positive role in promoting public health as people increasingly engage with health information online. The positive effect can be amplified if companies like Facebook act as moderators and enablers to scale up campaigns with accurate information, combat misinformation, and empower users by creating a safe online space.
- The communication strategy enacted by Facebook is applicable beyond COVID-19 to other common health concerns and to future crises.
- Especially in times of crisis, social media moderation can be a challenge because people react to posts with a high volume of comments, which often demand a timely response. Facebook's communication guide offers moderation tools and information on community engagement that can be harnessed by government organisations and officials worldwide when using social media.

Links:

- Facebook Communication Guide: Facebook_Communicating_during_a_Crisis-A_comprehensive_Guide_EN.pdf
- Global Science Forum virtual Workshop, April 2022, on "Public communication and engagement in science: lessons learned from COVID-19", Session 1, Presenter Lu'Chen Foster (Head of health partnerships, Facebook). Available at: Public communication and engagement in science: lessons learned from COVID-19 - OECD.