# Science Communication
## Guidelines for science communication

Rui Mata, HS 2024

Version: October 17, 2024

# Course structure

## Session information

Sessions take place Thursdays, 8.15-9.45, Biozentrum, Hörsaal U1.131.

| # | Date | Topic | Instructor(s) | Slides |
|---|---|---|---|---|
| 1 | 19.09.2024 | What is science communication? | Mata | pdf |
| 2 | 03.10.2024 | Models and elements of science communication | Mata | pdf |
| 3 | 10.10.2024 | Scientific uncertainty and trust in science | Mata | pdf |
| 4 | 17.10.2024 | Guidelines for science communication | Mata | pdf |
| 5 | 24.10.2024 | Science communication gone wrong | Mata | pdf |
| 6 | 31.10.2024 | Practical: Knowledge and Data Visualization | Hil/Lachenmeier | pdf |
| 7 | 07.11.2024 | Practical: Modular Information Design | Hil/Lachenmeier | pdf |
| 8 | 14.11.2024 | Practical: Modular Information Design | Hil/Lachenmeier | pdf |
| 9 | 21.11.2024 | Practical: Modular Information Design | Hil/Lachenmeier | pdf |
| 10 | 28.11.2024 | Practical: Modular Information Design | Hil/Lachenmeier | pdf |
| 11 | 05.12.2024 | Practical: Modular Information Design | Hil/Lachenmeier | pdf |
| 12 | 12.12.2024 | Practical: Modular Information Design | Hil/Lachenmeier | pdf |
| 13 | 19.12.2024 | Exam | | |

# Recap of last session

- Become familiar with the concept of scientific evidence and be able to distinguish different levels/quality of evidence

- Become familiar with the concept of uncertainty, be able to distinguish different types of uncertainty, and become familiar with several factors influencing the role of uncertainty on communication

- Discuss reasons for trust in science and scientists; become familiar with overall trends in trust in science, understand its measurement, and discuss its importance for public health and well-being

# WHO'S GOT THE ANSWER?

According to GRADE, results of a meta-analysis may be considered as providing the highest level of evidence when…
[Select all the correct answers]

- A: reporting well-controlled observational studies
- B: publication bias is considered to be low.
- C: conducted by experts in the specific area surveyed
- D: reporting low variability in results.

## SUMMARY POINTS

A guideline's formulation should include a clear question with specification of all outcomes of importance to patients

GRADE offers four levels of evidence quality: high, moderate, low, and very low

Randomised trials begin as high quality evidence and observational studies as low quality evidence

Quality may be downgraded as a result of limitations in study design or implementation, imprecision of estimates (wide confidence intervals), variability in results, indirectness of evidence, or publication bias

Quality may be upgraded because of a very large magnitude of effect, a dose-response gradient, and if all plausible biases would reduce an apparent treatment effect

Critical outcomes determine the overall quality of evidence

Evidence profiles provide simple, transparent summaries

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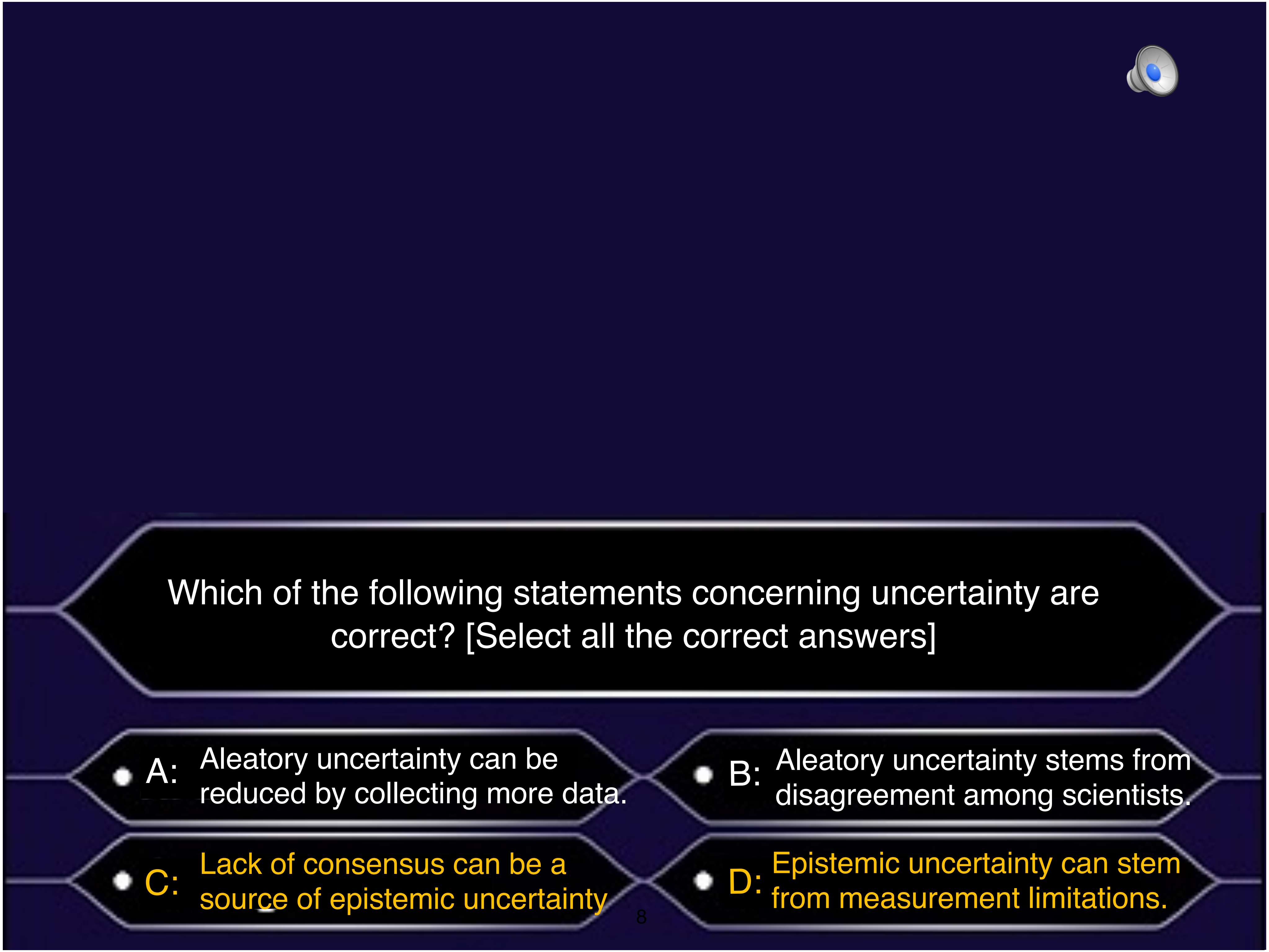
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Many professionals communicate risk and uncertainty using verbal probability terms because …
[Select all the correct answers]

- A: these can be used in a face-saving manner.
- B: research shows they are helpful to individuals with low numeracy.
- C: these allow for fine-grained uncertainty communication.
- D: can be coupled with precise numeric information

# A framework for communicating uncertainty

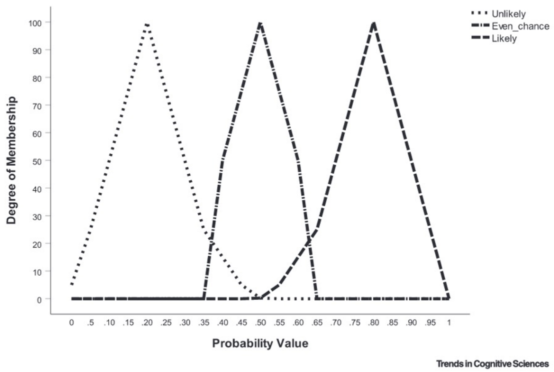


Figure 1. Hypothetical membership functions for three probability terms. Participants are asked to determine how well they think each numeric probability value (e.g., 0, 0.5, 0.10,…1) represents a specific term (e.g., *likely*). Responses are provided by marking a point on a scale (from 0 to 100) for each probability value. This yields several measures, such as the ‘minimum’, ‘maximum’, and ‘peak’ numeric values that the term represents, as well as the ‘spread’ (i.e., maximum minus the minimum) of values.

**Highlights**

The (positive and negative) directionality of verbal probabilities enables them to convey more than uncertainty. Probability terms can communicate uncertainty in a face-saving manner and implicitly shape receivers’ cognitions and behavior.

Verbal probabilities preclude fine-grained uncertainty communication. Assigning numeric probability ranges to words does not eliminate their imprecise and variable meaning, but can have unintended effects on judgment and decision-making.

Senders are misplaced in their belief that verbal expressions of uncertainty are especially helpful for those with lower numeracy and in thinking that these individuals cannot benefit from numeric probability information.

The benefits of precise numeric expressions of uncertainty, coupled with receivers’ preference for numeric information when it really matters, suggests that senders ought to embrace numeric precision over vague words if they wish to communicate uncertainty clearly.


Dhami, M. K., & Mandel, D. R. (2022). Communicating uncertainty using words and numbers. *Trends in Cognitive Sciences*, S1364661322000602. https://doi.org/10.1016/j.tics.2022.03.002


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# Goals for today

- Discuss the steps involved in developing science communication initiatives
- Become familiar with some guidelines and recommendations for science communication
- Discuss science communication during crises

# Getting started

| | |
|---|---|
| **1.Scoping**<br>Look at what people are saying and the underlying assumptions. | *How is your research topic being talked about in the public domain? How well is information being used? What are the misconceptions? What context is missing? What are the key underlying assumptions?* |
| **2.Involving people**<br>Work out the significance for different groups and how to involve them. | *Which individuals and groups are most interested, concerned or involved in the issue? Who isn't but should be? Who is driving the public conversation? Who should be part of the project team? Who should you invite to user testing? Who can help you share your findings?* |
| **3.Planning**<br>Propose content and formats that are relevant for the people accessing them. | *What is the best format to communicate your research: website, graphics, video, events, publications? What is the key content and context you need to include? What language and style should you use?* |
| **4.User testing**<br>Develop your material together. | *How can you run user testing? Who should be involved? Which parts of your output should you user test? What questions can you ask?*<br>Use the feedback from user testing to re-plan your science communication activity. |
| **5.Dissemination**<br>Continue to engage people and use feedback. | *Who should know about your research findings? Who will talk about and publicise them? How can you share them with the media, with professionals, with the public?* |

Bertemes, J. P., Haan, S., & Hans, D. (Eds.). (2024). *50 essentials on science communication*. De Gruyter. https://doi.org/10.1515/9783110763577

# Getting started

| Inputs | Participants & Activities | Short-term Outcomes | Medium-term Outcomes | Long-term Outcomes | Vision |
|---|---|---|---|---|---|
| ▪ Research<br>▪ Evaluation<br>▪ Practitioners<br>▪ Leadership programs<br>▪ Support to scientists<br>▪ Communication & engagement training<br>▪ Institutional support for scientists and publics<br>▪ Funding (including Broader Impacts and other funding requirements)<br>▪ Strategy of communication | Participants<br>▪ Scientists<br>▪ Publics<br>▪ Practitioners<br>Activities<br>▪ Public Dialogue Approaches<br>▪ Policy Deliberation Approaches<br>▪ Knowledge co-production approaches<br>▪ University-led, cooperative engagement approaches<br>▪ Everyday engagements<br>▪ Note: see typology for more details and examples | Scientists humanized/ publics individualized | Build trust between publics and scientists | Build trust between publics and scientists | Sound, evidence-informed public decision-making on science-related issues<br>Dialogue on critical science-society issues embedded in public discourse<br>Influence individual and collective action and behavior<br>Influence policy<br>Influence research agendas<br>Research that is responsive to societal needs and interests<br>Resilient STEM workforce<br>Science embedded in daily life |
| | | Positive affect | Longer-term positive affect about science | Long term positive affect | |
| | | Increased sense of public engagement identity | Shared appreciation of public engagement<br>Do more & better engagement (more able and comfortable)<br>Build relationships to continue public engagement with science | Engagement is part of work and life (proposals, plans) in strategic and reflective ways<br>Institutional change | |
| | | Intention to act or engage again<br>Increase skills/ability to engage civically<br>Increased self-efficacy | Act on something from engagement<br>Be ready to advocate/amplify<br>Increased preparation to engage between science and society | Share scientific or social content and understanding with networks | |
| | | Increased interest and motivation around topic | Increased willingness to consider science-society intersections | Improve goals or focus of research<br>Hear/understand others' views about science | |
| | | Increased understanding of the process of science and social institutions | Increased ability to discuss science-society intersections | Frame science to be relevant to publics<br>Framing knowledge outcomes for use by scientists and decision-makers | |

https://www.aaas.org/resources/communication-toolkit/communication-fundamentals

# Guidelines and Recommendations

HOME | RESOURCES

## AAAS Communication Toolkit

Excellent public engagement with science builds on a foundation of clear, concise communication. This section provides guidance and tips to improve your communication skills.

The way scientists are trained is excellent preparation for communicating with precision about your work with colleagues. When communicating with public audiences, however, you need to shift to the way you would speak when 'off the clock.' Think about the last time you explained your work to a friend or family member. Those who care about you are highly motivated to understand the science you work on, yet they may struggle to engage with it.

As highlighted in the diagram below, typical scientific communication (such as the last journal article you read or wrote) includes a lengthy background, and then describes the methods and process used with great precision. It is not until the very end of the paper that results or conclusions are reported.

Public communication flips this approach on its head: the bottom-line is the lead, followed quickly by the "so what," and then the supporting details, as appropriate.

**PUBLIC ENGAGEMENT**

- PUBLIC ENGAGEMENT ACTIVITIES
- AMBASSADOR & FELLOW PROGRAMS
- CENTER NEWS & EVENTS
- WHY PUBLIC ENGAGEMENT MATTERS
- **COMMUNICATION TOOLKIT**
  - COMMUNICATION FUNDAMENTALS
  - COMMUNICATING SCIENCE ONLINE
  - WORKING WITH JOURNALISTS
  - ENGAGING POLICYMAKERS

American Association for the Advancement of Science

# Guidelines and Recommendations

## PREPARING TO DO MEDIA WORK

- Find your press officer – they can give you help and advice on doing media work. Keep their name, and phone numbers to hand in case a journalist calls you. You should also make sure that your press officer has your **mobile number**. Borrow one if needed!
- If you expect to be doing a lot of media work in the future ask your press officer whether they can get you some **media training.**
- The SMC offers you the chance to attend our 'Introduction to the News Media' event, and give support and advice when your area of science hits the headlines.
- Practice speaking about your work in **jargon free** language to non-scientists (try writing about your work in 150 words). Do not use acronyms or measurements that the public may not understand.
- If you have an important paper coming out, ask if the journal is going to issue a **press release**. If it is, make yourself available for interviews before and after the publication date.
- Before speaking to a journalist, decide on **3 key messages** that you want to put across in the interview. If you are asked a question that does not relate to your 3 points, try to get back to the subjects you want to cover using phrases such as 'what we must remember is...', 'the really important point is...', 'interestingly...'.
- Is your research at all **controversial**? If so, plan ahead and be prepared to answer tricky questions. Ask the SMC for help if you need it.

**"THE WEST AFRICAN EBOLA VIRUS OUTBREAK UNDERSTANDABLY GENERATED A FRENZY OF JOURNALIST AND PUBLIC INTEREST. THE OPPORTUNITY TO SPREAD ALARMIST MISINFORMATION WAS IMMENSE. BUT BY CONSTANTLY ENGAGING WITH THE MEDIA, OCCASIONALLY AT SLIGHTLY UNSOCIABLE HOURS OF THE DAY AND NIGHT, WE WERE ABLE TO ENSURE THAT REPORTING WAS WELL-INFORMED AND BALANCED.**

Prof Jonathan Ball, Professor of Molecular Virology, University of Nottingham

Firstly, find out why the journalist is phoning, what is the reason for writing this story now (their peg)? You should also check where the journalist is calling from, are they a newspaper, radio or TV journalist? And which programme or publication?

## NEWSPAPER

- Find out what the journalist's **deadline** is – it could be in 10 minutes and they need you to respond immediately.
- You are entitled to **phone the journalist back in a few minutes**, giving you you time to collect your thoughts – but make sure you phone them back in the time frame promised.
- You don't have to have the best publication record in the world to comment in the media. For the consumers of national news if you work in the area you are an expert.
- If the enquiry really isn't in your area, **recommend someone else** who might be suitable. Even if you don't have their contact details the journalists can find them through their press office or the SMC.
- Always take the **journalist's contact details**, so you can get back in touch if you think of something important later on.
- If you need **more information**, and there is time before the journalist's deadline, you can ask to see the press release or paper related to the story.
- Because of time constraints and issues surrounding editorial independence print journalists very rarely **check their copy** back with scientists, so don't expect to see the finished article before it is published.
- Remember that the **tabloids** have very large circulations (Just under 2 million people in the UK buy *The Sun* every day compared to around 400,000 people who buy *The Times*) so by speaking to them you will be getting your message to a larger audience than by speaking to the broadsheets. In addition, the tabloid journalists produce some of the best and most accurate coverage of science issues in the media.

## GENERAL POINTS ABOUT BROADCAST INTERVIEWS

- Will the interview be **live or pre-recorded?** Although live interviews may sound daunting they have the advantage of not being 'cut' before the broadcast.
- If you have to go to a studio the TV/radio station will often **send a car** for you or pay for you to get a taxi.
- Get the **contact details of the journalist** who is organising the interview.
- If you are doing an interview on a controversial topic, ask if you will be **head to head** with someone who has an opposing view point. If you are, and have time before the interview, try to find out about their views on the subject.
- If you are struggling with too many requests for interviews from journalists, ask **your press officer** for help. They should be able to take calls for you and help manage your interview schedule.
- When you are doing an interview try not to repeat back the questions to the interviewer. If possible, you should make your answers stand-alone, succinct statements.

**"NO JOURNALIST WANTS TO BE SPOON-FED BUT THANKS TO TIGHT DEADLINES, A BROAD REMIT, AND THE NEED FOR OUR WORK TO RESONATE WITH AUDIENCES, WE DO NEED SOME HELP. AND SCIENTISTS CAN DO THAT BY FOLLOWING THREE BASIC PRINCIPLES.**

**1) EXPLAIN THEIR WORK WITH THE GREATEST POSSIBLE CLARITY**

**2) KEEP LANGUAGE SIMPLE BECAUSE MOST PEOPLE WON'T UNDERSTAND DENSE TERMINOLOGY, OR CARE ABOUT IT**

**3) JOURNALISTS ALWAYS HAVE MANY STORIES ON THE GO AT ONCE SO, WHEN THEY CALL, A SWIFT RESPONSE AND READY AVAILABILITY ARE ESSENTIAL."**

David Shukman, Science Editor, BBC News

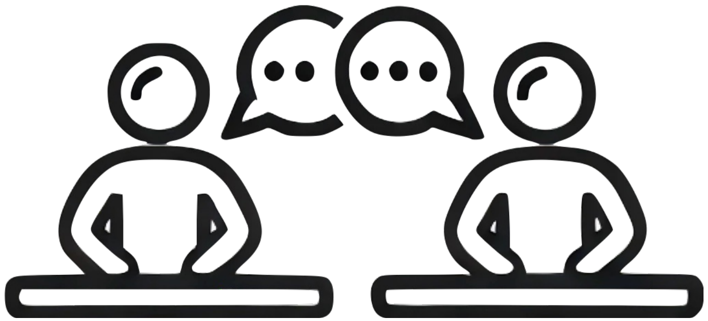
UK Science Media Centre

# Guidelines and Recommendations

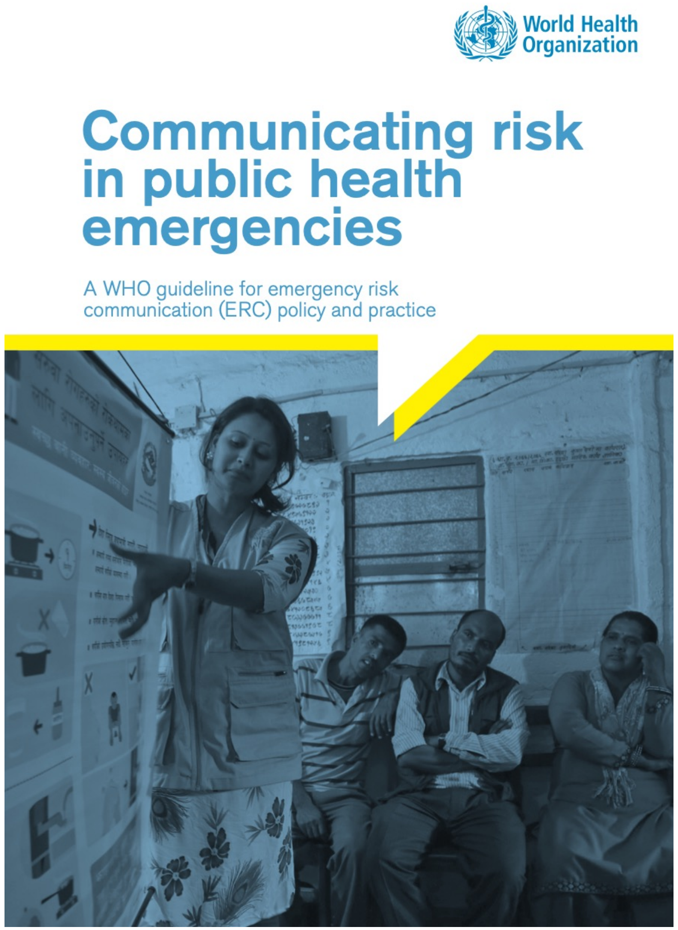
| Key Points | Description |
|---|---|
| Factual accuracy | Science communication should be conducted without exaggerations and without concealing risks |
| Clarity | Science communication should be conducted without distorting facts, even when complex research content is simplified |
| Societal Storytelling | Science communication should filter the diversity of information according to societal needs |
| Relevance | Science communication should be used as a didactic method to clarify factual content |
| Transparency | Science communication should name sources, cooperation partners, or any potential dependencies |
| Peer-Review | Communicating preprints should only occur when they are of significant public interest |
| Uncertainties | Science communication should always make the limits of statements and methods visible |
| Respect | Science communication should allow for open dialogue and respect for the positions of all parties involved |

# COMMUNICATING IN A CRISIS?

## do’s and don’ts



# Communicating in a crisis



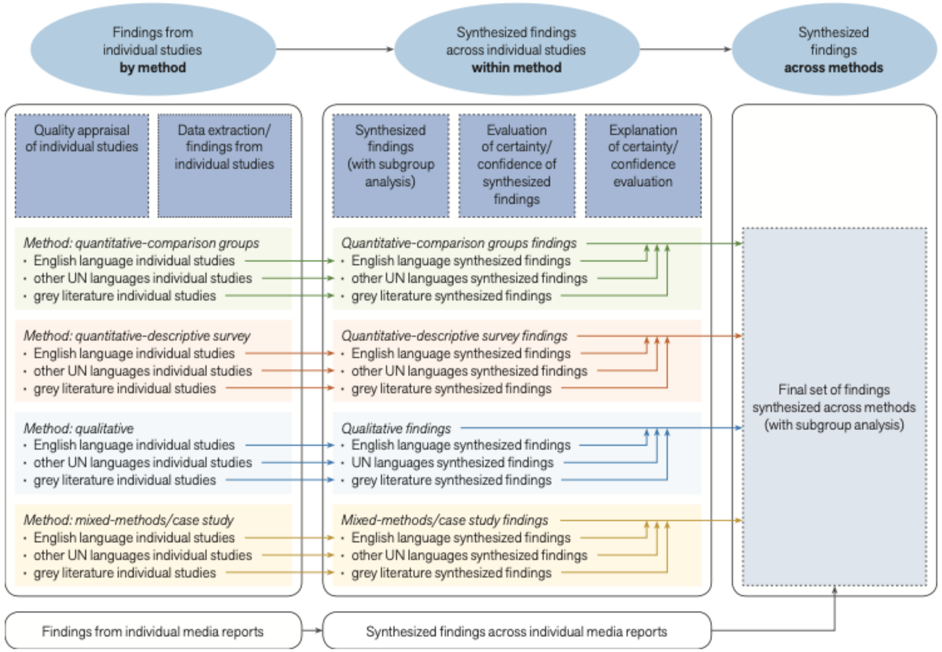




Figure 1. Summary of methods reviewers used to develop the evidence synthesis

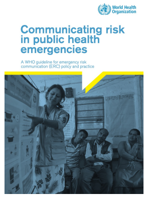
**A** — Building trust and engaging with affected populations

**B** — Integrating ERC into health and emergency response systems

**C** — ERC practice

https://www.who.int/publications/i/item/9789241550208

# Communicating in a crisis




**A. Building trust and engaging with affected populations**

**A.1.: Trust**
Recommendation

**To build trust, risk communication interventions should be linked to functioning and accessible services, be transparent, timely, easy-to-understand, acknowledge uncertainty, address affected populations, link to self-efficacy, and be disseminated using multiple platforms, methods and channels.**

Strong recommendation
Moderate quality evidence

**A.2.: Communicating uncertainty**
Recommendation

**Communication by authorities to the public should include explicit information about uncertainties associated with risks, events and interventions, and indicate what is known and not known at a given time.**

Strong recommendation
Moderate quality evidence

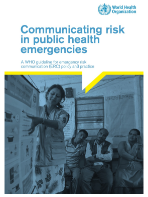
**A.3.: Community engagement**
Recommendation

**Identify people that the community trusts and build relationships with them. Involve them in decision-making to ensure interventions are collaborative, contextually appropriate and that communication is community-owned.**

Strong recommendation
Moderate quality evidence

https://www.who.int/publications/i/item/9789241550208

# Communicating in a crisis




**C4: Messaging**

Recommendations

**C4.1. Risk should not be explained in technical terms, as this is not helpful for promoting risk mitigation behaviours.**

Strong recommendation
Moderate quality evidence

**C4.2. Consistent messages should come from different information sources and emerge early in the outbreak.**

Strong recommendation
Moderate quality evidence

**C4.3. Messages should promote specific actions people can realistically take to protect their health.**

Strong recommendation
Moderate quality evidence

[https://www.who.int/publications/i/item/9789241550208](https://www.who.int/publications/i/item/9789241550208)

# Communicating in a crisis

Check-list for trustworthy communication in a crisis:

The communicator (e.g., scientist, public health specialist, policy maker) should say

☐ 1. What they know (knowledge)

☐ 2. What they don’t know (uncertainty)

☐ 3. What they are doing to find out (plans)

☐ 4. What can be done in the mean time to be on the safe side (self-efficacy)

☐ 5. That advice will change (flexibility)

Blastland, M., Freeman, A. L. J., Van Der Linden, S., Marteau, T. M., & Spiegelhalter, D. (2020). Five rules for evidence communication. Nature, 587(7834), 362–364. https://doi.org/10.1038/d41586-020-03189-1

# Summary

- **Developing science communication initiatives:** Involves defining clear short- and long-term goals for communication, identifying target audience, and selecting the most appropriate channels (e.g., social media, press releases) to ensure the message is received and understood.

- **Guidelines and recommendations**: Effective science communication should be factual, transparent, respectful, and include discussion of uncertainty. Several guidelines and recommendations exist which is helpful but sometimes hard to navigate.

- **Communication during crises:** Successful crisis communication requires clarity and honesty. One should communicate what is known, what is not known, and what is currently being done to improve knowledge. In addition, it should be made clear what actions can be taken in the interim (e.g., self-protection) and that information is likely to be updated in the future.