



Report **Gap Analysis of Risk Communication** **Research**

in Animal Health and Welfare



**European Animal Health
& Welfare Research**
COLLABORATIVE WORKING GROUP

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Report on Gap Analysis of Risk Communication Research in Animal Health and Welfare

Background

Animal health and welfare are important to the European Union for ethical, economic, public health, environmental, and societal reasons. Yet communication of animal disease risks is increasingly failing to change human understanding and behaviour, public understanding of animal welfare relevant agricultural practices is waning as well – as is general trust in science.

An outbreak of an animal or plant disease was rated by Europeans as the third lowest of the listed 14 disaster risks that they felt personally exposed to. Thus, Europeans do not feel particularly vulnerable to disease outbreaks originating from animals or plants (Special Eurobarometer 547, 2024). According to the European Commission (2026), 49 % of European citizens do not feel well-informed about disaster risks. If the communicator is trusted, the message is more likely to be taken as fact. Animal health and welfare risks are often communicated by authorities. OECD (2024) reports that trust to public institutions has fallen from 2021 to 2024, and large differences exist between countries in how citizens trust public institutions. The majority of Europeans trust authorities and emergency services concerning disaster risks to handle disaster situations competently, yet this trust varies across the EU countries - from 96 % in Finland to 57 % in Romania (Special Eurobarometer 547, 2024).

According to Eurobarometer, Europeans want better animal welfare (European Commission 2023). There is a consumer concern about farm animal welfare, especially in three primary areas: production methods, transport and slaughter (Harper, 2001). However, objective knowledge about livestock production systems is lacking. Public understanding of animal welfare is fragmented and often inaccurate (Clark et al., 2016). Citizens' knowledge of animal care is limited, indirect and largely derived from media narratives. Understanding is often shaped by assumptions and moral intuitions, not direct knowledge. Thus, there is a gap between citizens' concern on animal welfare and factual knowledge, which can cause problems in risk communication.

Objectives of the study

This study was conducted in order to identify gaps in current research and practice, to understand public perception and communication needs, to analyse existing communication structures and resources, and to report on strategies to increase societal awareness and the acceptability of livestock practices, animal welfare and regulatory progress. The main objective of this study was to develop actionable recommendations for enhancing risk communication strategies within the context of animal health and welfare.

Content of the report

This report consists of three separate analyses of gaps and existing knowledge of current research. The first analysis reports the gaps in existing research on risk communication in the field of animal health and welfare, based on 75 predefined articles. The second part discusses good risk communication – principles, methods, practical implementation – based on analysis of eight risk communication guidelines documents. The third part is an AI-assisted analysis of what is lacking in risk communication research worldwide. The report gives insights into well-studied topics as well as gaps in recent research and describes what is missing across six dimensions: animal categories, communication channels, stakeholder groups, geographic and cultural contexts, risk types, and research methodology.

The fourth part of this report provides a comprehensive insight on strategic research needs in risk communication in animal welfare issues. Research needs are discussed in terms of source of the communication and trust, message and language, target audiences, and tools. A roadmap for future research aimed at increasing the acceptability of animal farming practices suggests an agenda on communications with practical proposals for research lines and questions.

The report also includes an executive summary, recommendations for future research, and appendices.

Summary of the report

Risk communication is an integral part of risk analysis and an indispensable factor of success in responding to health emergencies (Reynolds & Seeger 2007). Based on the lessons learnt from recent disease outbreaks and pandemics (Van Bavel et al. 2020), there is an urgent need to increase general societal involvement, recognition and participation for better informed awareness of risks associated with animal diseases, compliance with required risk management measures and better-informed acceptance of livestock production practices, particularly in relation to animal welfare.

To maintain and improve the effectiveness of risk communication, it is essential to promote research to generate and disseminate knowledge on animal health and welfare to consumers, stakeholders and the general public, and to increase its uptake through appropriate structures as well as human and economic resources (Fischhoff 2013). Such an approach will ensure an effective and coordinated response to future emergencies and rebuild trust when communicating with all stakeholders.

This study aims to address the urgent and complex challenges in the field of risk communication as it relates to animal health and welfare. Communication strategies may fall short in fostering public trust, societal engagement, and informed acceptance of livestock production practices. There is a growing need to understand the facilitating and hindering factors in risk communication to ensure effective responses to future emergencies and promote a well-informed, participatory public discourse (Wachinger et al. 2012), especially around animal welfare and health management.

This study identified gaps in current research of risk communication in animal health and welfare, with the aim to understand public perception and communication needs and to analyse existing communication structures and resources. The study report also examines predefined guidelines of strategic risk communication, but it does not cover other strategic documents, plans related to risk communication, national regulatory guidance, or legally mandated official communication documents.

Our analysis on research gaps highlights the critical weaknesses in current risk communication research on animal health and welfare. Based on our findings, scientific research on animal health and welfare risk communication is diverse but sporadic or limited in several detailed aspects. The existing body of work is characterised by a strong predominance of conceptual and policy-oriented studies, while empirically tested communication interventions remain limited. Target audience analysis is generally weak and inconsistently applied, which undermines the development of tailored and effective communication strategies. Theoretical frameworks are fragmented and methods are highly heterogeneous, making cumulative learning and comparison across studies difficult. In addition, monitoring and evaluation are addressed in a limited and largely unsystematic manner. Communication messages themselves are more often implied than explicitly defined, which reduces their transparency and assessability. Overall, there is a clear scarcity of well-documented and rigorously evaluated communication interventions in the field, the importance of which is acknowledged in previous research (Lundgren 2018; WHO 2018). These findings demonstrate the need for more systematic, audience-

focused, and empirically grounded research to strengthen risk communication practices in the field.

The basic elements of good risk communication can be found in guidelines written for authorities, stakeholders and citizens about communicating risks in animal health and welfare. WHO and FAO (2016) summarise good risk communication as a reliable, two-way, audience-tailored and coordinated communication process that is open and transparent, timely and responsive, addresses risk perceptions and technical evidence, communicates uncertainty early and clearly, offers practical actions to reduce risk, and is continuously monitored and evaluated to ensure that messages adapt as the situation and public concerns evolve. However, there is a notable issue in the emphasis on best practices and benchmarks for good risk communication in the sector: most of the reviewed documents focus on animal health, while animal welfare might be mentioned but in generally given less emphasis.

The AI-assisted analysis of research published over the past decade on gaps in animal health and welfare risk communication shows that this field has expanded substantially, particularly in relation to zoonotic diseases (Laconi et al. 2023; Manyweathers 2017; Mendez et al. 2016; Osuagwu et al. 2025; Reaser et al. 2025), antimicrobial resistance (AMR) (Noordhuizen 2022; Sharma et al. 2022), and veterinarian-farmer and veterinarian-owner communication (Ciaravino et al. 2023; Míχα 2025; Spence et al. 2019). The reviewed literature reveals that the field has matured in its qualitative and descriptive foundations but remains weak in experimental evidence (Ciaravino et al. 2023; Kim et al. 2025; Míχα 2025; Noorhuizen 2022; Sharma et al. 2022), geographic diversity (Laconi et al. 2023; Mendez et al. 2016; Míχα 2025; Osuagwu et al. 2025; Reaser et al. 2025; Sharma et al. 2022; Spence et al. 2019), and coverage of key animal categories (Arnecke et al. 2024; Kim et al. 2025; Laconi et al. 2023; Manyweathers 2017; Reaser et al. 2025) and stakeholder groups (Hueston 2013; Mendez et al. 2016; Reaser et al. 2025; Sharma et al. 2022).

Recommendations for future research

- ✦ Conduct randomized or quasi-experimental intervention trials measuring behavioral outcomes (biosecurity adoption, vaccination rates, AMR stewardship) across diverse settings.
- ✦ Extend research on risk communication on health or welfare issues in aquaculture and wildlife with specific attention to conservation-framed risk communication.
- ✦ Develop and test culturally adapted communication strategies for LMIC (Low- and Middle-Income Country) settings, with attention to indigenous knowledge and local communication norms.
- ✦ Investigate digital and social media communication interventions and their effectiveness in countering misinformation about animal health and welfare risks.
- ✦ Expand communication by including non-veterinary animal health workers, policymakers, vulnerable subgroups and children.
- ✦ Include climate change into animal health risk communication research frameworks and communication stakeholders.
- ✦ Apply implementation science methods to understand how to scale and sustain effective communication programs.
- ✦ Conduct economic evaluations of risk communication interventions to inform and justify resource allocation decisions.
- ✦ Investigate animal welfare as a separate risk category in media and public communication analyses. Investigate how animal welfare risks are communicated to producers, decision-makers and the public.

Gap analysis based on predefined literature

1. Scope and Purpose of the Gap Analysis

The scope of this work was to address the challenges in the field of risk communication as it relates to animal health and welfare and to develop actionable recommendations for enhancing risk communication strategies within the context of animal health and welfare.

This report summarises the findings of a gap analysis of existing research on risk communication in animal health and welfare. The analysis focuses on identifying structural, methodological, and conceptual gaps in the current body of work, with the aim of informing future research and strategy development

2. Material and methods

2.1 Material

The gap analysis of existing research was based on scientific literature. We scrutinized a list of 65 pre-chosen journal articles from the last 25 years concerning risk communication in animal health and welfare and extra 10 articles added based on AI-assisted search (Appendix 1). We used a question pattern with 13 carefully formulated questions with multiple choice options (Appendix 2) formulated and approved by the CWG AHW Management and Risk Communication Unit, based on their professional expertise in the field of risk communication research and practices. The questions covered disciplines and topics of the studies, formative research themes (target audience analysis, investigation techniques, theoretical frameworks, content messages), and strategy-related objects (key areas of intervention, goals of risk communication, target audiences, communication sources and tools, monitoring and communication evaluation).

A pilot test was run to check whether the 13 identified questions would be a valid instrument to analyse the selected articles. From the pilot test, it emerged that for many of the questions, the option 'other' was the proper answer, eventually indicating the need to revise the question pattern. This mismatch was discussed among the group, who chorally agreed not to modify the questions, as they were indeed collecting the intended data out of the selected articles.

We posed all 13 questions to each article with the help of generative artificial intelligence (AI) software in the study in compliance with the RefreSCAR AI Principles and Requirements for using AI. We then coded AI-assisted responses in Excel using a coding scheme consistent with multiple choice options of the question pattern. The question pattern included 'other' option in questions 1, 2, 4, 5, 9, 10, and 11. Whenever the 'other' option was chosen, we took notes to define and clarify the option.

Based on the coded responses in the Excel file, we created question-specific bar charts (Appendix 4) to analyze the data and compiled the responses that included separate additional comments (Appendix 5).

2.2 Methods and the use of AI

As we used only public sources of information (scientific articles and guidelines published on the internet) there was no confidential data in this study. We are aware of possible bias, discrimination, privacy (possibility of infringing Intellectual Property Rights), misinformation, hallucinations, complacency, categorical/absolute statements, lack of nuance and environmental impacts that may emerge when using AI and have done our best to take these into account and avoid the harmful interference in the study. We as researchers are responsible for all errors that may occur due to the use of AI tools.

We used Science-based generative AI tools SciSpace AI (premium version) and Scite AI (personal version) to figure out the study field and to find gaps in existing research literature. We gave these AI tools the following prompt: *Search for scientific articles from the last ten years on risk communication related to animal health and welfare.*

The AI suggested some further articles in the field in addition to the research publications already listed by the SCAR Animal Health and Welfare Group, and we added these papers to the final list of papers (the 75 scientific articles altogether).

We analysed the 75 scientific articles and 5 guidelines with ChatGPT (version 5.3) and MS Copilot (version GPT 5.3). MS Copilot turned out to be the most useful and accurate in analysing the papers with a given question pattern. We used a prompt for MS Copilot based on the question pattern (Appendix 3).

We uploaded the papers (scientific articles and guidelines) one by one and ran the prompt in MS Copilot. At the same time, we read the abstract of each paper and manually checked if the Copilot answer matched the paper title, authors, publication details and content of the paper.

The Copilot answered promptly. However, if there were answers we did not expect (possible outliers), we double-checked the paper manually and made necessary small corrections to the prompt. When the prompt seemed to work correctly, we ran the prompt with each paper and filled in the excel sheet.

There was a minor curiosity in Copilot: as it “read” through the paper and answered the same question pattern multiple times in a row, the answers were not identical but might differ in minor details when considering the most interpretation-prone questions, e.g. 8. *What are the goals of risk communication in the article?* The differences between consequent runs were however small enough not to interfere with the task, and we made decisions when filling in the excel sheet by checking papers manually when needed. This seemed to be not an error but a characteristic of generative AI as we could not fix it by making corrections in the prompt.

When filling in the excel sheet, we made random manual checks in each question, going through approximately 20 % of the papers this way (checking one question per paper). Afterwards we read through approximately 5 % of the papers, answered the question

pattern manually and then compared our answers with the Copilot answers. Based on this cross-check, Copilot seemed to be accurate and reliable, sometimes even more careful and exact in answering the question pattern than us humans. The Copilot also offered arguments and visible deductive reasoning supporting the decisions it had made, and this made it easy to follow the reasoning of the AI and fix the prompt when needed.

Whenever Copilot suggested choosing option 'other' and gave specific justifications and answers for the question, we added those as a comment in the excel cell and later aggregated (Appendix 5) and analysed all 'other' descriptions.

3. Results

Distributions of the responses in the 13 questions are shown in Appendix 4.

3.1 Disciplines and topics

The study material belongs mostly to the disciplines of animal and human health sciences, communication science, sociology and psychology (chart 1). There are also some studies in political sciences, food sciences and other disciplines such as animal ethics, veterinary epidemiology, animal welfare, environmental health, economics and systems science (see appendix 5). Topics investigated include most often biosecurity measures, zoonoses, emerging infectious diseases, farm animal welfare and wildlife disease transmission. There are also studies on specific animal diseases such as avian influenza and African swine fever, vector-borne diseases, and antimicrobial resistance (chart 2), and a variety of other topics (listed in appendix 5). For breakout or crisis scenarios, mentions in the material appear inconsistent. Systematic studies on communication during disease outbreaks and rapid-response situations are few.

3.2 Target audience analysis

In approximately half of the articles studied, the target group is clearly defined, identified and analysed. Almost half of the studies focus on target group analysis, and the target group's trust in different information sources, the communication channels they use, their knowledge and need for information on the topic are taken into account in the target group analysis (chart 3).

While the reviewed studies often address targets such as scientists, policy makers, risk managers, veterinarians, farmers and regulators, many of them still acknowledge their audiences implicitly (chart 9). Systematic identification, segmentation, and analysis of target groups is rarely conducted. Only a few studies investigate what information different target groups actually need.

3.3 Methods and theoretical frameworks

Based on the coding system, the methods used in the reviewed studies are most often content analyses, systematic reviews, meta-analyses, surveys and interviews (chart 4). Yet the methodologies and techniques used are more diverse than the predefined coding scheme was able to fully capture, as can be seen in the large number of techniques coded

as 'other'. In particular, participatory approaches, workshops, narrative reviews, and modelling methods appear frequently (see appendix 5) but are used inconsistently.

Theoretical frameworks are especially fragmented in the material, as the most often coded option 'other' shows (chart 5). Many studies combine elements from participatory research, qualitative analysis, and modelling-based approaches, while others remain largely conceptual. Risk perception theory, social amplification of risk framework, and theory of planned behaviour gain some mentions but do not represent the majority of theoretical frameworks used.

3.4 Communication sources, channels, and content

Communication strategies, messages, tools, and sources vary widely. Identified sources of communication include e.g. international agencies, informal professional and stakeholder networks, digital platforms and operational emergency systems. Scientists, researchers and universities (i.e. academia) are most often mentioned. Also, associations, public health authorities, risk managers, policy makers and regulators are mentioned (chart 10), such as international standard-setting bodies (OIE, EFSA, FAO, WHO), among others (see appendix 5).

Communication channels vary widely, including e.g. events and outreach, educational materials, and public relations such as press releases (chart 11). Other tools for communication address e.g. internal communication systems, contingency plans, online training, advisory apps, and stakeholder dialogue tools (see appendix 5). It is also notable that not all studies reviewed report using tools or channels for communication.

Content messages in the material have rarely been pre-tested, or the language of the message has been adapted especially to the target audience. Only in a few studies does the message contain clear calls to action or has been clearly defined (chart 6). Content messages are often described implicitly rather than being clearly framed and documented. Therefore, assessing message consistency, clarity, or transferability across studies and contexts is not feasible.

3.5 Key areas and goals of risk communication

Not all studies reviewed have a clear key area of intervention or communication, but approximately one third of them cover areas of crisis communication, one third of consensus communication, and the rest consider care communication (chart 7). Almost every study reviewed has an educational goal of risk communication (chart 8). Half of the studies also mention behavioural, psychological, reputational, and contingency management as the goals of the communication. Administrative, advocacy-related and ethical goals are also often represented.

3.6 Intervention, monitoring and communication evaluation

Only four out of the 75 articles studied include clearly defined communication strategies with explicit interventions (see appendix 4, question 12). Where strategies are described, their scope and duration vary substantially (chart 13b).

In the four cases with intervention studies there are altogether eight ways of monitoring and communication evaluation mentioned as part of the strategy framework. Documented

intervention formats include short workshops, intensive intervention programmes and long-term piloting programmes (chart 13a).

3.7 Information left outside the coding scheme

When conducting the pilot test, there was a large number of choices that fall into the 'other' category. Notes describe findings not captured by the questionnaire categories. All supplements and notes added in 'other' options are listed in Appendix 5.

3.7.1 Disciplines

Main additional study disciplines were interdisciplinary one health and welfare; ethics including animal ethics, one health ethics, public-health ethics, value-laden communication; veterinary subfields such as veterinary epidemiology, veterinary education, veterinary public health; environmental domains, e.g. invasion biology, environmental policy, natural resource management, ecology, disease ecology; social sciences such as behavioural science, health psychology, agricultural economics, development studies; emergency and disaster management and ICS/NIMS frameworks; communication studies across public health, veterinary and environmental sector; and narrative, editorial, doctoral thesis classifications - papers that were not standard research articles.

3.7.2 Topics

Topics that fell outside the coding scheme were biosecurity beyond animals; risk perception, misinformation, and EU food safety governance; consumer behaviour; meat consumption, animal suffering and public attitudes; livestock disease management frameworks outside specific diseases; national eradication programmes including diagnostics and surveillance; communication during environmental crises and flood-related disease emergence; ethnoveterinary practices, traditional ecological knowledge; public engagement in invasive species management and biocontrol; veterinary occupational health, mental health, workload stress; and complex food-system modelling and environmental impacts.

3.7.3 Target audience analysis

The question of target audience analysis had no 'other' option, but the choices reveal this was the weakest area, often addressed indirectly but rarely implemented systematically. In most studies, target audience analysis was only partial (notes frequently highlighted 'partially', 'implicitly', and 'indirectly'), without performing a formal audience analysis. Common patterns were that studies often identified key stakeholders but did not analyse them systematically. Several papers highlighted trust dynamics, e.g., veterinarians as primary trusted sources, or low trust in authorities. Information gaps between expert and public perceptions were frequently noted. Some studies discussed risk perception conceptually, not as a measured variable. Specific crises such as bTB, ASF, Hendra, COVID-19 and flooding events revealed audience-specific communication challenges without structured analytical frameworks. Digital communities appeared as informal audiences not covered in the questionnaire.

3.7.4 Investigation techniques

The range of methods was far broader than the coding system could reach. Many 'other' choices indicated a wide range of methods, including participatory and deliberative methods; qualitative and conceptual analyses; quantitative or mixed methods; epidemiological and modelling approaches; and expert-model approaches.

3.7.5 Theoretical frameworks

The theoretical frameworks used in studies were fragmented, frequently combining participatory, qualitative, and modelling-based approaches, or included many conceptual discussions but no single guiding model. This was most evident in reviews which discuss several frameworks but do not explicitly apply any of those. A considerable number of papers had no single guiding framework, but synthesised multiple conceptual traditions.

The 'other' category captured a large set of theoretical frameworks, both formal and conceptual, including risk and communication theories; behavioural change theories; one health and governance frameworks; ethics frameworks; and other conceptual approaches.

3.7.6 Content messages, key areas of intervention, goals of risk communication

Communication strategies and messages in the material were rich and varied, involving international agencies, informal networks, digital platforms, and operational emergency systems. There was a widespread emphasis on two-way dialogue and stakeholder participation, trust-building strategies, policy co-creation and collaborative governance, and long-term capacity building instead of crisis-only action.

3.7.7 Target audiences

Additional target audience groups included NGOs, civil society organisations, wildlife professionals, abattoir workers, industry representatives, teachers, local and online communities, human health professionals, conservation organisations, extension officers and agricultural advisors, hunters, certification bodies, and residents near farms.

3.7.8 Communication sources

Information sources fields covered a wide spectrum of authorities, organisations, informal networks, international bodies, and technical systems. Sources not covered in predefined categories were international organisations, donor agencies, funding bodies, online platforms, social media networks, WhatsApp groups, peer networks, alert systems, and local government and community leaders. Scientific literature was often the only explicit source.

3.7.9 Tools

Communication tools frequently mentioned outside the coding scheme were contingency plans, SOPs, emergency frameworks, online training platforms, mobile apps for disease reporting, benchmarking tools, ethical matrix as a communication and policy tool, web portals, early warning systems, word clouds, risk maps, and advisory services delivered via veterinarians.

3.7.10 Interventions

Actual interventions in the studies were rare. Duration of the interventions and evaluations varied between multi-year programmes (e.g., bTB vaccination since 2018), ongoing or iterative evaluations (before/during/after), and retrospective media analyses across outbreak timelines. In conceptual papers there was no fixed intervention period.

4. Discussion

Risk communication in animal health and welfare is not purely technical (Renn 2008) but sits between **epidemiology and biosecurity systems**, and **human cognition, behaviour, attitudes and social systems**, including translating a complex biological risk into human decision-making contexts (Brennan 2013).

Across the analysed studies, risk communication research in animal health and welfare is characterised by considerable heterogeneity. Rather than forming a coherent, standardised research field, the literature consists of diverse approaches, objectives, and conceptualisations. Research spans multiple disciplines, but coverage remains uneven.

Animal health management takes place in social and local contexts where knowledge is interpreted and applied in different ways, and risk communication acts as a mediator between scientific knowledge and local practice (Enticott, 2012). Thus, all communication should be carefully targeted to the given audiences. According to our study, target audience analysis emerges as the weakest component across the reviewed material. **Audience analysis is recognised as essential, but poorly operationalised.** Systematic identification, segmentation, and analysis of target groups is rarely conducted. Only a few studies investigate what information different target groups actually need. In most cases audiences are treated as homogeneous. Audience needs, values, and information-processing characteristics are inferred rather than empirically examined, and audience engagement is indirect rather than participatory. This limits the ability of communication strategies to be tailored, relevant, and effective.

A notable feature is the dominance of non-empirical work in study material and the rarity of studies that include actual, implemented communication interventions. Empirical, field-based studies, controlled experiments, intervention studies and longitudinal field research are mostly missing. Many studies are conceptual, narrative, integrative, or policy-oriented, rather than focused on designing, implementing, and evaluating concrete risk communication interventions. Applied and impact-oriented research remains scarce. This hybridity suggests experimentation, but it also indicates the absence of widely accepted theoretical foundations for risk communication in this field. It reflects a broader weakness in assessing outcomes, impacts, and learning potential of communication efforts. Without robust evaluation mechanisms, the cumulative knowledge base on effective risk communication remains fragmented.

Based on the few intervention studies in this material, it is not possible to address shared standards regarding appropriate intervention length, intensity, or level of institutionalisation. There is no dominant model for designing communication strategies,

making comparison across studies difficult. Most of the literature studied discusses communication at a conceptual or strategic level without moving into practice. This gap limits evidence-based development of risk communication and constrains the ability to scale or adapt successful approaches.

The material discusses a variety of sociological and psychological approaches in communicating animal health and welfare issues. However, there is weak coverage of psychological drivers, decision-making processes and barriers to adopting recommendations. Behavioural science frameworks are used but not closely linked to risk communication in practice. Motivation, trust, and risk perception of the target audiences could have been more widely studied.

An overarching finding emerging from the research is that animal welfare is often overruled by animal health, or these are treated separately even though the principle of one welfare is mentioned in several studies. This has been the case even in the scientific literature of animal health and welfare for decades, as Fraser (2008) put it: animal welfare often remains as a secondary factor compared to first-hand measures of animal health, particularly so when discussing production animal medicine. In our data, there seems to be a gap in how health risks and welfare risks are communicated together in research, and in how trade-offs, e.g. disease control versus welfare impact, affect communication efficiency. Animal welfare is present but embedded within **risk management contexts**. Communication is driven by **threats such as disease, outbreaks, and system risks**.

Good risk communication is inherently **preventive and system-oriented**, not just awareness-raising (Slovic 2010). It should be grounded in **how people perceive risk**, not just objective risk; it should consider **trust networks and** address **information gaps (Fischhoff 2013)**. **Yet, according to our data, risk communication is often treated as information transfer rather than behaviour change with guiding decision-making under uncertainty.**

The large number of choices falling into the category 'other' (than indicated in the coding scheme) indicate that the research field was substantially more diverse than the coding scheme used. Notes and explanations of 'other' options shed light to the large amount of information that fell outside the coding scheme.

Communication strategies and messages in the material were richer and more varied than the questionnaire could capture. Messages were often implicitly described rather than formally defined. Papers described messages through context rather than as structured communication plans. Communications were sometimes embedded in policy letters, alerts, and surveillance notices. Calls to action existed but were not framed as explicit communication strategies. Communication was **heterogeneous and context-dependent, and** included both formal and informal channels. A good practice to communicate would combine **interpersonal communication**, institutional channels, and media and digital tools (Fischhoff 2013).

Common sources of information in the material were heavily **expert-driven and** dominated by institutional communication. However, trust is contextual; e.g. veterinarians are often the most important and trusted source of animal health and welfare related information for farmers (e.g. Brennan 2013). Thus, good risk communication from authorities and professionals to

animal owners and laymen must align **source credibility with audience trust, and leverage existing professional relationships (Moya 2025).**

In the material studied, there is a shortage of evidence-based evaluations of how risk communication actually affects farmer behaviour, veterinary decision-making and animal welfare outcomes. The data reveals strong awareness of behavioural and social factors in scientific literature, but weak implementation in practical research settings. The **current research shows** a descriptive, fragmented field, limited methodological rigour and implementation practices that could be utilized further in practice.

As a consequence, actionable evidence on what communication strategies work, for whom, and under what conditions remains limited. Applied, behaviour-focused research evaluating effectiveness of risk communication in improving animal health and welfare outcomes would add useful knowledge to communication plans and strategies in the future.

5. Summary of the key gaps identified

The gap analysis highlights the critical deficiencies in current risk communication research on animal health and welfare. The existing body of work is characterized by a strong predominance of conceptual and policy-oriented studies, while empirically tested communication interventions remain limited.

Target audience analysis is generally weak and inconsistently applied, which undermines the development of tailored and effective communication strategies. Theoretical frameworks are fragmented and methods are highly heterogeneous, making cumulative learning and comparison across studies difficult. In addition, monitoring and evaluation are addressed in a limited and largely unsystematic manner.

Communication messages themselves are more often implied than explicitly defined, which reduces transparency and accessibility. Overall, there is a clear scarcity of well-documented and rigorously evaluated communication interventions in the field.

These findings demonstrate the need for more systematic, audience-focused, and empirically grounded research to strengthen risk communication practices in the field.

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Analysis of what is lacking in animal health and welfare risk communication research

1. Animal health and welfare risk communication - Scientific literature and research gaps from the years 2015 to 2026

Risk communication is a core component of animal health management and public health preparedness. It encompasses the exchange of information about hazards, risks, and protective actions among scientists, policymakers, practitioners, animal owners, and the public. Effective risk communication influences biosecurity compliance, vaccination uptake, antimicrobial stewardship, and public trust in veterinary and public health systems.

Despite its recognized importance, particularly in the context of zoonotic disease outbreaks, antimicrobial resistance (AMR), and the One Health paradigm, the evidence base for risk communication in animal health and welfare remains fragmented.

The research field has grown substantially, particularly around zoonotic diseases, antimicrobial resistance (AMR), and veterinarian-farmer and veterinarian-owner communication. However, significant research gaps were found. The reviewed literature reveals that the field has matured in its qualitative and descriptive foundations but remains weak in experimental evidence, geographic diversity, and coverage of key animal categories and stakeholder groups. The AI assisted gap analysis describes what is missing in the research across six dimensions: animal categories, communication channels, stakeholder groups, geographic and cultural contexts, risk types and research methodology.

2. Material and methods

We used the premium version of SciSpace AI to find scientific articles from the last 10 years on animal health and welfare related communication and, based on these articles, describe what kind of research is lacking in the field. We used the following prompt: "Search for scientific articles from the last ten years on risk communication related to animal health and welfare. Based on these articles, describe what kind of research information is missing on risk communication in animal health and welfare." The search was done on 2.4.2026.

The SciSpace AI reported that it conducted a search across SciSpace, Google Scholar, PubMed, and ArXiv for scientific papers from 2015 to 2026 covering livestock, companion animals, wildlife, and aquaculture, including veterinarian-farmer and veterinarian-owner communication, public health messaging about zoonotic diseases, policy and regulatory risk communication, and media and public perception of animal disease outbreaks. The AI reported that it identified 330 unique peer-reviewed studies published between 2015 and 2026 on the field. The analysis of research gaps refers to 15 references listed in the reference list of this report.

3. Results

3.1 Well-studied themes

The following well-studied themes were found around animal health and welfare risk communication:

- 1) Zoonotic disease communication: Studies on Hendra virus, HPAI (avian influenza), rabies, SARS-CoV-2 and bovine tuberculosis (Laconi et al. 2023; Manyweathers 2017; Mendez et al. 2016; Osuagwu et al. 2025; Reaser et al. 2025).
- 2) Antimicrobial resistance (AMR): How AMR risk is communicated to farmers and veterinarians (Noordhuizen 2022; Sharma et al. 2022).
- 3) Veterinarian-client and veterinarian-farmer communication: Qualitative and survey-based studies explore barriers and facilitators in professional communication (Ciaravino et al. 2023; Μίχα 2025; Spence et al 2019).
- 4) Media and public perception: Content analyses and mixed-methods studies examine how animal diseases are framed in mass media and social media (EFSA 2026; Kim et al. 2025).
- 5) Biosecurity communication: Studies on poultry, dairy, and cattle farms address compliance with biosecurity protocols (Osuagwu et al. 2025; Reid 2018).

3.2 Research gaps

The following six research gaps were found around animal health and welfare risk communication:

Gap 1 - Underrepresented animal categories

Wildlife

Wildlife-associated disease communication is largely framed around risks to humans and rarely examines the effects of communication on conservation outcomes or public attitudes toward wildlife. Integrated wildlife-conservation messaging research is markedly absent. Studies on diseases such as HPAI and rabies in wildlife exist, but they focus primarily on detection and response rather than on how risk is communicated to communities living near wildlife or to conservation stakeholders (Reaser et al. 2025).

Aquaculture

No studies in the reviewed data specifically examined risk communication in aquaculture contexts. Given the economic significance of aquaculture globally and the recognized risks of disease outbreaks, this represents a critical and entirely unaddressed gap in the literature.

Horses and exotic pets

While a few studies address Hendra virus communication among horse owners (Laconi et al. 2023; Manyweathers 2017) and zoonosis risk communication for exotic pet owners (Arnecke et al. 2024), these remain a small and understudied fraction compared to livestock and companion animals (specially dogs and cats).

Animal welfare as a risk category

Animal welfare risks, distinct from disease risks, are frequently neglected in media and public messaging analyses. Media content research indicates that welfare concerns receive less systematic framing or communication compared to infectious disease risks (Kim et al. 2025). Research on how welfare risks are communicated to producers, policymakers, and the public is sparse.

Gap 2 – Weakly studied communication channels

Digital and social media interventions

While media content analyses document the prevalence of misinformation and crisis-focused framing in social media (EFSA 2026; Kim et al. 2025), very few studies have tested the effectiveness of digital communication interventions in changing animal health behaviors. AI-enabled monitoring and targeted digital strategies are proposed, but empirical intervention studies are limited (Kim et al. 2026).

Veterinarians as public communicators

Surveys consistently show that veterinarians are trusted by the public but are infrequently used as information sources for zoonoses outside the clinical encounter (Arnecke et al. 2024; Mendez et al. 2016). Research on how veterinarians can be supported to act as broader public health communicators, through media, community outreach, or digital platforms, is lacking.

Peer and industry networks in agriculture

Farmer studies show that informal peer networks and company technicians are often the primary source of animal health information in farming communities (Míxa 2025). Yet systematic evaluations of peer-based or industry-network communication channels are sparse, and little is known about how to harness or improve these informal networks.

Participatory and co-designed communication

Some authors recommend participatory meetings and locally co-designed communication approaches as more effective and acceptable than top-down messaging (Ciaravino et al. 2023). However, only a few pilot interventions have been documented and rigorously evaluated. The evidence base for participatory risk communication in animal health remains thin.

Multi-channel integrated strategies

Integrated communication packages combining veterinary consultation, mass media, social networks, and digital tools are advocated in literature but rarely tested as packaged interventions. Comparative effectiveness data for multi-channel strategies are essentially absent (Ciaravino et al. 2023; Kim et al. 2025; Noorhuizen 2022).

Gap 3 - Understudied stakeholder groups

Non-veterinary animal health workers

Animal health assistants, and allied workers appear in only a small number of studies (Sharma et al. 2022). Their communication roles, information needs, and training requirements in risk communication are poorly understood, despite their frontline importance in many low- and middle-income countries.

Policymakers and institutional actors

While policy failures (e.g., BSE/vCJD, foot-and-mouth disease) have been historically analyzed (Hueston 2013), empirical work evaluating how to communicate with policymakers, or how policymakers' messaging shapes stakeholder behavior, is limited. The mechanisms through which evidence is translated into policy communication are underexplored.

Vulnerable subgroups within the general public

Surveys include general public samples in a few contexts, but systematic segmentation of at-risk subgroups, such as immunocompromised individuals, children in households with animals, rural non-farm populations, or ethnic minorities with distinct human-animal interaction patterns, is largely absent. Tailored messaging evaluations for these groups are minimal (Mendez et al. 2016; Reaser et al. 2025).

Children and youth

No studies were found in the data that specifically examined risk communication strategies targeting children or young people, despite their frequent contact with animals and their role as future animal owners, farmers, and veterinary professionals.

Gap 4 - Missing geographic and cultural contexts

Concentration in high-income countries

The majority of empirical studies originate from Europe (Italy, Germany, UK, Spain, France), Australia, and North America (Laconi et al. 2023; Mendez et al. 2016; Míxa 2025; Osuagwu et al. 2025; Spence et al. 2019). This geographic concentration limits the generalizability of findings and leaves major global animal-producing regions, such as Sub-Saharan Africa, South and Southeast Asia, and Latin America, poorly represented.

Limited low- and middle-income country (LMIC) research

Some intervention research exists in LMICs, e.g., India (Sharma et al. 2022), transdisciplinary projects on wildlife trade (Reaser et al. 2025), but these represent a small fraction of the data. Risk communication in contexts with limited veterinary infrastructure, high human-animal interface, and significant zoonotic disease burden is understudied.

Cultural cognition and ideological framing

Political ideology and cultural worldviews influence receptivity to zoonotic disease messaging. However, the broader application of cultural cognition theory to animal health risk communication is limited. Cross-cultural comparative studies on message effectiveness are essentially absent.

Indigenous and traditional knowledge systems

No studies were found that addressed how risk communication can be integrated with or respectful of indigenous or traditional knowledge systems regarding animal health. Despite the importance of such integration for effective communication in many regions globally.

Gap 5 – Underexplored risk types

Antimicrobial resistance (AMR) communication

AMR communication has received growing attention (Noorhuizen 2022; Sharma et al. 2022), but the evidence on what messages work for different audiences (farmers vs. veterinarians vs. the public) remains limited. Studies on AMR communication to the general public about animal-sourced AMR are particularly scarce.

Emerging and re-emerging diseases

Studies on HPAI, Hendra, and COVID-19 in animals exist, but authors call for more context-sensitive communication research around emerging disease events, particularly on how uncertainty is communicated and how trust is maintained during rapidly evolving outbreaks (Osuagwu et al. 2025; Reaser et al. 2025; Reid 2018).

Non-infectious animal health risks

Non-infectious risks, such as metabolic diseases, production diseases, and chronic welfare conditions in farmed animals, receive little attention in risk communication research. Communication strategies for these less dramatic but economically and welfare-significant conditions are understudied.

Climate change and animal health

The intersection of climate change, shifting disease distributions, and animal health risk communication is almost entirely absent from the reviewed literature, representing a significant emerging gap.

 Food safety linked to animal health

While some studies may touch on zoonoses with food safety implications, dedicated research on communicating animal-health-related food safety risks (e.g., residues, foodborne pathogens, production practices) to consumers is limited.

Gap 6 – Methodological weaknesses

 Dominance of cross-sectional and qualitative designs

The literature relies heavily on surveys, qualitative interviews, and content analyses that describe perceptions and barriers but rarely test causal effects of communication strategies on behavior (Ciaravino et al. 2023; Kim et al. 2025; Μίχα 2025). Longitudinal and experimental designs are underrepresented.

 Scarcity of rigorous intervention trials

Pilot interventions and educational meetings demonstrate knowledge gains, but randomized controlled trials or quasi-experimental designs demonstrating sustained behavior change (e.g., improved biosecurity, reduced AMR use, increased vaccination) are scarce (Ciaravino et al. 2023; Sharma et al. 2022).

 Limited measurement of downstream outcomes

Most studies measure awareness, perceptions or self-reported intentions. Fewer measure concrete behavioral outcomes such as vaccination uptake rates, antimicrobial prescribing changes or sustained biosecurity adoption (Μίχα 2025; Noorhuizen 2022; Spence et al. 2019).

 Insufficient message framing experiments

Use of controlled framing trials across stakeholder segments is limited. How best to frame messages for diverse audiences (e.g., gain vs. loss framing, emotional vs. rational appeals) remains underexplored.

 Lack of implementation and scalability research

Transdisciplinary and community projects report practical lessons, but formal implementation science research—examining how to scale, sustain, and govern effective risk communication interventions—is largely absent (Ciaravino et al. 2023).

 Absence of economic evaluations

No studies were found that conducted cost-effectiveness or cost-benefit analyses of risk communication interventions in animal health. This gap hinders evidence-based resource allocation for communication programs.

Research questions for a possible agenda in animal health and welfare risk communication

As discussed in the previous sessions of this report, the gap analysis has identified critical deficiencies in animal health and welfare risk communication research that can be categorized as follows:

- ✦ underrepresentation of certain animal categories (wildlife, aquaculture)
- ✦ geographic concentration in high-income countries
- ✦ underexplored risk types
- ✦ lack of empirical interventions
- ✦ weak target audience analysis and missing stakeholder groups (non-veterinary workers, children)
- ✦ fragmented theoretical frameworks
- ✦ poor monitoring/evaluation
- ✦ and methodological weaknesses (dominance of cross-sectional designs, scarcity of RCTs).

Accordingly, research questions should fall within this suggested roadmap

- ✦ Empirical deficit: Move beyond conceptual and policy-oriented studies toward tested interventions
- ✦ Weak target audience analysis: Prioritize systematic segmentation and formative research
- ✦ Methodological fragmentation: Encourage experimental, longitudinal, and comparative designs
- ✦ Coverage gaps: Extend research to neglected animal categories (wildlife, aquaculture), geographic regions (LMICs), and stakeholder groups (non-veterinary workers, children)
- ✦ Missing evaluation: Build in monitoring, evaluation metrics, and economic analyses.

Based on the theory and practice behind good risk communication, that identify source and trust, message and language, target, and tools as building blocks for effective communication strategies, the identified gaps have been translated into actionable research questions, specifically tailored for animal health and welfare contexts.

Source and trust

Gaps addressed: veterinarian as underutilized public communicator (Gap 2), missing LMIC research (Gap 4)

The “trust” of a target into a source of information plays a fundamental role. Main levers for increasing trust are:

- ✦ Perceived competence
- ✦ Honesty and transparency
- ✦ Consistency over time
- ✦ Similarity with the audience
- ✦ Social validation
- ✦ Quality of argumentation

In risk communication, to identify the most effective source of messages (i.e., “who should speak”) choosing an intuitively authoritative profile is not enough: a structured, comparative research that tests different sources against your target audience is needed.

There's no universally best source. You must evaluate:

- ✦ coherence → is the source suitable for that risk?
- ✦ perceived legitimacy → does it have the right to speak?
- ✦ timing → emergency vs. prevention
- ✦ polarization → some sources may trigger resistance

Fundamental role is the “trust” of target into source and the main levers for increasing trust are:

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- ✦ Honesty and transparency
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- ✦ Similarity with the audience
- ✦ Social validation
- ✦ Quality of argumentation

Research areas to be explored with the aim of identifying the best trusted source are:

1. Analysis for typing risk and the target

Before testing sources, the following aspects should be clarified:

- ✦ nature of the risk (health, environmental, technological, etc.)
- ✦ level of target involvement (high vs. low)
- ✦ pre-existing trust in institutions

This is because the choice of source varies greatly: for example, in the healthcare field, experts often work, but in polarized contexts, a peer may work better.

2. Define possible “candidate sources”

A set of sources to test has to be defined, for example:

- ✦ experts (doctors, scientists)

- ✎ institutions
- ✎ influencers or communicators
- ✎ peers (people similar to the target)
- ✎ testimonials with direct experience

Here, the classic dimensions of credibility studied by Carl Hovland come into play:

- ✎ expertise
- ✎ trustworthiness
- ✎ perceived intentions

3. Analyze trust and social influence?

Integrate metrics related to:

- ✎ reputation (reviews, consensus)
- ✎ media exposure
- ✎ social proof dynamics (e.g., "everyone's saying it")

Useful tools:

- ✎ large-scale surveys
- ✎ social listening
- ✎ network analysis (who influences whom)

Research questions

The optimal source

- ✎ What type of source maximizes the target audience's trust in risk communication?
- ✎ Does the ideal source vary depending on the type of risk (health, environmental, technological)?
- ✎ Is a combination of sources (expert + peer) more effective than a single source?

Psychological mechanisms of effectiveness

- ✎ Which dimensions of credibility (competence, trustworthiness, benevolence) most influence source effectiveness?
- ✎ How does the perception of the sender's intentions affect acceptance of the risk message?
- ✎ What factors activate central vs. peripheral processing in source evaluation?

Context and moderators

- ✎ How does source effectiveness vary based on the target's level of institutional trust?
- ✎ Does the degree of urgency of the risk affect source preference?
- ✎ Does social polarization reduce the effectiveness of institutional sources?

Digital environment and media

- ✿ Are digital sources (influencers, creators) perceived as more credible than traditional sources?
- ✿ How does the platform (social vs. institutional) affect the source's credibility?
- ✿ Does the number of interactions (likes, shares) increase trust in the source?

Trust, reputation, and social proof

- ✿ How does a source's prior reputation influence the effectiveness of risk messages?
- ✿ What role does social proof play in selecting the most credible source?
- ✿ Do multiple endorsements increase trust or generate scepticism?

Temporal dynamics

- ✿ How does trust in the source evolve over time during a crisis?
- ✿ Does repeating the same message from the same source increase or decrease effectiveness?
- ✿ Are different sources more effective at different stages (prevention vs. emergency)?

Hybrid and multimodal strategies

- ✿ Which combinations of sources produce the best results (e.g. expert + testimonial + institution)?
- ✿ Does the sequence of sources (i.e. who speaks first) influence overall effectiveness?
- ✿ Does integrating sources increase understanding or cause confusion?

Outcomes and effectiveness metrics

- ✿ Which source maximizes not only trust but also behavioral change?
- ✿ Is there a trade-off between perceived credibility and persuasiveness?
- ✿ Which metrics are best suited to assessing a source's effectiveness in risk communication?

Message and language

Gaps addressed: animal welfare neglected risks (Gap 1), limited framing experiments (Gap 6).

Structuring a proper risk communication message requires more than just "saying the right things": it requires a balance between accuracy, comprehensibility, and behavioral activation. A too technical message will not be understood; a too simplified one can be misleading or lack credibility.

During a risk communication campaign, sometimes it is preferable to sacrifice the clarity of a message compared to its impact and its ability to penetrate the segment of the population identified as the target. To make these choices consciously, research certainly guides towards more effective communication that is suited to your final purpose.

An effective risk communication message:

- ✦ reduces ambiguity
- ✦ does not unnecessarily amplify fear
- ✦ clearly states what to do
- ✦ uses language tailored to the target audience

Above all, a message must be empirically tested to test its effectiveness.

The following research areas are useful to structure of an effective risk communication message:

1. Clear and contextualized opening - Avoid ambiguity and abstraction

- ✦ What is the risk?
- ✦ Why does it concern the recipient?

2. Explanation of the risk - Translate the technical data into concrete examples

- ✦ What can happen
- ✦ How likely it is (if possible)
- ✦ With what consequences

3. Balanced assessment (without alarmism)

- ✦ Avoid both minimization and catastrophizing
- ✦ Introduce uncertainty transparently

4. Operational instructions (what to do)

- ✦ Clear, practical, feasible actions
- ✦ Priorities (what to do now vs. later)

5. Strengthening self-efficacy

- ✦ The recipient must feel capable of taking action
- ✦ Show that the action is useful

6. Consistency with the target audience

- ✦ Literacy level
- ✦ Values and cultural context
- ✦ Social distance or proximity

Research questions

Clarity and comprehensibility

- ✦ What level of simplification maximizes comprehension without reducing accuracy?
- ✦ Does the use of concrete examples improve risk understanding compared to numerical data?
- ✦ How does text structure affect comprehension (sequential vs. narrative)?

Language and target adaptation

- ✎ Which language style (formal vs. informal) is most effective for different audiences?
- ✎ Does the use of technical terms reduce trust or increase credibility?
- ✎ How can the message be adapted to different literacy levels?

Risk framing

- ✎ Is positive (prevention) or negative (loss) framing more effective in promoting behaviour?
- ✎ Do fear-based messages elicit action or avoidance?
- ✎ What is the optimal level of emotional intensity?

Communicating uncertainty

- ✎ Does making uncertainty explicit increase or decrease trust in the message?
- ✎ Which ways of presenting uncertainty are most understandable?
- ✎ Does the target audience correctly interpret probabilities?

Message actionability

- ✎ What characteristics make a message more actionable?
- ✎ Messages with specific instructions produce more behavioural change?
- ✎ How many actions is it effective to communicate without creating overload?

Self-efficacy and empowerment

- ✎ How much does the perception of self-efficacy influence behavioural adoption?
- ✎ Are messages that emphasize the ability to act more effective than informative ones?
- ✎ Are the most comprehensible messages also the most effective in the long run?

Trust and communicative tone

- ✎ Which linguistic elements increase the perception of honesty and transparency?
- ✎ Does an empathetic tone improve message reception?
- ✎ Is neutrality more effective than value-based communication?

Consistency and repetition

- ✎ Does message repetition improve comprehension or lead to saturation?
- ✎ Do consistent messages over time increase trust?

Target

Gaps addressed: understudied stakeholder groups (Gap 3)

To communicate risk effectively, the challenge is not just what to say, but who to say it to first and in what form. There is no universally best target: priority segments (most exposed, most impressionable, or most influential) need to be identified and messages tailored to their cognitive and social patterns.

A research phase must focus on exploring latent needs, that is, identifying real needs beyond the stated ones. Drawing on approaches from market research, consumer psychology, and user experience can help at this stage. Methods must be employed to uncover what the target isn't saying. It will then be important to discover the motivations

that actually drive the target's choices and how emotions and rationality influence perceived needs.

For effective risk communication campaigns, it is often more important to segment based on needs than to segment the target audience's socio-demographic profile, perhaps identifying highly relevant micro-segments. Therefore, research should be conducted using mixed methods to identify the target audience's needs, integrating qualitative and quantitative methods.

Research often shows that the ideal target is not the one most at risk, but the one most actionable or influential and that target, source, and message should be designed together, not separately.

The most effective message combines:

- ✦ clarity
- ✦ concrete actions
- ✦ consistency with the target's values

Main research areas are:

1. Identify the priority target

Segmentation based on:

- ✦ Vulnerability to risk
- ✦ Agency
- ✦ Social role (influence on others)

*2. Psychographic and Cognitive Segmentation - **going beyond demographics***

Segmentation of the target audience based on:

- ✦ Risk Perception
- ✦ Cognitive Biases
- ✦ Attitudes Toward Institutions
- ✦ Connections with Social Psychology

*3. Social Dynamics and Networks of Influence - **the target is a strategic node, not an isolated individual***

- ✦ Network Analysis: opinion leaders, social hubs, diffusion dynamics

4. Trust and relationship with the source

- ✦ Interaction between: target, source, context

5. Identify the most appropriate message - content, tone, structure

Systematic testing of message variations on the target audience:

- ✦ Framing (positive vs. negative)
- ✦ Tone (alarmist vs. reassuring)
- ✦ Level of detail

Research questions

Priority target

- ✿ Which segments are most likely to change their behaviour in response to a risk message?
- ✿ Is it more effective to communicate with the most vulnerable or the most socially influential individuals?
- ✿ What characteristics predict receptivity to the message (trust, literacy, experience)?

Segmentation

- ✿ How does risk perception vary among different psychological profiles?
- ✿ What biases (unrealistic optimism, denial) influence message reception?
- ✿ Do segments with high institutional distrust require different communication strategies?

Network Analysis

- ✿ How does preventive behaviour spread within a network?
- ✿ Who are the key players that amplify or block the spread of the message?
- ✿ Is targeting a few influential nodes more effective than reaching many individuals?

Trust and relationship with the source

- ✿ Which targets respond better to expert sources versus "similar" sources?
- ✿ Does prior trust in the system influence the selection of priority targets?
- ✿ Is there an optimal fit between segment and broadcaster type?

Identifying the most appropriate message

- ✿ What type of framing maximizes understanding and action across different segments?
- ✿ Are fear-based or efficacy-based (what-to-do) messages more effective?
- ✿ Do adaptive messages reduce resistance and misinformation?
- ✿ How much information detail is optimal for each target audience?

Context

- ✿ Does the priority target change between the prevention phase and the crisis phase?
- ✿ How does context influence risk perception and message effectiveness?
- ✿ Are different messages needed in high- versus low-urgency contexts?

Integrated methodological approaches

- ✿ Which combination of methods best identifies the target audience and the effective message?
- ✿ Do declarative or behavioural data better predict effectiveness?
- ✿ Is the most reactive target also that one that changes behaviour in the long term?

Tools

Gaps addressed: untested digital/social media interventions, unevaluated multi-channels strategies (Gap 2)

There's no single "best tool": effectiveness depends on the target, context, type of risk, and objective (informing vs. inducing action). Useful research, therefore, is comparative and situational.

Research often shows us that the most effective tools are hybrid (multi-format + multi-channel) and that effectiveness depends more on targeting than on the tool itself. Furthermore, interactive and personalized tools are promising, but not always scalable. Lastly, and no less crucial, trust in the channel can be as crucial as the content.

Therefore, studies for each situation are necessary to identify the best tools to best express the identified communication strategies.

Main areas of research focus on:

1. Communication channels

Comparison between channels:

- ✦ social media
- ✦ traditional media (TV, radio)
- ✦ institutional websites
- ✦ direct messaging (SMS, apps)
- ✦ combined use of tools

2. Content format (how the message is presented)

Comparison between, e.g.:

- ✦ text
- ✦ video
- ✦ infographics
- ✦ animations

3. Channel trust and credibility

- ✦ Relationship between tools and perception of trustworthiness

4. Interactivity and Engagement

Interactive tools:

- ✦ Chatbot
- ✦ Risk Simulators
- ✦ Quizzes

Personalization and adaptability - tools that adapt to the user:

- ✦ Personalized Notifications
- ✦ Dynamic Content
- ✦ Behavioural Data-Based Systems

5. Accessibility and inclusion

Tools for different levels of:

- ✦ Literacy
- ✦ Digital Competence
- ✦ Language

6. Timeliness and Frequency

Tool timing:

- ✦ Real-time notifications

- Periodic communications

Research questions

Channels

- Which channels maximize risk understanding among different population segments?
- Is social media more effective than institutional channels in promoting preventive behaviour?
- Does multi-channel communication increase effectiveness or create confusion?
- Which tools facilitate central message processing?
- Which combinations of tools produce the best results?

Format

- Does visual content improve risk understanding compared to text?
- Short videos or long-form content: which format is more effective for behaviour change?
- Do infographics reduce probability interpretation errors?
- Does format affect comprehension or engagement?

Tools' credibility and trust

- Are institutional channels perceived as more credible than social media?
- Does the platform influence trust regardless of content?
- How does the tool's credibility vary based on the target audience?

Involvement and interactivity

- Do interactive tools increase risk understanding?
- Does active engagement improve retention and action?
- What is the optimal level of interactivity?

Personalization and adaptability

- Are personalized tools more effective than standardized ones?
- What data best improves message adaptation?
- Does personalization reduce resistance and misinformation?
- Which tools facilitate central message processing?

Accessibility and inclusion

- Which tools are most effective for low-literacy audiences?
- Does format accessibility influence more than content?
- How to design inclusive tools without losing accuracy
- Which tools produce lasting effects?

Timing

- What is the optimal timing to maximize effectiveness?
- Do frequent notifications increase attention or generate saturation?
- Do real-time tools improve risk response?

Analysis of good risk communication guidelines

1. Good animal health and welfare risk communication according to guideline documents

We reviewed what constitutes good risk communication for animal health and welfare based on eight agreed guideline documents. The guidelines documents are listed at the Appendix 1 of this report.

The basic elements of good risk communication were found in all documents. WHO and FAO (2016), summarises good risk communication as a reliable, two-way, audience-tailored and coordinated communication process that is open and transparent, timely and responsive, addresses risk perceptions and technical evidence, communicates uncertainty early and clearly, offers practical actions to reduce risk, and is continuously monitored and evaluated to ensure that messages adapt as the situation and public concerns evolve. The above-mentioned issues were identified in each of the eight documents as important good practices for risk communication.

The eight documents had a slightly different emphasis on best practices and benchmarks for good risk communication in the sector. Most documents focused on animal health, while animal welfare was maybe mentioned but given less emphasis. One document focused on human health risk communication (WHO, 2017), one on outbreak communication (WHO, 2005) and one on environmental health communication (CDC, 2018). One of the documents (CDC, 2024) was a website that consisted of several clear fact sheets and graphics explaining the One Health concept. All documents had at least indirect links to animal health communication. This chapter summarises the good practices and benchmarks for animal health and welfare risk communication from the eight documents reviewed.

2. Methods

We used AI to analyse the guideline documents and loaded the documents into MS Copilot one by one and asked the AI to stay with the loaded document in its response. For CDC (2024) the AI prompt was not used.

We used the following prompt:

Based only on the attached document, please describe what good a) environmental health (CDC, 2018), b) animal health and welfare (EFSA, 2017; USDA, 2022; OIE and WHO, 2015; WHO and FAO, 2016), c) health (WHO, 2017), d) outbreak (WHO, 2005) risk communication looks like? What are the recommendations, best practices and benchmarks for good a) health (CDC, 2018; WHO, 2017), b) animal health and welfare

(EFSA, 2017; USDA, 2022, OIE and WHO, 2015; WHO and FAO, 2016), c) outbreak (WHO, 2005) risk communication?

3. Results

3.1 Good environmental health risk communication (CDC, 2018)

Good environmental health risk communication according to the Centers for Disease Control and Prevention U.S. Health Communication Playbook (CDC, 2018) is a message-driven, audience-centered, plain-language, visually clear, action-oriented, transparent and trust-building approach. Good communication is implemented through the following formats: fact sheets, websites, social media, videos, media materials and interviews. Communication is planned and evaluated.

Benchmarks for good risk communication

Message

- ✎ Use maximum 3 key messages, each 1–2 sentences, that are memorable, consistent, audience-tailored and jargon-free. Use less than 5 talking points per message, that are data-supported, specific and easy to understand.

Readability

- ✎ Use maximum 20 word sentences, recurs across products. Use story paragraphs maximum 5 sentences and web paragraphs maximum 3 lines.

Design and layout

- ✎ Use web font minimum 16 pt, print minimum 12 pt and line height 140–160 %. Avoid capitals and italics overuse. Use white space, paragraphs, headings, bullet points and visuals support. Don't rely on color alone for risk cues.

Product length

- ✎ Fact sheet 1–2 pages, include at least one clear action item
- ✎ Press release maximum 2 pages, most important info in first 2 paragraphs
- ✎ Media advisory about 1 page
- ✎ Video 1–3 minutes, main message in first 30 seconds, must also operate without sound

Interview and spokesperson

- ✎ Use maximum 3 key messages, maximum 9 words and 3 facts each. Answer in 10–15 seconds and repeat key messages about 3 times.

Update and evaluation

- ✎ Include last updated date to webpage, maintain schedule and working links. For social media and video use platform analytics: views, engagement, follower change, comments and questions to evaluate performance.

3.2 One Health communication graphics (CDC, 2024)

Centers for Disease Control and Prevention U.S. One Health Communication Resources (CDC, 2024) includes communication graphics explaining the One Health concept and content, such as fact sheets, brochures, social media banners and infographics. One of the documents is a colouring book for children with the One Health theme.

3.3 Good animal welfare risk communication (EFSA, 2017)

According to European Food Safety Authority's When food is cooking up a storm publication (EFSA, 2017) communication on controversial, high-interest animal welfare topics requires a proactive, transparent, and consistent approach that emphasizes trust-building, clear delineation of roles, genuine stakeholder engagement, and accessible, layered information delivery.

Assume high interest and strong opinions, plan communications proactively

- ✿ Novelty, diverging scientific, political, stakeholder opinions and high public concern increase sensitivity and require coherent messaging.
- ✿ Decide on the level of communication using the logic of impact vs. interest. Controversial animal welfare measures often resemble low public health impact & high public interest or high impact & high interest scenarios.

Protect trust

- ✿ Publish assessments and supporting materials openly for stakeholders to scrutinise.
- ✿ Explain transparently how decisions are made and clearly communicate uncertainty and its implications.
- ✿ Demonstrate independence from vested interests. This is critical, as debates about ethics and animal welfare are heated.
- ✿ Early communication is important, as gaps in communication increase concerns.

Define scope and responsibilities, reduce confusion

- ✿ Clearly state what your organization can and cannot address (e.g. scientific risk vs. ethical and social issues). Controversial topics often extend beyond the scope of responsibility.

Two-way engagement model (not through media)

- ✿ Run public consultations where feedback will genuinely be used to shape outputs. Avoid consultations if feedback isn't considered.
- ✿ Use meetings and workshops for sensitive issues where debate and informed decisions are required.
- ✿ Use partner and stakeholder networks to listen, build relationships, and enable forward dissemination.

Layered, empathetic and practical content pattern

- ✿ Provide layered outputs: web hub + FAQs + plain-language summary + technical opinion. Keep language understandable and usable.

- ✿ Anticipate and answer the recurring public questions: what is the risk, what will be done, what can and what should I do?
- ✿ If actions affect animals directly, address welfare impacts explicitly and respectfully. Transparency and respect matter in emotive animal welfare contexts.

Channel choices for contested issues

- ✿ Use media engagement proactively for high-profile issues (briefings, clear background materials) while avoiding sensationalism.
- ✿ Use blogs and social media only if you have resources for real dialogue. One-way use is inappropriate.
- ✿ Anchor everything on the website for full context and accessible layered content.

Measure success and adapt

- ✿ Build evaluation and adjustment into the programme: feedback + monitoring + iteration.

3.4 Good animal health and welfare risk communication (USDA, 2022)

United States Department of Agriculture, Animal and Plant Health Inspection Service (USDA, 2022) defines in their Foreign Animal Disease Preparedness & Response Plan that effective animal health and welfare risk communication is pre-planned and protocol-driven, integrated within incident management systems to enable shared situational awareness and timely decision-making, while remaining transparent, accurate, audience-targeted, and coordinated across roles throughout the entire outbreak lifecycle, ensuring not only clear communication of disease control restrictions but also how animal welfare is safeguarded during these measures.

Good animal health and welfare risk communication is

- ✿ Prepared and protocol-driven, established before outbreaks
- ✿ Integrated across ICS (Incident Command System), enabling common awareness and timely decisions
- ✿ Transparent, timely, accurate, designed to reduce panic and economic harm
- ✿ Audience-targeted and compliance-oriented, keeping public, industry, and trading partners informed
- ✿ Role-clear and coordinated
- ✿ Lifecycle-based, sustained from initial detection through recovery

When communicating risks related to animal welfare, it must be ensured that communication covers not only the restrictions resulting from the control of a potential disease, but also how the welfare of the animals is ensured during the restrictions.

3.5 Good animal health and welfare risk communication (OIE and WHO, 2015)

Effective animal health and welfare risk communication according to World Organisation for Animal Health and World Health Organization Communication Handbook Veterinary

Services (OIE and WHO, 2015) is a strategic, audience-centred process that defines a clear outcome in advance, delivers concise and relevant messages tailored to audience needs and perceptions of risk, builds trust through transparency and empathy, promotes actionable guidance, and is systematically embedded into veterinary operations with defined structures, capacity and continuous evaluation.

Good animal health and welfare risk communication

- ✿ Is designed to achieve a specific, audience-centered change, not just informing, by defining a Single Overarching Communications Outcome (SOCO) before any messaging begins.
- ✿ Gets to the point quickly, then layers supporting information in decreasing order of relevance to the audience.
- ✿ Starts from a real understanding of the audience, their needs, motivations, attention limits, and the environment of information overload and mistrust. Then selects channels, language level, and message complexity accordingly.
- ✿ Treats risk as both hazard + outrage (technical danger plus emotional engagement) and chooses the communication approach based on where the situation is between these four strategy types.
- ✿ Builds and protects trust through transparency, credibility, empathy and caring, consistency, honesty and timely updates. Especially during outbreaks and crises when uncertainty is high.
- ✿ Is actionable, gives people something to do, making risk feel more controllable and improving retention and compliance.
- ✿ Is operationally embedded in Veterinary Services, supported by authority, structures, resources, plans, monitoring and revision rather than being an ad hoc activity during emergencies only.

A set of benchmarks to judge whether risk communication is good

Strategy and intent

- ✿ SOCO (Single Overarching Communications Outcome) exists and is audience-outcome focused, time-limited and realistic.
- ✿ Message leads with the point and returns to it.

Audience fit

- ✿ Stakeholder analysis is completed and periodically reviewed. Targets are selected based on influence, energy and reach.
- ✿ Message design respects retention limits: maximum 5 items, ideally 3 key things.
- ✿ Risk-method fit
- ✿ Situation mapped on hazard vs outrage. Strategy is chosen accordingly (education / precaution advocacy / outrage management / crisis comms).
- ✿ Trust, credibility and empathy addressed alongside technical facts.
- ✿ Product and message quality
- ✿ Passes the 7 Cs checklist (attention, clarity, benefit, consistency, heart+head, trust, call to action).

- Uses storyline (problem → solution → VS response) and 3 talking points with supporting evidence.

Media readiness

- Spokespersons follow golden rules (no lying, no speculation, no no comment, plain language).
- Uses bridging, blocking, flagging, enumerating techniques. Avoids repeating negative accusations.
- Sound bites meet 27/9/3, plain language, action and emotion, rehearsed.
- Operational capacity
- Communication systems exist with authority, structures, focal point, staffing, training, budget and equipment.
- Strategic plan monitored and reviewed with measurable performance objectives. Operational plans define audience, objectives, activities and timeline.

10 golden rules for dealing with media

1. Never lie
2. Never say "No comment"
3. No "off the record"
4. Be short, get to the point, think of audience
5. Stay calm, confident, in charge
6. Use simple language and avoid jargon
7. Be human, smile when appropriate
8. It's OK to say I don't know, but I'll find out
9. Do not speculate
10. Beware reporters' tactics

3.6 Good health communication (WHO, 2017)

The World Health Organization Guideline for Emergency Risk Communication Policy and Practice (WHO, 2017) outlines best practices in health communication and emphasizes building trust through transparency, clear and timely communication, community engagement, facility preparedness, strategic planning, integrated media use, actionable messaging, and continuous evaluation.

Checklist for best practices in health communication

- Build and maintain trust through transparency, timeliness, clarity, multiple channels, and linkage to services people can access.
- State uncertainty explicitly (what is known, not known) to prevent confusion and erosion of trust.
- Engage communities early and continuously, via trusted community figures and shared decision-making. Listen and create feedback loops.
- Institutionalize ERC leadership role, defined responsibilities, cross-sector networks, tailored information systems, trained workforce, and a sustained budget. ERC = Emergency Risk Communication as an intervention carried out before, during, and after

an emergency so that people at risk can make informed decisions to protect themselves, their families, and communities.

- ✿ Plan strategically before crises: participatory, context-sensitive, multi-channel, adaptable, and integrated with monitoring and evaluation.
- ✿ Use integrated media ecosystems (traditional + social), including rumour monitoring and myth-busting as part of the strategy.
- ✿ Design messages for action: non-technical language, early and consistent, with realistic protective steps. Pretest culturally and revise as events evolve.

A research recommendation

WHO (2017) marks research needs to identify the best mechanisms for rapid evaluation and for incorporating evaluation findings and stakeholder and community feedback into ongoing and future responses (i.e., building an effective feedback loop). The WHO (2017) document also lists commonly used data-gathering tools (not endorsed as best, because evidence is insufficient): focus groups, interviews, surveys, participatory approaches, media and social media monitoring, website monitoring and case studies, used across preparedness and response and recovery phases.

3.7 Good outbreak communication (WHO, 2005)

According to the World Health Organization Outbreak Communication Guidelines (WHO, 2005) good outbreak communication is early, transparent and trust building dialogue with the public. Communication is integrated into outbreak management so that people understand what is known and unknown, see how decisions are made, and know what actions to take, enabling rapid containment with minimal social disruption.

Trust

Trust is the overriding goal across cultures and political systems. Communicate in ways that build, maintain or restore trust. When trust is low people become more afraid and less likely to follow instructions. Prepare leadership for counter trust builders, such as acknowledging uncertainty and avoiding excessive reassurance. Build internal trust among the trust triangle: communicators, policy makers and technical enablers, ideally beforehand. Establish accountability, involvement, and transparency mechanisms. Let even critics observe and participate. Assume the public can tolerate incomplete and alarming information. Panic is rare when people are candidly informed. In practice, give steady, candid updates that respect the public, show how decisions are made, and demonstrate competence while being honest about unknowns.

Announce early

Announce as early as possible, because outbreaks are hard to keep hidden and early framing helps prevent rumours and misinformation. Recognize that the first official announcement is pivotal, it sets the parameters of trust through timing, candour and comprehensiveness. Announce when public behaviour can reduce risk or aid containment. Do not use the small size of the outbreak or lack of information as reasons to delay communication. If information is incomplete or may change, say so explicitly.

Acknowledge that early information can be revised as verification proceeds. Reduce partner surprise by building and testing communication pathways among key stakeholders. In practice, give a timely first briefing that states what is known, what is unknown, what is being done to find out, and what the public should do now, without pretending certainty.

Transparency

Maintain trust by being transparent, candid, easily understood, complete, and factually accurate. Let the public view the information gathering, risk assessing, and decision making processes. Use transparency to show systematic progress even amid uncertainty and unknowns. Aim for total candour as the operational goal, while balancing privacy and individual rights against the public good. If you set limits to transparency, announce and justify them publicly. This is generally tolerated if justified, unnecessary secrecy risks loss of trust. Don't let economic arguments override health priorities. WHO notes evidence that economic recovery can be faster when governments are transparent and manage outbreaks effectively. Build capacity for transparency. Media preparation should be part of professional development, focused on message preparation and likely questions. Address common barriers (fear of bad news, fear of exposing infrastructure weaknesses, pride, embarrassment and blame) via preparedness phase culture change. Transparency alone is not enough. People must see that competent decisions are being made. However, in general, greater transparency results in greater trust.

The public

Understand the public's beliefs and concerns and communicate as a dialogue, not decide and tell. Actively learn what the public thinks (communications surveillance), because it's hard to change pre-existing beliefs unless they are explicitly addressed. Where feasible, bring public representatives into decision making. If not feasible, the communication lead should understand and represent public views as decisions evolve. Treat public concerns as legitimate inputs even when they seem unfounded. If a publicly held view is valid, align policy accordingly. If mistaken, acknowledge and correct it, don't ignore, patronize or ridicule. Include practical actions people can take to protect themselves. This increases perceived control and supports reasoned responses. The public deserves information affecting their health and their families' health. In practice, message design starts with public questions. Correct misinformation respectfully and always include what can be done now.

Planning

Make risk and outbreak communication part of preparedness and response planning, integrated with risk analysis and risk management. Keep a risk communication plan ready before it is needed. Outbreak communication must be part of outbreak management planning from the start. Avoid treating communication as a last-minute announcement. Principles like acknowledging uncertainty and empathizing are too important to introduce during a crisis.

Pre agree key issues with senior management and ideally political leadership, including:

- ✎ first announcement approach,

- ✎ limits of transparency,
- ✎ what needs to be done, who needs to know, who is spokesperson, which agency leads, who needs to act, and links to other ministries and international partners.

Officials' decisions and actions shape trust and risk perception even more than words. Everything outbreak control managers do has a risk communication impact. In practice, communications must be embedded in command and technical decision-making cycles, not separated as a press function.

3.8 Good animal health and welfare risk communication (WHO and FAO, 2016)

Good animal health and welfare risk communication according to World Health Organization and Food and Agriculture Organization of the United Nations Risk Communication Handbook Applied to Food Safety (WHO and FAO, 2016) is a trusted, two-way, audience-tailored, and coordinated communication process that is open and transparent, timely and responsive, addresses risk perceptions as well as technical evidence, communicates uncertainty early and clearly, provides practical actions to reduce risk, and is continuously monitored and evaluated so messages adapt as the situation and public concerns evolve.

- A. Interactive exchange, not just one-way messaging
 - ✎ Two-way channels for farmers, veterinarians, industry, NGOs and advocates and the public to ask questions and feedback observations (e.g., practical feasibility, unintended impacts).
 - ✎ Early stakeholder engagement, not only at the end, to improve fit-for-purpose decisions and reduce opposition.
- B. Built on trust (credibility + perceived goodwill)
 - ✎ Clear demonstration that decisions prioritize health and welfare outcomes over narrow economic or political interests, because perceived misalignment erodes social trust.
 - ✎ Use of spokespeople who can connect with ordinary people while being technically competent. Expertise without connection can reduce trust.
- C. Open, transparent, timely and responsive
 - ✎ Early statements that acknowledge what is known and unknown (e.g., suspected source of an outbreak, welfare impacts of a control measure), plus what authorities are doing next.
 - ✎ Continuous adjustment of messages as the event evolves, monitoring misinformation and correcting it quickly to avoid confusion and erosion of trust.
- D. Starts from risk perception, not only technical risk
 - ✎ Acknowledge moral and ethical concerns that are common in welfare, perceptions of involuntary exposure (e.g., consumers), and vulnerability (e.g., impacts on certain

animal categories) because these can dominate acceptance even when measured risk is low.

- ✎ Provide actions that restore a sense of control, what farmers, transporters, pet owners, or consumers can do, because personal control is emphasized as important.

E. Tailored to audiences (culture, language, access, literacy)

- ✎ Use channels that reach hard-to-reach groups (community networks, extension services, veterinary channels, NGOs) and provide information in relevant languages and accessible formats.
- ✎ Use visuals, stories, demonstrations, and non-text formats where appropriate. Provide low-literacy writing approaches when using text.

F. Explicitly addresses uncertainty, and does so early

- ✎ Outbreaks e.g., suspected zoonoses: communicate investigation status and practical precautions before full confirmation.
- ✎ Welfare controversies or emerging evidence: clarify what is known, what is debated, and how disagreements are being resolved to reduce confusion.

G. Coordinated across institutions and stakeholders

- ✎ Joint communications across veterinary authorities, public health, agriculture, industry, and border and trade functions, aligned messages and timing.
- ✎ Pre-agreed protocols and exercises, tested plans to coordinate quickly during outbreaks or high-profile welfare events.

References

- Arnecke, A. L., Schwarz, S., Lübke-Becker, A. et al. (2024). Risk Communication on Zoonoses and Antimicrobial Resistance—How Do Exotic Pet Owners Perceive the Communication of Their Veterinarians? (2024). *Animals*, 14(14), 2035. <https://doi.org/10.3390/ani14142035>
- Bavel, J.J.V., Baicker, K., Boggio, P.S. et al. (2020). Using social and behavioural science to support COVID-19 pandemic response. *Nat Hum Behav* **4**, 460–471. <https://doi.org/10.1038/s41562-020-0884-z>
- Brennan, M.L., Christley, R.M. (2013). Cattle producers' perceptions of biosecurity. *BMC Vet Res* **9**, 7. <https://doi.org/10.1186/1746-6148-9-71>
- Ciaravino, G., Espluga, J., Moragas-Fernández, C., et al. (2023). Improving the communication between farmers and veterinarians to enhance the acceptability of bovine tuberculosis eradication programmes. *Preventive Veterinary Medicine*, 220. <https://doi.org/10.1016/j.prevetmed.2023.106046>
- Clark, B., Stewart, G. B., Panzone, L. A., Kyriazakis, I., & Frewer, L. J. (2016). A Systematic Review of Public Attitudes, Perceptions and Behaviours Towards Production Diseases Associated with Farm Animal Welfare. *Journal of Agricultural and Environmental Ethics*, 29(3): 455-478. <https://doi.org/10.1007/s10806-016-9615-x>
- EFSA (European Food Safety Authority), Smith, A.I.M., Bearth, A., Mazzocchi, M., et al. (2026). Risk communication on avian flu biosecurity: social research, audience segmentation, and communication strategy for an EU awareness-raising campaign. EFSA supporting publication 23(3):EN-10003. 40 pp. <https://efsa.onlinelibrary.wiley.com/doi/abs/10.2903/sp.efsa.2026.EN-10003>
- Enticott, G. (2012). The Local Universality of Veterinary Expertise and the Geography of Animal Disease. *Transactions of the Institute of British Geographers*, 37(1): 75–88. JSTOR, <http://www.jstor.org/stable/41427929>
- European Commission (2026). Citizens' Engagement Platform, Preparedness (retrieved 29.4.2026) https://citizens.ec.europa.eu/online-debate-preparedness_en?prefLang=en
- European Commission (2023). Directorate-General for Health and Food Safety and Kantar Public, Attitudes of Europeans towards animal welfare – Report, Publications Office of the European Union. <https://data.europa.eu/doi/10.2875/872312>
- Fischhoff, B. (2013). The sciences of science communication. *Proc. Natl. Acad. Sci. U.S.A.* 110 (supplement_3) 14033-14039. <https://doi.org/10.1073/pnas.1213273110>
- Fraser, D. (2008). Understanding animal welfare. *Acta Veterinaria Scandinavica*, 50(1), S1.
- Harper, G. (ed.) (2001). Consumer Concerns about Animal Welfare and the Impact on Food Choice. EU FAIR CT98-3678. Proceedings of the dissemination seminar. Centre for Food Economics Research (CeFER), Department of Agricultural and Food Economics, The University of Reading, UK. <https://orgprints.org/id/eprint/1650/2/EU/harper.pdf>

Hueston, W.D. (2013). BSE and variant CJD: Emerging science, public pressure and the vagaries of policy-making. *Preventive Veterinary Medicine*, 109(3-4): 179-184.

<https://doi.org/10.1016/j.prevetmed.2012.11.023>

Kim, W.S., Lee, M.Y., Myung, E.B., Han, S.H. (2025). Media Bias, Misinformation and Public Veterinary Literacy: A One Health Mixed-Methods Study. *Crisisonomy*, 21(9), 1-21.

<https://doi.org/10.14251/crisisonomy.2025.21.9.1>

Laconi, A., Saracino, B., Fattorini, E., et al. (2023). SARS-CoV-2 and Companion Animals: Sources of Information and Communication Campaign during the COVID-19 Pandemic in Italy. *Veterinary Sciences*, 10(7), 426. <https://doi.org/10.3390/vetsci10070426>

Lundgren, R.E. & McMakin, A.H. (2018). *Risk Communication: A Handbook for Communicating Environmental, Safety, and Health Risks*, 6th Edition. ISBN: 978-1-119-45615-5. Wiley IEEE Press, 544 pages.

Manyweathers, J. (2017). Straight from the horse's mouth: risk perception and discourse of horse owners and veterinarians around Hendra virus. Doctoral Thesis. The University of Western Australia. <https://research-repository.uwa.edu.au/en/publications/straight-from-the-horses-mouth-risk-perception-and-discourse-of-h/>

Mendez, D., Buttner, P., Kelly, J., et al. (2016). Difficulties experienced by veterinarians when communicating about emerging zoonotic risks with animal owners: the case of Hendra virus. *BMC Veterinary Research*, 13, 56. <https://doi.org/10.1186/S12917-017-0970-2>

Μίχα Ρόζα Ν. (2025). Η επικοινωνιακή διαχείριση της υγειονομικής κρίσης του ιού PPR και ο ρόλος των ΜΜΕ: το παράδειγμα των κτηνοτρόφων της νήσου Κρήτης. Communicative management of the PPR virus health crisis and the role of the media: the case of livestock farmers on the island of Crete. Post Graduate Theses. In Greek with English summary.

<https://doi.org/10.26262/heal.auth.ir.365752>

Moya, S., Lamont, K., Brennan, M.L., Ciavarino, G., Costa, M., Allepuz, A., Tamminen, L-M., Correia-Gomes, C., De Carvalho, Ferreira, H., Dogusan, M.M., Imperial, T., De Meneghi, D., Kjosevski, M., Chantziaras, I. and Burrell, A. (2025). Stakeholders' perspectives on communicating biosecurity to encourage behavior change in farmers. *Front. Vet. Sci.* 12:1562648. doi: 10.3389/fvets.2025.1562648

Noordhuizen, J.P. (2022). Risk identification & Risk management versus Vaccination on Dairy Farms: a true controversy? (With special attention to professional communication and risk communication). *Medical Research Archives*, 10(10).

<https://doi.org/10.18103/mra.v10i10.3244>

OECD (2024). OECD Survey on Drivers of Trust in Public Institutions – 2024 Results: Building Trust in a Complex Policy Environment, OECD Publishing, Paris,

<https://doi.org/10.1787/9a20554b-en>

Osuagwu, J.U., Merrill, S.C., Smith, J.M., et al. (2025). Mitigating the Impact of HPAI on Dairy Farms: Bridging Knowledge Gaps in Crisis Communication, Biosecurity, and Public Health. *International Crisis and Risk Communication Association Reports*, 13(1), 101-104.

<https://doi.org/10.69931/001c.142854>

- Reaser, J.K., Li, H., Southey, S. (2025). Love Them & Leave Them: science-based rationale for a campaign at the public health-conservation interface. *Frontiers in Conservation Science*, 5: 1488974. <https://doi.org/10.3389/fcosc.2024.1488974>
- Reid, M. (2018). Describing the Rabies Management System in an Ontario Municipality: A Mixed Methods Study of Human and Companion Animal Health Outcomes. Theses, University of Ottawa. <https://doi.org/10.20381/RUOR-22743>
- Renn, O. (2008). *Risk Governance: Coping with Uncertainty in a Complex World* (1st ed.). Routledge. <https://doi.org/10.4324/9781849772440>
- Reynolds, B. & Seeger, M. (2007). Crisis and Emergency Risk Communication as an Integrative Model. *Journal of Health Communication*, 10(1): 43-55. <https://doi.org/10.1080/10810730590904571>
- Sharma, G., Mutua, F., Deka, R.P., et al. (2022). Comparing the Effectiveness of Different Approaches to Raise Awareness About Antimicrobial Resistance in Farmers and Veterinarians of India. *Frontiers in Public Health*, 10:837594. <https://doi.org/10.3389/fpubh.2022.837594>
- Slovic, P. (2010). *The feeling of risk. New perspectives on risk perception*. Earthscan, Oxon, UK. ISBN 9781849711487
- Special Eurobarometer 547 (2024). Disaster risk awareness and preparedness of the EU population. <https://europa.eu/eurobarometer/surveys/detail/3228>
- Spence, K.L., Cardwell, J.M., Slater, J., et al. (2019). Preliminary insight into horse owners' perceptions of, and attitudes towards, exotic diseases in the United Kingdom. *BMC Veterinary Research*, 15, 338. <https://doi.org/10.1186/S12917-019-2120-5>
- Wachinger, G., Renn, O., Begg, C. and Kuhlicke, C. (2013). The Risk Perception Paradox–Implications for Governance and Communication of Natural Hazards. *Risk Analysis* 33: 1049-1065. <https://doi.org/10.1111/j.1539-6924.2012.01942.x>
- WHO (2018). *Communicating risk in public health emergencies: a WHO guideline for emergency risk communication (ERC) policy and practice*. Guideline. <https://www.who.int/publications/i/item/9789241550208>
- WHO and FAO (2016). *World Health Organization WHO and Food and Agriculture Organization of the United Nations FAO. Risk Communication Applied to Food Safety: Handbook. Food Safety and Quality Series 2. ISSN: 2415-1173.* <https://iris.who.int/handle/10665/250083>

Appendices

1. Material of the gap analysis
2. Question pattern
3. Copilot prompt
4. Distributions
5. Explicit notes on 'other' options
6. Research agenda on communication and animal welfare

Appendix 1. Material of the gap analysis

Predefined articles

Alarcon, P., B. Wall, K. Barnes, M. Arnold, B. Rajanayagam, and J. Guitian (2023). Classical BSE in Great Britain: Review of Its Epidemic, Risk Factors, Policy and Impact. *Food Control* 146: 109490. <https://doi.org/10.1016/j.foodcont.2022.109490>.

Almond, A. J. (2017). Chronic wasting disease as a model for the development of risk communication using the mental models approach. Dissertation. Iowa State University. <https://dr.lib.iastate.edu/handle/20.500.12876/30686>

Anthony, R. (2004). Risk communication, value judgments, and the public-policy maker relationship in a climate of public sensitivity toward animals: revisiting Britain's foot and mouth crisis. *Journal of Agricultural and Environmental Ethics* 17, 363-383. <https://doi.org/10.1007/s10806-004-5187-2>

Anthony, R. (2024). US public attitudes on farm animal welfare during a disease outbreak and pandemic preparedness, University of Alaska Anchorage, Anchorage, AK, USA. M.F. Giersberg, B. Bovenkerk and F.L.B. Meijboom Back to the future. *Veterinary and animal ethics*. EurSafe 2024 DOI 10.3920/978-90-0471-550-9_34 © Brill Wageningen Academic. <https://brill.com/downloadpdf/edcollchap-oa/book/9789004715509/BP000037.pdf>

Arnecke, A.L. Schwarz, S., Lübke-Becker, A., Jensen, K.C., Herre, K. & Bahramsoltani, M. (2024). Risk Communication on Zoonoses and Antimicrobial Resistance—How Do Exotic Pet Owners Perceive the Communication of Their Veterinarians' Animals 14, no. 14: 2035. <https://doi.org/10.3390/ani14142035>.

Bagnol, B., Naysmith, S., De Bruyn, J., Wong, J. & Alders, R. (2016). Effective Animal Health Programming Requires Consideration of and Communication with Those at the Human-Animal Interface. *CABI Reviews*, 1-7. <https://doi.org/10.1079/PAVSNNR201611030>.

Baker, L., McLeod-Morin, A., Bausch, M., & Lindsey, A. (2020). Who do you know? Zoonotic disease communication networks of livestock producers, veterinarians, human health professionals, and emergency managers. *Advancements in Agricultural Development*, 1(2), 39-52. <https://doi.org/10.37433/aad.v1i2.41>

Balzani A. & Hanlon, A. (2020). Factors that Influence Farmers' Views on Farm Animal Welfare: A Semi-Systematic Review and Thematic Analysis. *Animals (Basel)*. 28;10(9):1524. doi: 10.3390/ani10091524

Baye, R. S., Zia, A., Merrill, S. C., & Smith, J. M. (2025). Beyond Fear and Trust: Invoking Anticipated Regret to promote Biosecurity Measures Among US Swine Producers. *International Crisis and Risk Communication Association Reports*, 13(1), 83-86. DOI: 10.69931/001c.142849

Berg, C. & Hedman Lundmark, F (2020). Compliance with Animal Welfare Regulations: Drivers and Consequences. *CABI Reviews*, PAVSNNR202015025. <https://doi.org/10.1079/PAVSNNR202015025>.

Biesheuvel, M.M., Santman-Berends, I.M.G.A., Barkema, H.W., Ritter, C., Berezowski, J., Guelbenzu, M. & Kaler, J. (2021). Understanding Farmers' Behavior and Their Decision-Making Process in the Context of Cattle Diseases: A Review of Theories and Approaches. *Frontiers in Veterinary Science* 8: 687699. <https://doi.org/10.3389/fvets.2021.687699>.

Boqvist, S., Söderqvist, K. & and Vågsholm, I. (2018). Food Safety Challenges and One Health within Europe. *Acta Veterinaria Scandinavica* 60, no. 1: 1. <https://doi.org/10.1186/s13028-017-0355-3>.

Boschiroli, M.L. (2023). Animal Tuberculosis Control in a Disease-Free Country, France: Does the Long and Winding Road Really Lead to Eradication? *Irish Veterinary Journal* 76, no. S1: 25. <https://doi.org/10.1186/s13620-023-00258-5>.

Burgiel, S.W. (2020). The Incident Command System: A Framework for Rapid Response to Biological Invasion. *Biological Invasions* 22, no. 1: 155-65. <https://doi.org/10.1007/s10530-019-02150-2>.

Ciaravino, G., Espluga, J., Moragas-Fernández, C., Capdevila, A., Freixa, V., López i Gelats, F., Vergne, T. & Allepuz, A. (2023). Improving the communication between farmers and veterinarians to enhance the acceptability of bovine tuberculosis eradication programmes, *Preventive Veterinary Medicine*, Volume 220, <https://doi.org/10.1016/j.prevetmed.2023.106046>

Cipolla, M., Bonizzi, L. & Zecconi, A. (2015). From "One Health" to "One Communication": The Contribution of Communication in Veterinary Medicine to Public Health. *Veterinary Sciences* 2, no. 3: 135-49. <https://doi.org/10.3390/vetsci2030135>.

Crovato, S., Menegon, F., Mascarello, G., Pinto, A., Nadin, A., Piovan, G., Ricaldi, G., Di Martino, G., & Pozza, G. (2023). Development of a Training Strategy Aimed at Increasing Veterinarians' Awareness of the Proper Use of Antibiotics on Rabbit Farms. *Animals*, 13(15), 2411. <https://doi.org/10.3390/ani13152411>

Crovato, S., Menini, A., Mulatti, P., Dorotea, T., Favretto, A.R., Zaltron, F., Mascarello, G. & Pozza, G. (2024). The application of biosecurity practices for preventing avian influenza in North-Eastern Italy turkey farms: An analysis of the point of view and perception of farmers, *Preventive Veterinary Medicine*, 222, <https://doi.org/10.1016/j.prevetmed.2023.106084>

Crovato, S., Pinto, A., Di Martino, G., Mascarello, G., Rizzoli, V., Marcolin, S., & Ravarotto, L. (2022). Purchasing Habits, Sustainability Perceptions, and Welfare Concerns of Italian Consumers Regarding Rabbit Meat. *Foods*, 11(9), 1205.

<https://doi.org/10.3390/foods11091205>

Dalla Villa, P., C. Watson, O. Prasarnphanich, G. Huertas, and I. Dacre (2020). Integrating Animal Welfare into Disaster Management Using an "All-Hazards" Approach: -EN- -FR- L'intégration Du Bien-Être Animal Dans La Gestion Des Catastrophes à Travers Une Approche « tous Risques » -ES- Integración Del Bienestar Animal En La Gestión de Desastres Desde Una Lógica Que Considere Todo Tipo de Peligros. *Revue Scientifique et Technique de l'OIE* 39, no. 2: 599-613. <https://doi.org/10.20506/rst.39.2.3110>.

Decker, D.J., Evensen, D.T.N., Siemer, W.F., Leong, K.M., Riley, S.J., Wild, M.A, Castle, K.T & Higgins, C.L. (2010). Understanding Risk Perceptions to Enhance Communication about Human-Wildlife Interactions and the Impacts of Zoonotic Disease. *ILAR Journal* 51, no. 3:255-61. <https://doi.org/10.1093/ilar.51.3.255>.

Decker, D. J., Siemer, W. F., Evensen, D. T. N., Stedman, R. C., McComas, K. A., Wild, M. A., Castle, K. T., & Leong, K. M. (2012). Public perceptions of wildlife-associated disease: risk communication matters. *Human-Wildlife Interactions*, 6(1), 112-122. <https://www.jstor.org/stable/24874082>

Dickmann, P., Abraham, T., Sarkar, S., Wysocki, P., Cecconi, S., Apfel, F. & Nurm, Ü. (2016). Risk Communication as a Core Public Health Competence in Infectious Disease Management: Development of the ECDC Training Curriculum and Programme. *Eurosurveillance* 21, no. 14 (7). <https://doi.org/10.2807/1560-7917.ES.2016.21.14.30188>.

Enticott, G., & Vanclay, F. (2011). Scripts, animal health and biosecurity: The moral accountability of farmers' talk about animal health risks. *Health, Risk & Society*, 13(4), 293-309.

European Food Safety Authority (EFSA), Maxim, L., Mazzocchi, M., Van den Broucke, S., Zollo, F., Robinson, T., Rogers, C., Vrbos, D., Zamariola, G. & Smith, A. (2021). Technical Assistance in the Field of Risk Communication. *EFSA Journal* 19, no. 4. <https://doi.org/10.2903/j.efsa.2021.6574>.

Farrell, S., McKernan, C., Benson, T., Elliott, C. & Dean, M. (2021). Understanding farmers' and veterinarians' behavior in relation to antimicrobial use and resistance in dairy cattle: A systematic review. *J Dairy Sci.* 104(4):4584-4603. doi: 10.3168/jds.2020-19614

Fonseca, R.P. & Sanchez-Sabate, R. (2022). Consumers' Attitudes towards Animal Suffering: A Systematic Review on Awareness, Willingness and Dietary Change. *Int J Environ Res Public Health*. 6;19(23):16372. doi: 10.3390/ijerph192316372.

Garforth, C. J., Bailey, A. P., & Tranter, R. B. (2013). Farmers' attitudes to disease risk management in England: a comparative analysis of sheep and pig farmers. *Preventive veterinary medicine*, 110(3-4), 456-466.

- Giangaspero, M. & Sekiguchi, S. (2016). Risk Assessment of Animal Infectious Diseases and Decision Making Process. *Clinical Microbiology* 05, no. 02. <https://doi.org/10.4172/2327-5073.1000242>.
- Gilbert, W. & Rushton, J. (2018). Incentive Perception in Livestock Disease Control. *Journal of Agricultural Economics* 69, no. 1: 243-61. <https://doi.org/10.1111/1477-9552.12168>.
- Hernández-Jover, M., Hayes, L., Woodgate, R., Rast, L. & Toribio, J.L.M.L. (2019). Animal Health Management Practices Among Smallholder Livestock Producers in Australia and Their Contribution to the Surveillance System. *Frontiers in Veterinary Science* 6: 191. <https://doi.org/10.3389/fvets.2019.00191>.
- Horigan, V., Simons, R., Kavanagh, K. & Kelly, L. (2023). A Review of Qualitative Risk Assessment in Animal Health: Suggestions for Best Practice. *Frontiers in Veterinary Science* 10: 1102131. <https://doi.org/10.3389/fvets.2023.1102131>.
- Hueston, W.D. (2013). BSE and Variant CJD: Emerging Science, Public Pressure and the Vagaries of Policy-Making. *Preventive Veterinary Medicine* 109, no. 3-4: 179-84. <https://doi.org/10.1016/j.prevetmed.2012.11.023>.
- Jardine, C.G. (2014). Role of Risk Communication in a Comprehensive Risk Management Approach. In *Wiley StatsRef: Statistics Reference Online*, edited by Ron S. Kenett, Nicholas T. Longford, Walter W. Piegorisch, and Fabrizio Ruggeri, 1st ed. Wiley, 2014. <https://doi.org/10.1002/9781118445112.stat03860>.
- Kasza, G., Izsó, T., Langsrud, S., Vrbos, D., Veflen, N., Ueland, Ø., Schodrerer, J., Munter, L., Csenki, E., Szakos, J.R. & Süth, M. (2024). Institutional food safety risk communication-A self-evaluation tool and its interpretation. *Trends in Food Science & Technology*, 150, 104594.
- Kasza, G., Csenki, E., Szakos, D., & Izsó, T. (2022). The evolution of food safety risk communication: Models and trends in the past and the future. *Food Control*, 138, 109025.
- Kendall, H., Clark, B., Rhymer, C., Kuznesof, S., Hajslova, J., Tomaniova, M., Brereton, P., & Frewer, L. (2019). A Systematic Review of Consumer Perceptions of Food Fraud and Authenticity: A European Perspective. *Trends in Food Science & Technology* 94: 79-90. <https://doi.org/10.1016/j.tifs.2019.10.005>.
- Khalid, Z., Abrar Yousaf, M., Tu-Allah Khan, A., Rauf Shakoori, F., Munir, M. & Rauf Shakoori, A. (2020). Debunking Myths about COVID-19, Paranoiac Misconceptions, Recent Developments and Its Current Stance. *Pakistan Journal of Zoology* 52, no. 6 (2020). <https://doi.org/10.17582/journal.pjz/20200608144416>.
- Kieh, M.D., Cho, E.M. & Myles, I.A. (2017). Contrasting Academic and Lay Press Print Coverage of the 2013-2016 Ebola Virus Disease Outbreak. Edited by Jens H. Kuhn. *PLOS ONE* 12, no. 6: e0179356. <https://doi.org/10.1371/journal.pone.0179356>.
- Kimman, T., Hoek, M., & de Jong, M. C. (2013). Assessing and controlling health risks from animal husbandry. *NJAS-Wageningen Journal of Life Sciences*, 66, 7-14.

Kuhn, C., Hayibor, K. M., Acheampong, A. T., Pires, L. S. A., Costa-Ribeiro, M. C. V., Burrone, M. S., Vasques-Almazan, C.R., Radon, K., & Soto, M.T.S. (2024). How studies on zoonotic risks in wildlife implement the one health approach–A systematic review. *One Health*, 100929.

Kumbasar, B. (2021). Health Risk Communication and Media. In: *Advances in Linguistics and Communication Studies*, edited by Gülşah Sarı, 123–39. IGI Global, 2021.
<https://doi.org/10.4018/978-1-7998-6825-5.ch008>.

Kwasny, T., Dobernig, K. & Riefler, P. (2022). Towards reduced meat consumption: A systematic literature review of intervention effectiveness, 2001–2019. *Appetite* 1;168:105739. doi: 10.1016/j.appet.2021.105739

Lofstedt, R.E. (2006). How Can We Make Food Risk Communication Better: Where Are We and Where Are We Going? *Journal of Risk Research* 9, no. 8: 869–90.
<https://doi.org/10.1080/13669870601065585>.

MacLeod, A. & Spence, N. (2020). Biosecurity: Tools, Behaviours and Concepts. Edited by Alan MacLeod and Nicola Spence. *Emerging Topics in Life Sciences* 4, no. 5: 449–52.
<https://doi.org/10.1042/ETLS20200343>.

Mantovani, C. (2017). Risk Communication by Health Professionals: An Analysis of Press Releases Drafted by Italian Veterinarians. *Veterinaria Italiana* 53, no. 3: 185–95.
<https://doi.org/10.12834/VetIt.796.3843.3>.

Manyweathers,, J. (2017). Straight from the horse’s mouth: risk perception and discourse of horse owners and veterinarians around Hendra virus. Doctoral Thesis. The University of Western Australia. <https://research-repository.uwa.edu.au/en/publications/straight-from-the-horses-mouth-risk-perception-and-discourse-of-h/>

Manyweathers, J., Maru, Y., Hayes, L., Loechel, B., Kelly, J., Felton, S., El Hassan, M., Kruger, H., Woodgate, R. & Hernandez-Jover, M. (2022). Foot and mouth disease ready? How co-creation of and participation in knowledge development and sharing can transform relationships between livestock producers and other animal health stakeholders – an Australian case study *JCOM* 21(02), A03. <https://doi.org/10.22323/2.21020203>

Mascarello, G., Pinto, A., Crovato, S., Tiozzo Pezzoli, B., Pietropaoli, M., Bertola, M., Mutinelli, F., & Formato, G. (2024). Consumers’ Perceptions and Behaviors Regarding Honey Purchases and Expectations on Traceability and Sustainability in Italy. *Sustainability*, 16(20), 8846. <https://doi.org/10.3390/su16208846>

Mathur, M.B., Peacock, J., Reichling, D.B., Nadler, J., Bain, P.A., Gardner, C.D. & Robinson, T.N. (2021). Interventions to reduce meat consumption by appealing to animal welfare: Meta-analysis and evidence-based recommendations. *Appetite* 1;164:105277. doi: 10.1016/j.appet.2021.105277.

Meletis, E., Jarynowski, A., Maksymowicz, S., Kostoulas, P., & Belik, V. (2024). Animal Health Discourse during Ecological Crises in the Media–Lessons Learnt from the Flood in Thessaly from the One Health Perspective. *Veterinary Sciences*, 11(4), 140.
<https://doi.org/10.3390/vetsci11040140>

- Mendez, D.H., Büttner, P., Kelly, J., Nowak, M. & Speare, R. (2016). Difficulties Experienced by Veterinarians When Communicating about Emerging Zoonotic Risks with Animal Owners: The Case of Hendra Virus'. *BMC Veterinary Research* 13, no. 1: 56. <https://doi.org/10.1186/s12917-017-0970-2>.
- Michie, S., van Stralen, M.M. & West, R. (2011). The behaviour change wheel: A new method for characterising and designing behaviour change interventions. *Implementation Sci* 6, 42 (2011). <https://doi.org/10.1186/1748-5908-6-42>
- More, S. J. (2019). Perspectives from the science-policy interface in animal health and welfare. *Frontiers in Veterinary Science*, 6, 382
- Morrison, R. & Rose, D.C. (2023). Factors that influence dairy farmers' decisions to implement Johne's Disease control practices: A systematic review. *Prev Vet Med.* 220:106053. doi: 10.1016/j.prevetmed.2023.106053
- Muzzo, A., Pollastri, I., Biasetti, P., Vogt, G., Manenti, R. & de Mori, B. (2023) Ethical reasoning and participatory approach towards achieving regulatory processes for animal-visitor interactions (AVIs) in South Africa. *PLoS ONE* 18(3): e0282507. <https://doi.org/10.1371/journal.pone.0282507>
- Noordhuizen, J. (2022). Risk Identification & Risk Management versus Vaccination on Dairy Farms: A True Controversy? (With Special Attention to Professional Communication and Risk Communication). *Medical Research Archives* 10, no. 10. <https://doi.org/10.18103/mra.v10i10.3244>.
- Okafor, C. C., Ekakoro, J. E., Caldwell, M., & Strand, E. B. (2022). Emotive Themes from Tennessee Cattle Producers Regarding Responsible Antibiotic Use. *Animals*, 12(16), 2088. <https://doi.org/10.3390/ani12162088>
- Osuagwu, J. U., Merrill, S. C., Smith, J. M., Maciel, A., & Soares, R. (2025). Mitigating the Impact of HPAI on Dairy Farms: Bridging Knowledge Gaps in Crisis Communication, Biosecurity, and Public Health. *International Crisis and Risk Communication Association Reports*, 13(1), 101-104. DOI: 10.69931/001c.142854
- Pfeiffer, D. (2014). From Risk Analysis to Risk Governance - Adapting to an Ever More Complex Future. *Veterinaria Italiana*, no. 50(3): 169-76. <https://doi.org/10.12834/Vetlt.313.1220.3>.
- Pozza, G., Pinto, A., Crovato, S., Mascarello, G., Bano, L., Dacasto, M., Battisti, A., Bartoli, B., Ravarotto, L. & Marangon, S. (2020). Antimicrobial use and antimicrobial resistance: standpoint and prescribing behaviour of Italian cattle and pig veterinarians. *Italian Journal of Animal Science*, 19(1), 905-916. <https://doi.org/10.1080/1828051X.2020.1807419>
- Prata, J.C. (2020). Strategies for the Improvement of Pet Health and Welfare in Portugal Based on a Pilot Survey on Husbandry, Opinion, and Information Needs. *Animals*, 10(5):848. <https://doi.org/10.3390/ani10050848>

- Ravarotto, L., Mascarello, G., Pinto, A., Schiavo, M.R., Bagni, M., Decastelli, L. (2014). Food allergies in school: design and evaluation of a teacher-oriented training action. *Italian Journal of Pediatrics*, 40, p.100. <http://www.ijponline.net/content/40/1/100>
- Roberts, H. C., Elbers, A. R. W., Conraths, F. J., Holsteg, M., Hoereth-Boentgen, D., Gethmann, J. & van Schaik, G. (2014). Response to an emerging vector-borne disease: Surveillance and preparedness for Schmallenberg virus, *Preventive Veterinary Medicine*, Volume 116, Issue 4:341-349. <https://doi.org/10.1016/j.prevetmed.2014.08.020>
- Rogoll, L., Schulz, K., Schulz, J., Brock, J., & Thulke, H.-H. (2025). Beyond Crisis Response: A Roundtable on Long-Term Strategies for Managing African Swine Fever. *Viruses*, 17(5):604. <https://doi.org/10.3390/v17050604>
- Eoin, R., Breslin, P., O’Keeffe, J., Byrne, A.W., Wrigley, K. & Barrett, D. (2023). The Irish bTB Eradication Programme: Combining Stakeholder Engagement and Research-Driven Policy to Tackle Bovine Tuberculosis. *Irish Veterinary Journal* 76, no. S1 (23): 32. <https://doi.org/10.1186/s13620-023-00255-8>.
- Salmon, G.R., M. MacLeod, J.R. Claxton, U. Pica Ciamarra, T. Robinson, A. Duncan & A.R. Peters. (2020). Exploring the Landscape of Livestock “Facts”. *Global Food Security* 25: 100329. <https://doi.org/10.1016/j.gfs.2019.100329>.
- Schrobback, P., Zhang A., Loechel B., Ricketts, K. & Ingham, A. (2023). Food Credence Attributes: A Conceptual Framework of Supply Chain Stakeholders, Their Motives, and Mechanisms to Address Information Asymmetry. *Foods* 12, no. 3: 538. <https://doi.org/10.3390/foods12030538>.
- Speksnijder, D.C. & Wagenaar, J. A. (2018). Reducing antimicrobial use in farm animals: how to support behavioral change of veterinarians and farmers, *Animal Frontiers*, Volume 8, Issue 2: 4-9, <https://doi.org/10.1093/af/vfy006>
- Stetina, B.U. & Krouzecky, C. (2022). Reviewing a Decade of Change for Veterinarians: Past, Present and Gaps in Researching Stress, Coping and Mental Health Risks. *Animals* 12, no. 22: 3199. <https://doi.org/10.3390/ani12223199>.
- Tenorio, J.C.B. (2022). Risks, Hazards, Harm and Risk Analysis: A Brief Introductory Overview for Veterinarians. *Journal of Livestock Science* 13, no. 2: 159. <https://doi.org/10.33259/JLivestSci.2022.159-163>.
- Townsend, A.K., Hawley, D.M., Stephenson, J.F. & Williams, K.E.G. (2020). Emerging Infectious Disease and the Challenges of Social Distancing in Human and Non-Human Animals. *Proceedings of the Royal Society B: Biological Sciences* 287, no. 1932: 20201039. <https://doi.org/10.1098/rspb.2020.1039>.
- Vogl, C.R., Vogl-Lukasser, B. & Walkenhorst, M. (2016). Local knowledge held by farmers in Eastern Tyrol (Austria) about the use of plants to maintain and improve animal health and welfare. *J Ethnobiology Ethnomedicine* 12, 40. <https://doi.org/10.1186/s13002-016-0104-0>

Warner, K.D. (2012). Fighting Pathophobia: How to Construct Constructive Public Engagement with Biocontrol for Nature without Augmenting Public Fears. *BioControl* 57, no. 2: 307–17. <https://doi.org/10.1007/s10526-011-9419-x>.

Weaver, J., E.A. Leon, M. Edan, and F. D'Alessio (2012). Initial Assessment of Strategic Plans for Improving the Performance of Veterinary Services in Developing Countries: A Review of OIE PVS Gap Analysis Reports: -EN- -FR- Évaluation Initiale Des Plans Stratégiques Visant à Améliorer Les Performances Des Services Vétérinaires Dans Les Pays En Développement : Examen Des Rapports d'analyse Des Écarts PVS de l'OIE -ES- Evaluación Inicial de Planes Estratégicos Para Mejorar La Eficacia de Los Servicios Veterinarios En Países En Desarrollo: Estudio de Los Informes de Análisis de Brechas PVS de La OIE. *Revue Scientifique et Technique de l'OIE* 31, no. 2: 631–45. <https://doi.org/10.20506/rst.31.2.2144>.

Guidelines documents

CDC (2018). Health Communication Playbook. Resources to Help You Create Effective Materials. Centers for Disease Control and Prevention CDC (U.S.). Agency for Toxic Substances and Disease Registry. <https://stacks.cdc.gov/view/cdc/103379>.

CDC (2024). One Health Communication Resources. Centers for Disease Control and Prevention CDC (U.S.). <https://www.cdc.gov/one-health/php/communications-resources/index.html>.

EFSA (2017). European Food Safety Authority EFSA. When food is cooking up a storm - Proven recipes for risk communications. Publications Office. <https://data.europa.eu/doi/10.2805/119491>.

OIE and WHO (2015). World Organisation for Animal Health - OIE, World Health Organization - WHO. Communication Handbook Veterinary Services. <https://www.who.int/publications/i/item/communication-handbook-veterinary-services>.

USDA (2022). United States Department of Agriculture USDA, Animal and Plant Health Inspection Service, Veterinary Services. Aphis Foreign Animal Disease Framework - Roles and Communication. FAD PrEP Foreign Animal Disease Preparedness & Response Plan. https://www.aphis.usda.gov/sites/default/files/fadprep_manual_1.pdf

WHO (2005). World Health Organization WHO. Outbreak Communication Guidelines. <https://www.who.int/publications/i/item/WHO-CDS-2005.28>.

WHO (2017). World Health Organization WHO. Communicating Risk in Public Health Emergencies: A WHO Guideline for Emergency Risk Communication (ERC) Policy and Practice. Geneva: World Health Organization. <https://iris.who.int/handle/10665/259807>.

WHO and FAO (2016). World Health Organization WHO and Food and Agriculture Organization of the United Nations FAO. Risk Communication Applied to Food Safety: Handbook. Food Safety and Quality Series 2. ISSN: 2415-1173. <https://iris.who.int/handle/10665/250083>.

Appendix 2. Question pattern

-  Type of document
-  Peer reviewed articles
-  Guidelines, documents, ...

QUESTIONS

1 - Which disciplines the study belongs to the most?

-  Human health sciences
-  Animal health sciences
-  Food science
-  Psychology
-  Sociology
-  Communication science
-  Political science
-  Other

2 - Which topic was investigated?

-  Farm Animal Welfare
-  Companion animal welfare
-  Avian influenza
-  African swine fever
-  Vectorborne diseases
-  Zoonoses
-  Antimicrobial resistance (AMR)
-  Biosecurity measures
-  Emerging infectious diseases
-  Climate change effects on animal health
-  Wildlife disease transmission
-  Other

3 - Formative research - Target audience analysis

-  Does the study consider the target audience analysis?
-  Is the study's target audience clearly defined?
-  Did the author(s) take any action to identify the specific target group?
-  Has a target audience analysis been conducted regarding their knowledge of the subject matter under examination?
-  Has a target audience analysis been conducted regarding their information needs?
-  Has a target audience analysis been conducted regarding their risk perception?
-  Has a target audience analysis been conducted regarding which communication channels they use to get information on the subject matter under examination?
-  Has a target audience analysis been conducted regarding their trust in possible sources of information?

- ✎ Has the most appropriate and defining language for the target audience been identified?
- ✎ Has a target audience analysis been conducted regarding their trust in the competent authorities - risk managers?

4 - Formative research - Which investigation technique was used?

- ✎ Survey
- ✎ Interviews
- ✎ Focus group
- ✎ Delphi
- ✎ Consensus conference / scenario workshop
- ✎ Content analysis
- ✎ Case study
- ✎ Systematic review / meta analysis / scoping review ...
- ✎ Experimental study
- ✎ Network analysis
- ✎ Other participatory research methods (e.g. participant observation, ethnography, ...)
- ✎ Other

5 - Formative research - Which theoretical framework guided the study?

- ✎ Theory of planned behaviour
- ✎ Health belief model
- ✎ Grounded theory
- ✎ Mental models
- ✎ Protection motivation theory
- ✎ Framing
- ✎ Social representations
- ✎ Social Amplification of Risk Framework
- ✎ Risk perception theory
- ✎ Social network theory
- ✎ COM-B Model for behaviour change
- ✎ Other

6 - Formative research - Content message

- ✎ Has the communication message been clearly defined?
- ✎ Does the message contain clear calls to action for the target audience?
- ✎ Has the language of the message been adapted to the target audience?
- ✎ Has the content of the message been pre-tested?

7 - Strategy - Key areas of intervention

- ✎ Care communication
- ✎ Consensus communication
- ✎ Crisis communication

8 - Strategy - The goals of risk communication

- ✦ Educational (disseminate knowledge, explain, create awareness, influence attitudes, and make people listen)
- ✦ Behavioural (influence action and decision making)
- ✦ Contingency management (manage, avoid, minimize, or eliminate risk)
- ✦ Administrative/organizational (fulfil organizational goals and follow procedures for decision making)
- ✦ Reputational (promote legitimacy and trust)
- ✦ Ethical (ensure responsible and fair communication practices)
- ✦ Psychological (address emotional and cognitive responses to risk)
- ✦ Technological (leverage modern communication tools for effective dissemination)
- ✦ Advocacy

9 - Strategy - To which target audience?

- ✦ Citizens/consumers
- ✦ Children/students
- ✦ Farmers
- ✦ Breeders
- ✦ Veterinarians
- ✦ Pet owners
- ✦ Risk assessors
- ✦ Risk managers
- ✦ Policy makers
- ✦ Regulators
- ✦ Scientists/researchers
- ✦ Food manufacturers
- ✦ Media/journalists
- ✦ Retails
- ✦ Other

10 - Strategy - Communication sources

- ✦ Public health authorities
- ✦ Risk assessors
- ✦ Risk managers
- ✦ Policy makers
- ✦ Regulators
- ✦ Journalists
- ✦ Associations (e.g. consumers', farmers', breeders', veterinarians' , ...)
- ✦ Scientists, Researchers, Universities
- ✦ Private companies
- ✦ Food manufacturers
- ✦ Retails
- ✦ Other

11 - Strategy - Tools

- ✦ Educational materials (e.g. leaflet, brochures, flyers, ...)

- ☐ Videos
- ☐ Gaming (e.g. videogames, crosswords, quizzes, ...)
- ☐ Events, outreach
- ☐ (Digital) public relations
- ☐ Media relation (e.g. press releases, press conferences, advertorial)
- ☐ Other

12 - Strategy - Duration

Please indicate the duration of the intervention

13 - Strategy - Monitoring and communication evaluation

- ☐ Yes
- ☐ No

13a - If Yes, how?

- ☐ Focus group
- ☐ Questionnaire
- ☐ Interviews
- ☐ Social Media monitoring
- ☐ Press clipping
- ☐ Other

13b - If Yes, when?

- ☐ During the intervention
- ☐ One week after the intervention
- ☐ One month after the intervention
- ☐ Other

Appendix 3. Copilot prompt

Answer the questions using the given article only. Transfer the answers into a checklist (exactly matching my coding template) and add explanations for each checklist item.

Is the document a peer reviewed article or a guideline or other document?

To which of the following scientific disciplines does the article most closely relate: Human health sciences, Animal health sciences, Food science, Psychology, Sociology, Communication science, Political science or Other?

Which of the following topics were dealt with in the article: Companion animal welfare, Farm animal welfare, Avian influenza, African swine fever, Vectorborne diseases, Zoonoses, Antimicrobial resistance (AMR), Biosecurity measures, Emerging infectious diseases, Climate change effects on animal health, Wildlife disease transmission or Other?

Below are questions regarding the target audience of the article:

- ✎ Does the article consider the target audience analysis?
- ✎ Is the article's target audience clearly defined?
- ✎ Did the authors of the article take any action to identify the specific target group?
- ✎ Has a target audience analysis been conducted regarding their knowledge of the subject matter under examination?
- ✎ Has a target audience analysis been conducted regarding their information needs?
- ✎ Has a target audience analysis been conducted regarding their risk perception?
- ✎ Has a target audience analysis been conducted regarding which communication channels they use to get information on the subject matter under examination?
- ✎ Has a target audience analysis been conducted regarding their trust in possible sources of information?
- ✎ Has the most appropriate and defining language for the target audience been identified?
- ✎ Has a target audience analysis been conducted regarding their trust in the competent authorities, risk managers?
- ✎ Did the article use one or more of the following research techniques: survey, interview, focus group, Delphi, consensus conference or scenario workshop, content analysis, case study, systematic review or meta-analysis or scoping review, experimental study, network analysis, other participatory research method (e.g. participant observation, ethnography, ...) or other?
- ✎ Which of the following theoretical frameworks guided the study: Theory of planned behaviour, Health belief mode, Grounded theory, Mental models, Protection motivation theory, Framing, Social representations, Social Amplification of Risk Framework, Risk perception theory, Social network theory, COM-B Model for behaviour change or Other?

Below are questions about the content message of the article:

- ✎ Has the communication message been clearly defined?
- ✎ Does the message contain clear calls to action for the target audience?
- ✎ Has the language of the message been adapted to the target audience?
- ✎ Has the content of the message been pre-tested?

What are the key areas of intervention in the article?

- ✎ Care communication
- ✎ Consensus communication
- ✎ Crisis communication

What are the goals of risk communication in the article?

- ✎ Educational (disseminate knowledge, explain, create awareness, influence attitudes, and make people listen)
- ✎ Behavioural (influence action and decision making)
- ✎ Contingency management (manage, avoid, minimize, or eliminate risk)
- ✎ Administrative/organizational (fulfil organizational goals and follow procedures for decision making)
- ✎ Reputational (promote legitimacy and trust)

- ✎ Ethical (ensure responsible and fair communication practices)
- ✎ Psychological (address emotional and cognitive responses to risk)
- ✎ Technological (leverage modern communication tools for effective dissemination)
- ✎ Advocacy

Who are the target audience for this article?

- ✎ Citizens/consumers
- ✎ Children/students
- ✎ Farmers
- ✎ Breeders
- ✎ Veterinarians
- ✎ Pet owners
- ✎ Risk assessors
- ✎ Risk managers
- ✎ Policy makers
- ✎ Regulators
- ✎ Scientists/researchers
- ✎ Food manufacturers
- ✎ Media/journalists
- ✎ Retails
- ✎ Other

What communication sources are used in the article?

- ✎ Public health authorities
- ✎ Risk assessors
- ✎ Risk managers
- ✎ Policy makers
- ✎ Regulators
- ✎ Journalists
- ✎ Associations (e.g. consumers', farmers', breeders', veterinarians' , ...)
- ✎ Scientists, Researchers, Universities
- ✎ Private companies
- ✎ Food manufacturers
- ✎ Retails
- ✎ Other

What kind of tools the article/research produced or recommended for use?

- ✎ Educational materials (e.g. leaflet, brochures, flyers, ...)
- ✎ Videos
- ✎ Gaming (e.g. videogames, crosswords, quizzes, ...)
- ✎ Events, outreach
- ✎ (Digital) public relations
- ✎ Media relation (e.g. press releases, press conferences, advertorial)
- ✎ Other

If the article includes intervention, indicate the duration of the intervention.

Was communication monitoring and evaluation carried out in the research for the article?

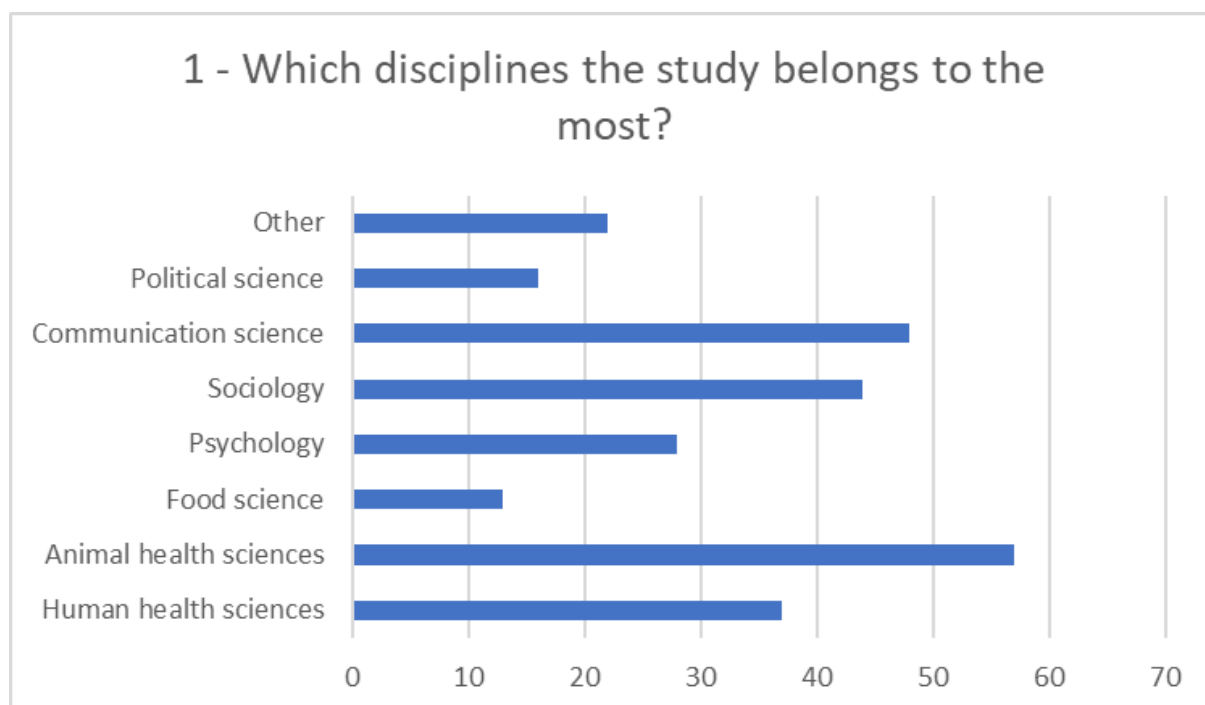
13 a. If communication monitoring and evaluation was carried out, was it done through:

- ☐ Focus group
- ☐ Questionnaire
- ☐ Interviews
- ☐ Social Media monitoring
- ☐ Press clipping
- ☐ Other

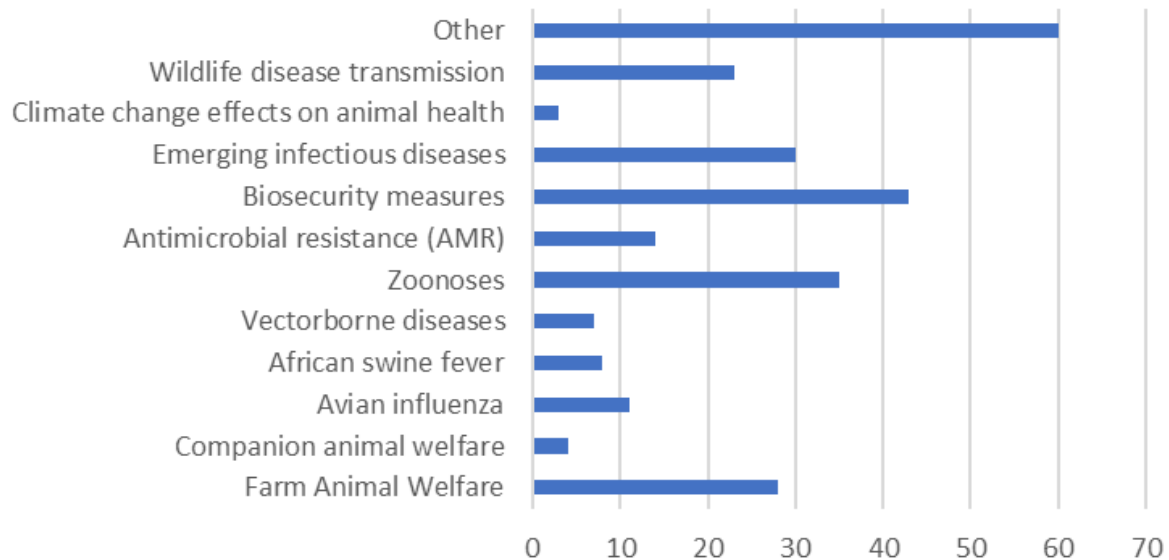
13 b. If communication monitoring and evaluation was done, when was it done?

- ☐ During the intervention
- ☐ One week after the intervention
- ☐ One month after the intervention
- ☐ At another time

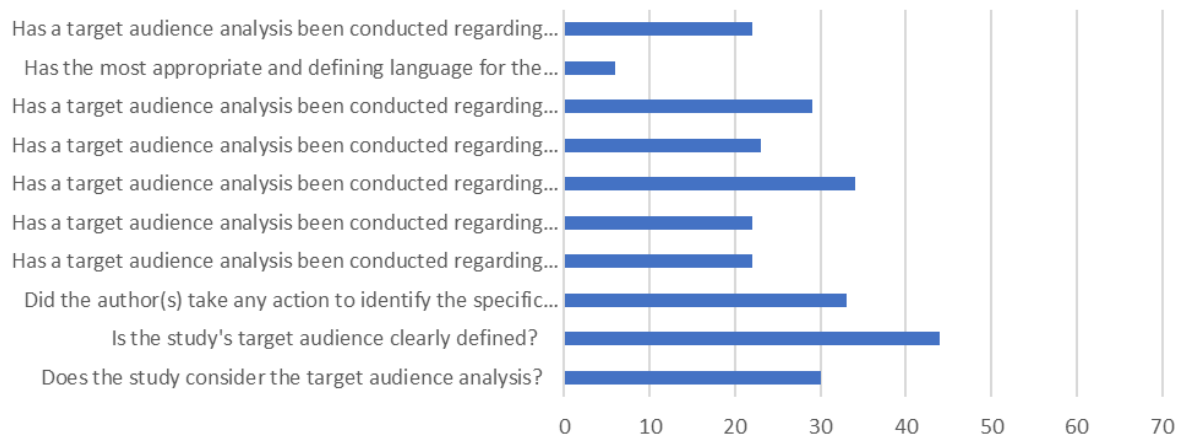
Appendix 4. Distributions



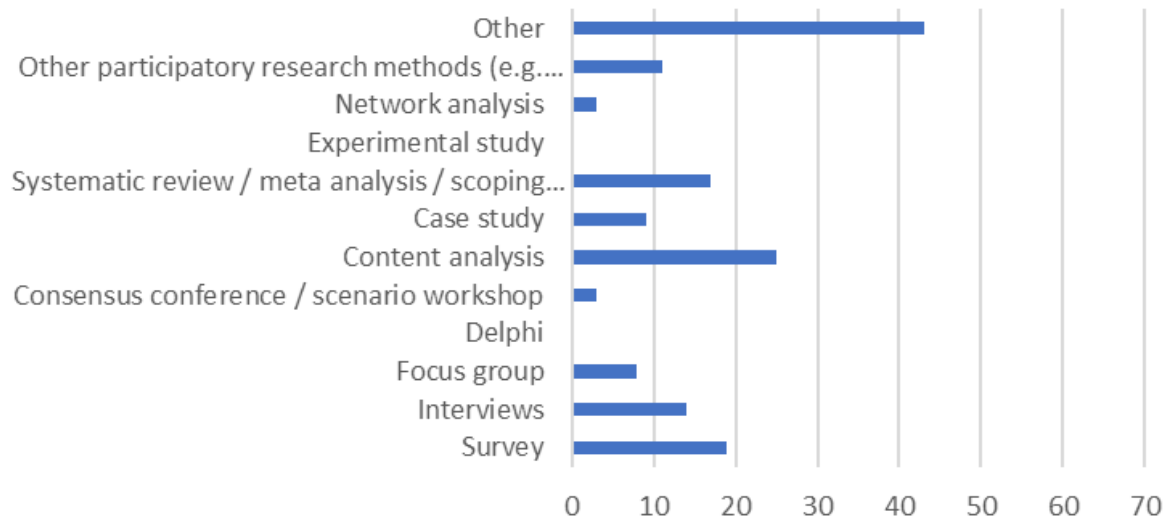
2 - Which topic was investigated?



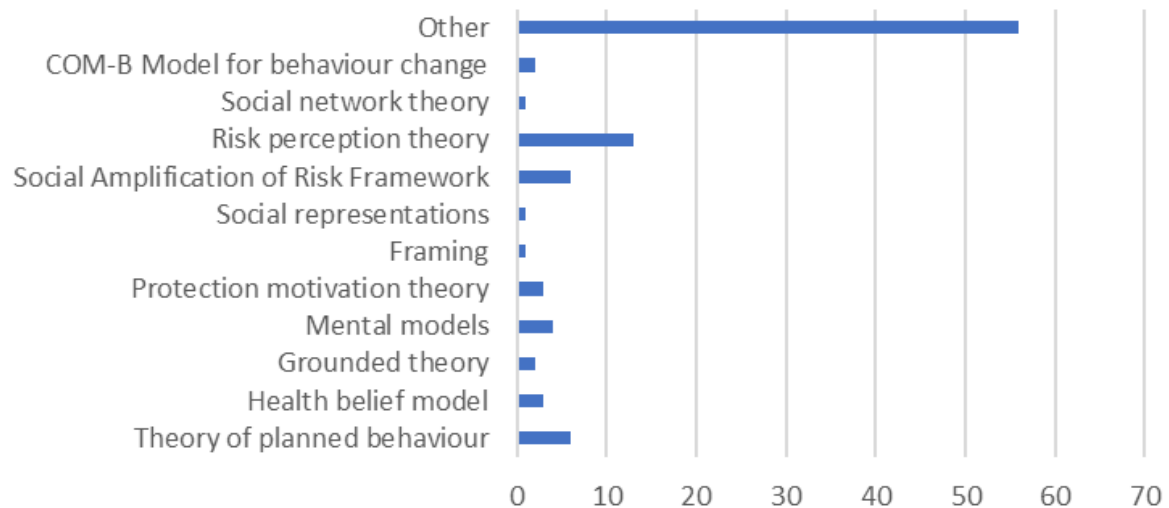
3 - Formative research - Target audience analysis



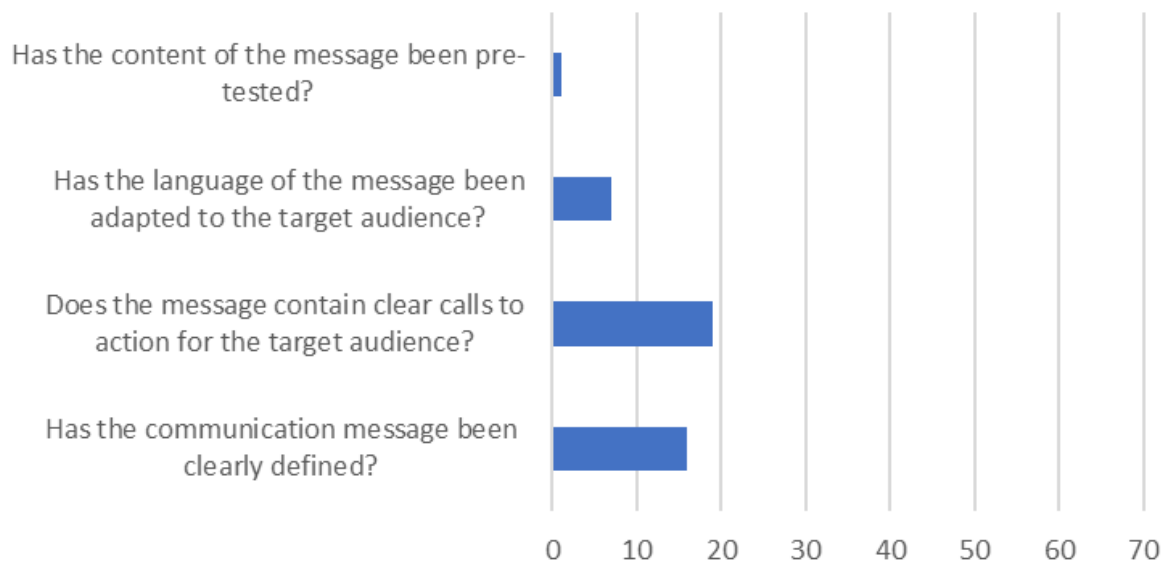
4 - Formative research - Which investigation technique was used?



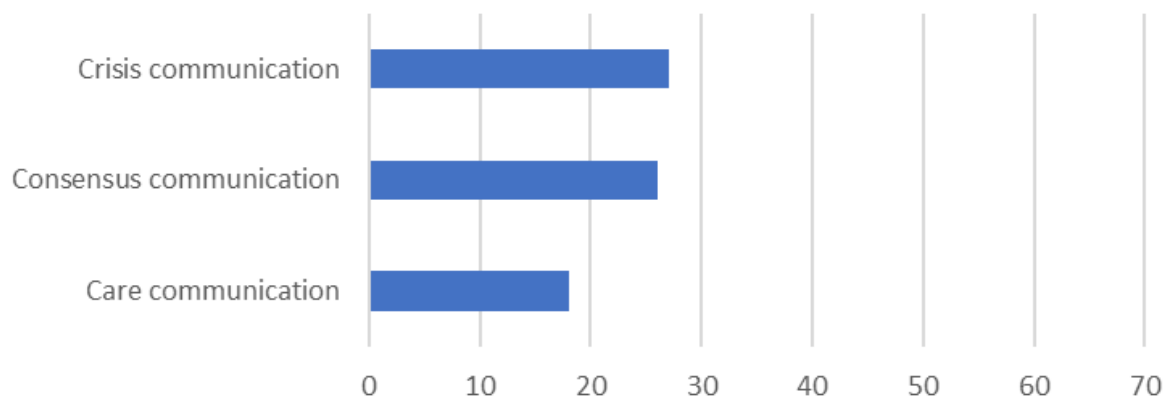
5 - Formative research - Which theoretical framework guided the study?



6 - Formative research - Content message



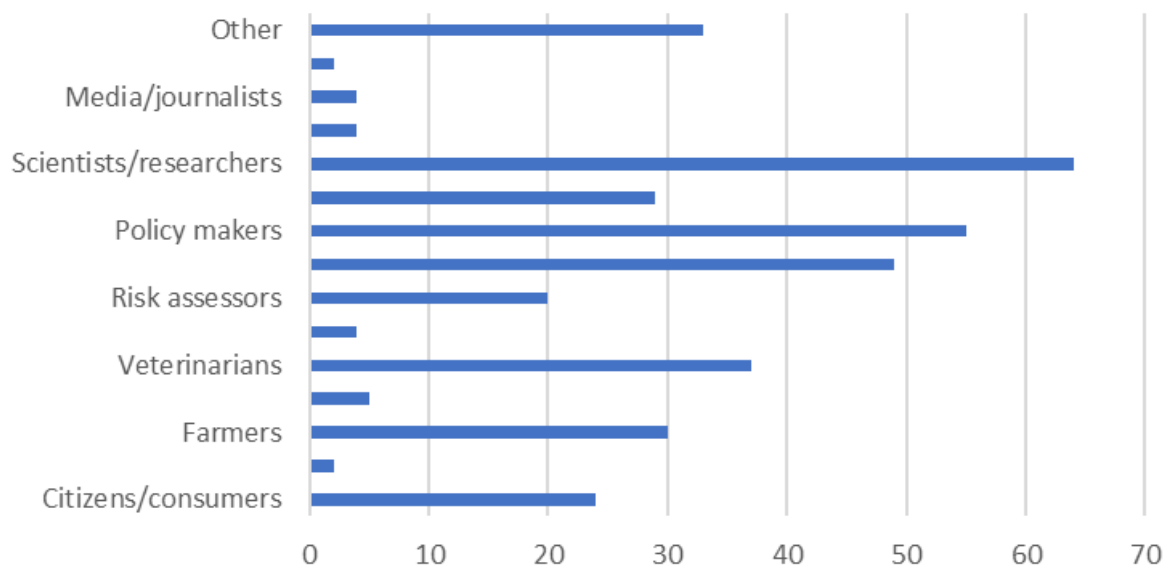
7 - Strategy - Key areas of intervention



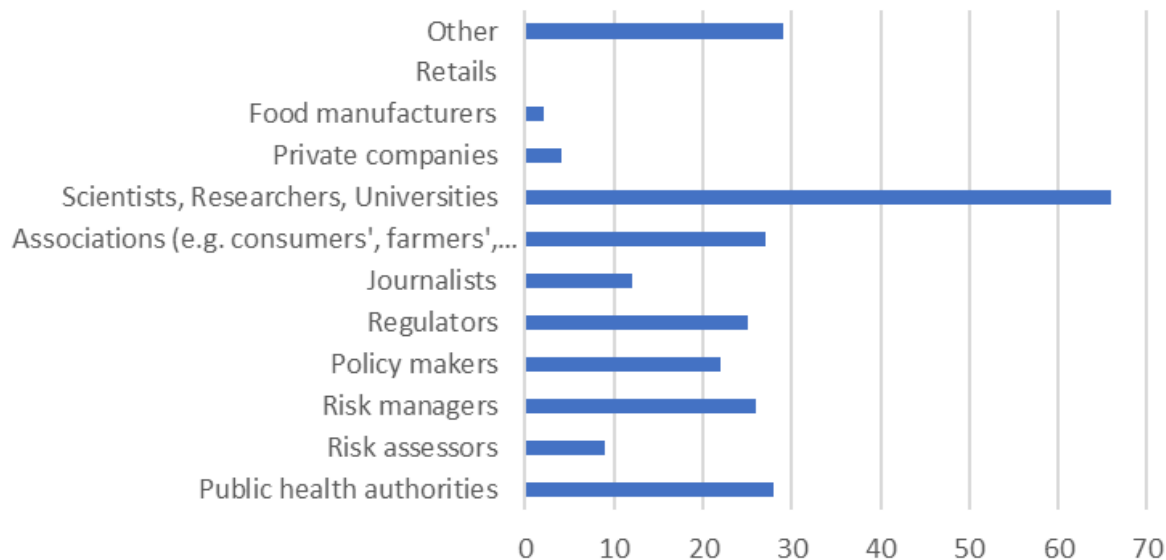
8 - Strategy - The goals of risk communication



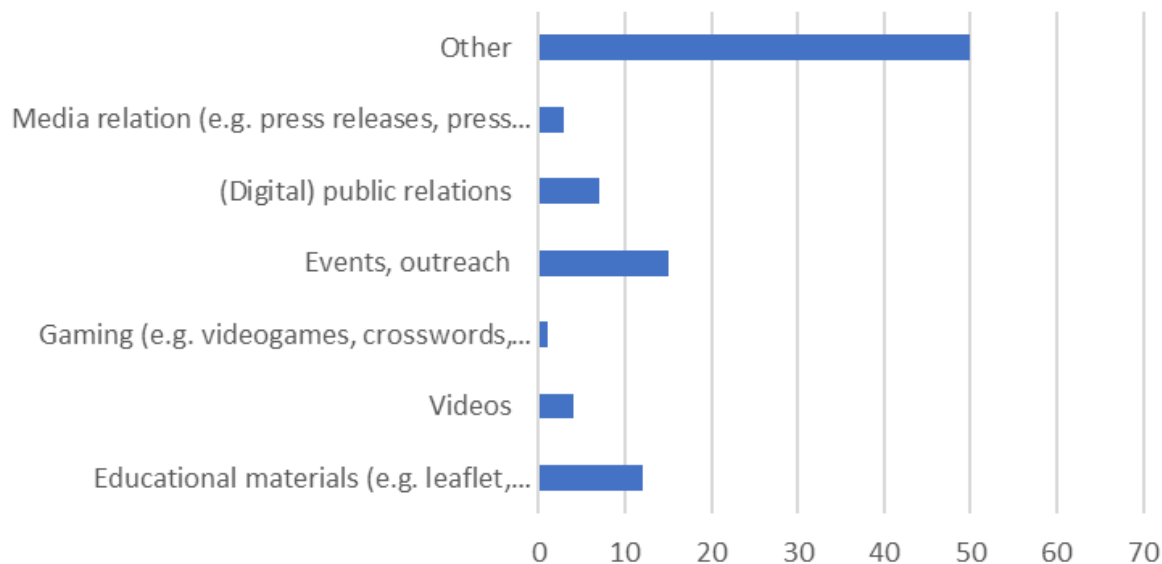
9 - Strategy - To which target audience?



10 - Strategy - Communication sources



11 - Strategy - Tools



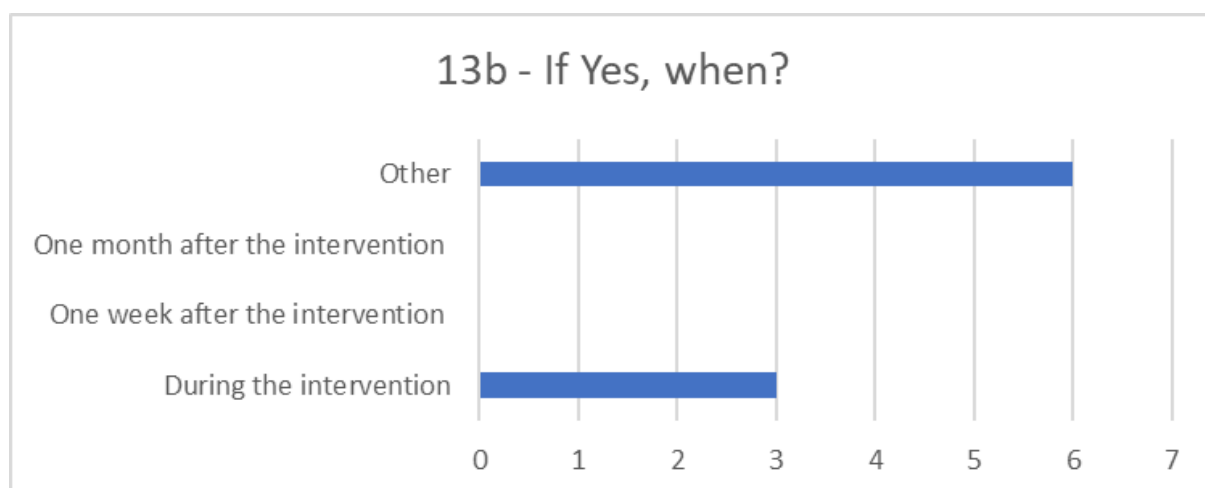
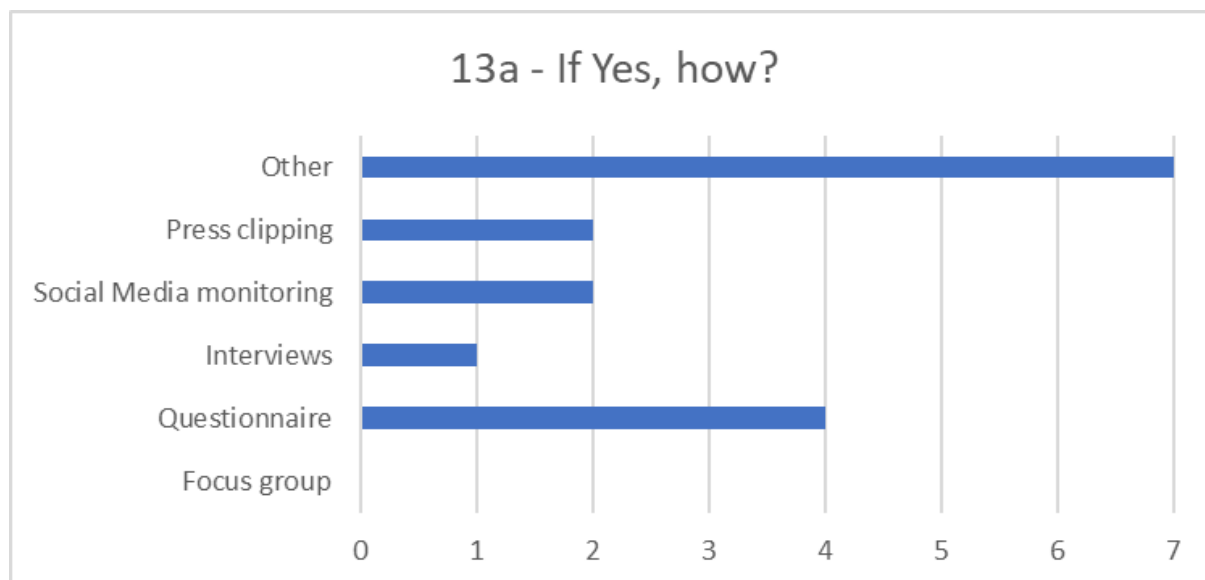
12 Strategy - Intervention and duration

In 4 cases

- ✿ 2 h workshop
- ✿ 4 h workshop
- ✿ 6 months intervention program
- ✿ 3-year piloting program

13 Strategy - Monitoring and communication evaluation

8 ways to evaluate



Appendix 5. Explicit notes on 'other' options

1. Disciplines

- editorial
- doctoral thesis
- animal ethics, one health ethics, emergency management
- veterinary epidemiology; development studies
- interdisciplinary One Health / zoonotic outbreak communication
- animal welfare science; agricultural economics
- behavioural science / health psychology
- food safety challenges & One Health
- emergency management, invasion biology, environmental policy

- ✦ veterinary education
- ✦ ethics
- ✦ environmental health & One Health
- ✦ biosecurity across plant-animal-human domains
- ✦ partially food safety
- ✦ implementation science, behavioural intervention methodology
- ✦ risk governance, systems science
- ✦ education sciences
- ✦ environmental science, economics, food systems modelling
- ✦ food policy
- ✦ cross-disciplinary behavioural science applied to veterinary context
- ✦ occupational health; workplace wellbeing; veterinary public health
- ✦ ecology, evolutionary biology, disease ecology
- ✦ ethnobiology, ethnoveterinary medicine, TEK
- ✦ conservation biology; biocontrol communication
- ✦ public health & risk management
- ✦ consumer behaviour & risk
- ✦ BSE: epidemic/policy analysis
- ✦ risk communication design, expert/audience models
- ✦ risk communication & stakeholder participation
- ✦ human-animal interactions, ethics, government policy

2. Topics

- ✦ animal disease prioritization
- ✦ biosecurity (plant + animal + human + environmental)
- ✦ risk perception, misinformation, EU food safety system
- ✦ meat consumption attitudes; animal suffering
- ✦ livestock disease risk management
- ✦ TADs beyond main focus (CSF, FMD)
- ✦ national eradication policies, diagnostics, surveillance (e.g. TB)
- ✦ ICS (Incident Command System)
- ✦ communication in veterinary medicine
- ✦ farmer perceptions of biosecurity
- ✦ consumer sustainability perceptions; traceability
- ✦ overarching animal welfare in disaster risk reduction
- ✦ integrating communication theories in public health
- ✦ farmers' scripts and moral accountability
- ✦ food allergies and teacher training
- ✦ risk communication during epidemics (cross-media)
- ✦ health risk communication (general)
- ✦ interventions to reduce meat consumption
- ✦ social amplification, trust, uncertainty, media
- ✦ biocontrol communication; public fears
- ✦ wildlife interface disease; One Health
- ✦ occupational risks, suicide risk in vets

- ✎ plant and environmental health integration
- ✎ animal welfare in visitor facilities (ethical reasoning)
- ✎ HPAI crisis communication & public health
- ✎ risk governance frameworks
- ✎ fact checking & livestock sector communication
- ✎ supply chain information asymmetry
- ✎ AMU/AMR stewardship & behaviour change
- ✎ behavioural immunity and disease ecology
- ✎ ethnoveterinary plant knowledge
- ✎ public engagement in invasive species control
- ✎ plant biosecurity
- ✎ human biosecurity
- ✎ environmental biosecurity
- ✎ integrated biosecurity systems
- ✎ consumer behaviour in sustainability, traceability, food fraud, information asymmetry
- ✎ frameworks outside specific diseases such as TADs like CSF, FMD mentioned alongside ASF

3. Target Audience Analysis

In the sub-questions of the target audience analysis there was no 'other' option. Yet multiple notes were added. 'Partially', 'implicitly' or 'indirectly' were often mentioned in the notes. Many papers had no systematic target group analysis but explored target groups qualitatively or contextually, e.g.:

- ✎ Stakeholder engagement without formal audience analysis
- ✎ farmers, veterinarians, pet owners, wildlife professionals, policymakers
- ✎ Veterinarians as trusted messengers to farmers
- ✎ Identification of information gaps (public vs. expert)
- ✎ Trust dynamics (lay referral, perceived incompetence of authorities)
- ✎ Emphasised need for communication via trusted channels
- ✎ Risk perception discussed conceptually but not measured
- ✎ Farmer attitudes analysed but not as structured audience analysis
- ✎ Internet users grouped (pet owners, farmers) but no campaign audience
- ✎ Wildlife agency audiences indirectly included
- ✎ Risk managers, veterinarians, policymakers, practitioners, farmers – implicit audiences
- ✎ Specific crises (bTB, ASF, Hendra, COVID 19, flooding events)
- ✎ Digital communities (forums, WhatsApp groups, online networks)

4. Investigation Techniques

- ✎ World Café workshops
- ✎ Stakeholder workshops (sticky notes, voting, SWOT)
- ✎ Consensus conferences
- ✎ Citizen advisory committees
- ✎ Policy review & narrative synthesis
- ✎ Epidemiological analyses (epidemic curves, spatial statistics)

- ✎ Mental Models Approach (expert/actual models)
- ✎ Thematic qualitative analysis (NVivo)
- ✎ PLS-SEM modelling
- ✎ Narrative literature review
- ✎ Critical Metaphor Analysis
- ✎ Mixed-methods (qual + quant)
- ✎ Internet mining, Brand24, Google Trends, topic detection
- ✎ Passive surveillance & modelling (NAME)
- ✎ Ethnography/ethnoveterinary fieldwork
- ✎ Lexicometric analysis (Gulpease index, SI index)
- ✎ Reflexive thematic analysis
- ✎ Conceptual and policy analyses
- ✎ Ethnography
- ✎ Ethnoveterinary fieldwork
- ✎ Reflexive thematic analysis
- ✎ Cognitive and metaphor analysis CMA
- ✎ NVivo-supported coding
- ✎ PLS SEM
- ✎ Lexicometric analysis like Gulpease and SI-index, word clouds, text mining
- ✎ Internet and media listening: Brand24, Google trends, topic detection
- ✎ Epidemic curves
- ✎ Spatio temporal analysis
- ✎ Modelling dispersal e.g. NAME meteorological model
- ✎ Surveillance systems and
- ✎ Risk maps
- ✎ Mental models approach expert vs. actual models
- ✎ Workshops with expert elicitation, operational tool validation

5. Theoretical Frameworks

- ✎ Cultural theory of risk
- ✎ Participatory science communication, AIS framework
- ✎ Discursive script theory, cognitive script theory
- ✎ Social marketing, health promotion (Ottawa Charter)
- ✎ One Health, One Welfare, Sendai Framework for disaster risk reduction
- ✎ Risk governance (IRGC)
- ✎ Transtheoretical model TTM
- ✎ Theory of reasoned action TRA
- ✎ Social cognitive theory
- ✎ COM B and behaviour change constructs
- ✎ Anticipated regret extensions to TPB
- ✎ Social amplification of risk
- ✎ Trust theory
- ✎ Agenda-setting, lay referral system
- ✎ Ethical Matrix framework
- ✎ Cardinal Rules of ERC (Covello)

- ✎ IDEA model
- ✎ Veterinary risk analysis frameworks (OIE/WOAH)
- ✎ Lay referral system
- ✎ Crisis and emergency risk communication CERC
- ✎ Covello's cardinal rules
- ✎ Media agenda-setting
- ✎ Sociological and participatory communication theory
- ✎ Agricultural innovation systems AIS
- ✎ Blended learning models
- ✎ Social marketing
- ✎ Health promotion
- ✎ No single framework but conceptual synthesis
- ✎ Many papers explicitly: narrative/theoretical reviews

6. Message Content, notes

There was no 'other' option in this question, but the notes added indicate that

- ✎ the message is 'partly' or 'implicitly' defined/formulated/adapted/pre-tested
- ✎ there is a plain depiction of context but no explicit, structured message
- ✎ messages are embedded in policy letters, surveillance alerts e.g.
- ✎ guidance on efficacy framing (self/proxy/response efficacy)
- ✎ emphasis on transparent communication
- ✎ emotion-informed educational campaigns
- ✎ stakeholder co-designed advice
- ✎ efficacy framing (self-efficacy, response efficacy)

7. Key areas of intervention (no notes added)

8. The goals of risk communication

There is no 'other' option in this question and only one comment ('social media' as a technological communication tool)

9. Target audiences

- ✎ NGOs, civil society
- ✎ Wildlife professionals
- ✎ Abattoir staff
- ✎ Teachers
- ✎ Local communities & online communities
- ✎ Industry representatives (processors, stock agents)
- ✎ Conservation organizations
- ✎ Certification bodies
- ✎ Occupational health practitioners
- ✎ Extension networks
- ✎ Hunters
- ✎ Animal welfare groups
- ✎ Human health professionals

- ✦ Agricultural advisors
- ✦ Residents near farms

10. Communication sources

- ✦ International standard-setting bodies (OIE, EFSA, FAO, WHO)
- ✦ Online communities (forums, social media)
- ✦ Peer networks of farmers and veterinarians
- ✦ WHO used by emergency managers
- ✦ Donors, funding bodies
- ✦ State extension networks
- ✦ ProMED, alert systems
- ✦ Online platforms, social media networks, WhatsApp groups
- ✦ Scientific literature as explicit source
- ✦ Local government & community leaders

11. Tools for communication

- ✦ Internal communication systems
- ✦ SOPs, contingency plans
- ✦ Online training (PrepVet®, FEMA/NIMS)
- ✦ Advisory apps for farmers
- ✦ Bayesian communication aids
- ✦ E-learning for veterinarians
- ✦ Stakeholder dialogue tools
- ✦ Ethical Matrix as communication tool
- ✦ Decision-support tools
- ✦ Surveillance dashboards
- ✦ Word clouds, risk maps
- ✦ Benchmarking tools e.g., AMU/AMR prescribing

12. Duration of the intervention (no notes added)

13. Monitoring and communication evaluation

- ✦ Programme timelines (e.g. bTB: ongoing since 2018)
- ✦ Retrospective evaluations
- ✦ Cross-sectional content reviews
- ✦ Pilot testing of operational tools
- ✦ Multi-phase training evaluation

Appendix 6. Research agenda on communication and animal welfare

A research agenda aimed at increasing the acceptability of animal farming must be based on advanced training, information, and communication techniques.

- ✦ Acceptability depends not only on "actual welfare," but on perceived welfare.
- ✦ Trust in the supply chain is often more crucial than technical information.
- ✦ Narratives have a greater impact than data.
- ✦ Transparency can only increase acceptability if it is interpreted as credible and not defensive.

The intent must never be manipulative but intended to understand each other's reasons and lead the parties towards shared ground where the foundations for a sustainable future can be laid.

The research must involve all parties involved and present and explain the facts, rules and ethical and moral implications.

The lines of research therefore converge on four major dimensions:

1. *Cognitive*
 - ✦ Knowledge vs. Perception
 - ✦ Framing and Interpretation
2. *Social*
 - ✦ Trust in Stakeholders
 - ✦ Media Influence
3. *Ethics*
 - ✦ Dissonance and Moral Acceptability
 - ✦ "Social Contract" on Animals
4. *Structural*
 - ✦ Certifications
 - ✦ Supply Chain Transparency

In detail, an integrated social research model could be based on the following lines of research:

1. *Perceptions of animal welfare and the construction of judgments*

Research line: How the public defines and evaluates "animal welfare" in different production systems

Research questions

- ✦ How is "animal welfare" spontaneously defined by different segments of the population?
- ✦ Which elements (space, freedom, suffering, naturalness) weigh most heavily in the evaluation?
- ✦ Are perceptions based on scientific knowledge or cultural representations?

2. Effects of communicative framing on attitudes

Research line: how the presentation of the topic influences acceptability and trust

Research questions

- ✎ Is positive framing (care, quality) more effective than negative framing (animal suffering)?
- ✎ How do attitudes change if sustainability is emphasized versus productivity?
- ✎ Which narratives reduce the psychological distance between consumers and farms?

3. Trust in the Supply Chain and Information Sources

Research line: the role of trust in supply chain actors (farmers, industry, institutions, NGOs)

Research questions

- ✎ Which actors are perceived as more credible in animal welfare communications?
- ✎ Does trust vary between intensive, extensive, and organic systems?
- ✎ Does supply chain transparency increase perceived legitimacy?

4. Cognitive Dissonance and Consumption of Animal Products

Research line: study of the conflict between consumption and ethical concerns

Research questions

- ✎ How do consumers manage the dissonance between meat consumption and animal welfare?
- ✎ What communication strategies reduce cognitive resistance?
- ✎ Does awareness of animal welfare reduce or strengthen consumption?

5. Scientific Knowledge vs. Social Perception

Research line: the gap between scientific evidence and public opinion

Research questions

- ✎ To what extent does actual knowledge of farming systems influence acceptability?
- ✎ What scientific information is misunderstood or ignored?
- ✎ Does science education really change attitudes?

6. Influence of the Media, Activism, and Social Media

Research line: the role of media and advocacy campaigns in shaping opinions

Research questions

- ✎ What is the impact of animal rights campaigns on the social acceptability of animal farming?
- ✎ Do social media amplify negative perceptions or foster informed debate?
- ✎ What types of content generate greater polarization?

7. Effect of Certifications and Labeling Systems

Research line: impact of labels (e.g., "certified animal welfare") on perception

Research questions

- ✎ Do animal welfare certifications increase trust in products?
- ✎ Which label elements are most influential (logo, standard, certifying body)?

- Do labels reduce or increase scepticism?

8. Social Acceptability and the Moral Contract Between Society and Animal Farming

Research line: building an implicit "social pact" on animal farming

Research questions

- What conditions make animal farming socially acceptable?
- Is there a perceived threshold of "tolerable suffering"?
- How does acceptability vary across cultures and socioeconomic contexts?