ecdc
EUROPEAN CENTRE FOR DISEASE PREVENTION AND CONTROL

TECHNICAL REPORT

Effective communication around the benefit and risk balance of vaccination in the EU/EEA

www.ecdc.europa.eu

ECDC TECHNICAL REPORT

Effective communication around the benefit and risk balance of vaccination in the EU/EEA

Acknowledgements
This report was commissioned by the European Centre for Disease Prevention and Control (ECDC) under the service contract no. ECD.14827 REF.26094. The project was coordinated by Andrea Würz, with the contribution of Kate Olsson, John Kinsman and Catalin Bercaru from ECDC.

The report was developed by the project contractors Bea Rofagha (Schuttelaar & Partners) and Laura Rennie (Technopolis Group).

ECDC would like to acknowledge the experts from national public health organisations from Belgium, Bulgaria, Cyprus, Denmark, Greece, Hungary, Italy, Iceland, Ireland, Latvia, Lithuania, Luxembourg, Malta, Norway, Slovakia, Spain and Sweden who participated in the online survey.

ECDC would like to also acknowledge the insights provided during the interviews by colleagues from national public health organisations from Denmark (Mia Jorgensen, Kirstine Moll Harboe and Bolette Søborg), Ireland (Yvonne Morrissey and Lucy Jessop), Latvia (Gints Georgs Muraševs), Norway (Anita Odveig Daae), Spain (Laura Sánchez-Cambronero Cejudo), Sweden (Madelene Danielsson) as well as by the interviewees from WHO Regional Office for Europe (Brett Craig and Oleg Benes), the European Medicines Agency (Rosa Gonzalez-Quevedo), the European Food Safety Authority (Barbara Gallani), the Harding Center for Risk Literacy (Felix Rebitschek), the Institute for Planetary Health Behaviour at University of Erfurt (Mirjam Jenny) and the EU-funded project VAX-TRUST coordinated by Tampere University, Finland (Pia Vuolanto).

Finally, ECDC would like to acknowledge the valuable input from participants at the online workshop from Finland (Soile Koskela), Greece (Dimitrios Iliopoulos), Malta (Tanya Melillo), Netherlands (Lea Visser), Norway (Christina Rolfheim-Bye), Romania (Georgeta Dinculescu), Slovakia (Zuzana Soukupová), Slovenia (Alja Polajzer), Sweden (Madelene Danielsson), the Coalition for Vaccination – European Federation of Nurses (Alessia Suma), the European Commission (Kathryn Owens), the European Medicines Agency (Rosa Gonzalez-Quevedo), the Harding Center for Risk Literacy (Felix Rebitschek), WHO Regional Office for Europe (Brett Craig), and the EU-funded project VAX-TRUST (Pia Vuolanto).

Suggested citation: European Centre for Disease Prevention and Control. Effective communication around the benefit and risk balance of vaccination in the EU/EEA. Stockholm: ECDC; 2024.

Stockholm, May 2024.

ISBN 978-92-9498-721-1
doi: 10.2900/274174
Catalogue number TQ-06-24-081-EN-N

Contents

Figures

Tables

Abbreviations

AI	Artificial Intelligence
COVID-19	Coronavirus disease 2019
EEA	European Economic Area
EMA	European Medicines Agency
EU	European Union
EFSA	European Food Safety Authority
FAQ	Frequently asked questions
GP	General practitioner
HCPs	Healthcare professionals
HCWs	Healthcare workers
HPV	Human papillomavirus
MMR	Mumps, measles, rubella
RQ	Research question
VPD	Vaccine-preventable disease
VR	Virtual reality
WHO	World Health Organization

Executive summary

Vaccination protects people against serious and potentially life-threatening infectious diseases: the World Health Organization (WHO) estimates that vaccination prevents 3.5 to 5 million deaths every year globally [1]. However, despite the importance of vaccines, numerous surveys done in European Union/European Economic Area (EU/EEA) countries show that the concerns of some people regarding the safety of vaccines as well as the perception that they are not effective pose a major challenge to the efforts of public health authorities to promote vaccine acceptance and uptake.

This report presents the results of a study that dealt specifically with effective communication around the benefit and risk balance of vaccination, people's risk perceptions around vaccines and diseases, and approaches to enhancing communication about the safety and effectiveness of vaccines. The study was performed between June and November 2023, with an aim to increase knowledge about:

- How to communicate effectively about vaccination with a focus on its individual and community benefits outweighed against risks. The risks include the individual risk of contracting the disease and its outcomes, and potential risks associated with being vaccinated (i.e. side-effects).
- How people and communities perceive risks related to vaccines and infectious diseases.
- How the safety and effectiveness of vaccines can be better communicated to different audiences based on innovative and effective approaches.

This study used a literature review, an online survey, interviews and an online workshop to contribute to the knowledge base on these topics. The literature review consisted of a structured review of both grey and published literature to get an overview of existing, peer-reviewed and other academic literature, and other documentary evidence, and covered the period 2018 to 2023 (2015 to 2023 for review articles).

The work took into account lessons learned by public health organisations during the COVID-19 pandemic. In addition to COVID-19 vaccination, it also focused on recent influenza, MMR, and HPV vaccination campaigns conducted by public health organisations in the EU/EEA.

The findings of this study can support public health professionals in the EU/EEA involved in vaccination programmes, in particular in communication on vaccines, and other organisations in their work to promote vaccine acceptance and uptake in the EU/EEA.

Summary of findings

The study findings are presented in the two main sections of chapter 3 of this report: one on main challenges and one on good practices, as identified in the literature and as reported by countries and organisations during stakeholder consultations. For each of the good practices, the good practice is described and, where possible, concrete examples are presented. Practical considerations that can impact the feasibility of implementation and transferability of the good practice to diverse settings are then discussed.

In relation to the considerations and challenges for effective benefit/risk communication on vaccines, the following were identified in the study:

- Individual perceptions about the risks and benefits of vaccines are very important in determining vaccine acceptance and uptake, and they vary widely between individuals in terms of the perceived size and nature of risks and benefits. Perceptions among different population sub-groups vary, potentially exacerbating health inequalities. Similarly, health disparities can contribute to negative perceptions of vaccines, lower literacy levels, and reduced vaccine confidence.
- Evidence on vaccine risks and benefits evolves rapidly in the case of new vaccines, posing challenges for public health authorities to have access to and review the emerging data and communicate on ongoing uncertainties.
- An individual's decision to vaccinate involves a complex process of weighing up a range of risks and benefits, and this can require a relatively high degree of health literacy and numeracy.
- Vaccine mis- and disinformation are widespread, and they compete with the communication initiatives from public health authorities.
- Migrant populations and ethnic minorities often have lower levels of trust in public health institutions. They are also more difficult to reach via the standard communication channels most often used by public health authorities.
- Some public health authorities face operational challenges in terms of available expertise in risk communication on vaccination and insufficient resources (human and financial). This can impact their capacity to communicate on risk and benefits of vaccines as effectively as they would like.

In relation to the good practices which can serve to address some of the challenges identified, these included:

- Monitoring risk perceptions of the population and adapting communication accordingly.
- Addressing misinformation on vaccine risks with pre-bunking and debunking interventions.
- Illustrating facts through data visualisation.
- Transparency in processes, in providing data, and communication.
- Use of narratives and conveying emotional values through personal stories.
- Exploring the potential uses of innovative technologies, such as chatbots, virtual reality, and gamification.
- Providing support materials and training to those engaging in vaccine conversations.

In addition, a number of general good practices around health communication that are particularly relevant to vaccine benefit-risk communication, several of them mentioned during the stakeholder consultation process, are summarised in this report.

Results of this study confirm the complexity of effective communication around benefit/risk balance of vaccination. There is still much to be learned about the psychological processes that operate when individuals access multiple sources of information and weigh up the benefits and risks of vaccinating, and how this can be taken into account when communicating with individuals about vaccine benefits and risks.

Within the scope of this study, it became challenging to identify one clear strategy with clear evidence backing its use, even if many show a great deal of promise. Vaccination acceptance and uptake is likely to be enhanced through use of several of the good practices described in this report. Further, communication around benefit/risk on vaccines should be embedded within broader vaccination communication strategies, making use of multiple different communication techniques, to ensure impact across multiple different audiences.

1 Background

Vaccines are an extremely effective way to prevent infectious diseases and protect public health. Vaccination protects both the individual as well as large groups of populations from serious illnesses and related complications. The World Health Organization (WHO) estimates that vaccination prevents 3.5 to 5 million deaths every year globally [1]. Vaccination has also played a key role in bringing the COVID-19 pandemic under control: a 2023 study by WHO Regional Office for Europe estimated that, across the WHO European region, COVID-19 vaccines have saved more than 1.4 million lives, most of them aged 60 or older. [2].

Sub-optimal vaccination coverage

Despite immunisation against infectious diseases being one of the most successful public health interventions, the current sub-optimal levels of immunisation in some countries or specific population groups remain a significant public health issue. Vaccination against measles is one important example, with only five of 27 EU countries having vaccination coverage above the 95% elimination target for measles, for both (first and second) doses in relation to 2022 data [3]. Insufficient immunisation coverage results in a higher risk of individuals getting infected as well as the inability to achieve 'herd immunity' (a term also referred to as 'community immunity' and which refers to the indirect protection from an infectious disease that happens when a population is immune either through vaccination or immunity developed through previous infection [4]).

During the unprecedented and exceptional health crisis caused by the COVID-19 pandemic, the availability of effective vaccines and high vaccination rates became key to saving lives, keeping healthcare systems operational and key to returning to open and economically strong societies. There was enormous pressure on public health authorities in the EU/EEA not only to deliver vaccines but also to ensure high vaccine acceptance and uptake in the population. As of 5 October 2023, over 82% of all adults aged 18 years and over in the EU/EEA had received a primary course of vaccination against COVID-19 versus 65% of first and only 36% of the eligible people a second booster vaccination[i]. Although the uptake of the primary course of vaccination was an impressive achievement over a short period of time, the uptake of booster vaccinations was much lower. In addition, vaccine coverage across the EU/EEA countries was very uneven.

Vaccine confidence during the COVID-19 pandemic

The reasons for lower-than-expected COVID-19 vaccine coverage in a number of countries were manifold and included difficulties with vaccine supply, inconvenient access, and insufficient service delivery, but were also rooted in people's attitudes and behaviours towards the vaccines [5–8]. EU-wide surveys showed that COVID-19 vaccine confidence remained a major challenge for high vaccine uptake [9]. As of February 2022, results of an EU Flash Eurobarometer survey showed that a substantial share of the EU public remained apprehensive about the speed by which COVID-19 vaccines had been brought to the market, and about their long-term safety, with close to half of respondents indicating agreement with a survey statement (among a selection of statements) that COVID-19 vaccines were being developed, tested and authorised too quickly to be safe [10].

Public health authorities' challenging communication task

When the new COVID-19 vaccines went into clinical trials and several months later received conditional marketing authorisation, public health authorities had to include the newly available vaccines into their crisis communication. The benefit of the vaccines versus the risk of the disease and eventual potential side-effects of the vaccines had to be communicated against the background of quickly evolving effectiveness and safety data. At the same time, public health authorities were competing with a multitude of information sources (traditional, digital and social media) for the attention of healthcare professionals and communities. Countless self-proclaimed experts created their own 'truths' about COVID-19 vaccine related topics, which rapidly spread and gained traction in the public sphere. Thus, the context of the public health crisis exacerbated the already challenging task that public health authorities face in peace time to communicate effectively about vaccines.

Context of this study

Based on the European Commission Council Recommendations of December 2018 on strengthened cooperation against vaccine-preventable diseases [11], ECDC has worked on several aspects that impact vaccine acceptance and uptake. Earlier, ECDC had already developed projects on vaccine hesitancy, for example on a catalogue of interventions to address this [12]. Further work in this area, following the Council Recommendations, included the

[i] https://vaccinetracker.ecdc.europa.eu/public/extensions/COVID-19/vaccine-tracker.html#uptake-tab

development of an online information portal on vaccination by ECDC in collaboration with EMA and the European Commission [13], and a report and e-learning on how to address online vaccine misinformation [14, 15].

More recently, ECDC published a report dedicated specifically to strategies for facilitating COVID-19 vaccination acceptance and uptake [16]. Within the latter report, the '5C-model' [17] is referred to as a complement to other models focused on vaccine hesitancy and confidence [18]. This 5C-model and its components, which include vaccine confidence, complacency (not perceiving diseases as high risk), constraints (structural and psychological barriers), calculation (engagement in information searching on a vaccine and/or about the disease in question, and then conducting a risk-benefit analysis about whether or not to be vaccinated), and aspects pertaining to collective responsibility (willingness to protect others) can be used to understand the vaccination behaviour of people and thus inform the design and implementation of vaccination and communication strategies. In particular, the aspects of 'confidence', 'calculation' and 'complacency' provide a frame for the topic of this study and report.

Scope

This report presents the results of a study which dealt specifically with effective communication around the benefits and risks of vaccination, risk perceptions and approaches to enhance communication about the safety and effectiveness of vaccines. The study was performed between June and November 2023, with an aim to increase knowledge about:

- How to communicate effectively about vaccination with a focus on its individual and community benefits outweighed against risks. The risks include the individual risk of contracting the disease and its outcomes, and potential risks associated with being vaccinated (i.e. side-effects).
- How people and communities perceive risks related to vaccines and infectious diseases.
- How the safety and effectiveness of vaccines can be better communicated to different audiences based on innovative and effective approaches.

In line with its mandate and its previous work, ECDC aims to continue also with this study to support public health professionals in the EU/EEA involved in vaccination programmes, in particular in communication on vaccines, and other organisations in their work to promote vaccine acceptance and uptake, by:

- Summarising recent research around risk perception and considerations for communicating and presenting information on risk/benefit balance around vaccination.
- Discussing lessons learned from the communication around COVID-19 vaccines and examples from practice.
- Sharing experiences from EU/EEA countries on the challenges they have faced in communicating the risk/benefit balance of vaccination (in particular for COVID-19 vaccines), and any innovative approaches implemented in order to address the challenges.
- Providing examples of tools (e.g. data visualisation) and innovative approaches that can be used for effective communication on risk/benefit balance and their use to clearly convey information on probabilities and ease comprehension of complex statistical information (including both during the context of a pandemic/emergency situation and during 'peace time' around routine vaccinations, and what differences there may be with communicating during these contrasting situations).
- Contributing to improve the communication around the safety and effectiveness of vaccines, by highlighting innovative and effective approaches to convey information on the risk/benefit balance of vaccination[ii].

[ii] Bulleted list taken directly from the terms of reference for the request for offer for this project, published by ECDC.

2 Overview of the methodology

The methodology of this study was supported by research questions which are outlined below.

2.1 Research questions

Table 1 provides an overview of the main study research questions.

Table 1. Study research questions

Research question	Sub-questions / themes
RQ1: Which considerations and contexts have to be taken into account when communicating information on the benefit/risk balance around vaccination? (i.e. what factors predict vaccine-related cognitions and behaviours?)	• Disease factors • Vaccine factors • Factors relating to the individual • Cultural factors • Communication factors • What models are used to predict vaccination-related attitudes and behaviour?
RQ2: What are the known risk perceptions of individuals with respect to vaccines and vaccine-preventable diseases? (Both general risk beliefs and beliefs specific to certain vaccines and/or diseases)	• Common concerns about vaccine safety, their prevalence and veracity • Common risk perceptions about vaccine-preventable diseases, their prevalence and veracity • Are these concerns prevalent in particular population groups? • Have these concerns been shown to negatively impact vaccination behaviours?
RQ3: What are the examples of good practices of effective communication around the benefit/risk balance of vaccines? (i.e. that have used evidence and theory in the design of the intervention and/or that have a proven impact on vaccine-related cognitions and behaviours)	• Description of the communication, and how/whether it takes into account what we know about vaccine perceptions • Impact of the communication on outcomes (vaccine attitudes, acceptance, intentions and/or behaviours), if applicable • Examples of innovative approaches used during the COVID-19 pandemic. • Suitability for use in other settings, based on what we know about vaccine perceptions
RQ4: To what extent are these good practices transferable to other contexts/countries?	• What factors need to be taken into account when considering transferability? • What health models can be used to draw conclusions regarding the generalizability of findings? • How can this inform preparedness in the face of future pandemics?
RQ5: Based on the above analysis, how can the communication around the effectiveness and safety of vaccines be improved in the EU/EEA?	
RQ6: What are the gaps, risks and limitations with respect to the effective communication around the benefit/risk balance of vaccines?	

To answer the above-mentioned research questions, a combination of quantitative and qualitative research methods including a review of scientific and grey literature, an online survey and interviews (stakeholder consultation), and an online workshop were conducted.

Further information on the methods used to address each research question, as well as a detailed descriptions of each, are available in the Annex.

The scope of the research was progressively narrowed: in the literature review stage, the scope was wide with few geographical limits and articles on all vaccines and vaccine-preventable diseases were considered, whereas this was narrowed to EU/EEA countries and four key vaccines in the stakeholder consultation (the online survey and the interviews) and the online workshop. Specifically, the scope was narrowed to look at COVID-19 vaccines, MMR, HPV and seasonal influenza vaccines. This covers a range of target age groups for vaccination - childhood (MMR), adolescence (HPV) and mainly adult and specific at-risk groups (influenza) as well as vaccines developed and implemented in crisis/pandemic situations (COVID-19) versus routine vaccinations in peace time (MMR, HPV).

2.2 Structure of the report

This report summarises the findings gathered from the literature review, online survey, interviews and online workshop on the main challenges faced in communicating about the risks and benefits of vaccines and how they can best be addressed. These are summarised in chapter 3, in the sections on main challenges and good practices. For each of the good practices, the good practice is described and, where possible, concrete examples are presented. Practical considerations that can impact the feasibility of implementation and transferability of the good practice to diverse settings are then discussed. Through this, it is intended that these good practices can thereby support professionals in the countries' public health authorities and other organisations in their work to promote vaccine acceptance and uptake in the EU/EEA.

3 Findings

This chapter describes the main project findings, structured according to the main considerations for and challenges in communicating about vaccine risks and benefits, followed by the good practices identified to address these challenges.

3.1 Considerations and challenges for effective communication of vaccine benefits and risks

The following considerations and challenges were identified mainly through the literature review. Where appropriate, these have been complemented with feedback on their relevance or with additional information gathered during the stakeholder consultation.

3.1.1 Individual risk perceptions and factors determining behaviour (uncertainty around safety and effectiveness)

Deciding whether to vaccinate or not involves appraising a series of risks and benefits. The risks associated with vaccination include side effects, ranging from frequently experienced but less serious side effects (e.g. tiredness, numbness/soreness at the site of vaccination, light symptoms of disease) to rare but serious side effects. The decision to vaccinate may also include other risks such as loss of earnings due to taking time out from the working day to get vaccinated, social risks for members of groups in which vaccination is stigmatised or considered negatively. Some people may also fear unfounded risks, such as the circulating rumours that COVID-19 vaccines contained a nanochip. Others may be concerned that a vaccine can facilitate engaging in a behaviour perceived as undesirable (e.g. some parents that are worried of increased sexual activity in adolescent girls who have received the HPV vaccine).

The main benefit of vaccination is disease prevention or in the case of COVID-19 to limit severe disease. This could be framed at the level of the individual, community or society (i.e. prevention of disease in oneself, of one's community or of one's society).

Individual perceptions around the relative weight of these risks and benefits are predictive of vaccine acceptance and uptake. Greater perceived risks (i.e. perceived risks in terms of adverse effects) are associated with reduced acceptance and uptake [20]. Greater perceived benefits (in the form of perceived effectiveness of the vaccine in preventing disease) is associated with increased vaccine acceptance and uptake [20]. Perceived disease risks are also important - increased perceived seriousness of a vaccine-preventable disease and increased perceived susceptibility to it increases vaccine acceptance and uptake. This process of weighing up risks and benefits is reflected in the Health Belief Model, which predicts that, to the extent that the perceived benefits of a health behaviour (vaccination) outweigh its perceived risks, an individual is more likely to engage in the health behaviour. This model has been found to successfully predict vaccine hesitancy [21].

It also appears that individual (and subjective) perceptions around the risks and benefits can influence vaccine acceptance and uptake more than objective risks and benefits. For example, the actual COVID-19 infection rates (i.e. objective susceptibility) in a given location may have a limited influence on vaccination intentions [22], whereas subjective perceptions of susceptibility (i.e. an individual's perception of their likelihood of contracting the disease) may be more influential [22]. Similarly, vaccine acceptance and vaccination intentions are not necessarily higher among healthcare workers (HCW), who are objectively at a higher risk of contracting the disease [22].

In addition, research shows that individuals do not consider risk and benefit information equally; risks are given more weight in decision-making than benefits. This finding holds across multiple behavioural domains, including health behaviours and vaccination behaviour [23].

Another challenge consists of the fact that risks and benefit perceptions have been found to differ by population sub-group, potentially exacerbating health inequalities. For example, perceptions about the safety of vaccines are lower in some migrant populations than in non-migrant populations [20]. To the extent that these different perceptions of risk translate into different vaccine acceptance and uptake (at least in some migrant populations, this has found to be the case), then this will contribute towards health inequalities and hinder efforts to 'leave no one behind' [24] when it comes to vaccination. Similarly, health disparities can contribute to negative perceptions of vaccines, lower literacy levels, and reduced vaccine confidence.

Thus, many complex factors are at play in determining the way in which the risks and benefits of vaccination are appraised, even before considering communications around vaccine risks and benefits.

3.1.2 Evolving evidence on risks of disease and benefits-risks of vaccines

During the COVID-19 pandemic, access to accurate and up-to-date information was made more challenging by the fact that the evidence on risks of disease and benefits/risks of vaccines evolved over time. A joint report from the Heads of Medicines Agencies (HMA) and EMA on lessons learned[iii] highlighted: 'The pandemic also exposed the crucial need for more and better data and scientific evidence to guide decision making, e.g. regarding the use of vaccines and therapeutics in the different populations and age groups, the duration of protection or vaccine effectiveness against newly emerged virus variants. During the public health emergency it was difficult to gather mass vaccination campaign data promptly to confirm safety and effectiveness of the new vaccines in the routine care setting, for example to support use in special populations, such as immunocompromised individuals or pregnant women'.

Study participants confirmed during the interviews that uncertainty around vaccine safety and effectiveness made it challenging for them to shape the communication and convey the benefit/risk balance. For instance, the evidence on the protection of oneself and of others through vaccination evolved (given, for example, that the vaccine was less protective against disease transmission). Similarly, the evidence on protection from disease evolved into protection from severe disease. In addition, the vaccine recommendations changed over time, i.e. which groups were recommended vaccination.

This challenge was particularly significant in the pandemic situation and cannot be transferred to the same extent to 'normal times'. However, real-world evidence on vaccines will continue to evolve especially for newer vaccines and this may also lead to adaptations of their benefit/risk communication over time.

3.1.3 Health and data literacy

Risk and benefit information around vaccination is complex and difficult to understand. Making a fully-informed decision to vaccinate involves conducting a complex risk-benefit analysis that weighs up numerous different risks of vaccinating (e.g. non-serious risks such as tiredness, potential serious risks such as blood clotting, social risks) and benefits of vaccinating (i.e. effectiveness in preventing disease contraction, serious disease, transmission) that need to be considered at a number of levels (individual-level vs. societal-level) and are often measured using different metrics that are not directly comparable (e.g. percentages vs. probabilities).

Beyond making the decision to vaccinate or not, a further decision may be required as to which specific vaccine will be chosen, when options are available and in the context of a public health emergency (e.g. vaccines against COVID-19 using mRNA technology vs. an adenoviral vector vaccine), each with its own set of risks and benefits. Further, a decision on following the specific vaccination schedule recommended in a country may also be required, particularly for childhood vaccinations.

Making an informed choice requires a high degree of health literacy and numeracy skills. Lower levels of health literacy are linked to vaccine hesitancy [22], and lower levels of numeracy are correlated with greater susceptibility to vaccine misinformation [25]. This can create health inequalities and sub-optimal levels of vaccine acceptance and uptake, representing a great challenge for vaccine communication.

3.1.4 Vaccine mis- and disinformation

Vaccine mis- and disinformation is widespread: online discussion fora and social media platforms facilitate the spread of misinformation. A report published by ECDC in 2021 found that, in six European countries, between 3% (Spain) to 12% (the Netherlands and Romania) of all social media postings regarding vaccines and vaccine-preventable diseases contained misinformation [14]. Further, exposure to negative information about vaccines on social media has been found to have a negative impact on vaccine acceptance and uptake [22].

The complexity of the information about vaccine risks and benefits is difficult to grasp and this leaves people more vulnerable to believing mis- and disinformation. Evidence also suggests that specific groups can be at higher risk of being influenced by misinformation (including mothers, persons with lower numeracy skills, and ethnic minorities [14]) thereby further contributing to health inequalities.

Indeed, vaccine hesitancy has been recognised as a major global health problem: in 2019, the World Health Organization (WHO) placed it on their top 10 list of global health threats[iv] and stressed the need for countries to

[iii] HMA-EMA joint report on COVID-19 lessons learned. EMA/269282/2023, p. 18. Available at: https://www.ema.europa.eu/en/documents/report/covid-19-lessons-learned-joint-report-response-public-health-emergency_en.pdf

[iv] WHO, Ten threats to global health in 2019: https://www.who.int/news-room/spotlight/ten-threats-to-global-health-in-2019

accelerate their efforts to tackle the issue. Reflecting on this, the importance of addressing mis- and dis-information was often discussed in the stakeholder consultation conducted as part of this study.

3.1.5 Reaching ethnic minorities and migrant populations

Within countries, vaccine hesitancy can often be higher in ethnic minorities and migrant populations[v] [20]. People of ethnic minorities also report less trust in vaccines [26]. Historically, these are also populations who have not been served well by the health system, and whose trust in the health authorities is likely to be low as a result, in addition to likely having fewer resources with which to access health services [26]. Migrant populations can often perceive greater risks associated with vaccines [27, 28]. Migrant populations are also less likely to be native language speakers in the country in which they are based, meaning they are both more difficult to reach via vaccine communications used for the local populations and less likely to have the resources necessary to navigate the health system.

Given the fact that various factors such as political instability and climate change are resulting in increasing numbers of migrant populations, finding methods of effectively communicating about the risks and benefits of vaccines with these groups should be a priority. The importance of this issue was also mentioned by stakeholders during the consultation process conducted for this study.

3.1.6 Expertise in risk communication and resource constraints

Some public health authorities face operational challenges that can impact their capacity to communicate on risk and benefits of vaccines as effectively as they would like. The consultations with public health organisations confirmed that their communication professionals are well skilled to develop campaigns to foster the uptake of vaccines by messaging about their benefits. However, a few respondents reported insufficient expertise in risk communication on vaccination. In addition, over half of the respondents of the online survey expressed that they did not have sufficient human resources to communicate effectively around the risks and benefits of vaccines, and some also reported insufficient financial resources.

In the online survey, the vast majority of respondents did not report on the use of specific theories or models for the design of their communication campaigns. Among the few that mentioned use of specific theories and models, one referred to the use of the health belief model, social cognitive theory, and an interactive communication model for one of their campaigns. Another respondent mentioned the use of the COM-B model[vi].

These results highlight the importance of addressing human resource and financial constraints that could impact the initiatives to promote vaccine acceptance and uptake, as well as further guidance on use of theories and models of behaviour change to inform development of interventions.

3.2 Identified good practices

In this chapter, we describe good practices in benefit/risk communication on vaccination, that enable people to make informed choices and ultimately aim at increasing vaccine acceptance and uptake. These good practices were identified in the literature review and reported by countries and organisations in the stakeholder consultations (survey and interviews). Their transferability to other contexts or countries was then further discussed in the online workshop conducted for this study. Good practices were defined as concrete examples of strategies, approaches and/or activities in vaccine benefit-risk communication that had been shown to be effective in improving vaccine acceptance and/or uptake.

For the good practices outlined, the practices themselves are described, going into more detail where appropriate with concrete examples presented in a text box. Then practical considerations for use of the practice that came out of the stakeholder consultation process and the online workshop, are presented - for example the feasibility of implementation, transferability to different settings, as well as some related suggestions from study participants on approaches to improve benefit/risk communication around vaccination in the EU/EEA.

The following good practices were identified:

1. Monitoring risk perceptions of the population and adapting communication accordingly.
2. Addressing misinformation on vaccine risks.
3. Illustrating facts through data visualisation.
4. Transparency in processes, in providing data, and communication.
5. Use of narratives and conveying emotional values through personal stories.

[v] Migrant populations are considered people born outside the country where they currently reside.

[vi] COM-B stands for: Capability, Opportunity, Motivation—Behaviour. See: Michie, S., van Stralen, M.M. & West, R. 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

6. Exploring the potential uses of innovative technologies, such as chatbots, virtual reality, gamification.
7. Providing support materials and training to those engaging in vaccine conversations.

These good practices are mostly interdependent and relevant to different aspects of the communication, be it the design (e.g. illustrating facts through data visualization), the delivery (e.g. use of innovative technologies) or practical aspects (e.g. development of support materials).

Finally, while the focus of this report is on good practices specific to benefit/risk communication on vaccination, a separate section then lists additional good practices linked to health communication around vaccines in general, that are important to take into account in any benefit-risk communication.

3.2.1 Monitoring risk perceptions of the population and adapting communication accordingly

The consultations with experts from countries and organisations showed that monitoring the public's risk perceptions of vaccines and infectious diseases through various means, including polls, surveys or qualitative interviews is important for public health organisations to build or adapt benefit/risk communication strategies accordingly. The monitoring allows them to design interventions which respond to people's changing risk perceptions over time. The workshop confirmed that active listening, including monitoring social media and learning from public questions, can improve campaign effectiveness by addressing misinformation and unbased claims.

Experts from several countries and organisations emphasized in the survey and interviews that they regularly monitored the risk perceptions of the public during the COVID-19 pandemic in order to adapt their communication strategy. The monitoring also helps to better understand some of the main challenges identified, that are of individual risk perceptions as well as health and data literacy of the population.

An example of such an approach, beyond the COVID-19 pandemic, comes from the public health authorities in Ireland. They found benefits from employing marketing techniques such as using quarterly ad trackers (collecting data and user insights on the performance of online campaigns) and monitoring visits to their public health website to track how many people interact with their social media pages as well as materials on their websites. They also track what people search for in relation to vaccine-preventable diseases and ensure their website addresses the common concerns as a trusted source of information. By utilising ad trackers, they are also able to ask the public about previous campaigns, including COVID-19, and ask if the campaign was memorable and collect any feedback.

An example of tailoring messages to specific audiences comes from Malta's influenza communication campaign, in which the effectiveness of the campaign was monitored through vaccine uptake. Malta's campaign targeted the elderly population and additionally their carers, and other vulnerable groups. The campaign provided evidence-based information about the vaccine. It focussed on benefits of vaccination for the target group of elderlies, their family, in preventing transmission, reducing risk of hospitalisation, ICU care and deaths, as well as the impacts of being hospitalised and the difficulties in returning them to their care homes or the risk of long-term disabilities. Both disease-associated risks and non-serious vaccination risks were conveyed in the campaign. The campaign was disseminated through social media, television, radio, and newspapers.

A further example, in a different area, namely food safety, comes from EFSA. EU's Food Safety Authority uses flash polls (quick polls with a turnaround of just a few days) throughout Europe to gain quick insights on specific issues. Within seven working days, the contractor in charge can issue a flash poll on a specific topic either EU-wide or in a specific country or region. The flash poll allows EFSA to make informed decisions on different aspects of communications depending on the perceptions of a topic.

In addition, EFSA conducts a Eurobarometer survey every three years for their social science research team to gain deep insights into literacy and perceptions on food topics against demographics, attitudes, and values across EU countries. From the survey, country-specific fact sheets are developed and shared to assist national authorities with communication strategies.

Example: Sweden

During the first half of 2021, Sweden launched a COVID-19 vaccination campaign which was aimed at the general public using multi-channel communication. It was rolled out in several phases, from the most at-risk groups onwards. Based on the progression of events and evolving evidence about the authorised vaccines, the benefit/risk communication was adjusted, and specific target groups were addressed. Several times national surveys and qualitative interviews were conducted by the Swedish public health agency and other institutions and research groups to understand the risk perceptions of the public and specific target groups, intentions to get vaccinated as well as sentiments of the target groups. For instance, the Swedish public health agency collaborated with the Karolinska Institute on a project exploring barriers and challenges for vaccinations among immigrant groups from outside Europe. They also investigated the vaccine perspectives of healthcare personnel in elderly care, through interviews. Such initiatives ensured that communication strategies of the public health agency were tailored and therefore more effective.

Practical considerations

Sweden's example of surveys and interviews could be used for other vaccines, specific target audiences and in other countries where such mechanisms have not been implemented. The implementation of sentiments and perceptions analysis is a matter of priority and resources rather than of available technologies.

During the consultations some public health authorities in the EU/EA countries expressed that the systematic monitoring of public perceptions regarding vaccines remained a challenge to them. The development of a common EU/EEA-wide monitoring tool was suggested as a helpful resource to measure attitudes and knowledge about vaccines, including mis- and disinformation prevalent in social media.

Examples from the field on potential approaches are provided in this report, such as the work conducted by EFSA, in the area of food safety, with periodic surveys done at EU level that can then inform national communication strategies. Further, this EU agency incorporated social science expertise in their teams, and set up coordination mechanisms for consistent communications, for example.

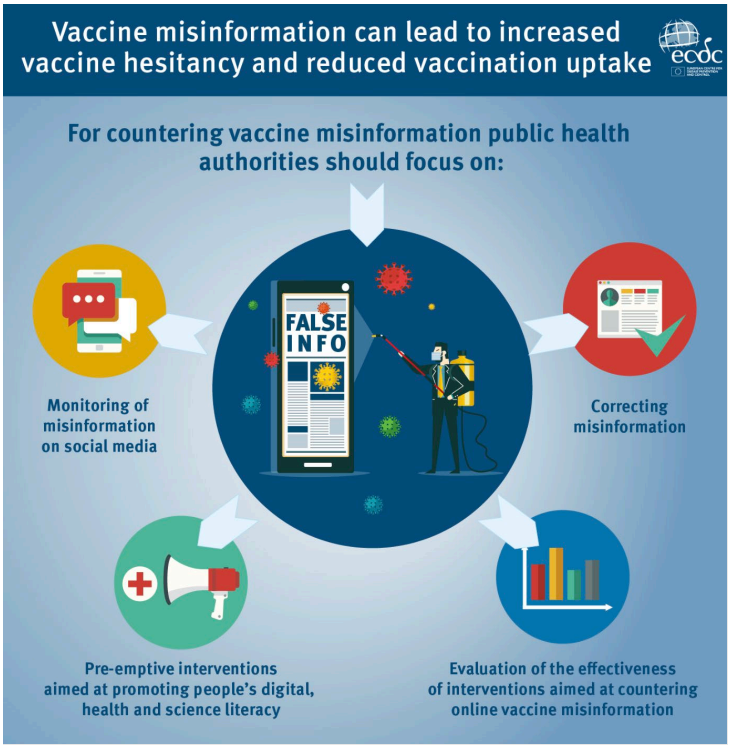
Initiatives such as the tool and guidance developed during the COVID-19 pandemic by WHO Europe for behavioural insights [29] can also be useful in this regard. This tool, albeit not specifically on vaccines (as it was done before the vaccines became available) provides a rapid, flexible and cost-effective option for monitoring of public knowledge, risk perceptions, behaviours and trust, and includes questions on (then still potential) vaccines.

It was also suggested during the consultations to include social media monitoring beyond national borders. Further, a country mentioned the usefulness of collaborative approaches to share information between countries on drivers and barriers for vaccination, and to better understand perceptions in specific communities of migrants that have moved to the country from another EU/EEA country. In addition, it was suggested to integrate basic monitoring of public risk perceptions regarding vaccines into regular general population surveys without demanding a major increase of human and financial resources.

3.2.2 Addressing misinformation on vaccine risks

In an ECDC report on vaccine misinformation [14], a number of key strategies were outlined that public health authorities can put in place in order to address vaccine misinformation, as shown in Figure 1 below:

Figure 1. Strategies to counter vaccine misinformation



Source: Countering online vaccine misinformation in the EU/EEA (ECDC) [14]

Monitoring of misinformation on social media relates to the first set of good practices outlined in section 3.2.1. In this section, we present information on the pre-emptive provision of information aimed at promoting people's digital, health and science literacy ('pre-bunking'), and correcting misinformation ('de-bunking').

'Pre-bunking' interventions

'Pre-bunking' interventions are pre-emptive actions, warning people of how misinformation is used and explaining the misleading argumentation and techniques used by those spreading it, thereby giving them the ability to 'resist' misinformation should they be exposed to it in the future. 'Pre-bunking' is also sometimes referred to as 'inoculation', as it is based on inoculation theory; this argues that, just as injections containing a weakened dose of a disease can trigger antibodies in the immune system to confer resistance against future infection, the same can be achieved with information by cultivating mental 'antibodies' against misinformation [30].

These interventions have been shown to be effective in reducing the impact of vaccine misinformation [31–33]. Of these three aforementioned studies, two specifically focused on investigating the effectiveness of pre-bunking interventions, using a written message or video that highlighted the practices typically used to spread misinformation, such as:

- Scaring people with shocking claims;
- Cherry-picking information or experts and using them out of context;
- Presenting false claims as though they are valid and accepted by everyone.

In these two studies, participants received misinformation about vaccines following the intervention, and the intervention was found to 'buffer' them against the ill effects of the misinformation on vaccine acceptance and uptake [31,32]. In the other study, which had a broader focus, adolescents were encouraged to think critically about the credibility of different information sources and the challenges in communicating information about vaccination to adolescents [33].

Example: 'Bad news' game

Bad News is a free online browser game developed in 2019 by the University of Cambridge's Social Decision-Making Laboratory in collaboration with the Dutch media platform DROG. It uses the 'inoculation' method, whereby 'pre-emptively exposing, warning, and familiarising people with the strategies used in the production of fake news helps confer cognitive immunity when exposed to real misinformation.' Taking on the role of a fake news creator, players try to 'attract as many followers as possible while also maximising credibility'. They can do this through scenarios, each of which focuses on one of six documented techniques commonly used in the spread of misinformation. Players 'gradually go from being an anonymous social media presence to running a (fictional) fake news empire', and are rewarded with badges for excelling in the following unethical online practices: impersonating others' accounts; producing emotionally charged material to provoke; polarising followers through heightening grievances; creating conspiracy theories about news events; attacking and discrediting anyone who questions their views; and trolling people [30]. The game has been shown to be effective in boosting immunity against misinformation in those who play it [30, 34]; however, a version adapted to COVID-19 vaccines was not found to be effective in increasing readiness to vaccinate [35].

Debunking interventions

Debunking interventions comprise 'post-exposure' correction of misinformation and disinformation by providing evidence-based counterarguments. In the scientific literature, evidence on the effectiveness of debunking is mixed. In a recent systematic review of the communication interventions for countering vaccine misinformation [36], five debunking interventions were reviewed. All five studies found either mixed or unclear effects on intentions to vaccinate. Further, two studies found that the debunking intervention decreased intentions to vaccinate in those who had the most hesitant attitudes towards vaccination at baseline. A literature review conducted for this study also uncovered little evidence pointing to the effectiveness of debunking interventions. One study tested a written debunking message against a message outlining the benefits of vaccination, and while the benefits message resulted in increased vaccination behaviour relative to a control group, the debunking message did not [37]. The ECDC report on countering online vaccine misinformation [14] concurs with this finding, based on document review and stakeholder consultations with national public health authorities.

It may be more effective to concentrate efforts into ensuring that mis- and disinformation do not get traction in the first place, through pre-bunking interventions, or by increasing efforts to provide credible information. The WHO's Vaccine Safety Net, a global network of websites providing information on vaccine safety, employs this tactic. The network aims to increase access to reliable, credible and understandable information on vaccine safety for all [38].

Many of the public health authorities and organisations consulted as part of this study used a similar tactic, and stressed the importance of acting fast to communicate accurate information on vaccine safety as soon as this became available, to ensure credible information reached the public before false information. A handbook on debunking [39], developed in collaboration with 20 researchers in the field of debunking, also suggests this strategy. They advise that the first strategy should be to prevent misinformation from gaining traction, or 'sticking', in the first place. In the event that this is not possible (e.g. the misinformation is already widespread), the guidelines advise taking the following steps to ensure effective debunking communication and avoiding backfiring effects:

'**Fact**: Lead with the fact if it's clear, pithy, and sticky – make it simple, concrete, and plausible. It must "fit" with the story.

Warn about the myth: Warn beforehand that a myth is coming… mention it once only.

Explain fallacy: Explain how the myth misleads.

Fact: Finish by reinforcing the fact – multiple times if possible. Make sure it provides an alternative causal explanation.' [39]

The debunking handbook is freely available online in 21 languages.

Practical considerations

Care should be taken with debunking interventions to minimise the risk of any potential backfiring effects, as described above.

Debunking interventions are context-specific, in that they are designed to address a specific mis- or disinformation circulating about vaccines (e.g. false narratives such as that 'Covid vaccines contain micro-chips'). These should be identified using monitoring (see section 3.2.1).

Pre-bunking or inoculation interventions are less context-specific and have the potential to have a wider reach, in that the techniques used in misinformation are often similar across different countries and settings. As such, they have greater potential transferability and may need less resources to develop.

3.2.3 Illustrating facts through data visualisation

As described in previous sections, taking the decision to vaccinate is complex and involves balancing risk and benefit information relating to oneself, and also one's family and the broader community. This requires a certain degree of health literacy but also an ability to understand statistical information. The use of clear, easy-to-understand graphics illustrating the risks and benefits of vaccination can help the individual make an informed choice.

The stakeholder consultation revealed use of visualisations by a number of countries, including Latvia and Norway. Both countries used simple graphics to illustrate the benefit of getting vaccinated. More details are given in the example boxes below.

Example: Norway

Norway employed a communications team during the COVID-19 pandemic drawing in expertise from the domains of behavioural science, social psychology, and social media management. In response to a persistent rumour about the ineffectiveness of vaccination that circulated on social media, they released a social media post containing the correct information about the effectiveness of COVID-19 vaccines (i.e. they did not address the misinformation directly – this was not a debunking intervention as described in the previous section). They did so with a very simple and easily understandable graphic depicting hospital admissions of COVID-19 patients who were vaccinated versus unvaccinated, thus depicting how vaccination can prevent serious disease. This image also included qualifying information on the average age of those in the unvaccinated and vaccinated groups, as this had some bearing on the hospital admission rates and should be taken into account (Figure 2).

The post went viral in three days, underlining the importance of simple, effective communication that can present data visually and without too many caveats and uncertainties. On Facebook alone, the post reached 1.4 million people and was shared nearly 30 000 times.

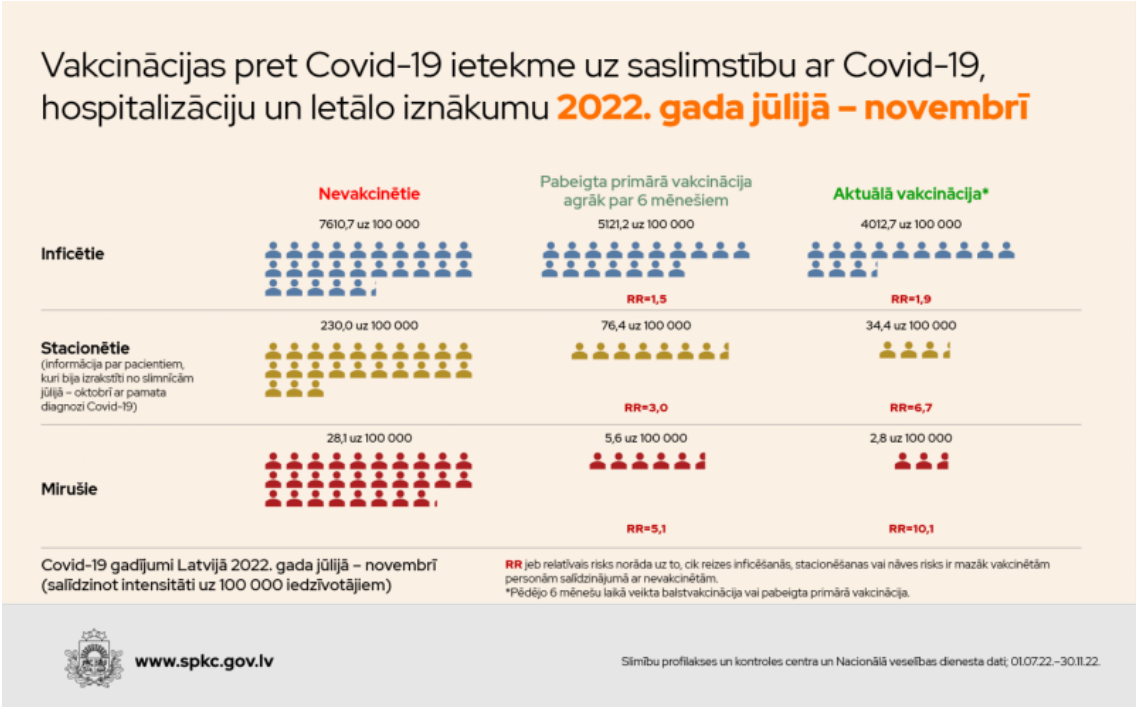
Figure 2. Graphic depicting hospital admissions of COVID-19 patients who were vaccinated versus unvaccinated in Norway, November 2021

© Folkehelseinstituttet, the Norwegian Institute of Public Health (FHI), 2021.
Source: Facebook page of Folkehelseinstituttet. Accessed on 2 February 2024: https://www.facebook.com/folkehelseinstituttet.no/posts/er-du-i-tvil-om-du-ønsker-å-ta-koronavaksine-eller-ikke-tenker-du-at-overskrifte/4676641839069794. Translation: the header reads 'Patients admitted to hospital with COVID-19 (tally from week 44); the columns are 'Unvaccinated' and 'Vaccinated'; 'av' is 'per'; 'Alder' is 'Age'. The footer text reads: 'The figures show how many per 100 000 of respectively unvaccinated and vaccinated people aged over 18 years were admitted with COVID-19 as the main diagnosis in the last week. The figures are taken from FHI's weekly report at fhi.no. Median age, which is a type of average age, is also from the last week. The figures include those aged above 18 years.'

Example: Latvia

Latvia included a greater degree of granularity, as displayed in Figure 3 below. The data visualisations used by Latvia show information on outcomes for the unvaccinated (left column), those who were vaccinated six months ago (middle column) and those who were vaccinated recently (right column). They also displayed several different disease outcomes: COVID-19 infections (top row) versus hospitalisations (middle row) versus deaths (bottom row). These details provide more nuanced information to the reader, which can take more time and effort to process than that shown in the Norwegian example above. Latvia displayed this information on their website and updated the visualisations weekly according to real-time statistical data.

Figure 3. Data visualisation practices to communicate about the risks and benefits of COVID-19 vaccines in Latvia

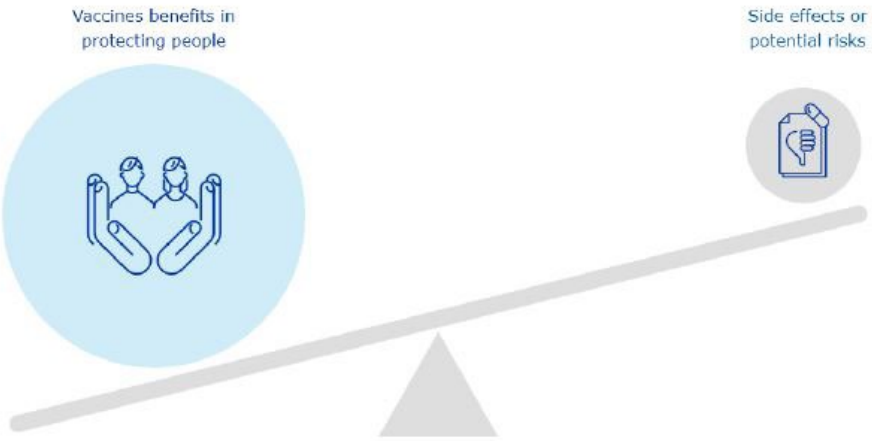


© Latvian Disease Prevention and Control Centre 2022
Source: SPKC website, Latvia [40]. Translation: the left-hand row titles (top to bottom) read 'infections', 'hospitalisations', 'deaths'. The column titles (left to right) read 'unvaccinated', 'vaccinated six months ago', and 'recently vaccinated'.

While the examples above display the benefits of vaccinating (i.e. reductions in disease outcomes), the European Medicines Agency (EMA) developed graphics that conveyed the concept of benefit-risk balance of vaccinating. Figure 4 shows one different option of three that was user-tested (this was most frequently voted as the preferred of the three). The graphic shows the scale of benefits on the left and risks on the right. This graphic was subsequently used on EMA's website[vii], as well as in presentations and videos.

[vii] Available at: https://www.ema.europa.eu/en/human-regulatory-overview/public-health-threats/coronavirus-disease-covid-19/covid-19-public-health-emergency-international-concern-2020-23/covid-19-vaccines-development-evaluation-approval-and-monitoring#ema-inpage-item-13443

Figure 4. Graphic used by EMA to convey the concept of benefit-risk balance of vaccination



© European Medicines Agency 2023
Source: Stakeholders' Understanding of European Medicine Agency's COVID-19 Vaccine Information Materials in EU and Regional Contexts (2023) [41]

EMA conducted user-testing as part of a large-scale survey among patients/consumers, healthcare professional organizations, and individual stakeholders to see if EMA's core information materials were informative and well understood. They also asked about the public's preferred communication channels. The surveys showed that individual patients/consumers generally prefer to get information about COVID-19 vaccines from the internet or mass media. Organisations and individual healthcare professionals prefer to get information from national and international health authorities' sources. This supports EMA's approach of using media, stakeholder engagement, and web-based formats to communicate about COVID-19 vaccines.

Another example comes from visualisation tools developed by the Harding Center for Risk Literacy and Germany's Robert Koch Institute[viii]. The Harding Center originally developed fact boxes that displayed benefits (in terms of disease outcome reduction) and risks (in terms of side effects) for vaccines, in addition to other health interventions [42, 43], with an example below used for COVID-19 vaccines. The fact boxes are accompanied by text that addresses decision-relevant information requirements.

[viii] The Robert Koch Institute (RKI) is a German federal government agency and research institute responsible for disease control and prevention.

Figure 5. Fact box on the risks and benefits of the COVID-19 vaccine for adults 18–60 years of age

How safe and effective is the vaccine (mRNA method) against COVID-19 for younger adults?

The following data refer to vaccinated and non-vaccinated adults **between 18 and 60 years of age,** some of them with and some of them without pre-existing conditions, using the example of a region with many cases.

	Out of every 1,000 non-vaccinated younger adults	Out of every 1,000 vaccinated younger adults
Benefits		
How many got sick with COVID-19?	20	1
How many have to be treated at a hospital due to a severe COVID-19 course?	1 – 3 (depending on age and pre-existing conditions)	About 0 (depending on age and pre-existing conditions)
How many suffer from long-term complications of COVID-19, e.g. shortness of breath and memory impairment?	This is still uncertain.	
Harms		
Within one week (after a vaccination appointment), how many suffer temporarily from… …fatigue and exhaustion?	8	60
…chills?	1	8
How many need fever or pain medication temporarily within one week (after a vaccination appointment)?	140	370
How many suffer severe health damage, e.g. a heart attack, within one month (after a vaccination appointment)?	No difference: about 10 in both groups.	
How many suffer from long-term complications of a COVID-19 vaccine?	There is currently no evidence on long-term complications caused by the vaccine.	

Note: Typical vaccine reactions, e.g. redness or fever, usually subside after one to two days. The potential relationships between the vaccine and rare (e.g. allergies) and atypical reactions (e.g. insomnia, enlarged lymph nodes) as well as transient facial paralysis are currently under examination.

Sources on the vaccines Comirnaty and Moderna: Baden 2020. NEJM; BioNtech & Pfizer 2020. www.comirnatyeducation.de; CDC 2021. MMWR; EMA 2020. www.ema.europa.eu; FDA 2020. FDA Briefing Document; Polack 2020. NEJM; RKI 2020. Meldedaten; STIKO 2021. Epidemiologisches Bulletin, 2.

Last update: 24 January 2021 Latest version available at www.hardingcenter.de/en/fact-boxes

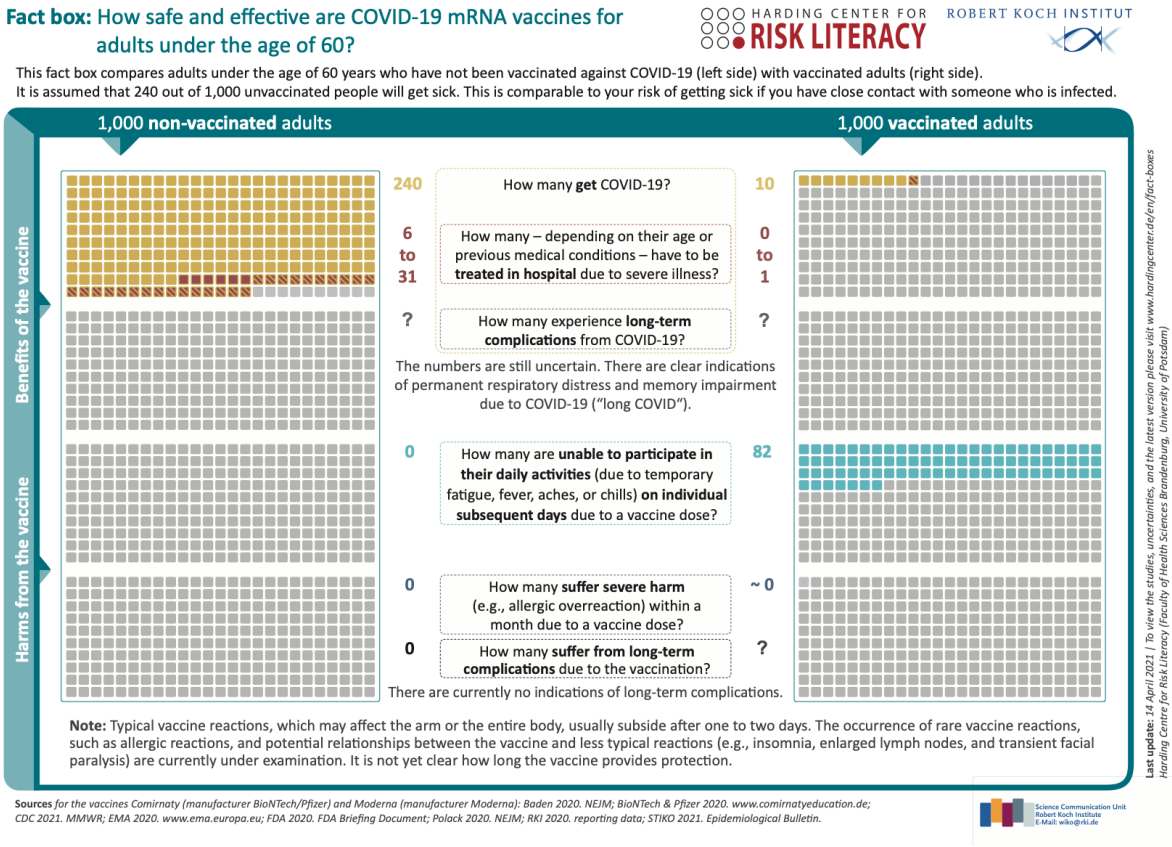
© Harding Center for Risk Literacy 2021
Source: Fact boxes that inform individual decisions might contribute to a more positive evaluation of COVID-19 vaccinations at the population level (2022) [42]

The box shows the probability of a series of benefits and harms of varying seriousness occurring in those who were unvaccinated versus vaccinated, based on the best available evidence (published randomised controlled trials). For example, the first row shows that, of a sample of 1 000 younger adults living in a region of currently high spread of the virus (determining the absolute baseline risks), 20 unvaccinated adults got sick with COVID-19 versus just one vaccinated adult (a vaccine benefit). In terms of harms, the box shows that eight unvaccinated adults experienced symptoms such as fatigue and exhaustion, versus 60 vaccinated adults (a vaccine risk).

The idea of these fact boxes is to inform so that those who are undecided or sceptical evaluate vaccination more positively, in line with the evidence, without resorting to persuasive strategies that can threaten the credibility of the communicator and of vaccinations. This strategy is based on principles of informed decision-making, whereby every citizen should be enabled to weigh the possible benefits and harms of medical options on the basis of the best available evidence and to decide freely on this basis. A more simplified tabular box was found to lead to more accurate COVID-19 risk estimates and knowledge of risks and benefits compared to no intervention [44].

This was subsequently developed further to be represented in the form of a graphic, showing how one image can be used to display both the risks and benefits of vaccines, using a comparable metric (see Figure 6). This style of 'fact boxes' has been shown to have a positive impact on short-term comprehension and knowledge recall versus the same information in purely text form [45], but comprehension and recall was no better for the fact boxes visualising evidence with the help of pairs of icon arrays (as shown in Figure 6) than those in tabular form [46].

Figure 6. Fact boxes in graphic form



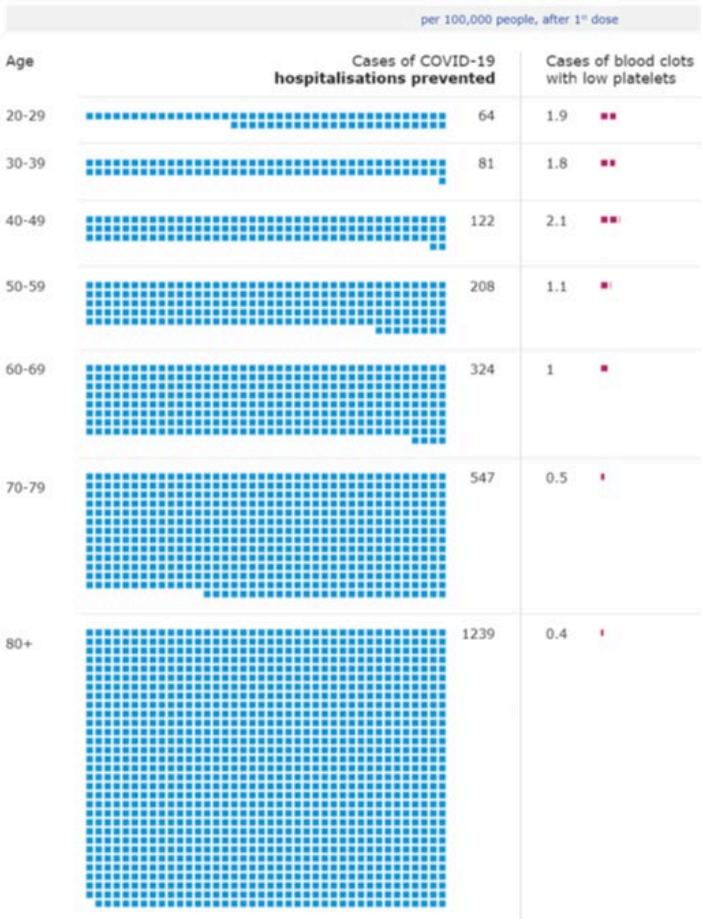
© Harding Center for Risk Literacy 2021
Source: Graphic created by the Harding Center for Risk Literacy and the Robert Koch Institute[ix]

Finally, risks and benefits can be displayed by different risk groups, such as by age group to allow for even more informed decision-making. The graphic below in Figure 7 is specific for the COVID-19 vaccine Vaxzevria and displays the benefit of vaccination in terms of the number of hospitalisations from COVID-19 prevented among those vaccinated, versus the risk of developing a very rare type of blood clot with low platelets (thrombosis with thrombocytopenia syndrome, TTS) from the vaccine itself. This is displayed by age group, showing clearly how the benefit-risk ratio tips towards increased benefit and lower risks, with increasing age[x].

[ix] See https://www.who.int/news-room/feature-stories/detail/scicom-compilation-factbox, accessed on 2 February 2024.

[x] Note that EMA provided the same graphic for different infection rates (i.e. for situations of low, medium and high virus circulation). Note also that these graphics were intended to be used to support national authorities making decisions on how to best use the vaccine in their territories, rather than the public per se.

Figure 7. COVID-19 hospitalisations prevented with Vaxzevria compared with unusual blood clots with low platelets



© European Medicines Agency 2021
Source: EMA [47]

In summary, while data visualisation is by no means simple, it holds great promise in addressing several of the challenges associated with communicating around the benefits and risks of vaccines. However, within the scope of this project the literature found very few studies showing how to facilitate understanding of complex statistical information around vaccination with the use of data visualisation.

As we outlined in section 3.1.1, individual perceptions around the risks and benefits of vaccines and disease are strongly associated with vaccine acceptance and uptake but are complex to understand, ever evolving, and likely to be distorted by misinformation. The use of clear graphics that can communicate complex information around risks and benefits in a simple and comprehensible way that is less dependent on a good understanding of the language in which they are presented (e.g. could be potentially useful for migrant populations) is likely to result in a better-informed public.

Practical considerations

To summarise, public health authorities that use data visualisation in risk-benefit communications may wish to consider:

- Whether to communicate about the risks of vaccinating, the benefits of vaccinating, or to directly compare risks against benefits. However, it should be considered that there are medical guidelines for evidence-based health communication on how balanced information about both potential benefits and risks should be presented to those making a decision[xi].
- Which disease outcomes should be used (e.g. infections, hospitalisations, deaths, other; generally patient-relevant outcomes).

[xi] For example, the following guidelines from the Department of Patient Information and Participation of the German Network of Evidence-based medicine (in German): https://www.ebm-netzwerk.de/de/medien/pdf/leitlinie-evidenzbasierte-gesundheitsinformation-fin.pdf

- The level of granularity to be used in illustrating vaccination status and disease outcomes.
- The numeracy and literacy levels of the target audience should be taken into account when developing, piloting and implementing visuals.
- Use of qualifying information to nuance the information presented (e.g. presenting the benefits and risks by different age groups and other relevant groups).
- The media through which the images will be distributed.
- Whether comparable metrics can be used.
- User-testing the materials prior to use, though sometimes it might be challenging due to time and/or resource limitations.
- Producing data visualisation materials that are easily adaptable as the data change (in particular for new vaccines).

In the ECDC online workshop with representatives from EU/EEA public health authorities and other organisations, participants agreed that this good practice was transferable to country contexts, with some reserves about the practicality of implementation, as explained below.

In terms of feasibility, participants highlighted that in crisis situations, it can be difficult to user-test interventions (particularly data visualisation) given the urgency for action, and so the principles should be tested on well-established vaccines and/or in peacetime (outside crisis situations). Some participants also expressed that they experienced challenges in terms of what disease outcomes should be included. Finally, they expressed that it was difficult to represent uncertainty in such visualisations; the nature of data visualisations gives the impression that the displayed figures are 'set in stone', but this is often not the case, as statistical data are ever evolving. As displayed in the example box for Latvia, data visualisations can be updated on a weekly basis; information on when the data were last updated should therefore be made clear to the target audience.

Stakeholders agreed that use of data visualisations needed to be better coordinated both within and between countries. Between countries, more EU-level guidance on the use of data visualisation would be useful to share knowledge. Of course, the statistical benefit-risk data itself may differ from one country to the next but the general principles used to create the graphics (level of granularity, use of graphics or tables, etc) can be shared between countries.

The work of research groups specialised in methods and tools that enable informed and risk literate decisions in relation to health and medical treatments could be helpful to inform further approaches. This includes for example the work of the Harding Center for Health Literacy[xii], consulted for this project.

3.2.4 Transparency in processes, in providing data, and communication

There is a clear ethical imperative to ensure that public health authorities and institutions are transparent with the public about vaccine safety and the processes used to monitor this. In addition, transparency is important for building trust. It is essential that the public have trust in public health authorities for communication to be effective.

The academic literature shows that trust in both the safety and efficacy of vaccines, and in health institutions, is critical in ensuring vaccine acceptance [26]. Once the trust of the public is lost, it can be difficult to gain it back. Practitioners must communicate transparently about all of the risks associated with vaccines as well as benefits and their level of certainty about these risks and benefits, even when this might risk a decrease in vaccine demand. Consistent with this, research shows that although detailed communication about the risks and benefits of a vaccine[xiii] may result in decreased intentions to vaccinate compared to a message that is vaguer about risks and benefits, it does increase trust in health authorities [48].

In line with these findings, many representatives of public health authorities and organisations consulted for this study mentioned the importance of transparency. A number of guidelines that were reviewed for this project also emphasised the importance of transparency. This echoes calls from the research community for 'radical transparency'[xiv] ahead of the introduction of COVID-19 vaccines, on trial protocols and results, particularly in a context in which the testing and approval procedures for new vaccines were adjusted for the crisis situation.

[xii] Harding Center for Risk Literacy | Harding-Zentrum für Risikokompetenz: https://www.hardingcenter.de/en

[xiii] Note that this research featured messages about a fictitious COVID-19 vaccine ('Covacid'), in order to be able to effectively manipulate the featured risks and benefits.

[xiv] Nature, COVID vaccine confidence requires radical transparency. Editorial, 29 September 2020. Available at: https://www.nature.com/articles/d41586-020-02738-y, accessed 1 February 2024.

This could be transparency in presenting new risk information concerning adverse events relating to vaccines, transparency around the effectiveness of vaccines, or transparency in the processes involved in the authorisation of vaccines, for example. This could also include transparency around the processes that feed into a decision to withdraw a vaccine from circulation.

While acknowledging that transparency was ethically important, some stakeholders emphasised that care should be taken in communicating about vaccine safety in a way that does not undermine trust in the vaccine and thereby reduce acceptance and uptake.

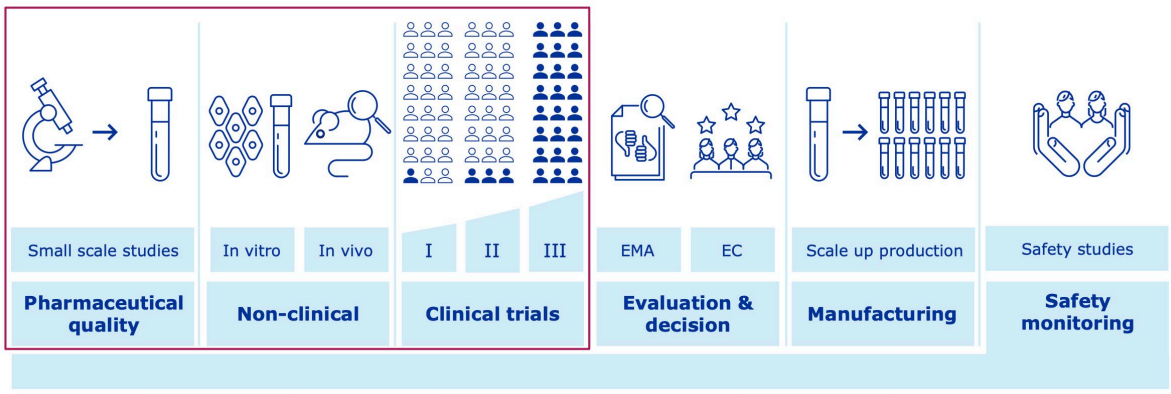
Example: European Medicines Agency

The European Medicines Agency (EMA) described in the stakeholder consultation their commitment to transparency around vaccine communication on their website. This applies to the way in which information about the safety and efficacy of vaccines is presented on the website, and also extends to the presentation of information about the vaccine testing and approval process.

Stakeholder engagement with patients, consumers and healthcare professionals is of paramount importance for EMA in order to ensure transparency. This was achieved in the following ways during the COVID-19 pandemic:

- The EMA website was continuously updated with vaccine safety information as soon as it emerged.
- Representatives from civil society (patients and healthcare professionals) were included as part of EMA's Pandemic Task Force (now ETF), who could present the views of patients and healthcare professionals in the discussions supporting vaccine development and safety monitoring.
- Public stakeholder meetings were organised, to present the new vaccines and their safety, in addition to how safety was assessed. Figure 8 shows an example of how the process was presented to the public in a simple and comprehensible format.

Figure 8. An example of process presentation to the public in a simple and comprehensible format



© European Medicines Agency 2020.
Source: EMA public stakeholder meeting: development and authorisation of safe and effective COVID-19 vaccines in the EU[xv]

As described above, stakeholders consulted for this study often highlighted transparency in communicating around vaccines, but with some reservations. Transparency in communication is crucial, but it can be challenging when dealing with technical information that the public may not fully understand. Often scientific evidence contains nuances and caveats that are not easily communicated. For example, data on suspected adverse events reported by vaccinated people and that has not yet undergone scientific evaluation, can be subject to misinformation if assumed that these have been confirmed.

Practical considerations

As the processes used to develop vaccines speed up, and new vaccines against other diseases and new vaccine platforms become available, there will be an increasing need for countries to reflect on how to communicate transparently and effectively in contexts in which there can be uncertainty and evolving evidence.

[xv] https://www.ema.europa.eu/en/events/public-stakeholder-meeting-development-and-authorisation-safe-and-effective-covid-19-vaccines-eu (11 December 2020) presentation – How are COVID-19 vaccines developed?: https://www.ema.europa.eu/en/documents/presentation/presentation-how-are-covid-19-vaccines-developed-marco-cavaleri_en.pdf, accessed 1 February 2024.

Care should be taken to ensure that risk information is clearly explained, ideally with the risk information presented in the context of the benefits, to ensure the information is not misunderstood and/or taken out of context, leading to inflated perceptions of risk (see Figure 7 for an effective example of this).

In addition, the main objective of a certain vaccine should be made clear in the communication (for example, COVID-19 vaccination to prevent severe disease), as opposed to overplaying the effectiveness which could lead to a consequent reduction in trust towards public health authorities and vaccination specifically.

Public health authorities consulted saw the need for accessible clinical data for independent researchers to scrutinise data on disease burden and vaccine safety issues. At the same time, public health communications and safety assessment information with sections and language tailored to different target audiences (media, HCPs, and patients) would be useful.

Another topic where clear communication is needed is the issue of varying vaccine recommendations across countries. During the workshop organised for this study, it was mentioned that varying vaccine recommendations from different health authorities can prove unsettling for people such as migrants who access vaccine recommendations from different countries and regions. Differences in advice – that may be the result of different epidemiological situations and programmatic considerations – can cloud the discussion and confuse people. It is therefore essential to explain the pluralism in actions between different countries through communication, and to clarify why decisions were made and may differ, based on data and evidence. This can prove challenging, especially in fast moving crisis situations.

3.2.5 Use of narratives and conveying emotional values through personal stories

The consultations with countries confirmed that people value being taken into account and are more responsive when they feel addressed as individual human beings. Through personal stories and narratives, campaigns can communicate with the target population not only by conveying facts but also feelings of being talked to and hereby triggering emotional risk awareness of a disease. In addition, individual risk perceptions can be influenced this way considering vaccine hesitancy is more common in individuals who have not personally witnessed the serious illness or death of a loved one due to a vaccine-preventable disease.

Two other challenging aspects may be addressed through this good practice, namely insufficient health and data literacy and reaching ethnic minorities and migrant populations. The emotional appeal conveyed through personal stories can overcome the barrier of not sufficiently understanding health facts and data to be able to make an informed decision. Furthermore, ethnic minorities and migrant populations may more easily identify themselves or empathise with faces or personas of a campaign which may be similar to their own.

A study reviewed for this project described the use of a storytelling intervention about HPV vaccination for Korean American college women. The women who watched the storytelling video were much more likely to receive the HPV vaccine than the women who had received information-based written material [49]. In another article, the authors describe how the cross-cultural, cross-generational storytelling HPV intervention was developed [50]. They used a peer-paired method, in which two storytellers interactively shared their stories, as a particular innovation that resonated with Korean American young women. Participants reported greater endorsement for videos that reflected their cultural and generational experiences.

Examples: HPV catch-up campaign in Ireland

An HPV catch-up vaccination campaign was launched by the Irish public health authorities utilising the real-life story of a young woman who was terminally ill with cervical cancer [51]. In the one-minute video she told her own story as a patient, highlighting the risks of HPV and the importance of vaccination (which was not yet available when she was a teen). The Irish public health authorities found that a personal story was a 'powerful' motivator for the target group of parents and teenagers to see the benefits of vaccination. The video ends with a strong affirmative message that the vaccine is effective and safe and calls to check the facts at WHO's dedicated webpage. In addition, a documentary bringing across the same key message was produced and published on Ireland's public media service [52].

In another good practice example, public health professionals from Slovakia pointed to their 'Zaočkuj babku' campaign ('Vaccinate grandma' campaign), which was a targeted COVID-19 vaccination campaign for seniors[xvi]. It took into account the reduced digital literacy of older individuals and therefore addressed a proxy group: their grandchildren, for whom it was easier to book a vaccination appointment online, who were better able to

[xvi] Example available at: https://www.facebook.com/photo/?fbid=809084279960350&set=a.282048765997240

distinguish between trustworthy channels, and become the 'bearers of a pro-vaccination attitude'. Results were effectively measured by looking at coverage among the older population.

The campaign used strong emotions in its communications, built on love for and from their grandchildren, and appealed to universal values of society for supporting one's family. Primarily using social media platforms, the campaign also encouraged grandchildren to share photos with their vaccinated grandparent – in this way user-generated content was a further communication mechanism to promote helping an elderly person in the vaccination process as a new social norm.

Practical considerations

The approach described in Ireland's example, of using personal patient stories, has been applied to other health interventions, specific target audiences, and in other countries. What could prove challenging is finding the right story to tell and the 'right' patient to become the face of a campaign.

The cost of good quality video productions has considerably reduced over the last years. What can make visual campaigns expensive is the overall approach: identifying the right face of the campaign, supporting the person throughout the campaign, choosing the right communication channels, and addressing the target audience. Alternatively, when instead of a 'real' face a persona, i.e. a fictional character is to be used, the animation of the video can still take time and may be costly.

3.2.6 Exploring the potential uses of innovative technologies

The literature review showed that the use of innovative technologies in vaccination communication appears promising and is increasing [53]. A tailored approach to communication that takes into account the specific risk beliefs or the understanding of language of the target population can result in improved acceptance and uptake, so this represents an opportunity to address the underlying challenges.

On the other hand, from consultations with public health organisations it became clear that they often lack sufficient resources for vaccination communication and taking a tailored approach requires increased resources. For this reason, the use of innovative and, in particular, AI tools holds promise, as they could allow for a tailored approach but on a mass scale. However, there is a lack of studies testing the effectiveness and risks of such interventions, given the speed at which technology is advancing and new tools are becoming available.

Chatbots allow for a two-way 'dialogue' with the individual that is likely to be more engaging and that allows the individual to receive a fully tailored experience. Use of chatbots can integrate various other good practices described in the current report, for example tailoring, narratives and dialogue. As AI chatbots become more effective, their potential to support individuals and communities in making informed decisions about their health could increase.

Further, the use of virtual reality (VR) technology can aid individuals in understanding complex issues like herd immunity (also referred to as 'community immunity') in an engaging and entertaining way that has been shown to be effective in increasing vaccination intentions.

There have been several studies that look into the use of innovative technologies, which need to be further explored. Below are two examples:

In November 2021, researchers conducted a pre-post pilot study to evaluate 'Vac Chat, Fact Check,' a web-based chatbot for promoting COVID-19 vaccination at the University of Hong Kong, China [54]. The chatbot provided information about COVID-19 vaccination (e.g. efficacy and common side effects), debunked common myths about the vaccine, and included a decision aid for selecting vaccine platforms (inactivated and mRNA vaccines). The efficacy of the chatbot was tested among 46 participants who were either unvaccinated or hesitant about receiving a booster. Using a within-subjects before-after design, the authors showed that having seven days of access to the chatbot significantly increased intentions to vaccinate. At four months post-intervention, 82% of the initially unvaccinated individuals had been vaccinated, and 29% of the booster-hesitant individuals had received the booster.

In June 2021, researchers in Copenhagen, Denmark, assessed the effectiveness of a virtual reality (VR) intervention to strengthen participants' understanding of herd immunity and thereby reduce hesitancy for the COVID-19 vaccine [55]. In the VR simulation intervention, participants' goal was to try not to infect other non-player characters in a virtual scene or try not to get infected by them. All participants played two scenarios, starting with an environment in which few characters are vaccinated, followed by an environment where many characters are vaccinated. The simulation thus allowed participants to experience community immunity from a first-person perspective, learning how much more slowly infection spreads when vaccination rates are high versus low. Intervention effectiveness was tested using a randomised between-subjects design with 222 adult participants, with a control group that was given standard text and images about vaccination. The virtual reality intervention resulted in significantly stronger intentions to get vaccinated post-intervention.

Another approach that uses novel IT technologies is gamification, which can help to convey complex scientific information in an interactive and entertaining way, and also provide tailored information for specific population groups.

An example of such initiatives was mentioned by WHO Regional Office for Europe during the interview. This organisation developed, together with academia, a game-based educational module called 'Immune Patrol' [56], to be embedded in school curricula. It aims to increase children's knowledge of infectious diseases, the immune system, outbreaks and vaccines, as well as source criticism. It was tested and evaluated in four countries (including Armenia and Moldova) and combines digital gaming with physical classroom activities and simulations. Such initiatives can contribute to health literacy and also to resilience against misinformation in the younger generations.

Practical considerations

The two examples of chat-bots and VR are studies based on a small number of participants. Their scalability and transferability to real-world settings has yet to be explored. Importantly, innovative technologies such as AI pose a set of new challenges related to data privacy, security, transparency, potentially lowering trust in public health organisations, and legal issues which have to be addressed before they can be recommended for use in practice.

During the ECDC online workshop, participants concluded that the effectiveness of technological interventions to impact people's decisions is dependent on the intervention and context. Some tools can provide good opportunities for feedback and interaction. But others, such as currently available online chatbots, can have limitations in terms of feedback capacity and they may not sufficiently allow for asking and answering all questions. Mixed methods of interaction should be applied to reach the widest population – technology is more likely to reach younger generations while person-to-person is more likely to reach older populations.

Workshop participants also discussed that innovative technologies might be useful especially for routine vaccination campaigns, such as for prevention of measles or HPV, however available resources and time needed for development and piloting might be issues. For public health emergencies such as the COVID-19 pandemic, it might not be feasible as it takes time to develop the system and the information is changing very fast, therefore there is limited time to adapt content fast enough.

3.2.7 Providing support materials and training to those engaging in vaccine conversations

Participants during the workshop emphasized that the public health workforce is the most important driver of vaccination while it is at the same time often overstretched, with limited time and resources, and it needs to be supported with communication techniques, tools and training.

Supporting those who have direct contact with the public with clear, accurate information about the safety and effectiveness of vaccines is of highest importance. This includes providing support materials to healthcare professionals to help them in their vaccine benefit/risk dialogue with patients. Leaflets, brochures, fact sheets, fact boxes to aid decision, slide decks, and videos including explanations of vaccine safety and adverse events have been mentioned as examples in the consultations with stakeholders. Moreover, these support materials yield a wider benefit by increasing the vaccine literacy of patients which is one of the main challenges identified.

As an example, Latvia's flu vaccination leaflet for pregnant women [57] communicated key benefits of protection and prevention. Information materials were provided to family doctors to support the conversation with patients. Short-term vaccine side-effects were included, with both public trust and ability to understand benefit-risk calculations included in the campaign strategy.

WHO Regional Office for Europe highlighted during the consultation that medical doctors and nurses may often need information and communication first to educate themselves and become convinced about the safety of vaccines. Moreover, they need proper examples of messaging on how to effectively communicate vaccine safety to the recipients and the public. WHO Europe has sought to support health workers in various ways. For instance, for COVID-19 vaccination, they prepared job aids for vaccination nurses and for GPs who consult patients before vaccination [58]. This practice was adopted in many countries. In addition, they crafted specific messaging tailored to the safety of each particular vaccine in use. Another tool, developed together with stakeholders[xvii] was the online portal 'COVID-19 vaccines and vaccination explained': https://www.covid19infovaccines.com. It aimed to help healthcare workers (as well as the public) with answers to common question on COVID-19 vaccines. The portal included videos, podcasts, and downloadable materials to facilitate use and translation to national contexts. Content was available in seven languages and continuously updated during the pandemic as knowledge evolved.

Furthermore, the European VAX-TRUST project [59] – which is especially interested in the perceptions and reflections of vaccine-hesitant parents and healthcare professionals – used multiple interventions, including developing online learning tools focusing on the interaction between the HCP and patient.

[xvii] Developed by WHO Regional Office for Europe in collaboration with WHO Collaborating Centre for Vaccine Safety from the Hospital Clínico Universitario de Santiago, Spain, and health-related professionals from different countries.

Example: Brussels-Wallonia

During European Immunisation Week 2023, the vaccination programme team of Brussels-Wallonia used letters and brochures (print and online) to send to vaccinators for promotion of HPV vaccination. The aim was to encourage HCPs to display these print materials for patients and raise awareness around the benefits of protection for individuals, communities, and preventing transmission. All key risks of the disease and the safety profile of the vaccine were presented in these materials and aimed to address several drivers of vaccination. Downloadable versions of the leaflet were made available via a number of channels to healthcare professionals/vaccinators [60]. On the first page of the leaflet (in French), the following questions are addressed:

1. What is HPV?

2. How many people are annually affected by HPV-caused cancer in Belgium?

3. How can you protect yourself from catching HPV?

The second page describes the Belgian HPV vaccination programme and dedicates the lower part of the page to the safety of the HPV vaccination.

Practical considerations

The use of print and online materials for HCPs is a highly transferable practice and carried out in many countries. Increasing the quality of materials and information included, such as comparing the risks of disease with the benefit/risk profile of the vaccine, should be achievable.

Support materials need not be limited to medical settings but can also be disseminated in schools – experiences were mentioned by Swedish public health authorities during the interview on providing support materials on HPV vaccination, such as factsheets, films and information aids for the school health services, for example – and other public places as appropriate.

All national health authorities consulted mentioned support materials in some form during the survey, with others mentioning it further in their interviews. However, challenges raised included financial and human resources. Further, while support materials are often seen as the 'default' mechanism for disseminating health information to the public, they should ideally not be used alone. Rather, they should always, where possible, be complemented with other approaches such as those listed further above.

3.2.8 General good communication practices

Thus far, this report has focused mainly on good practices that are particularly useful in benefit-risk communication on vaccination. However, all benefit-risk communications should also follow basic health communication practices, many of which were mentioned during the stakeholder consultation process. These are vital to consider for any health communication intervention, including benefit-risk communications around vaccines, and are summarised here:

Communicate rapidly, clearly and in a responsive way

- Act quickly to address safety and other concerns around the vaccine(s).
- Update information regularly and address vaccine risk information (adverse events) promptly so as to control the narrative.

Tailor communication to the target group

- Tailor communications to target groups, focussing on those who are open to messages. Don't concentrate on the minority of people with extreme anti-vaccination attitudes who are not reachable through facts and campaigns and whose behaviour is unlikely to be influenced through communication.
- Tailor communication campaigns to address specific health concerns, e.g. older adults with diabetes, pregnant women.
- Issue messages in the language(s) and wording that your target group understands.
- Involve the communities in co-creating tailored messages and interventions.

Value the information source and the messenger

- The source and the messenger are as important as the message.
- Make transparent who is issuing the communication; public health agencies can make a difference as governmental organisations and as such stand out as impartial and unbiased organisations.
- Empower and support trusted HCPs such as GPs, paediatricians, gynaecologists, pharmacists and nurses to talk about vaccination.

Collaborate

- Collaboration and coordination between national and regional public health agencies is paramount for disease and vaccine risk detection and management, the communication strategy being part of it.
- Jointly address questions related to differences in vaccine recommendations across countries or regions.
- Communication expert networks are helpful to share best practices across countries.

Leverage expertise from various fields

- To provide a fresh perspective on developing messages, especially in fast-paced situations, leveraging experts in communication from various fields such as data and social sciences has proven useful (e.g. in EFSA's communication team).
- Collective international efforts in benefit/risk communication around vaccines could help overcome limitations of current practice. To this end, setting up an extended prevention community of practice, which complements the existing networks and where communication, medical, epidemiological, and behavioural insights practitioners and experts share experiences and collaborate could be beneficial to practitioners working in vaccine communication in public health organisations, in countries and international agencies.

Test and evaluate

- Ensure communications are pilot tested prior to distribution to the wider public (see EMA's user-testing in section 3.2.3).
- Besides testing, where feasible also conduct impact evaluations after dissemination.

Discussion

This report has described the findings of a study on benefit/risk communication on vaccination. Evidence from the academic literature was reviewed, and national public health authorities and European-level stakeholders were consulted in order to identify the main challenges experienced in this field and examples of good practices that can be drawn on. What emerges above all is that there is still a long way to go in terms of improving knowledge and practice in this field.

Despite the fact that vaccination is a long-established health practice, there is still much to be learned about the psychological processes that operate when people access multiple sources of information and weigh up the benefits and risks of vaccinating, and how this can be taken into account when communicating with individuals about vaccine benefits and risks. There does not seem to be one clear strategy with clear evidence backing its use, even if many show a great deal of promise. Further, the stakeholder consultation process revealed that there are a number of important challenges associated with most of the good practices identified in communicating about the benefits and risks of vaccines.

Among the communication techniques to aid in effective benefit-risk communication, the use of data visualisation appears to have great promise as an intervention, in that it addresses several of the challenges outlined in section 3.1. Presenting vaccine benefit and risk information in a clear and simple graphic format requires less language skills and is easier to understand for those who are less able or motivated to process quantitative data.

The practice of data visualisation is directly related to key vaccination drivers as described in the 5Cs model - more specifically the 'calculation' and 'constraints' elements: data visualisation can help individuals calculate benefits and risks and remove constraints in terms of inability to process this information. Through this, it can enhance confidence in the vaccine. Data visualisation appears to hold a great deal of promise, but within the scope of this study no substantial evidence of its impact on vaccine acceptance and uptake has been found. This could indicate that there is in fact no simple relationship between data visualisation communications and acceptance and uptake[xviii]. Indeed, some individuals may decide not to go ahead and vaccinate once they become more aware of the risks involved.

One practical issue that arises in the use of data visualisation techniques, as well as in the communication of vaccine benefit and risk information more broadly, is the trade-off between accuracy and comprehensibility. This plays out clearly where there is a progression from very simplified to more complex graphics that contain more nuanced information. Data on vaccine risks and benefits by their nature are complex and nuanced and contain caveats. Public health authorities should take into account the literacy and numeracy levels of the target audience in determining the most appropriate level of complexity. Complex information is likely to be off-putting for those who are less able, or less motivated, to process complex numerical information. On the other hand, over-simplified graphics may appear less credible to those who are looking for a greater level of granularity in the representation of risks and benefit information.

For some audiences, information on risks and benefits might have more impact when they are embedded in a narrative, especially when the story is told from the perspective of a person or persona that people can easily identify or empathise with. Short video formats are watched by a big share of the population and are easily shared.

Interactive tools and gamification methods could also be a promising way to engage audiences who are less motivated to engage with quantitative data. Innovative technologies such as AI-based chatbots or VR simulations are not yet widely enough tested and studied to have gained a substantial evidence base to support their use, but it is likely that they will gain more traction in the future because of their potential to adapt to individual risk concerns, language and health literacy barriers, while also providing the possibility to be scaled up. On the other hand, people or 'users' will adopt whatever technology seems to be affordable, convenient to access and informative for them. Behavioural and social scientists should consider experimenting with these innovative approaches to better understand their capabilities, limitations, risks, and potential use.

In general (and as with any form of health communication) consideration needs to be paid to the target audience and their capacity and interest for processing quantitative and qualitative data when thinking about whether or not to vaccinate. Where possible, communications should be tailored to the target audience in terms of the content and delivery (media used, type of message used, information contained in the message). The way the message is tailored should be based on detailed research on the target audience – their existing beliefs about the risks and benefits of vaccines and their communication preferences. Furthermore, the source of information should be clearly shown, as the source (and the messenger) are as important as the message. This principle can contribute to building trust into public health organisations in general and in vaccination programmes in particular.

[xviii] Due to publication biases, results that are not statistically significant are less likely to be published.

Results of this study confirm that benefit/risk communications should be embedded within broader vaccination communication strategies, making use of multiple different communication techniques, to ensure impact across multiple different audiences. As stated at the outset of this discussion section, there is not one single, clear strategy in vaccine benefit/risk communication that stands out in terms of the evidence showing its impact on vaccine acceptance and uptake, even if many show a great deal of promise.

Vaccination acceptance and uptake is likely to be enhanced through use of several of these good practices, by producing better knowledge and understanding about the benefits and potential risks involved in vaccination.

Limitations of this study

The scope of the data collection through the literature review and the consultations (survey and interviews) and the workshop resulted in several limitations of the study:

- The literature review was performed following pre-defined inclusion and exclusion criteria such as the year (2018-2023) and language of publication (English), infectious disease, vaccines, timing of risk communication (outbreak, crisis, ongoing) and outcomes (vaccine attitudes, vaccine acceptance/uptake, vaccine confidence/hesitancy, vaccination intentions and behaviours). The inclusion criteria were established to ensure maximum inclusion of relevant material while remaining feasible with the resources of the study. This will inevitably mean that relevant yet out of scope material will have been excluded.
- The consultations with national public health authorities and European organisations only occasionally revealed details about their specific practices in benefit/risk communication about vaccines. Mostly participants embedded their benefit/risk communication into more general good practices of vaccine communication.
- The survey, performed during the summer holiday period, resulted in responses from 17 of 30 EU/EEA countries. Survey responses were provided at different levels of detail by participants.
- The study scope allowed only for a limited number of interviews with representatives of national public health authorities. As these authorities may not be the sole entity involved in vaccine communication in the respective countries, the data presented here may not cover the full spectrum of activities undertaken in these countries.
- The online workshop was attended by a limited number of professionals involved in communication on vaccines from national public health authorities and European organisations, thus not being representative for the whole EU/EEA region.

Due to these limitations, some care should be taken in interpreting the good practices presented in this report and in extrapolating the findings to other settings. Nonetheless, these findings illustrate some of the efforts that national public health authorities and European organisations have recently taken to communicate about benefit and risks around vaccines.

References

1. World Health Organization (WHO). Vaccines and immunization. Available at: https://www.who.int/health-topics/vaccines-and-immunization#tab=tab_1 (accessed 21 March 2024).
2. WHO Regional Office for Europe (WHO Europe). COVID-19 vaccinations have saved more than 1.4 million lives in the WHO European Region, a new study finds. 16 January 2024. Press release. Copenhagen: WHO Europe; 2024. https://www.who.int/europe/news/item/16-01-2024-covid-19-vaccinations-have-saved-more-than-1.4-million-lives-in-the-who-european-region--a-new-study-finds
3. European Centre for Disease Prevention and Control (ECDC). Measles. In: ECDC. Annual Epidemiological Report for 2022. Stockholm: ECDC; 2023. Available at: https://www.ecdc.europa.eu/en/publications-data/measles-annual-epidemiological-report-2022
4. World Health Organization (WHO). Coronavirus disease (COVID-19): Herd immunity, lockdowns and COVID-19. Q&A. 31 December 2020. Geneva: WHO; 2020. Available at: https://www.who.int/news-room/questions-and-answers/item/herd-immunity-lockdowns-and-covid-19#
5. European Centre for Disease Prevention and Control (ECDC). Overview of the implementation of COVID-19 vaccination strategies and vaccine deployment plans in the EU/EEA. 23 September 2021. Stockholm: ECDC; 2021. Available at: https://www.ecdc.europa.eu/en/publications-data/overview-implementation-covid-19-vaccination-strategies-and-deployment-plans
6. European Centre for Disease Prevention and Control (ECDC). Overview of the implementation of COVID-19 vaccination strategies and deployment plans in the EU/EEA. 31 January 2022. Stockholm: ECDC; 2022. Available at: https://www.ecdc.europa.eu/en/publications-data/overview-implementation-covid-19-vaccination-strategies-and-deployment-plans
7. European Centre for Disease Prevention and Control (ECDC). Overview of the implementation of COVID-19 vaccination strategies and deployment plans in the EU/EEA. 21 April 2022. Stockholm: ECDC; 2022. Available at: https://www.ecdc.europa.eu/en/publications-data/overview-implementation-covid-19-vaccination-strategies-and-deployment-plans
8. European Centre for Disease Prevention and Control (ECDC). Rollout of COVID-19 vaccines in the EU/EEA: challenges and good practice. 29 March 2021. Stockholm: ECDC; 2021. Available at: https://www.ecdc.europa.eu/en/publications-data/rollout-covid-19-vaccines-eueea-challenges-and-good-practice
9. European Commission. State of Vaccine Confidence in the EU (2022). Available at: https://health.ec.europa.eu/publications/state-vaccine-confidence-eu-2022_en
10. Eurobarometer. Attitudes on vaccination against COVID-19 (2022), survey. March 2022. Available at: https://europa.eu/eurobarometer/surveys/detail/2692
11. European Council. Council Recommendation of 7 December 2018 on strengthened cooperation against vaccine-preventable diseases. Official Journal of the European Union, 2018/C 466/01.
12. European Centre for Disease Prevention and Control (ECDC). Catalogue of interventions addressing vaccine hesitancy. Stockholm: ECDC; 2017. Available at: https://www.ecdc.europa.eu/en/publications-data/catalogue-interventions-addressing-vaccine-hesitancy
13. European Vaccination Information Portal. Available at: https://vaccination-info.europa.eu/en (accessed 15 January 2024).
14. European Centre for Disease Prevention and Control (ECDC). Countering online vaccine misinformation in the EU/EEA. Stockholm: ECDC; 2021. Available at: https://www.ecdc.europa.eu/en/publications-data/countering-online-vaccine-misinformation-eu-eea
15. European Centre for Disease Prevention and Control (ECDC). E-learning: How to address online vaccination misinformation. Available at: https://www.ecdc.europa.eu/en/news-events/e-learning-how-address-online-vaccination-misinformation# (accessed 15 January 2024).
16. European Centre for Disease Prevention and Control (ECDC). Facilitating COVID-19 vaccination acceptance and uptake in the EU/EEA. 15 October 2021. Stockholm: ECDC; 2021. Available at: https://www.ecdc.europa.eu/en/publications-data/facilitating-covid-19-vaccination-acceptance-and-uptake
17. Betsch C, Schmid P, Heinemeier D, et al. Beyond confidence: Development of a measure assessing the 5C psychological antecedents of vaccination. PLoS One 2018; 13: e0208601.

18. Larson HJ, Jarrett C, Eckersberger E, et al. Understanding vaccine hesitancy around vaccines and vaccination from a global perspective: a systematic review of published literature, 2007-2012. Vaccine 2014; 32: 2150–2159.
19. EUSurvey. Available at: https://ec.europa.eu/eusurvey (accessed 15 January 2024).
20. McCready JL, Nichol B, Steen M, Unsworth J, Comparcini D, Tomietto M. Understanding the barriers and facilitators of vaccine hesitancy towards the COVID-19 vaccine in healthcare workers and healthcare students worldwide: An Umbrella Review. PLoS One. 2023;18(4):e0280439.
21. Limbu YB, Gautam RK, Pham L. The Health Belief Model Applied to COVID-19 Vaccine Hesitancy: A Systematic Review. Vaccines (Basel). 2022 Jun 18;10(6):973.
22. Al-Amer R, Maneze D, Everett B, et al. COVID-19 vaccination intention in the first year of the pandemic: A systematic review. Journal of Clinical Nursing 2022; 31: 62–86.
23. Gisbert-Pérez J, Martí-Vilar M, González-Sala F. Prospect Theory: A Bibliometric and Systematic Review in the Categories of Psychology in Web of Science. Healthcare (Basel). 2022 Oct 20;10(10):2098.
24. World Health Organization (WHO). Immunization Agenda 2030: A Global Strategy To Leave No One Behind. Geneva: WHO; 2020. Available at: https://www.who.int/publications/m/item/immunization-agenda-2030-a-global-strategy-to-leave-no-one-behind
25. Roozenbeek J, Schneider C, Dryhurst S, et al. Susceptibility to misinformation about COVID-19 around the world. R Soc Open Sci 2020; 7: 1–15.
26. Adhikari B, Yeong Cheah P, von Seidlein L. Trust is the common denominator for COVID-19 vaccine acceptance: A literature review. Vaccine X. 2022 Dec;12:100213.
27. Lin S. COVID-19 Pandemic and Immigrants' Elevated Health Concerns in Canada: Vaccine Hesitancy, Anticipated Stigma, and Risk Perception of Accessing Care. J Immigr Minor Health. 2022; 24: 896–908.
28. Acharya SR, Moon DH, Shin YC. Assessing Attitude Toward COVID-19 Vaccination in South Korea. Front Psychol. 2021;12:694151.
29. World Health Organization Europe (WHO Euro). WHO tool for behavioural insights on COVID-19. Available at: https://www.who.int/europe/tools-and-toolkits/who-tool-for-behavioural-insights-on-covid-19 (accessed 2 February 2024).
30. Roozenbeek J, van der Linden S. Fake news game confers psychological resistance against online misinformation. Palgrave Commun 5, 65 (2019). https://doi.org/10.1057/s41599-019-0279-9
31. Piltch-Loeb R, Su M, Hughes B, Testa M, Goldberg B, Braddock K, et al. Testing the Efficacy of Attitudinal Inoculation Videos to Enhance COVID-19 Vaccine Acceptance: Quasi-Experimental Intervention Trial. JMIR Public Health Surveill. 2022 Jun 20;8(6):e34615.
32. Vivion M, Anassour Laouan Sidi E, Betsch C, et al. Prebunking messaging to inoculate against COVID-19 vaccine misinformation: an effective strategy for public health. J Commun Healthc 2022; 15: 232–242.
33. Blanchard JL, Johnson C, McIntyre M, et al. A pre and post intervention study measuring the effect of interactive education on adolescent perceptions of vaccines, vaccine safety and disease risk. Journal of Public Health (United Kingdom) 2020; 42: E272–E277.
34. Basol M, Roozenbeek J, van der Linden S. Good News about Bad News: Gamified Inoculation Boosts Confidence and Cognitive Immunity Against Fake News. J Cogn. 2020 Jan 10;3(1):2.
35. Rędzio AM, Izydorczak K, Muniak P, Kulesza W, Doliński D. Is the COVID-19 bad news game good news? Testing whether creating and disseminating fake news about vaccines in a computer game reduces people's belief in anti-vaccine arguments. Acta Psychol (Amst). 2023 Jun;236:103930.
36. Whitehead HS, French CE, Caldwell DM, et al. A systematic review of communication interventions for countering vaccine misinformation. Vaccine 2023; 41: 1018–1034.
37. Burger MN, Mayer M, Steimanis I. Repeated information of benefits reduces COVID-19 vaccination hesitancy: Experimental evidence from Germany. PLoS One. 2022;17(6):e0270666.
38. Vaccine Safety Net. Available at: https://vaccinesafetynet.org (accessed 15 January 2024).
39. The Debunking Handbook 2020: Downloads and Translations. Available at: https://skepticalscience.com/debunking-handbook-2020-downloads-translations.html (accessed 15 January 2024).
40. Iepriekšējā nedēļā pieaudzis Covid-19 pacientu skaits stacionāros; Eiropā pieaug arī saslimstība ar gripu | Slimību profilakses un kontroles centrs. Available at: https://www.spkc.gov.lv/lv/jaunums/iepriekseja-nedela-pieaudzis-covid-19-pacientu-skaits-stacionaros-eiropa-pieaug-ari-saslimstiba-ar-gripu (accessed 15 January 2024).

41. Castro I, Van Tricht M, Bonaccorso N, et al. Stakeholders' Understanding of European Medicine Agency's COVID-19 Vaccine Information Materials in EU and Regional Contexts. Vaccines 2023; 11, 1616. DOI: 10.3390/vaccines11101616.
42. Harding Center. Available at: https://www.hardingcenter.de/en/transfer-and-impact/fact-boxes (accessed 7 May 2024).
43. McDowell M, Rebitschek FG, Gigerenzer G, Wegwarth O. A Simple Tool for Communicating the Benefits and Harms of Health Interventions: A Guide for Creating a Fact Box. MDM Policy Pract. 2016;1(1):2381468316665365.
44. Rebitschek FG, Ellermann C, Jenny MA, Siegel NA, Spinner C, Wagner GG. Fact boxes that inform individual decisions may contribute to a more positive evaluation of COVID-19 vaccinations at the population level. PLoS One. 2022;17(9):e0274186.
45. Brick C, McDowell M, Freeman ALJ. Risk communication in tables versus text: a registered report randomized trial on 'fact boxes'. R Soc Open Sci. 2020 Mar;7(3):190876.
46. McDowell M, Gigerenzer G, Wegwarth O, et al. Effect of Tabular and Icon Fact Box Formats on Comprehension of Benefits and Harms of Prostate Cancer Screening: A Randomized Trial. Medical Decision Making 2019; 39: 41–56.
47. European Medicines Agency (EMA). Annex to Vaxzevria Art.5.3 – Visual risk contextualisation. Available at: https://www.ema.europa.eu/en/documents/chmp-annex/annex-vaxzevria-art53-visual-risk-contextualisation_en.pdf. 23 April 2021. (accessed 15 January 2024).
48. Petersen MB, Bor A, Jørgensen F, et al. Transparent communication about negative features of COVID-19 vaccines decreases acceptance but increases trust. 2021; 118: 2021.
49. Kim M, Lee H, Kiang P, et al. A Storytelling Intervention in a Mobile, Web-Based Platform: A Pilot Randomized Controlled Trial to Evaluate the Preliminary Effectiveness to Promote Human Papillomavirus Vaccination in Korean American College Women. Health Education and Behavior 2020; 47: 258–263.
50. Kim M, Lee H, Kiang P, et al. Development and acceptability of a peer-paired, cross-cultural and cross-generational storytelling HPV intervention for Korean American college women. Health Educ Res 2019; 34: 483–494.
51. Laura Brennan, HPV advocate – YouTube. Available at: https://www.youtube.com/watch?v=iAoIJAC4MTM (accessed 15 January 2024).
52. Laura Brennan: This Is Me - RTÉ Player, https://www.rte.ie/player/movie/laura-brennan--this-is-me/102220328261 (accessed 2 February 2024).
53. Panickar R, Aziz Z, Mohd Sani N, Kamarulzaman A. The use of technology in vaccine safety communication: A systematic review of randomised controlled trials. Patient Educ Couns. 2023 Jul;112:107707.
54. Luk TT, Lui JHT, Wang MP. Efficacy, Usability, and Acceptability of a Chatbot for Promoting COVID-19 Vaccination in Unvaccinated or Booster-Hesitant Young Adults: Pre-Post Pilot Study. J Med Internet Res. 2022 Oct 4;24(10):e39063.
55. Vandeweerdt C, Luong T, Atchapero M, Mottelson A, Holz C, Makransky G, et al. Virtual reality reduces COVID-19 vaccine hesitancy in the wild: a randomized trial. Sci Rep. 2022 Mar 17;12(1):4593.
56. WHO Regional Office for Europe (WHO Europe). Game-based learning platform Immune Patrol increases children's knowledge of infectious diseases and vaccination. 6 March 2023. Copenhagen: WHO Europe; 2023. Available at: https://www.who.int/europe/news-room/photo-stories/item/game-based-learning-platform-immune-patrol-increases-children-s-knowledge-of-infectious-diseases-and-vaccination. (accessed 2 February 2024).
57. SPKC (Centre for Disease Prevention and Control – Latvia). ESI GRŪTNIECE, https://www.spkc.gov.lv/sites/spkc/files/data_content/gripa_info_grutniecem_297x210_3mm1.pdf (accessed 2 February 2024).
58. Job aid for COVID-19 vaccine administration: Pfizer–BioNTech COVID-19 vaccine, BNT162b2. Available at: https://www.who.int/europe/publications/i/item/WHO-EURO-2021-1834-41585-59310 (accessed 2 February 2024).
59. VAX-TRUST: Addressing vaccine hesitancy in Europe. Available at: https://vax-trust.eu (accessed 15 January 2024).
60. Fédération Wallonie-Bruxelles. Semaine européenne de la vaccination 2023. E-vax systéme vaccination. 24.04.2023. Available at: https://www.e-vax.be/welkom.do and https://www.ccref.org/e-vax/plaquette_semaine_europeenne_vaccination_2023.pdf (accessed 12 March 2024).

Annex. Methodology

To answer the study research questions, a combination of quantitative and qualitative research methods including a review of scientific and grey literature, an online survey, interviews, and an online workshop were conducted. This annex provides details on each of the methods used.

A.1 Overall approach

Table 1 below shows the methods used to address each research question.

Table A1. Methods used to investigate each research question

Research question	Literature review	Stakeholder consultation (online survey and interview)	Online workshop
RQ1: Which considerations and contexts have to be taken into account when communicating information on the risk/benefit balance around vaccination? (i.e. what factors predict vaccine-related cognitions and behaviours?)	X		
RQ2: What are the known risk perceptions of individuals with respect to vaccines and vaccine-preventable diseases? (Both general risk beliefs and beliefs specific to certain vaccines and/or diseases)	X		
RQ3: What are the examples of good practices of effective communication around the benefit/risk balance of vaccines? (i.e. that have used evidence and theory in the design of the intervention and/or that have a proven impact on vaccine-related cognitions and behaviours)	X	X	
RQ4: To what extent are these good practices transferable to other contexts/countries?			X
RQ5: Based on the above analysis, how can the communication around the effectiveness and safety of vaccines be improved in the EU/EEA?			X
RQ6: What are the gaps, risks and limitations with respect to the effective communication around the benefit/risk balance of vaccines?		X	

A.2 Literature review

A structured review of both grey and published literature was conducted to get an overview of existing, peer-reviewed/academic literature or otherwise documented information relating to the research questions 1, 2 and 3.

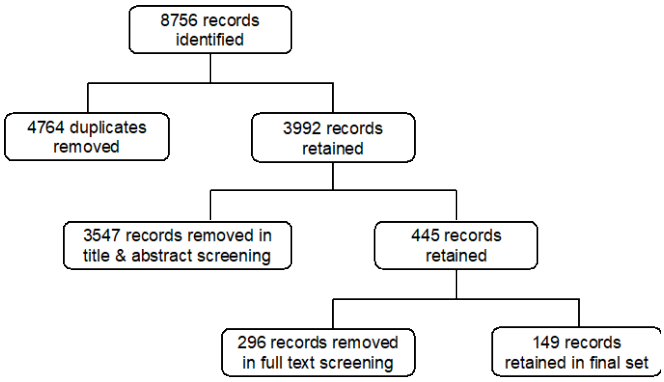
A.2.1 Inclusion and exclusion criteria

Table A2. Inclusion and exclusion criteria

Criterion	Values for inclusion
Year of publication	2018-2023 (2015-2023 for review articles)
Language of publication	English
Geographical coverage	Academic: Articles from authors affiliated with institutions in all countries included, articles describing populations in all countries included Grey literature: Reports from national-level organisations in EU countries and the UK and international-level organisations operating (also) in the EU included
Infectious disease	Mainly MMR, COVID-19, HPV, seasonal influenza, but all vaccine-preventable infectious diseases considered when relevant to the research questions
Vaccine	All vaccines authorised for use to prevent the above diseases in EU/EEA
Timing of risk communication	Outbreak, crisis, ongoing
Outcomes	Vaccine attitudes (including perceived risk and benefits of vaccines and vaccine-preventable diseases), vaccine acceptance/uptake, vaccine confidence/hesitancy, vaccination intentions, vaccination behaviours

The initial search returned a total of 8 756 records, 4 764 of which were duplicates and therefore removed, leaving a total of 3 992 records. Of these, 3 547 records were excluded based on title and abstract screening, leaving 445 records. A further 296 were excluded by full text screening, leaving 149 records in the final set. Of these 149 records, data were extracted from 30 articles for research question 1, 85 articles for research question 2 and 36 articles for research question 3 (data from two articles were reviewed for multiple research questions).

Figure A1. Summary of literature review screening process



A.2.2 Data extraction

The following data were extracted from the selected articles into an Excel spreadsheet for analysis. The data were organised and summarised using mostly qualitative methods, involving organising the search results according to relevant categories and then describing them qualitatively in the review, using some basic quantitative analysis where relevant (i.e. number of papers reviewed that found a link between perceived susceptibility and vaccine acceptance).

Table A3. Data extracted

Context	RQ1	RQ2	RQ3
• Filename • Authors • Year of publication • Study objectives • Country of residence of research subjects • Age of population • Size of study population • Risk group • Other group • Vaccine • Disease prevented by vaccine • Timing - crisis or ongoing • Review article?	• Outcomes (vaccine-related cognitions and behaviours) • Factor(s) significantly and positively predicting outcome variable • Model used to predict outcome (if applicable)	• Content of vaccine risk beliefs • Level of prevalence of vaccine-related risk beliefs • Content of disease-related risk beliefs • Level of prevalence of disease-related risk beliefs • Population group • Outcome that is positively and significantly related to risk beliefs	• Model/theory used to design intervention • Comparison group? • Short description of intervention • Media (print, TV, radio, online, counselling or training, etc.) • Outcome • Moderators of outcome • Mediators of outcome

A.3 Stakeholder consultations

The stakeholder consultations consisted of an online survey and afterwards interviews with a selection of representatives from countries' public health authorities and other organisations. The stakeholder consultations sought to obtain further information on countries and organisations experiences in communicating the benefit and risk balance of vaccination (in particular for vaccines against COVID-19, measles-mumps-rubella (MMR), influenza or human papillomavirus (HPV)). The consultations also sought information on both positive experiences and challenges, as well as measures applied in the country or organisation to mitigate these challenges.

The consultations addressed two research questions:

- RQ3: What are the examples of good practices of effective communication around the benefit/risk balance of vaccines? (i.e. that have used evidence and theory in the design of the intervention and/or that have a proven impact on vaccine-related cognitions and behaviours), and
- RQ6: What are the gaps, risks and limitations with respect to the effective communication around the benefit/risk balance of vaccines?

The online survey addressed national public health authorities of EU/EEA countries, a selection of those who responded were also asked to take part in an interview. In addition, stakeholders from international organisations, academia or representing specific European projects on vaccine acceptance were selected for the interviews.

A.3.1 Online survey

The survey was addressed to public health authorities in the EU/EEA, specifically to professionals working in the area of communication on vaccines, to whom ECDC reached out through their network of 30 National Focal Points for Communication.

The scope of the survey was narrowed from the literature review to cover vaccines against COVID-19, MMR, HPV and seasonal influenza, all of which are vaccines with sub-optimal coverage in the EU. At the same time, this selection of vaccines represented a diverse range of diseases and target age groups, from childhood to adolescents and older people. The survey included 30 mostly closed questions to ensure maximum engagement. In addition, where appropriate, use of 'other' options with an open text field was made. Respondents were given the opportunity to upload relevant information without it being obligatory. The survey was split into two main parts, one dedicated to COVID-19 vaccines and the other to one of the routine vaccinations against MMR, influenza, or HPV (respondents were able to choose which vaccination they wished to focus on).

The draft survey questionnaire is provided in the complementary material to this document. The questions per type of vaccine were organised in the following sections:

- Description of good practice (target population, content, formative research conducted, channels, period, evaluation of its effectiveness);
- Benefit and/or risk communication of this good practice;
- Communication addressing selected drivers for vaccination;
- Operational challenges encountered ;
- Solutions put in place;
- Theories or models used;
- External experts consulted;
- Evaluation of the good practice (process, impact);
- Lessons learned.

The survey concluded with two open questions related to support needed from ECDC and other expertise, resources and tools that could be helpful for benefit/risk communication around vaccines.

The survey was implemented in the EUSurvey tool [19]. Data from the EUSurvey tool are held in EU servers and are compliant with EU data privacy rules.

In order to promote a good response rate across the EU and to avoid 'survey fatigue' the following measures were applied:

- The relevance and importance of the survey was highlighted including a letter of support from ECDC outlining the intended use and impact of the study results.
- Replies in any other official EU language than English were accepted.
- The estimated time to complete the survey was 45 minutes.
- Survey responses could be partial and intermediate results could be saved.

The survey ran initially throughout the month of July 2023 and officially closed on 10 August. A specific request from one country to extend the duration of the survey was accepted and resulted in the survey being open until 31 August 2023.

Seventeen of 30 EU/EEA countries responded to the survey, namely: Belgium, Bulgaria, Cyprus, Denmark, Greece, Hungary, Italy, Iceland, Ireland, Latvia, Lithuania, Luxembourg, Malta, Norway, Slovakia, Spain and Sweden. The responses greatly varied in terms of the extensiveness of the information provided. Several countries uploaded weblinks to communication materials, mostly in the country's main language. Most responses except one were provided in English.

A.3.2 Interviews

The purpose of the interviews was to gather more in-depth information to describe successful initiatives of effective communication around the benefit and risk balance of vaccines in Europe. This included questions regarding the evaluation of the countries or organisations' campaigns or initiatives, both in terms of impact and process. The interviews were semi-structured; an interview guide was developed for indicative purposes, and a flexible approach was adopted where questions were adapted to the specific interviewee. The interview guide is available in the complementary material for this document.

Twelve interviews, including six with representatives of public health organisations in EU/EEA countries and six with other relevant organisations, were conducted in the English language. With respect to the EU/EEA countries, these were selected among those that described good practices in the survey with potential for transferability to other settings and contexts. At the same time the selection of countries aimed for geographical diversity. Where available, published online material (mostly in the country's main language) was shared.

Table 4 below lists the organisations interviewed.

Table A4. Stakeholders consulted in interviews

National public health authorities	European organisations	Research organisations
Through ECDC National Focal Points for Communication and/or other experts nominated by the country from: • Denmark • Ireland • Latvia • Norway • Spain • Sweden	• WHO Regional Office for Europe • European Medicines Agency • EFSA – European Food Safety Authority •	• Harding Center for Risk Literacy • Institute for Planetary Health Behaviour at University of Erfurt • EU-funded project VAX-TRUST at Tampere University Finland

Although the European Food Safety Authority (EFSA) is not working in the area of vaccine communication, this organisation was approached for an interview to benefit from their experience in risk communication related to food safety and to explore the potential of transferring some of their good practices to the area of vaccine communication.

All interviews were conducted online and lasted about 60 minutes. The transcript and summary of each interview was shared with the interviewee for review and approval.

Contact details of interviewees as well as interview transcripts and notes were stored in line with GDPR requirements in a secure online environment.

A.4 Online workshop

The online workshop represented an opportunity to present intermediate study findings of good practices of benefit/risk communication around vaccines, to validate the findings as well as to discuss transferability of these good practices in other contexts. The two-hour workshop took place on 12 October 2023 and gathered professionals involved in vaccine communication from national public health organisations, research organisations as well as EMA, European Commission and WHO Regional Office for Europe.

After an introductory plenary session, participants split up into three virtual working groups where they discussed the relevance of the good practices presented, the feasibility of their implementation in the participants' settings, including eventual challenges and solutions. The outcomes of the discussions in the working groups were reported back to the plenary.

European Centre for Disease Prevention and Control (ECDC)

Gustav III:s Boulevard 40
16973 Solna, Sweden

Tel. +46 858601000
ECDC.info@ecdc.europa.eu

www.ecdc.europa.eu

Follow ECDC on social media
Twitter: @ECDC_EU
Facebook: www.facebook.com/ECDC.EU
Linkedin: www.linkedin.com/company/ecdc/

Publications Office
of the European Union