



# Countering COVID-19 Vaccine Hesitancy

Report of an IAP Webinar with  
Recommendations for Action

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The full proceedings of the 'Countering Vaccine Hesitancy' webinar, held in March 2021, can be viewed at: <https://www.interacademies.org/news/countering-covid-19-vaccine-hesitancy-watch-iap-webinar>

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Under the umbrella of the InterAcademy Partnership (IAP), more than 140 national, regional and global member academies work together to support the vital role of science in seeking evidence-based solutions to the world's most challenging problems. In particular, IAP harnesses the expertise of the world's scientific, medical and engineering leaders to advance sound policies, improve public health, promote excellence in science education and achieve other critical development goals.

IAP's four regional networks in Africa (the Network of African Science Academies, NASAC), the Americas (the InterAmerican Network of Academies of Sciences, IANAS), Asia (the Association of Academies and Societies of Sciences in Asia, AASSA) and Europe (the European Academies' Science Advisory Council, EASAC) are responsible for managing and implementing many IAP-funded projects and help make IAP's work relevant around the world.

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# Executive summary

COVID-19 continues to cause problems around the world. Countries that seemed to have brought the virus under control with various lockdowns are suffering new waves of infection.

In addition, where the virus is spreading most rapidly, new variants continue to emerge, potentially threatening gains made via vaccination and other control measures.

It is increasingly clear, however, that although drugs that ameliorate the disease may help, vaccination will be the most effective way of bringing the COVID-19 pandemic under control.

A number of COVID-19 vaccines have passed through the necessary regulatory and authorisation processes and are now increasingly available in many countries. Such vaccines have been produced using various tried-and-tested methods, but also using new technologies such as messenger RNA (mRNA) linked with lipid nanoparticles.

It is estimated that at least 70% of people, distributed equitably around the world, will need to be fully vaccinated in order to bring the pandemic under control. However, as well as logistical and equity issues regarding access to the vaccines, the socio-political and psychological issue of ‘vaccine hesitancy’ also needs to be addressed to reach this target.

According to the World Health Organization (WHO), vaccine hesitancy refers to a “delay in acceptance or refusal of vaccines despite availability of vaccine services. Vaccine hesitancy is complex and context specific, varying across time, place and vaccines. It is influenced by factors such as complacency, convenience and confidence.”

In any population, there are people who will accept a given vaccine, and people who will strongly reject it. Then there are those in the middle who are undecided – hesitant – and may need more information or gentle persuasion in order to accept the vaccine. As these people may comprise a significant proportion of any given population, it is critical that their hesitancy is addressed and as many as possible can be persuaded to accept a COVID-19 vaccine. Achieving this goal will not only require knowledge of the relevant scientific facts, but also an understanding of the reasons behind people’s reluctance to embrace vaccination, which likely also requires an understanding of their psychologies, their in-groups (i.e. the social group/s to which a person psychologically identifies as being a member), and engagement with the media, including especially social media.

Scientists and doctors are typically members of professions in which the public has a high level of trust. And among providers of science advice, the independence and credibility of national academies means that they can play a special role as knowledge brokers, bringing together and synthesising available science, translating science into action, and in science communication. It is hoped, therefore, that the information and advice presented here by the InterAcademy Partnership – the global network of academies of science, medicine and engineering – will allow leaders and communicators of academies, as well as other credible scientific organisations and medical professionals in every country, to make strong and persuasive arguments for the acceptance of COVID-19 vaccines in a concerted effort to bring the pandemic under control.

This report is based on overviews by five experts in their fields that were presented during an IAP Global Webinar ‘Countering Vaccine Hesitancy’<sup>1</sup> (23 March 2021), the aim of which was to introduce the basic concepts of vaccine development and regulation/authorisation; to understand better the reasons why people think and make decisions the way they do, including in response to leaders and the media; to learn how to tackle false and misleading claims by those opposed to vaccines, including some scientists and clinicians; and how to promote a culture of trust in the COVID-19 vaccines.

Following an Introduction, Section 2 focuses on ‘Vaccines: Development and Regulation’ and reviews how vaccines work, the main ways that vaccines are developed, and how vaccines proceed from the laboratory through the clinical trial process to registration and approval for roll-out. It also attempts to allay fears regarding some of the main causes of vaccine hesitancy.

<sup>1</sup> Countering COVID-19 vaccine hesitancy: watch the IAP Global Webinar <https://www.interacademies.org/news/countering-covid-19-vaccine-hesitancy-watch-iap-webinar>

Section 3 focuses on ‘Vaccine hesitancy: Factors that affect people’s decision to choose vaccination’ and reviews the potential causes of vaccine hesitancy, including factors that are inherently linked with individual’s dispositions (e.g., values, beliefs and attitudes), as well as factors that are dependent on the situation (e.g., the pandemic and the spread of information and/or misinformation). Special emphasis is placed on the societal factors that affect how people intercept, acquire and disseminate mis/information, including the political landscape (with increased polarisation), the knowledge landscape (with distrust in scientists) and the media landscape (with an increased risk of spread of different kinds of false information). This section concludes by reviewing some ways in which academics and other scientific organisations can begin to address the causes behind people’s vaccine concerns.

Arising from these presentations, the subsequent discussions, as well as other cited resources, this report also includes a set of recommendations (Section 4). These recommendations are targeted at various groups, including academics and other scientific bodies, governments and healthcare providers, pharma companies, journalists and the media, and individuals, including individual scientists.

The recommendations include:

- Present the facts about vaccines in general and COVID-19 vaccines in particular: How they work, how they have been developed, what they contain.
- Engage in a public dialogue, use empathetic listening and responding to people’s concerns. Appeal to empathy and altruism.
- Establish participatory engagement and open debates, including with minorities and other marginalised communities, prior to, or at least very early on in the vaccine roll-out.
- Do not avoid questions of ‘uncertainty’ (in the face of an evolving pandemic and ongoing research situations), including over the issue of side effects.
- Also avoid politicising the debate. Listen to concerns and respond with facts, or at least the latest understanding.
- Be transparent, sharing data on trial protocols and results in easily accessible formats.
- Provide up-to-date information on any adverse reactions, including break-down of data by age group, gender, etc. There should be clear communication protocols for communicating with the public about adverse events.
- To assuage fears that vaccines are being pushed through the approval process too quickly, often with the perception that there is political pressure to do so, a number of vaccine manufacturers have pledged not to submit vaccines for approval in the US until proven safe in large clinical trials. Such pledges should be rolled out more broadly to give further reassurances for people everywhere.
- Establish surveillance systems, ideally run by independent bodies, to keep track of adverse medical events which may be caused, or perceived to be caused, by vaccines.
- Establish clear communication protocols for communicating with the public about adverse events. Establish qualitative research programmes to monitor vaccine confidence and hesitancy, and provide contextual understanding of the root causes, features, and trajectories of hesitancy. Data analysed and presented by such programmes can help inform strategy and policy as well as to adapt messaging to changing situations.
- Make adjustments to vaccine roll-out plans based on peoples’ feedback and concerns.
- Continually monitor roll-out and potential emerging and evolving causes of hesitancy (including via negative social media commentary) and adapt roll-out methodologies and messaging appropriately, also taking into account concerns of minorities or marginalised communities that may differ from those of the mainstream.

- Manage expectations about vaccine effectiveness and uncertainty about time-frame for 'returning to normal', which may depend on what proportion of the population is vaccinated; explain reasons for who is prioritised (medical and other key personnel, which age groups, etc).
- Use trusted biomedical professionals to administer the vaccines, ideally by using existing healthcare infrastructures that are already accepted. Such infrastructures, including on-line sign-up services, should be well maintained and efficiently run. This will help inspire confidence and avoid making the experience of booking and receiving the vaccine a negative one.
- However, also consider using locations such as shopping centres, schools, religious sites, etc, as vaccine centres that may be accessible to more sections of society.
- Address vaccine hesitancy among healthcare workers. Ensure that they themselves have the confidence to communicate effectively about COVID-19 vaccines and to convince those who are hesitant.
- Incentives and disincentives may be used to increase vaccine uptake, but coercive policies should be strictly limited and based on robust scientific evidence.
- Care should be taken if considering deploying the military to vaccinate people. In some countries this may contribute to mistrust and hesitancy.
- Ensure that messaging is jargon-free and accessible to all. Messages should be targeted to specific audiences, taking their concerns into account – hence the need for early dialogue.
- Consider using all the different languages spoken within a country.
- Context-specific messaging may be able to build on personal stories.
- Communication should utilise a range of platforms, both off and online, including social media.
- Visual imagery (including theatre) and memes can be effective and engaging ways to convey key information. Such accessible material can help people make sense of things in this uncertain period.
- Take time to understand the social media landscape and its complexities. For example, misinformation can be characterised by: (1) distrust of science and selective use of expert authority, (2) distrust in pharmaceutical companies and government, (3) the provision of simplistic explanations, (4) the use of emotion and anecdotes to impact rational decision-making; and, (5) the development of information bubbles and echo chambers.
- Appropriate and targeted messaging might be needed to gain traction in each of these scenarios.
- Act responsibly and think about the source and accuracy of any information prior to posting or sharing, either verbally or online (even if it is 'just for a laugh').
- Emphasise support for vaccination. This can be done by providing updated information on the number of vaccinations carried out, providing 'I got vaccinated' badges or stickers, promoting social media memes, etc. Focus on the positive and not on those who are strongly resisting getting vaccinated.
- Avoid repeating false claims and giving too much focus on tackling misinformation. It is better to be pro-active and to disseminate correct information. However, appropriate debunking and using techniques such as the 'truth sandwich' can be effective. Accept (and explain) that there are gaps in our current knowledge.
- Trusted celebrities and (e.g. musicians, sports stars, even online influencers) and community champions (e.g. faith leaders) can be leveraged to endorse vaccines. Identify such individuals and work with them to develop their understanding of the issues and suitable messaging.

It is hoped that these recommendations and the other factual information presented in this report can be used by academics and other organisations in an effort to counter vaccine hesitancy and promote vaccine acceptance in their countries as part of other major efforts aimed at finally bringing the COVID-19 pandemic under control.



# 1. Introduction

COVID-19 continues to cause problems around the world. Countries that seemed to have brought the virus under control with various lockdowns are suffering new waves of infection.

In addition, where the virus is spreading most rapidly, new variants continue to emerge, potentially threatening gains made via vaccination and other control measures.

It is increasingly clear, however, that although drugs that ameliorate the disease may help, vaccination will be the most effective way of bringing the COVID-19 pandemic under control.

The global scientific community, including via a number of public-private partnerships, have managed to develop a number of vaccines in record time (see section 2.6). It is gratifying to see a number of these have passed through the necessary regulatory and authorisation processes and are now being rolled out in many countries. Such vaccines have been produced using various tried-and-tested methods, but also using new technologies such as messenger RNA (mRNA) linked with lipid nanoparticles.

Reaching the number of people required to bring the pandemic under control (estimated to be at least 70%<sup>II</sup>, distributed equitably around the world) will be a huge task that will require global collaboration and national commitment.

In order to reach this target, issues to be tackled and better understood include the scientific (How long does a vaccinated person remain immune?); logistical (How can we ensure the vaccine cold-chain allows everyone to be reached?); and political (How can we make sure everyone has access to the vaccine?).

They can also be socio-political and psychological – especially when it comes to the issue of ‘vaccine hesitancy’.

**Vaccine hesitancy** refers to a “delay in acceptance or refusal of vaccines despite availability of vaccine services. Vaccine hesitancy is complex and context specific, varying across time, place and vaccines. It is influenced by factors such as complacency, convenience and confidence.”<sup>III</sup>

In any population, there are people who will accept a given vaccine, and people who will strongly reject it. Then there are those in the middle who are undecided – hesitant – and may need more information or gentle persuasion in order to accept the vaccine. As these people may comprise up to 70% of the population in some countries, it is critical that their hesitancy is addressed and as many as possible can be persuaded to accept a COVID-19 vaccine.

To do so not only requires knowledge of the relevant scientific facts, but also an understanding of the reasons behind people’s reluctance to embrace vaccination, which likely also requires an understanding of their psychologies, their in-groups (i.e. the social group/s to which a person psychologically identifies as being a member), and engagement with the media, including especially social media.

Immediately prior to the COVID-19 pandemic, a global study showed that, in many countries, public trust in scientists was high (80%)<sup>IV</sup>. And among providers of science advice, the independence and credibility of national academies means that they are considered to play strong roles in knowledge synthesis, as knowledge brokers, and in science communication.<sup>V</sup>

This report is based on overviews by five experts in their fields (see Acknowledgements

II Achieving 70% COVID-19 Immunization Coverage by Mid-2022 <https://www.who.int/news/item/23-12-2021-achieving-70-covid-19-immunization-coverage-by-mid-2022>

III WHO (2014). Report of the SAGE Working Group on Vaccine Hesitancy. 64pp.

IV Edelman Trust Barometer 2020 <https://www.edelman.com/trust/2020-trust-barometer>

V Gluckman, P., Bardley, A. & Kaiser, M. (2021). Brokerage at the science-policy interface: from conceptual framework to practical guidance. *Humanities and Social Sciences Communications*, 8, Article number: 84. <https://www.nature.com/articles/s41599-021-00756-3>

and Annex 1) that were presented during an IAP Global Webinar ‘Countering Vaccine Hesitancy’<sup>VI</sup> (23 March 2021), plus a subsequent question and answer session.

The aim of the webinar was to introduce the basic concepts of vaccine development and regulation/authorisation; to understand better the reasons why people think and make decisions the way they do, including in response to leaders and the media; to learn how to tackle false and misleading claims by those opposed to vaccines, including some scientists and clinicians; and how to promote a culture of trust in COVID-19 vaccines. Arising from these presentations, the subsequent discussions, as well as other resources, this report also includes a set of recommendations that can be used by academies and other organisations in an effort to counter vaccine hesitancy and promote vaccine acceptance in their countries.

It is hoped that the information and advice presented here will allow leaders and communicators of academies of science, medicine and engineering (even if they are not trained in immunology or infectious diseases), as well as other credible scientific organisations and medical professionals in every country, to make strong and persuasive arguments for the acceptance of COVID-19 vaccines in a concerted effort to bring the pandemic under control.

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VI Countering COVID-19 vaccine hesitancy: watch the IAP Global Webinar <https://www.interacademies.org/news/countering-covid-19-vaccine-hesitancy-watch-iap-webinar>

## 2. Vaccines: Development and Regulation

*In this section, we review how vaccines work, the main ways that vaccines are developed, and how vaccines proceed from the laboratory through the clinical trial process to registration and approval for roll-out. Answers are also provided to some of the main causes of vaccine hesitancy.*

*The text of this section is based largely on the presentations of Toni Gabaldon and Margaret Hamburg, presented during the IAP Global Webinar on Countering Vaccine Hesitancy.<sup>VII</sup>*

### 2.1 What are vaccines? How do they work?

Vaccines work by stimulating the body's own immune system to protect against a disease, generally an infectious disease. Prepared from the causative agent for that disease, or a component or product of that causative agent or a synthetic substrate, vaccines are designed to enable the immune system to recognise the infecting pathogen or foreign invader – without themselves producing an infection – so that an immune response and immune memory are triggered.

There are a range of types of vaccines and they may be administered in different ways, for example by injection, via the oral route, or by nasal spray. In some cases a single dose is enough to establish long-lasting immunity, but often a second initial dose is required and potentially also regular boosters.

In some cases, variants of a particular disease-causing pathogen, for example as seen with seasonal influenza, mean that the vaccine needs to be adjusted on a regular basis to help maximise its efficacy against circulating variants<sup>VIII</sup>.

Some vaccines prevent infection but others may not. However, vaccines do prevent severe disease, including hospitalisation, as well as reduce or eliminate transmission to other people. These various aspects have been demonstrated for different kinds of COVID-19 vaccine.

Before authorisation and roll-out of vaccines for use, they must also be proven to achieve stringent safety standards (see sections 2.4, 2.5 and 2.6).

### 2.2 How effective have vaccines been against other diseases?

One of the greatest collective achievements of humanity has been the eradication of smallpox – a highly infectious and debilitating disease that was consigned to history in 1980 thanks to a global vaccination campaign.

Likewise, a global vaccination campaign against poliomyelitis has almost succeeded in eradicating this scourge, with pockets of disease remaining in only two or three countries.

Indeed, data for disease after disease – including chickenpox, diphtheria, hepatitis A, hepatitis B, measles, mumps, pertussis and rubella<sup>IX</sup>, show the positive effects of vaccine licensing and roll-out campaigns. In many high-income countries, certain infectious diseases that were common in the early parts of the 20<sup>th</sup> century are now largely unknown, appearing only in communities where anti-vaccination sentiments have significantly reduced the proportion of protected people.

### 2.3 What are the different kinds of COVID-19 vaccines?

COVID-19 is the disease caused by the SARS-CoV-2 virus, a member of the coronavirus family, so-called because when visualised through an electron microscope they appear

<sup>VII</sup> Toni Gabaldón, professor, Comparative Genomics Group, Barcelona Supercomputing Centre (BSC-CNS), and Institute for Research in Biomedicine (IRB), Spain, and alumnus, Spanish Young Academy; Margaret Hamburg, vice president, Global Biological Programs and Policy, Nuclear Threat Initiative, and co-chair, IAP-Health. See also Appendix 1.

<sup>VIII</sup> Vaccine efficacy is defined as the percentage reduction of disease in a vaccinated group of people compared to an unvaccinated group under favorable conditions (e.g. in clinical trials). Vaccine effectiveness, on the other hand, refers to how well the vaccine protects people against disease in a 'real world' scenario.

<sup>IX</sup> Wadman, M. and You, J. (2017). The Vaccine Wars: debunking myths, owning real risks and courting doubters. *Science*, 356 (6336), pp 364-365.

like a crown (= *corona* in Latin) with a number of protruding spikes. It is the protein in these spikes that allows the virus to attach to and invade cells. Many COVID-19 vaccines are based on the stimulation of an immune response to spike proteins. However, there are a number of different approaches to making a vaccine; i.e. different platforms that can be used. Some of these have been used for many years to produce vaccines against other diseases, while others are being rolled out for the first time against COVID-19<sup>x</sup>.

*Live attenuated vaccines* use a virus culture that has been passaged through non-human cells so that it loses the ability to infect human cells. This process may take some time (weeks to months). The resulting vaccine may still cause a mild infection, but after many years of use, live attenuated vaccines are considered safe. Examples of such vaccines that are widely used include polio and the BCG vaccine against tuberculosis. In the case of COVID-19, there are no approved vaccines using this approach but some are in development such as the one being developed by Codagenix/Serum Institute of India.

*Vaccines based on inactivated virus*: This approach also uses whole virus, but it is inactivated, for example via a chemical or heat treatment. The protection obtained is usually lower than by using a live attenuated vaccine, so an adjuvant is typically added to help stimulate the immune system. Examples of such vaccines that are widely used include those that protect against cholera and rabies. In the case of COVID-19, the Sinopharm and Sinovac vaccines developed in China use this approach.

*Vaccines based on viral vectors* use a safe, non-pathogenic virus – one that is quite different to the target virus (in this case SARS-CoV-2). Such viruses are modified to contain parts of the target virus that will stimulate the immune response. In the case of COVID-19 vaccines, the harmless viruses are modified to contain the surface protein or spike protein. This platform has been used to create a vaccine against the Ebola virus. For COVID-19, vaccines from the Gamaleya Research Institute (Russia's Sputnik V), the AstraZenica/University of Oxford vaccine (sold under the brand names Covishield and Vaxzevria), and the Johnson & Johnson vaccine use this approach.

Instead of using whole viruses, the vaccine may just contain immunogenic *protein fragments* (again, such as the COVID-19 spike protein), which may be presented to the body in lipid nanoparticles designed to mimic viruses and stimulate the immune reaction. Seasonal influenza and hepatitis B are among the anti-virus vaccines currently in use that have been developed using this approach. Other examples that use this platform include the anti-tetanus vaccine, which uses a fragment of the bacterial pathogen that causes tetanus. Among the COVID-19 vaccines, EpiVaxCorona and NoviVax use this platform.

Finally, two new – but related – technologies have been employed in the development of vaccines against COVID-19. *DNA vaccines* make use of strands of synthetic DNA to synthesise viral components, again such as the spike proteins. The DNA needs to enter the nucleus within the cells to transcribe and translate the gene sequence into the desired protein. The delivery system, therefore, needs to be quite sophisticated. At present, no vaccines based on this approach have been approved for roll-out, but there are currently at least two versions undergoing Phase III clinical trials.

The second new technology involves the use of RNA, or more specifically *messenger RNA (mRNA)*. In this case, the RNA needs to enter the cell (the cytoplasm), but does not need to enter nucleus. Again, the outcome is the translation of the genetic sequence into the desired protein. Also, as many proteins can be made from a single RNA sequence, the dose of RNA required can be very low. However, RNA is unstable, so needs to be held at very low temperatures. This is a disadvantage as it can complicate the distribution of the vaccine, which would require a specialised (-70C) cold chain. The first vaccines to be approved using this approach are those against COVID-19, including those produced by Pfizer/BioNtech, Moderna and Curevac.

<sup>x</sup> For a summary of what follows, please see the IAP infographic, 'The different types of COVID-19 vaccines', available in English (<https://www.interacademies.org/publication/different-types-covid-19-vaccines>) and French (<https://www.interacademies.org/publication/les-differents-types-de-vaccins-covid-19>).

The advantages of using either the DNA or RNA platform include the fact that development and production can be rapid as there is no need to culture the virus. Instead, the DNA or RNA segments can be synthesised quite easily once the genetic code of the virus is known. In the case of COVID-19, this was shared by China in January 2020. These types of vaccines can also be readily recoded for variants that may arise. However, these new types of vaccine are also more expensive than those described above, but this may change as further development and roll-out proceed.

Because the mRNA vaccine technology is relatively novel, certain misconceptions have emerged. For example, the concern about whether the mRNA vaccine can genetically modify other cells of the body. This is not the case. As mentioned above, the RNA enters the cytoplasm of our cells, but not the nucleus where our own genetic material (our DNA) is located. RNA is also an unstable molecule and rapidly degrades to its harmless subunits. There is no risk of RNA integrating into the genetic make-up of the vaccine recipient.

There are many other misconceptions that arise because of confusion or misinformation about what vaccines are or how they work. For example the concern as to whether COVID-19 vaccines contain foetal material. In fact, none of the vaccines described above, indeed none of the vaccines authorized/approved for use, contain foetal material. Misconceptions may have arisen because foetal bovine serum is used to grow the virus or cells used for making some of the vaccines.

## **2.4 How are vaccines regulated?**

There is strong regulatory oversight of the vaccine research and development process, approval for use, and subsequent monitoring for safety or efficacy concerns once in more widespread use. It should be recognised that public trust and confidence in the safety and efficacy of vaccines relies on researchers, pharmaceutical companies and regulatory authorities rigorously following these procedures.

While each country has a different legal regulatory framework, they all follow common approaches. For example, approval is not just a ‘yes/no’, ‘approve/not approve’ decision, but is part of a life-cycle approach that begins with selecting the strain of the pathogen and the platform (see section 2.3) that will be used, and that proceeds through pre-clinical *in vitro* and animal tests, the design of clinical trials for human subjects (see section 2.5), manufacturing processes, the release of vaccine lots, etc.

Post-market surveillance is also hugely important. This involves the continued monitoring of those who have received the vaccine and covers the emergence of possible safety concerns and data on efficacy in the real world. Based on such feedback, information provided to vaccine recipients will be updated, and improvements may be made in the strategies for use.

Regulatory authorities also play the important role of providing information to both the public and healthcare providers concerning appropriate use of particular vaccines, etc, which is a critical component in reducing vaccine hesitancy.

## **2.5 How do COVID-19 clinical trials work?**

Again, it must be stressed that vaccine development typically follows a very careful, stepwise process: from pre-clinical data collection; to Phase I clinical trials with healthy volunteers that check safety and dosing issues; to Phase II clinical trials that expand the number of participants and look again at safety, but also efficacy. The Phase III clinical trial is critical and pivotal – it is much larger (often with several thousand participants) and brings in the idea of a control group (i.e. comparing the responses of those who received the vaccine versus those who received a placebo). Together, these three trial phases provide critical information for the overall assessment of safety and efficacy which is carefully analysed and reviewed, leading to a regulatory decision on approval.

In the case of COVID-19 vaccines, it is important to note that participants in Phase III

trials included those most at risk from the disease. These included the elderly, who are often excluded from clinical trials, those with medical co-morbidities (i.e. other medical conditions such as diabetes or obesity), racial and ethnic minorities that have been disproportionately burdened with COVID-19, and women of childbearing potential. Children and pregnant women were initially excluded from the trials, but those studies are now under way. Indeed, based on successful safety testing, vaccinations for children are now being rolled out in many countries, while evidence shows that the vaccines are also safe for pregnant women<sup>XI</sup>.

## **2.6 How long does it take to develop a vaccine? How were COVID-19 vaccines developed so quickly?**

It is important to note that the normal vaccine development timeline has been dramatically modified and accelerated in response to COVID-19. Early cases of the disease now called COVID-19 were first reported in late December 2019, and the genome sequence of the causative agent, SARS-CoV-2, was released in mid-January 2020. Remarkably, the first COVID-19 vaccines received authorisation for use in December 2020 – in other words, in just under a year.

More typically, each of the phases described above are completed in a stepwise manner. The data are analysed at each step as the process unfolds and the company assesses the probability of developing a successful product down the line and whether they want to continue to invest in it. Historically, the average time for vaccine development has been 10-12 years. Prior to COVID-19, the fastest vaccine to be developed was that now being used against mumps, which took four years.

The development of COVID-19 vaccines proceeded so quickly because the urgency of the pandemic led to a close partnership amongst regulatory authorities, scientists, academia and the pharma companies to determine how to consolidate and compress the different phases of study while still adhering to strict scientific standards and rigour (as called for in the ‘IAP Communiqué on the Development and Distribution of Vaccines against COVID-19’).<sup>XII</sup>

In parallel, many companies, often working with government, decided to invest in manufacturing facilities and the scale-up of production before it was clear if their particular vaccine would receive authorisation for use. This required both the companies and governments to take on considerable financial risks, but they are risks that have paid off. Without such foresight, the availability of COVID-19 vaccines that are now becoming more and more widely available would have been greatly delayed, even after successful review and authorisation by the regulatory authorities.

While there was uncertainty about this ‘pandemic speed’ vaccine development model (e.g. ‘Operation Warp Speed’ in the USA) that may have caused some hesitancy, it should be highlighted that data submitted to the regulatory authorities has also been reviewed by independent scientists and advisory boards.

However, it is important to understand that ‘authorisation’ is different from ‘full approval’. Most countries have leeway to give emergency authorisation to new vaccines (and other pharmaceutical products) under certain carefully prescribed conditions. These conditions may differ from country to country, but generally include an assessment (which may be an open, public advisory board meeting) of whether the benefits outweigh the known risks and whether there is a clear post-deployment surveillance and/or data collection strategy.

It should also be noted that collaboration among regulatory authorities has been unprecedented during the COVID-19 pandemic. The processes of different regulatory

XI Statement of Strong Medical Consensus for Vaccination of Pregnant Individuals Against COVID-19, American College of Obstetricians and Gynecologists, 9 August 2021: <https://www.acog.org/news/news-releases/2021/08/statement-of-strong-medical-consensus-for-vaccination-of-pregnant-individuals-against-covid-19>

XII IAP Communiqué on the Development and Distribution of Vaccines against COVID-19: [https://www.interacademies.org/vaccines\\_covid](https://www.interacademies.org/vaccines_covid)

authorities have been aligned along many dimensions, including the sharing and comparison of data, as well as the fact that pharma companies were not asked to collect different data or carry out different studies by different regulatory authorities. In particular, the International Coalition of Medicines Regulatory Authorities (ICMRA) has played – and continues to play – a critical role in coordinating international cooperation when it comes to accelerating research and development as well as administrative reviews.

## **2.7 Do COVID-19 vaccines protect against emerging variants of the virus?**

Variants of the SARS-CoV-2 virus have been emerging in regions where transmission rates are particularly high. There is evidence that some of these variants are more easily spread between people (e.g. the omicron, delta and mu variants), and certain variants, notably omicron at present, appear more able to evade the immune protection provided by the existing COVID-19 vaccines. Indeed, so-called ‘breakthrough infections’ by such variants are being recorded, at different levels, for most of the available COVID-19 vaccines. It is important to reiterate, however, that even in such cases, the chances of severe disease, hospitalization and death are significantly reduced in vaccinated versus non-vaccinated people.

In addition, it appears that available vaccine development platforms can enable scientists to go back and modify existing vaccines so that they can effectively address new variants without having to go back and repeat all the clinical studies (the so-called ‘plug and play’ option). Such a process is common practice for seasonal influenza, for example, which requires scientists to develop a new vaccine against emerging strains of the influenza virus each year. In this case, as will be needed with emerging variants of COVID-19, the regulators play a critical role by approving the validity of the vaccine platform.

## **2.8 Can vaccinated people contract COVID-19?**

After vaccination, the continued use of masks, handwashing, social distancing and other measures to prevent the spread of COVID-19 are still advised.

Vaccines offer critical protection, but as noted above (section 2.7), especially with the emergence of new variants, they are not able to provide absolute protection against infection and spread. Especially in the case of a previously unknown disease like COVID-19, scientists continue to learn about the nature of the disease and the vaccines that protect against it. Because these vaccines are so new, critical aspects of our understanding of their immune protection is still limited, including fuller definition of the correlates of immune protection and the duration of immunity, including through the use of booster shots. In addition, little is known about asymptomatic infection in, and potential spread from, vaccinated individuals.

We do know that the risk of severe disease and hospitalisation is significantly decreased in fully vaccinated individuals. However, a small percentage of people who are fully vaccinated may still get COVID-19 if they are exposed to the SARS-CoV-2 virus. If this happens, that individual could also still pass the virus to an unvaccinated person, who could then get seriously ill.

To provoke a strong and durable immune response, certain vaccines require more than one shot. If a second, third or other additional COVID-19 vaccine shot is recommended (depending on the type/manufacturer), it is critical to receive it to obtain the best protection.

# 3. Vaccine hesitancy: Factors that affect people's decision to choose vaccination

*In this section we delve into the potential causes of vaccine hesitancy, including factors that are inherently linked with individual's dispositions (e.g., values, beliefs and attitudes), as well as factors that are dependent on the situation (e.g., the pandemic and the spread of information and/or misinformation). Special emphasis is placed on the societal factors that affect how people intercept, acquire and disseminate mis/information, including the political landscape (with increased polarisation), the knowledge landscape (with distrust in scientists) and the media landscape (with an increased risk of spread of different kinds of false information). We conclude by reviewing ways in which academies and other scientific organisations can begin to address the causes behind people's vaccine concerns.*

*The text of this section is based largely on the presentations of Biljana Gjonjeska, Herman Wasserman and Hak-Soo Kim, presented during the IAP Global Webinar on Countering Vaccine Hesitancy.<sup>XIII</sup>*

## 3.1 How do we understand the concept of vaccine hesitancy?

Between those people who will accept a given vaccine and those who will resist or reject it, there is a typically a part of society that is still undecided, and who are going through a prolonged decision-making process on whether or not to accept the vaccine despite availability of vaccination services – the so-called 'vaccine hesitant' group.<sup>XIV</sup>

One of the prominent conceptual models of vaccine hesitancy<sup>XV</sup> proposes that it occurs as a result of a complex interplay between factors unfolding at the individual level (so-called 'dispositional factors') and at the level of society, in particular historic, political and socio-cultural circumstances (so-called 'situational factors').

Situational factors refer to all relevant actors in the society and the amount of public trust associated with them: influential political figures (including political leaders and governing parties), the communication and media landscape (including both traditional and digital media), as well as public health officials, scientists and medical professionals. On the other hand, the dispositional factors depend upon people's past experiences (either favourable or unfavourable), acquired knowledge (including education base and gaps), and personal beliefs and values (including moral norms and religious values). Together they exert influence on the perceived importance and the perceived risk of vaccines, ultimately affecting their attitudes and behaviours (i.e., the decision to get vaccinated or not).

The following section (3.2) will focus on the *societal factors* that influence the decision-making processes of people, while *individual characteristics* of people (personality traits, cognitive styles and worldviews) along with their needs and motivations to endorse false narratives and vaccine-hesitant attitudes are dealt with in section 3.3.

## 3.2 How do societal factors interact to enhance vaccine hesitancy?

The COVID-19 pandemic has been marked by rapid societal changes and fast evolving strategies for mitigation and containment. The following paragraphs highlight the importance of relevant factors in a society – including the political, knowledge and media landscapes – that play a role in vaccine hesitancy during the ongoing COVID-19 pandemic.

XIII Biljana Gjonjeska, research associate, Macedonian Academy of Sciences and Arts, and Steering Committee member, IAP Young Physician Leaders (YPL) Alumni; Herman Wasserman, professor in media studies, University of Cape Town, Centre for Film and Media Studies, South Africa, and Fellow, Academy of Science of South Africa; Hak-Soo Kim, distinguished professor, College of Transdisciplinary Studies, Daegu-Gyeongbuk Institute of Science & Technology, South Korea, and Fellow, Korean Academy of Science and Technology. See also Appendix 1.

XIV MacDonald, N.E. (2015). Vaccine hesitancy: Definition, scope and determinants. *Vaccine*, 33(34): 4161-4164.

XV Dubé, E., Loberge, C., Guay, M., Bramadat, P., Roy, R. & Bettinger, J. (2013). Vaccine hesitancy: an overview. *Human Vaccines and Immunotherapeutics*, 9(8): 1763-73.



The **political landscape** is an important contributing factor in people's motivation to get vaccinated, as it is closely related to the concept of social identity (i.e. the sense of belonging to a particular ethnic, religious or national group)<sup>XVI</sup>, and their political identity (i.e. identification with political groups or representatives who endorse similar political views to themselves). During the pandemic, someone's political identity, in particular, has served as an umbrella for other types of social identities and an indicator for attitudes towards COVID-19 control measures. In these circumstances, political leaders who endorse identity leadership strategies, by creating a shared sense of identity and galvanising individuals to identify more strongly with their nation might stimulate citizens to adhere to public health policies<sup>XVII</sup>. Leaders who can generate this feeling of 'belongingness', therefore, are likely to be those who are successful in conveying the message about the importance of vaccines for the good of the community. For example, Jacinda Ardern, Prime Minister of New Zealand, adopted such communication strategy, which included referring to the country's population as "a team of five million people"<sup>XVIII</sup>.

Regarding the **knowledge landscape**, the level of trust in experts (i.e., public health officials, medical professionals, pharmacy representatives and scientists) is one of the driving forces behind people's vaccine-related behaviours.

The lack of trust in relevant experts is one of the main hallmarks of 'science-related populism'<sup>XIX</sup>, a growing phenomenon based on the idea of an eternal struggle between (allegedly) virtuous ordinary people and an (allegedly) unvirtuous academic elite. The latter are perceived as morally corrupt as they hold supreme authority and lack transparency over the validity of information and decision-making processes. Such perceptions can manifest themselves as distrust in medical authorities, resulting in vaccine hesitant attitudes, including an indefinite postponement (or even abandonment) of the idea to get vaccinated.

This can be further explained when it is considered that the credibility of experts typically comes from the perspective of the information producer (e.g. of scientists themselves, or trusted media sources, etc.). However, when considered from the perspective of the public, there is a low 'credulity' towards politicians and experts that has accumulated over time. So it is natural that the general public sees expert views as a conspiracy to subdue other issues, especially when the experts recommend what may be considered excessive measures (lock-downs, travel restrictions, etc.), and when such decisions are perceived as being arrived at behind closed doors in a non-cooperative and non-transparent way, without public participation.

Without understanding this dynamic from the point of view of the public – a symptom of today's more general post-truth culture – effective communication will not be achieved. Importantly, one-way, persuasion-type communication must be rejected in favour of bi-directional communication, teamwork and collective decision-making between the public and experts, for example between the family doctor and the family, or between health professionals and the community. To deal with complex issues, a new, more effective way of science communication needs to take root. One-way communication that relies on 'bridging the gap' between experts and the public (i.e. knowledge transference from experts to the public) needs to be replaced with 'thinking together' or 'co-production' processes, including 'active listening' techniques (see section 3.6).

Regarding the **media landscape**, the rise of new platforms of communication has inadvertently created what has been labelled 'information disorder'<sup>XX</sup>. Characterised as

XVI Tajfel, H., Turner, J.C., Austin, W.G. & Worchel, S. (1979). An integrative theory of intergroup conflict. *Organizational identity: A reader*, 56(65), 9780203505984-16.

XVII Van Bavel, J.J., Cichocka, ..., Gjonneska, B., ...Boggio P. (2022). National identity predicts public health support during a global pandemic. *Nature Communications* volume 13, Article number: 517 (2022). <https://www.nature.com/articles/s41467-021-27668-9>

XVIII McGuire, D., Cunningham, J.E., Reynolds, K. & Matthews-Smith, G. (2020). Beating the virus: an examination of the crisis communication approach taken by New Zealand Prime Minister Jacinda Ardern during the Covid-19 pandemic. *Human Resource Development International*, 23(4): 361-379.

XIX Mede, N.G. and Schäfer, M.S. (2020). Science-related populism: Conceptualizing populist demands toward science. *Public Understanding of Science*, 29(5): 473-491.

XX Wardle, C. and Derakhshan, H. (2018). Thinking about 'Information Disorder': Formats of misinformation, disinformation, and mal-information. pp. 43-54. In "Journalism, 'Fake News' and Disinformation: A Handbook for Journalism Education and Training", Eds. Ireton, C. & Posetti, J. UNESCO, Paris. [https://unesdoc.unesco.org/ark:/48223/pf0000265552\\_eng](https://unesdoc.unesco.org/ark:/48223/pf0000265552_eng)

the disorganised, unregulated and unbalanced distribution of information, information disorder affects the knowledge system of people and their subsequent understanding of the importance to comply with public health measures (including vaccines). UNESCO has systematised the main elements of information disorder into three broad categories, based on the nature of their content and on the intention of those who create and spread such content:

**Misinformation:** Information that includes false content, but that is not created with deliberate intention of causing harm (e.g., inaccuracies, rumours).

**Mal-information:** Information that is mainly based on reality, but is used with the intention to inflict harm upon a person, social group, organisation or country (e.g., hate speeches or infringements of privacy).

**Disinformation:** A type of information that sits at the intersection of the two previous categories. It is partly false (combining fiction with facts) and is usually created with the hidden agenda of increasing reputational, social, political or economic gain by inducing loss in another person, social group, organisation or country. 'Fake news' (the conversational synonym for disinformation) and conspiracy theories (i.e., more elaborate narratives portraying secretly plotting groups or individuals with malevolent intentions) are the most prominent examples of disinformation.

### 3.3 How and why do individuals react to disinformation and conspiracy theories?

In the face of complex and often incomprehensible situations (such as the ongoing COVID-19 pandemic), people often seek refuge in simple explanations (such as disinformation and conspiracy theories)<sup>XXI</sup>. Conspiracy theories, in particular, might provide short-term relief from a threatening situation but they can also have long-term consequences, including, in the current pandemic, on health. Indeed, the use of the term 'conspiracy theory' practically doubled between October 2019 and October 2020.<sup>XXII</sup>

People vary in their tendency to endorse conspiratorial narratives, in accordance with some important individual characteristics:

- **Personality traits:** For example, people who lack emotional stability or display narcissistic traits tend to be more prone to believing in conspiracy theories.
- **Cognitive styles:** For example, people who think intuitively, or use reflexive reasoning, are more susceptible toward cognitive biases, and thus less resistant to conspiracy theories, compared to people who think analytically.
- **Social worldviews:** For example, people who think that the world is a threatening place or a competitive jungle also tend to adhere to conspiracy theories.<sup>XXIII</sup>

The personal motivation to trust in conspiracy theories is also guided by a desire to satisfy three sets of needs:

- **Existential needs** – or the motivation to feel safe and in control in one's environment.
- **Epistemic needs** – or the motivation to understand one's environment.
- **Social needs** – or the motivation to maintain a positive image of oneself and one's group.<sup>XXIV</sup>

It is clear that the current pandemic threatens the sense of safety and security in people, so it might frustrate their existential needs. In addition, changes in scientific

XXI Gjonneska, B., Fidanovski, K. & Krouwel, A. (2020). North Macedonia goes global: Pro-EU aspiration and anti-EU sentiment as a basis for EU-related conspiracy theories. In *Conspiracy Theories in Eastern Europe* (pp. 250-267). Routledge.

XXII <https://www.theguardian.com/books/2020/nov/23/oed-says-2020-too-many-potential-words-of-the-year-to-name-just-one-oxford-english-dictionary>

XXIII Lantian, A., Wood, M. & Gjonneska, B. (2020). Personality traits, cognitive styles, and worldviews associated with beliefs in conspiracy theories. pp. 155-167. In "Routledge Handbook of Conspiracy Theories", Eds. Butter, M. and Knight, P. Routledge, Abingdon, 26 February 2020.

XXIV Douglas, K.M., Sutton, R.M. & Cichočka, A. (2017). The psychology of conspiracy theories. *Current Directions on Psychological Science*, 26(6): 538-542.

knowledge and consensus regarding COVID-19 and the rapid development of vaccines might frustrate the epistemic needs of people who lack insight on how science advances and how vaccines are researched, produced and regulated. In addition, many people feel a sense of gratification when they are part of a group that agrees with them and where they can feel a sense of joint grievance against authority. Finally, some of the restrictive measures (e.g., lock-downs and curfews) can also frustrate people's social needs, such as physically meeting with friends. Taken together, all these circumstances provide fertile ground for the endorsement of conspiracy theories and lead to vaccine-hesitant attitudes.

### 3.4 How and why is misinformation and disinformation spread?

The COVID-19 pandemic has also instigated an 'infodemic', a term coined by the World Health Organisation (WHO), which refers to an over-abundance of information that can lead to people being confused and anxious<sup>XXV</sup> (see also the discussion on 'information disorder', section 3.2). In addition, as science and our knowledge of COVID-19 have advanced, the information and guidance being presented has been shifting, which has helped amplify misapprehensions among the public.

Anti-vaccination sentiments map onto earlier misinformation and disinformation, including conspiracy theories, for example, about origins of the virus, as well shifting advice such as the wearing of masks, and this has created the opportunity for an anti-vaxx 'superstorm'.

The definitions provided in section 3.2, for example, make the link with the information sharer's intent, which cannot always be judged. For example, when someone unknowingly shares incorrect information, s/he participates in spreading misinformation. The spreading of misinformation also depends heavily on the 'media landscape': the space in which people share and consume information. Social media platforms, for example, are essentially designed to encourage quick scrolling, promote inaccurate reading and incentivise sharing. In addition, algorithms are designed to provide users with content similar to that which they regularly consume, leading to a reinforcement of their views.

However, if someone actively and deliberately shares incorrect information, s/he participates in disseminating disinformation.

Such examples tap into people's individual psychologies as well as certain historical and socio-political contexts. This is especially noticeable on the African continent (and other low-income economies) where people already have a distrust of big pharma and of information shared by governments. In other words, where there is a long history of distrust, disinformation finds an easy foothold.

The category of mal-information does include hate speech, but sometimes it can just be incomplete or poorly informed journalistic reporting. There may be some correct information in a particular report, but it may not always be contextualised properly. For example, pauses in vaccine trials or roll-out can be framed in a way that shows there is a crisis about a specific vaccine, or they can be framed in the sense that this is exactly how the scientific process works: i.e., that there are pauses and constant reflection based on new data. If that process is not understood or explained properly, (i.e., it frustrates the epistemic needs of people to understand their environment, see section 3.3) then mal-information can be propagated.

Lack of trust in the media is a global problem, but it may take different inflections in different regions. In much of the Global South, for example, there is a history of state-owned media. This becomes important with regard to vaccine hesitancy because if people are disinclined to trust the traditional media, then they are more likely to trust information they receive through other means.

XXV World Health Organization (2020b). *Novel Coronavirus (2019-nCoV) Situation Report - 13*. Available online at: <https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200202-sitrep-13-ncov-v3.pdf>

And mal-information becomes especially problematic and damaging when it is amplified by people in power. That power is not necessarily political power, but it may relate to other positions in society, such as having a voice within a faith community or other form of social network that imbues certain people with a capacity that enables them to amplify a message and make it more damaging. Just as Jacinda Ardern successfully used ‘belongingness’ to tackle New Zealand’s COVID-19 outbreak (section 3.2), so identity politics can be used to encourage people to resist recommended COVID-9 control measures.

### 3.5 Does false information spread the same way everywhere?

It is important to understand how people in different cultures or societies consume and share mis- and disinformation. Only in this way can responses be tailored to specific contexts, users and sharing practices.

People’s anxieties and societal uncertainties can play important roles, as can stereotypes and bias – for example, there has been a lot of misinformation shared about China, where the COVID-19 pandemic originated, that has been influential in the African context. The confirmation of bias, whereby information confirms existing notions that have been fostered by bias, is also an issue with social media in-groups in which algorithms provide suggestions of material similar to what has already been viewed and shared (see section 3.4).

The motivations behind spreading mis- and disinformation or can also vary, depending on the cultural context. In Africa, for example, there is a high likelihood that people will share misinformation that they receive, even knowingly, for various reasons, including a misplaced sense of civic duty – the idea of warning others ‘just in case it might be true’. Humour and satire also play important roles, as people may share a piece of information ‘just for fun’, without considering whether it is correct or not. In this case, the social and cultural history of social communication networks in Africa and other regions of the Global South are important because the political use of humour has a long history, for example, being used to undermine authoritative accounts from governments (grand narratives) to undermine political power.

### 3.6 What techniques can academies and other scientific organisations use against mis- and disinformation?

First, academies can provide so-called ‘identification responses’ by carrying out fact-checking: identifying contentious issues, investigating where they come from, and de-bunking them. The target here can be either the mis- or disinformation itself, or the person spreading it (e.g. a vaccine denier). The major, trusted source of information on COVID-19 and vaccines is the World Health Organisation, and their website ([www.who.int](http://www.who.int)) should be referred to.<sup>XXVI</sup>

Responses may also be aimed at the target audience rather than the person spreading mis- or disinformation. This is typically achieved via media literacy campaigns and other types of educational empowerment responses.

Two tactics can be used:

- **The ‘technique rebuttal’**, which identifies the techniques commonly used by people spreading disinformation, explaining: “Well this is typically how disinformation works, how they purposefully spread this and why it appealed to you.”
- **The ‘topic rebuttal’**, which counter-attacks the plausibility of the disinformation with facts – more explicitly: “These facts are incorrect; these are the correct facts...”

In addition to strategies for de-bunking and fighting actively against further spread of disinformation, the concept of ‘**psychological inoculation**’ represents a preventive strategy<sup>XXVII</sup>.

XXVI The UN initiative <https://shareverified.com/en/> is also useful, as is <https://www.factchecker.com/>.

XXVII van Der Linden, S., Roozenbeek, J., & Compton, J. (2020). Inoculating against fake news about COVID-19. *Frontiers in Psychology*, 11, 2928.

Psychological inoculation works by pre-setting people's expectations and critical reception of any information by providing an advance warning (i.e. an 'inoculation') that perhaps some of the news to which they are exposed might have been construed in a false way.

The technique involves forewarning about a possible threat or attack on people's attitudes, for example a challenge to the truthfulness of a particular statement. This is followed by a pre-emptive refutation of counter-arguments or '**pre-bunking**' by providing correct information and reliable sources. Using such a strategy, which may involve repeatedly presenting correct information, has proven to be successful in tackling disinformation because it saves time and effort that would otherwise be needed for fact-checking and de-bunking of disinformation.

Another effective strategy, especially recommended in journalistic reporting, is to build a so-called '**truth sandwich**'.

For balance, journalists are often required to cover various perspectives when reporting a story. This is fine for political reporting, but can lead to imbalance in scientific reporting if non-mainstream views are given equal weight. With a truth sandwich, reporters ensure that the presentation of false information – usually placed in the middle of the report – is prefaced by a 'layer' of correct information that is reiterated in a second layer at the end of the report. Using the truth sandwich strategy ensures that inaccurate information is properly addressed, while accurate information is successfully conveyed.

The technique of '**active listening**'<sup>xxviii</sup> on the other hand, is recommended for medical professionals when dealing with patients, academics and other groups of experts when dealing with the public, and indeed anyone when dealing with their peers. The technique, which can be practiced and developed, is suitable for close interactions between a small number of people. As the dialogue unfolds, the aim is to begin to understand the perceptions and motivations of the spreader of disinformation, and to identify common ground as a basis for presenting correct information in a non-confrontational, unbiased and impartial way. Discussants should never be overloaded with statistics and information, and uncertainties should be acknowledged and presented fairly – considering what is known and is objective truth, but also what is still unknown or not yet resolved. In the case of vaccine hesitancy, this approach can be used so that objective information is presented rather than what might be considered a representation of big pharma, for example. Finally, a message can be tailored to fit with the interests and beliefs of the person who spreads disinformation, but which directly conveys correct information.

'Active listening' differs from 'psychological inoculation' as it aims to meet people where they are by seeking to understand their perceptions and motivations rather than to try to 'inject' them with information, and is thus usually more effective.

When applying any of these techniques it is important for academics and other scientific and medical organisations to choose their battles. Not every piece of misinformation needs to be challenged and not every individual is the right person to engage with: such organisations cannot tackle all misinformation all the time.

'Prioritisation' decisions must be taken so that only those issues considered to be the most important are tackled. In this way, messages can be reinforced and relevant information spread more quickly. In general, issues related to denial of science (including climate change and vaccines) should be prioritised. Vaccine hesitant people should be engaged with, as this group can be considered as being mid-way between accepting and refusing the vaccine. In practice, the idea is not to try and persuade people (which may create additional resistance), but to increase their awareness. Indeed, if time and resources allow, it is often a good idea to switch to a private 'active listening' discussion that can help avoid issues of moral outrage and moral grandstanding that can be prevalent on social media.

xxviii Active Listening: Hear what people are really saying: <https://www.mindtools.com/CommSkill/ActiveListening.htm>

Finally, while good journalism can help discount disinformation, it is important that journalism inspires trust through ethical and trustworthy practices. If people do not trust the media, alternative circuits of communication are likely to become more influential. Again, in parts of Africa, there is a history of alternative communication forms, such as ‘pavement radio’, that have thrived in contexts of repression and state control of the media. These informal networks of communication may, however, also contribute to the spread of rumours and disinformation. The social and historical tendency to communicate in this way must be acknowledged and consideration given to how responses and interventions might align with such practices.

### **3.7 What else can academics and the scientific community do?**

It is important to recognise that misinformation is simple, well-projected and very appealing. In contrast, data are often complicated, uncertain and very nuanced. Thus, scientists should never over-state the case. It is important to convey how science works and, in doing so, explain why the scientific answer is rarely a simple message. If there are unknown factors, for example, efforts should be made to explain that scientists will be looking for additional information in order to provide clarity when it is possible to do so.

As people tend to find content that reinforces their own attitudes, what academics and others in the scientific community need to do is consider what can be done pre-emptively: How can science communication effectively support those agencies that are running vaccination programmes?

Engaging with civil society, faith communities and family networks can all help build the credibility of the message and amplify correct information. In this regard, it could be useful for academy leadership, staff, and even experts in the areas of infectious disease, immunology, etc, to review guidelines produced by WHO<sup>XXIX</sup> and UNICEF<sup>XXX</sup> that advise on how difficult conversations on vaccination can be undertaken.

In certain circumstances, academics may also use their credibility and influence and consider trying to change the information production and distribution environment, for example by lobbying for policy interventions and legislative changes (but see section 3.9).

### **3.8 What else can other organisations do?**

Considering information production and distribution mechanisms, responses to tackle mis- and disinformation may be curatorial, algorithmic (for example, the platform can stop certain searches or tag inaccurate claims), or demonetisation (for example, the platform may remove advertisements and thus stop earnings on some social media channels).

Surveys, social media listening, qualitative research and social network analysis (SNA) are all viable angles of approach to establish the motivations, causes and perceptions of people spreading mis- and disinformation. Only by better understanding these aspects can effective counter measures be designed and applied. For instance, in a specific context, it could be that the notion of civic responsibility is the main driver of the sharing of misinformation.

In this case, a suitable response might be to identify some key influencers and sources of authority and enlist such people to help spread correct information. Alternatively, if the dominant motivation is fun – information is shared “for a laugh” – then a suitable response might be to develop memes and gamify memes as responses in order to get people’s attention. The World Health Organisation, for example, has started working with emojis as a way to tap into the same discourse and use the same elements used by those spreading disinformation.

Considering the above, and the many different contextual situations, there is clearly a need to promote additional research into vaccine hesitancy.

XXIX <https://www.who.int/news-room/feature-stories/detail/how-to-talk-about-vaccines>

XXX <https://www.unicef.org/coronavirus/how-talk-about-covid-19-vaccines>

### 3.9 What should be avoided?

Top-down, one-direction communication has its limits, especially when people are already skeptical of authority, and when there is deep-seated mistrust of the media or other official sources of information. As discussed above, it is better to create spaces where dialogue, discussion and question-and-answer sessions can take place.

Those promulgating disinformation should not be directly challenged or made fun of. Such tactics are likely to drive them underground or amplify the polarisation that is already happening (for example through social media echo chambers, which have been broadly defined as “as environments in which the opinion, political leaning, or belief of users about a topic gets reinforced due to repeated interactions with peers or sources having similar tendencies and attitudes.”<sup>XXXI</sup>). Again, the correct tactic should be to create a space, listen to them, and engage with them.

Some countries have tried to make the spreading of disinformation a criminal offence. This is considered excessive and can often be used as a smokescreen for curtailing freedom of expression and the repression of criticism.

XXXI Cinelli, M., De Francisci Morales, G., Galeazzi, A., Quattrocchi, W. & Starnini, M. (2021). The echo chamber effect on social media. *PNAS*, 118(9) e2023301118: <https://doi.org/10.1073/pnas.2023301118>

# 4 Recommendations on Countering Vaccine Hesitancy

In this section we bring forward some of the main recommendations that emerged from the IAP Global Webinar on Countering Vaccine Hesitancy – as outlined in Sections 2 and 3. We also review recommendations provided by academies and other trusted sources and collate them.<sup>XXXII</sup>

## 4.1 Recommendations from IAP

	Target group				
	Academies and other scientific bodies	Governments and healthcare providers	Pharma companies	Journalists and the media	Individuals, including individual scientists
Present the facts about vaccines in general and COVID-19 vaccines in particular: How they work, how they have been developed, what they contain. <i>The presentations of the first two speakers in the IAP webinar can help here, as well as the IAP infographic, and WHO information pages.</i>	✓	✓	✓	✓	✓
Engage in a public dialogue, use empathetic listening and responding to people’s concerns. Appeal to empathy and altruism.	✓	✓		✓	✓
Establish participatory engagement and open debates, including with minorities and other marginalised communities, prior to, or at least very early on in the vaccine roll-out.	✓	✓	✓	✓	✓
Do not avoid questions of ‘uncertainty’ (in the face of an evolving pandemic and ongoing research situations), including over the issue of side effects.					
Also avoid politicising the debate. Listen to concerns and respond with facts, or at least the latest understanding.					

XXXII National Academies of Science, Engineering and Medicine (NASEM), ‘Strategies for Building Vaccine Confidence’: <https://www.nap.edu/catalog/26068/strategies-for-building-confidence-in-the-covid-19-vaccines>; The Royal Society and the British Academy, ‘COVID-19 Vaccine Deployment: Behaviour, ethics, misinformation and policy strategies’: <https://royalsociety.org/-/media/policy/projects/set-c/set-c-vaccine-deployment.pdf>; Social Science in Humanitarian Action Platform (SSHAP), ‘Rapid Review: Vaccine hesitancy and building confidence in COVID-19 vaccination’: <https://www.socialscienceinaction.org/resources/rapid-review-vaccine-hesitancy-and-building-confidence-in-covid-19-vaccination/>; US Centers for Disease Control and Prevention (CDC), ‘12 COVID-19 Vaccination Strategies for Your Community’: <https://www.cdc.gov/vaccines/covid-19/vaccinate-with-confidence/community.html>



	Target group				
	Academies and other scientific bodies	Governments and healthcare providers	Pharma companies	Journalists and the media	Individuals, including individual scientists
<p>Be transparent, sharing data on trial protocols and results in easily accessible formats.</p> <p>Provide up-to-date information on any adverse reactions, including break-down of data by age group, gender, etc. There should be clear communication protocols for communicating with the public about adverse events.</p>	√	√	√		
<p>To assuage fears that vaccines are being pushed through the approval process too quickly, often with the perception that there is political pressure to do so, a number of vaccine manufacturers have pledged not to submit vaccines for approval in the US until proven safe in large clinical trials. Such pledges should be rolled out more broadly to give further reassurances for people everywhere.</p>		√	√		
<p>Establish surveillance systems, ideally run by independent bodies, to keep track of adverse medical events which may be caused, or perceived to be caused, by vaccines.</p> <p>Establish clear communication protocols for communicating with the public about adverse events.</p>	√	√	√		

	Target group				
	Academies and other scientific bodies	Governments and healthcare providers	Pharma companies	Journalists and the media	Individuals, including individual scientists
Establish qualitative research programmes to monitor vaccine confidence and hesitancy, and provide contextual understanding of the root causes, features, and trajectories of hesitancy. Data analysed and presented by such programmes can help inform strategy and policy as well as to adapt messaging to changing situations.	√	√	√		
Make adjustments to vaccine roll-out plans based on peoples' feedback and concerns.  Continually monitor roll-out and potential emerging and evolving causes of hesitancy (including via negative social media commentary) and adapt roll-out methodologies and messaging appropriately, also taking into account concerns of minorities or marginalised communities that may differ from those of the mainstream.	√	√	√	√	
Manage expectations about vaccine effectiveness and uncertainty about time-frame for 'returning to normal', which may depend on what proportion of the population is vaccinated; explain reasons for who is prioritised (medical and other key personnel, which age groups, etc).	√	√		√	

	Target group				
	Academies and other scientific bodies	Governments and healthcare providers	Pharma companies	Journalists and the media	Individuals, including individual scientists
<p>Use trusted biomedical professionals to administer the vaccines, ideally by using existing healthcare infrastructures that are already accepted. Such infrastructures, including on-line sign-up services, should be well maintained and efficiently run. This will help inspire confidence and avoid making the experience of booking and receiving the vaccine a negative one.</p> <p>However, also consider using locations such as shopping centres, schools, religious sites, etc, as vaccine centres that may be accessible to more sections of society.</p>		√			
<p>Address vaccine hesitancy among healthcare workers. Ensure that they themselves have the confidence to communicate effectively about COVID-19 vaccines and to convince those who are hesitant.</p>	√	√			√
<p>Incentives and disincentives may be used to increase vaccine uptake, but coercive policies should be strictly limited and based on robust scientific evidence.</p> <p>Care should be taken if considering deploying the military to vaccinate people. In some countries this may contribute to mistrust and hesitancy.</p>		√			

	Target group				
	Academies and other scientific bodies	Governments and healthcare providers	Pharma companies	Journalists and the media	Individuals, including individual scientists
<p>Ensure that messaging is jargon-free and accessible to all. Messages should be targeted to specific audiences, taking their concerns into account – hence the need for early dialogue.</p> <p>Consider using all the different languages spoken within a country.</p> <p>Context-specific messaging may be able to build on personal stories.</p>	√	√		√	√
<p>Communication should utilise a range of platforms, both off and online, including social media.</p> <p>Visual imagery (including theatre) and memes can be effective and engaging ways to convey key information. Such accessible material can help people make sense of things in this uncertain period.</p>	√	√	√	√	√
<p>Take time to understand the social media landscape and its complexities. For example, misinformation can be characterised by: (1) distrust of science and selective use of expert authority, (2) distrust in pharmaceutical companies and government, (3) the provision of simplistic explanations, (4) the use of emotion and anecdotes to impact rational decision-making; and, (5) the development of information bubbles and echo chambers.</p> <p>Appropriate and targeted messaging might be needed to gain traction in each of these scenarios.</p>	√	√	√	√	

	Target group				
	Academies and other scientific bodies	Governments and healthcare providers	Pharma companies	Journalists and the media	Individuals, including individual scientists
Act responsibly and think about the source and accuracy of any information prior to posting or sharing, either verbally or online (even if it is 'just for a laugh').	√			√	√
Emphasise support for vaccination. This can be done by providing updated information on the number of vaccinations carried out, providing 'I got vaccinated' badges or stickers, promoting social media memes, etc. Focus on the positive and not on those who are strongly resisting getting vaccinated.	√	√		√	√
Avoid repeating false claims and giving too much focus on tackling misinformation. It is better to be pro-active and to disseminate correct information. However, appropriate debunking and using techniques such as the 'truth sandwich' can be effective. Accept (and explain) that there are gaps in our current knowledge.	√	√		√	√
Trusted celebrities and (e.g. musicians, sports stars, even online influencers) and community champions (e.g. faith leaders) can be leveraged to endorse vaccines. Identify such individuals and work with them to develop their understanding of the issues and suitable messaging.	√	√		√	

# Appendix 1

This report is based on the presentations made during the IAP webinar on 'Countering vaccine Hesitancy' held on 23 March 2021. To view the full webinar, please see: <https://www.interacademies.org/news/countering-covid-19-vaccine-hesitancy-watch-iap-webinar>

## Webinar moderator

### Gagandeep Kang

Professor Gagandeep Kang, member of the Indian National Science Academy (INSA), is a physician-scientist who has built a strong inter-disciplinary research programme that uses careful and detailed field epidemiology with molecular tools for the characterization of infectious agents and host responses to infection to understand and change factors that affect transmission, development and prevention of enteric infections and their sequelae. Observational, interventional and mechanistic studies on enteric infection and nutrition have demonstrated the complex relationships between gut function and physical and cognitive development. She has conducted phase 1 to phase 4 trials of vaccines, particularly for rotavirus and developed multi-site surveillance programmes across India and south-east Asia. Based first at an outstanding medical college and then at the Translational Health Science and Technology Institute (THSTI), she established a strong training programme for students and young faculty in clinical translational medicine aiming to build a cadre of clinical researchers studying relevant problems in India. She is currently Professor in the Department of Gastrointestinal Sciences at the Christian Medical College, Vellore, India.

## Webinar introductions by IAP presidents:

### Volker ter Meulen

Volker ter Meulen qualified as MD in 1960 and received a training in virology in the USA. He specialised in paediatrics and in clinical virology. In 1975 he became a full professor and Chairman of the Institute of Virology and Immunobiology at the University of Wuerzburg. He retired in 2002, having twice been elected Dean of the Faculty of Medicine of Wuerzburg University. During his research career, ter Meulen worked on molecular and pathogenic aspects of viral infections in man and animals, in particular on infections of the central nervous system. Ter Meulen has on numerous occasions been invited to give policy advice on research matters to German research organisations and to state and federal ministries of science in Germany. Internationally, ter Meulen has served on a number of committees of organisations and scientific societies in the area of virology and infectious diseases. From 2003-2010, ter Meulen was President of the German Academy of Sciences Leopoldina. From 2007-2010, he was President of the European Academies Science Advisory Council (EASAC). In 2013, he was elected co-chair of the InterAcademy Partnership (IAP), and between 2017 and 2021 he acted as IAP co-president. At the request of the IAP Steering Committee, Volker ter Meulen has been appointed as [IAP Special Advisor](#).

### Depei Liu

Prof. Depei Liu is a medical molecular biologist. He graduated from Peking Union Medical College with a PhD degree of biochemistry and molecular biology in 1986. During 1987-1990, he worked as a postdoctoral research fellow at the University of California, San Francisco, in the United States. Now he is a professor and doctoral supervisor.

From 2001-2011, he served as President of Chinese Academy of Medical Sciences (CAMS) and Peking Union Medical College (PUMC), and from 2002-2010 as Vice President of Chinese Academy of Engineering (CAE). He was elected the member of Chinese Academy of Engineering (CAE) in 1996, and the member of the US Institute of Medicine (IOM) and The World Academy of Sciences (TWAS) in 2008. He has been the director of the State Key Laboratory of Medical Molecular Biology of China since 2004, vice president of the Chinese

Medical Association since 2010, the chairman of Division of Medical Biochemistry and Molecular Biology, CSBMB (Chinese Society of Biochemistry and Molecular Biology) since 2011. He is also the member of the eleventh and twelfth session of the Standing Committee of the National People's Congress of China.

At the National Laboratory of Medical Molecular Biology, Prof. Liu has been engaged in molecular biology research on the regulation of gene expression, transgenic animals and disease models, gene transfer and gene therapy.

Due to his prominent work and achievements in scientific research and administrative management, Prof. Liu was awarded several times by the State Council, Ministry of Education, Ministry of Health of PR China and the Beijing Municipal Government.

## **Webinar speakers (in order of appearance)**

### **Prof. Toni Gabaldón**

Toni Gabaldón is ICREA Research Professor jointly affiliated to the Institute for Research in Biomedicine (IRB) and the Barcelona Supercomputing Centre (BSC), where he leads the Comparative Genomics group (<http://www.cgenomics.org/>). He has published over 200 publications and his work has received over 18,000 citations (h-index=65). His research focuses on understanding how genomes and phenotypes evolve within and across species to understand important evolutionary transitions such as the emergence of pathogenesis. In this regard, he has used an evolutionary genomics approach to understand the origin and spread of emerging human pathogens. Dr. Gabaldón is a member of the [IAP COVID-19 Expert Group](#) and an alumnus of the [Spanish Young Academy](#).

### **Margaret Hamburg**

Margaret A. Hamburg, MD, currently serves as the interim Vice President for Biological Programs and Policy of the Nuclear Threat Initiative. She is a former Commissioner of the U.S. Food and Drug Administration, having stepped down from that role in April 2015 after almost six years of service.

Dr. Hamburg earned her B.A. from Harvard College, her MD from Harvard Medical School and completed her medical residency at Weill Cornell Medical Center. Following her medical training, Dr. Hamburg worked at the National Institutes of Health (NIH) doing research and policy as the Assistant Director of the National Institute of Allergy and Infectious Diseases (NIAID). In 1991, she was named Commissioner of the New York City Department of Health. During her six-year tenure there, she implemented rigorous public health initiatives that tackled the city's most pressing crises head-on – including improved services for women and children, an internationally recognized tuberculosis control programme, a needle-exchange programme to combat HIV transmission, and the nation's first public health bioterrorism defence programme. In 1997, President Clinton named Dr. Hamburg Assistant Secretary for Planning and Evaluation in the U.S. Department of Health and Human Services. She later became founding Vice President for Biological Programs at the Nuclear Threat Initiative, a foundation dedicated to reducing the threat to public safety from nuclear, chemical and biological weapons.

In March 2009, President Obama nominated Dr. Hamburg for the post of FDA Commissioner. In that role, Dr. Hamburg emphasized the critical need for innovation in meeting medical care and public health needs. As Commissioner, she provided leadership on many groundbreaking activities, including implementation of new authorities to regulate tobacco products, new legislation designed to transform America's food safety system to one based on prevention rather than simply responding when outbreaks occur, and modernization of the system for the evaluation and approval of medical products.

Dr. Hamburg is a Fellow of the American Association for the Advancement of Science (AAAS) and the American College of Physicians, past-President and Chair of the Board of AAAS, as well as a member of the Council on Foreign Relations and the Institute of Medicine, National Academy of Sciences, where she served as Foreign Secretary.

## **Biljana Gjonseka**

Biljana Gjonseka, MD, PhD, holds a medical degree from 'Ss Cyril and Methodius' University of Skopje, North Macedonia, and a doctoral degree in psychology and social neuroscience from 'Sapienza' University of Rome, Italy. Her educational background of a medical doctor and neuroscience researcher (supported by scholarships from the respective Ministries of Education), is coupled with a professional affiliation of Research Associate at the Macedonian Academy of Sciences and Arts. Specifically, her occupation represents a synthesis of exploratory and applied research, covering topics related to neuropolitics and neuroethics (with emphasis on neurophysiological and behavioural correlates of ideological division and group distinction), thus successfully binding several domains (from social psychology to cognitive neuroscience).

In addition, Dr. Gjonseka had success in national participation, representation, promotion and coordination of several international projects (funded by EU FP6/FP7/Horizon/COST Programmes). Currently (2017-ongoing), she acts as a national coordinator for the IAP Young Physician Leaders (YPL) programme, a national representative for the COST Action on Comparative Analysis of Conspiracy Theories, and a leader of the national task force for the COST Action on Problematic Usage of Internet. She has single-authored several peer-reviewed publications, and has appeared as author in publications for journals from the [Royal Society](#) (Open Science, 2019) and [Lancet](#) (2012).

## **Herman Wasserman**

Herman Wasserman is Professor of Media Studies at the University of Cape Town, South Africa, and a Senior Research Associate of the Centre for Analytics and Behavioural Change. He holds a doctorate from the University of Stellenbosch, South Africa, and worked as a journalist before starting an academic career. He has published widely on media in Africa. His books include '[Tabloid Journalism in South Africa](#)' (Indiana University Press), '[Media, Geopolitics, and Power](#)' (University of Illinois Press) and '[Media, Conflict and Democracy in Africa](#)' (Oxford University Press). His co-edited collection (with Dani Madrid-Morales), 'Rumors, false news and disinformation in the Global South' will be published by Wiley-Blackwell this year. He is a Fellow of the International Communication Association and an elected member of the Academy of Science of South Africa (ASSAf). His awards include a Fulbright fellowship, the Georg Foster Research Award from the Alexander von Humboldt Foundation in Germany and the Neva Prize from St Petersburg State University. Wasserman is editor-in-chief of the academic journal African Journalism Studies and editor-in-chief of the Annals of the International Communication Association. He has published and presented research on misinformation widely, including to the [World Health Organization](#)'s first conference on the Covid-19 'infodemic'.

## **Hak-Soo Kim**

Hak-Soo Kim got his PhD degree (March 1982) in Communication from the [University of Washington in Seattle, USA](#), after having received an MA and a BA degrees respectively from [Seoul National University](#) and [Yonsei University](#), Seoul, South Korea. Currently he is Distinguished Professor, College of Transdisciplinary Studies of DGIST (Daegu-Gyeongbuk Institute of Science and Technology) in Daegu and Emeritus Professor of Communication, Sogang University in Seoul, South Korea. He is also Fellow, [International Communication Association \(ICA\)](#) and [Korean Academy of Science and Technology \(KAST\)](#). He was the 28th President of Korean Society for Journalism and Communication Studies (KSJCS) and Founder & first Chair of the Special Committee on SHARE (Science, Health, Agriculture, Risk and Environment) Communication, [AASSA \(Association of Academies and Societies of Sciences in Asia\)](#) the Asian Regional Network of IAP. He is newly appointed as Member, Korea's Institute for Basic Science (IBS) Scientific Advisory Board (SAB). He has been internationally a pioneer of theory and research on science communication and social science in general.



## Webinar moderator assisted by:

### Peter McGrath

Based in Trieste, Italy, Dr. **Peter McGrath** is currently Coordinator of the IAP secretariat. He obtained his BSc (honours) in Agricultural Zoology from the University of Glasgow, UK, and followed this with a PhD from the University of Leeds, UK, in 1989. His 10-year research career focused on the insect transmission of plant viruses and included postdoctoral positions at the Scottish Crop Research Institute as well as Purdue University and the University of Arizona in the USA.

Returning to the UK in 1997, he established his own business as a freelance journalist focusing on agricultural, environmental and scientific issues. He joined the [TWAS](#) Public Information Office as writer/editor in 2003. From 2006, he began overseeing the implementation of TWAS's core programmes, including South-South fellowships and other exchange schemes, research grants and various prizes, as well as the activities of the [Organization for Women in Science for the Developing World \(OWSD\)](#). During this time he has helped expand these programmes as well as developing new partnerships and activities. In 2013, he switched to become Coordinator of the [InterAcademy Partnership \(IAP\)](#), overseeing the Trieste office of the IAP secretariat (IAP-Health and IAP-Science) and acting as liaison person for the [IAP Science Education Programme](#) and the [IAP Biosecurity Working Group](#). He also retains his position as coordinator of the [TWAS science and diplomacy initiative](#).



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