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Battling Misinformation with Science

Promoting Science Communication to Fight Misinformation in Germany

Markus Weißkopf and Rebecca Winkels

Facing up to the Infodemic: Promoting a Fact-Based Public Discourse in Times of Crisis

Policy Paper Series by the Israel Public Policy Institute (IPPI)

In Cooperation with: wissenschaft : im dialog

Battling Misinformation with Science

Promoting Science Communication to Fight Misinformation in Germany

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About this Paper

This policy paper is part of the paper series *"Facing up to the Infodemic: Promoting a Fact-Based Public Discourse in Times of Crisis."*

Against the backdrop of the COVID-19 crisis, this paper series explores some of the key challenges facing democratic societies as a result of misinformation in the digital public sphere. It features a unique mosaic of perspectives and insights by experts from Israel and Germany that shed light on different facets of the phenomenon of online misinformation, with the aim of invigorating a societal debate on the issue as well as offering concrete ideas about how to address it.

The series *"Facing up to the Infodemic: Promoting a Fact-Based Public Discourse in Times of Crisis"* was generously supported by the German Embassy in Tel Aviv. The content and opinions expressed in the papers are solely of the authors and do not necessarily reflect the views of the German government and/or the Israel Public Policy Institute.

About the Project

This paper series is part of the broader project *"Fostering Democratic Resilience in the Digital Age,"* conceptualized and executed by the Israel Public Policy Institute (IPPI) in collaboration with the Heinrich Böll Foundation, Tel Aviv.

The objective of the project is to promote dialogue, exchange of knowledge and collaboration between researchers and practitioners from Israel and abroad to enhance democratic resilience in the context of the changing media and information landscape in the digital age.

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Contents

Executive Summary

The COVID-19 pandemic has challenged societies across the globe economically, socially and politically. It has put western democracies to a test and has become the focal point of the life of people all over the world. When this paper was written, not a day went by without new information on the current state of infections, possible measures for keeping the virus at bay and stories of people's private and professional struggles.

In this paper we outline the German response to the pandemic with a focus on trust in science, trust in the government's measures and the spread of conspiracy myths and misinformation. The latter have been described by experts as an infodemic that is spreading almost as fast as the pandemic itself, thus posing a challenge both to society as a whole and more specifically to how scientific knowledge is received by the public.

The paper outlines how and why conspiracy myths occur during a pandemic and who is most vulnerable to them. Its aim is to offer a multilevel approach on how science communication and other stakeholders can help to tackle the challenge and work towards establishing a better dialog between different parts of the society.

- **Recommendation 1: Promote a multilevel approach to reach the undecided through various channels.**
  To combat misinformation, we need a multilevel approach that focuses on different channels and media outlets targeted towards a group that, based on current research, we define as "the undecided." However, even though this is a group we need to specifically target, we cannot underestimate the importance of reaching other audiences, as they may be able to influence those most vulnerable to misinformation.

- **Recommendation 2: Foster informed trust in science.**
  Fostering informed trust in science and research should be one of the most important goals of common-good-oriented science communication going forward. To reach this goal we need to place a new emphasis on communicating values, processes and methods of science through different channels.

- **Recommendation 3: Create spaces for interactions between scientists and the public.**
  The importance of social media channels in today's communication environment should not overshadow the importance of real-life and direct virtual interaction between scientists and the public as a means to foster trust. Thus, we need to create spaces for these interactions even during a time when real-life meetings are impossible. Furthermore, we need to prepare scientists for these interactions.

- **Recommendation 4: Facilitate an open and structured societal debate about the role and functions of the media.**
  Combating misinformation will not be possible without looking at our communication channels from a broader perspective. We therefore need to foster dialog within society about how communication channels should be regulated and how we can create a more meaningful and positive dialog within those channels. This dialog needs to be open and broad.

1. Introduction

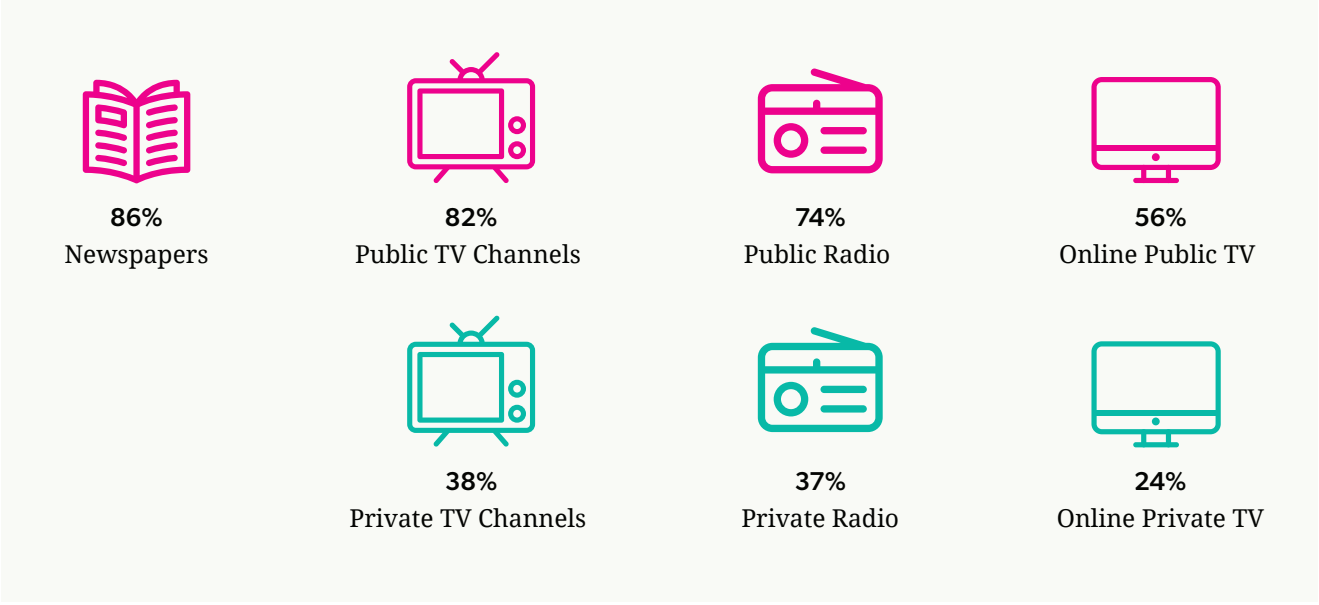
The COVID-19 pandemic has challenged societies across the globe economically, socially and politically. It has put western democracies to a test and has become the focal point of the life of people all over the world. As this paper is being written, no day goes by without new information on the current state of infections, possible measures for keeping the virus at bay and stories of people's private and professional struggles.

Science, naturally, plays a crucial role in all this, and so does science communication. This is particularly true as the impact of the virus and the success of the fight against it largely depend on the actions of individual citizens and, therefore, the quality of the information to which they are being exposed.[1] Overall, research shows that trust, especially in public-service broadcasters and major newspapers, has risen to an all-time high during the pandemic in Germany.[2]

A study by the German public broadcaster Westdeutscher Rundfunk (WDR), conducted in October 2020 showed that 82% of the respondents said that coverage of the pandemic on public-service television was "good" or "very good."[3] Public-service radio followed in second place with 74% of respondents saying it was "good" or "very good." Further, newspapers (68%) and Internet public-service broadcasting outlets (56%) were seen positively. In contrast, tabloid media was rated "bad" or "less good" according to 33% of the respondents when it came to covering COVID-19. Only 11% of respondents perceived it as being "good" or "very good."

Figure 1.

Evaluation of Media Coverage of the COVID-19 Pandemic



The percentage of German respondents who view media coverage of the pandemic as "good" or "very good," divided by media types. Based on a survey conducted in October 2020 by Westdeutscher Rundfunk.[4]

Despite the availability of reliable information, experts agree that misinformation and conspiracy myths have spread almost as fast as the virus itself.[5] "We're not just fighting an epidemic; we're fighting an infodemic," said Tedros Adhanom Ghebreyesus, Director-General of the World Health Organization (WHO) at a gathering of foreign policy and security experts in Munich, Germany, in mid-February 2020, referring to misinformation that "spread[s] faster and more easily than this virus."[6] The WHO defines infodemics as an excessive amount of information about a problem, which includes deliberate attempts to disseminate wrong information and advance alternative agendas of groups or individuals.[7] Infodemics can hamper an effective public health response and create confusion and distrust among people.

> **It is of great importance to better understand why people believe in conspiracy myths and misinformation, how they are disseminated and who is most vulnerable to them.**

Ghebreyesus and the WHO are not the only ones alerting people to the spread of misinformation and conspiracy theories. Frenkel et al.[8] state in a paper that "misinformation about COVID-19 has proliferated, including on social media." Brennen et al.[9] say in a recent paper that "mis- and disinformation about science, technology, and health is neither new nor unique to COVID-19" but that "amid an unprecedented global health crisis, many policy makers and academics have echoed the WHO and stressed that misinformation about the pandemic presents a serious risk to public health and public action."

Thus, it is of great importance to better understand why people believe in conspiracy myths and misinformation, how they are disseminated and who is most vulnerable to them. Misinformation and conspiracy myths pose a huge challenge to science and science communication and a broader knowledge of these phenomena is needed to ultimately develop measures against them.

2. Why We Buy into Conspiracy Myths

The reasons that people believe in conspiracy myths and are vulnerable to misinformation have been well researched. For example, psychologist Karen M. Douglas of the University of Kent[10] distinguishes between three categories:

- The desire for understanding and certainty
- The desire for control and security
- The desire to maintain a positive self-image

The last category is mirrored in Lantian et al.'s[11] research on the topic, which looks not only into the reasons but also personality traits common to some people who believe in conspiracy myths. Lantian argues, "that people high in need for uniqueness should be more likely than others to endorse conspiracy beliefs because conspiracy theories represent the possession of unconventional and potentially scarce information. […]".

Both Douglas's categories and Lantian's study, as well as other research results,[12] suggest that personality traits should be taken into account when trying to identify the people who are most vulnerable to misinformation and conspiracy myths – something that is crucial in the fight against such falsehoods.

Furthermore, their work makes it clear why conspiracy myths have been so prominent during the COVID-19 pandemic: They thrive at a time when uncertainty is high because we lack sufficient information about the virus while at the same time control and security are low and developments relatively unpredictable and rapid.

3. The COVID-19 Pandemic in Germany

The pandemic hit Germany a little bit later than other European countries,[13] such as Italy and Spain. Due to a well-funded and well-functioning healthcare system with a strong regional focus, Germany has seen lower death rates than other countries in Europe, especially in the first phase of the pandemic.[14] Still, the pandemic hit Germany's economy hard and changed the life of many people. Since early March, wide ranging measures have been taken by the government including contact restrictions, and the closing of borders, shops, restaurants, schools and eventually, kindergartens.

In coming up with these measures, the German government has relied heavily on scientific expertise and worked closely with both institutions and individual researchers. The German National Academy of Sciences Leopoldina has played an especially prominent role in policy advice throughout the pandemic.[15] The academy has published recommendations on various issues of the dealing with the pandemic that have regularly been cited by German Chancellor Angela Merkel when explaining the decisions of her government.

As drastic as the measures are, acceptance for them within the general public remained relatively high throughout the crisis. In a Civey survey at the end of March 2020, 56.8% of respondents said they were very satisfied or rather satisfied with the crisis management of the government.[16] The second wave of the pandemic has resulted in a slight decline of this number: As of February 2, 2021, 42,6% of the respondents of the ongoing survey indicated that they were "very satisfied" or "somewhat satisfied" with the government's crisis management.[17]

> **Trust in science and support for the measures taken by the government are still high in Germany, as in many other countries worldwide.**

A similar tendency can be observed regarding trust in science and research in the "Science Barometer – Corona Special Edition"[18] – a representative study on attitudes towards science and research conducted by Wissenschaft im Dialog (Science in Dialog, WiD). Trust in science rose to an all-time high at the beginning of the pandemic and has remained higher than ever before, even though there was a slight decrease in trust in the December survey compared to those from April (78%) and May (66%).

All in all, trust in science and support for the measures taken by the government are still high in Germany, as in many other countries worldwide. At the same time, we are seeing that people who openly oppose the measures are becoming increasingly vocal and more widely recognized in the coverage of the issues. Opponents to the measures exhibit a range of behaviors, some protesting peacefully for their rights to free movement while others claiming that the virus does not exist or even actively spreading misinformation about it.

The groups opposing the measures are often lumped together by the public into one big group under the somewhat misleading banner of "controversial thinkers." Over the course of the pandemic, this group has received disproportionately high media exposure compared to its relative marginality, leading to the impression it is far bigger than its actual size. This is further fueled by some public figures taking its side and promoting its claims, which results in even more media attention. This overrepresentation has been criticized by some. Its continuing presence, despite marginality and critique, means, however, that it remains a relevant factor in the debate. Some even go as far as suggesting that it might lead to more people joining the counter-measure movement.

4. Science Communication in Germany

Germany's response to the COVID-19 pandemic was called a master class in science communication by the US media outlet CNBC in July.[19] The article by Christina Farr praised German chancellor Angela Merkel for relying heavily on scientific findings citing her ability, as a former scientist, to understand the science relevant to combatting the pandemic. To understand whether the praise is merited, it is worth taking a look at the science communication landscape in Germany and how it fared during the pandemic.

Science communication began professionalizing in Germany in 1999, when the Memorandum of Public Understanding of Science and the Humanities (PUSH) was implemented by Germany's main research organizations.[20] Since then, institutional science communication has grown into a professional field with several branches and multiple stakeholders which interact closely. At the same time, like in most countries, science journalism is struggling with shrinking resources and has come under pressure in recent years.[21]

During the pandemic, science communication came under close scrutiny and several issues have gained the public's attention that previously had only been discussed within the scientific community.[22] The need for higher quality science communication and a better understanding of its impact, a need for a strengthening of researchers' role in it and the need for more common-good-oriented science communication had all been discussed prior to the pandemic and all became visible during it.[23]

During the pandemic, science communication came under close scrutiny and several issues have gained the public's attention that previously had only been discussed within the scientific community.

Since the outbreak started, scientists have been in the media spotlight as rarely before. They are invited for interviews, featured on talk shows take part in press conferences together with politicians.[24] The most prominent example has been Christian Drosten, a leading virologist conducting research on the virus, who became the public face of the pandemic in Germany,[25] giving regular insights into his research on the podcast Corona Update, which was broadcasted by the German public radio and television broadcaster Norddeutscher Rundfunk. He is also a good example of the challenges of the current situation, as he has been attacked by sceptics and some media channels throughout the pandemic. Drosten has received multiple awards for his communication efforts during the pandemic; and he is far from the only one speaking up.

However, some of those who have weighed into the public debate have not been quite as suitable experts as Drosten. The HIV-researcher Hendrik Streeck made headlines criticizing the measures taken by the government based on studies that later came under the scrutiny of the scientific community and were found to fall short of professional standards. Streeck – still one of the most outspoken researchers criticizing the government – was later criticized himself for working too closely with a PR company and with the governor of the federal state where he conducted his research.[26] Experts like Streeck are emblematic of the problem of science communication lacking quality standards, or the equally or even more problematic issue of scientists, journalists and research organizations not following the standards that do exist.

According to Siggener Kreis[27] – a German science communication think tank established by WiD and the Bundesverband Hochschulkommunikation (Federal Association of University Press Officers), the main lessons from the pandemic for science communication are the need for greater crisis-readiness and increasing the ability of science communicators to respond quickly, as well as deepening the understanding of how different actors within society contribute to science communication.

Furthermore, the pandemic gave rise to a high demand from the political sphere for policy advice from both individual scientists and scientific organizations. Under normal circumstances, policy advice is the main task of the German Academy of Science Leopoldina,[28] and indeed, they have played a main role in advising policy makers during the pandemic by issuing recommendations on a regular basis.[29] In addition, individual research organizations like the Helmholtz Association and the Max Planck Society have played a crucial role in advising the government, as have individual scientists such as Christian Drosten or Gérard Krause,[30] another prominent German epidemiologist. All these activities were accompanied by regular press conferences by the Robert Koch Institute to inform journalists as well as the general public about latest trends and developments with regard to the pandemic.

Altogether, the pandemic has revealed both the weaknesses and strengths of science communication in Germany, and will hopefully provide a good learning experience for future crises. Reshaping Germany's science communication landscape will largely depend on developments in the next few years, as awareness for it has risen not only due to the pandemic but also due to the fact that the Ministry of Research and Education has made it a priority to foster effective science communication.[31]

> **Conspiracy myths and the fight against misinformation, as well as stabilizing trust in science will have to be prominently featured in discussions about how to improve science communication, as they are key challenges society is currently facing.**

During the debates about an improved science communication system, identifying goals and a broadly agreed upon understanding of science communication play a crucial role. Conspiracy myths and the fight against misinformation, as well as stabilizing trust in science will have to be prominently featured in those discussions, as they are key challenges society is currently facing. While this lies in the future, in the present we need to gain a better understanding about why conspiracy myths thrive, who is vulnerable to them and why and what we can do to fight them in the short term as well as in the long run.

5. Vulnerability to Conspiracy Myths

A recent survey by the Konrad Adenauer Stiftung showed that conspiracy myths are a widespread phenomenon in Germany.[32] When asked whether secret powers control the world, nearly a third of those asked said this was "definitely true" (11%) or "probably true" (19%). In contrast, only 27% of people said this is "probably incorrect," or "definitely incorrect" (35%). The remainder did not know or were not willing to say.

Belief in such conspiracies was less common among people with higher levels of education. One in five people who graduated from academic high school or university said they agreed with the statement (15% of each group), and even fewer ranked the assertion that secret powers control as definitely correct (4% and 5%, respectively).

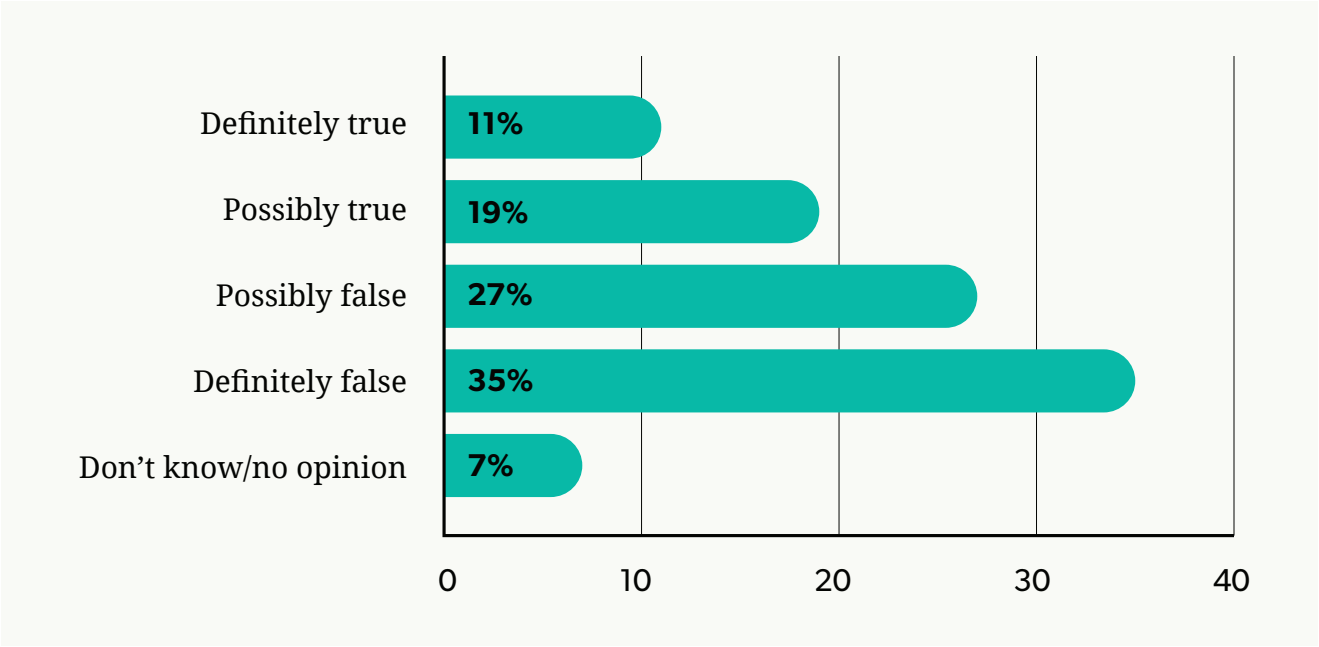
The proportions were higher among those with fewer years of schooling and who had vocational training.

Living in east or west Germany, being young or old, or being male or female did not affect the beliefs of those surveyed. However, those who voted for the far-right nationalist Alternative für Deutschland (AfD) party were particularly prone, with 56% them considering the statement as "certainly correct" or "probably correct."

Similar tendencies can be observed in WiD's Science Barometer.[33] Overall, the annual survey does not depict a general decline in trust in science. On the contrary, it shows an increase and all-time high in trust during the beginning of the COVID-19 pandemic. If, however, we look a bit deeper into the demographic distribution of trust, the results are similar to those depicted in the survey of the Konrad Adenauer Stiftung.

Figure 2.

Responses to the Statement "There Are Secret Powers That Control the World"



Responses indicating belief in conspiracy theories in Germany, based on a survey conducted by the Konrad Adenauer Stiftung among 3,250 respondents.[34]

According to the Corona Special Edition of 2020,[35] trust rises with the level of education. It also shows that people who voted for the AfD are the least trusting of science and research (13% are "not trusting" or "rather not trusting"). Furthermore, age seems a determining factor in regard to trust. Elderly people seem to trust less than younger people. This is a tendency that has been consistent throughout the last couple of years.

> **40% of respondents agreed with the statement that "scientists are not telling us everything they know." 66% of those voted for the right-wing AfD.**

New results from the Science Barometer, published in December 2020, showed a slight decrease in general trust in science and research but the number still remained higher than before the pandemic. While general trust remains high, there are some worrying tendencies suggested by the survey results. For example, 40% of respondents agreed with the statement that "scientists are not telling us everything they know." 66% of those voted for the right-wing AfD.

Furthermore, 25% of the respondents voting for the AfD (and 15% of all respondents) said that they do not think there is proof that the virus exists. This is a worrying number, especially when considering that infection rates were at an all-time high during the conduct of the survey in November. At first glance, virus-deniers seem to be the most important target group when it comes to fighting misinformation. Yet to many – perhaps rightly – convincing them otherwise seems to be a mission impossible.

The good news is that this group is still relatively small. To retain such low numbers in the future, we have to place our focus on a much larger target group for strategic science communication: "the undecided." This group of people has increased in numbers according to the current survey results.

6. Reaching the Undecided

When the Corona Special Edition of the Science Barometer was first published in April 2020,[36] 20% of the population were undecided whether or not to trust science. The December issue of the Barometer reported this number as having risen to 30%, which is still significantly lower than the levels of skepticism reported before the pandemic. In the 2019 Science Barometer, 46% of those surveyed said that they were undecided if to trust science.[37] We believe that this target group is especially important when combating misinformation.

The undecided group in 2019 comprised mostly people from the age 40-59. There was a slight shift in the age range of the undecided during the COVID-19 pandemic, with the age 60+ now dominating the group. 42% of the undecided have only a Hauptschulabschluss (secondary education certificate usually awarded after successful completion of nine or ten years of schooling), whereas 15% have the Abitur, the highest secondary education certificate in Germany. This data helps us gain better insight into the socio-demographic background of people who are undecided as to whether to trust in science.

People with different attitudes towards science use different media to inform themselves. Julia Metag et al. demonstrated this with data from the Swiss Science Barometer and its German equivalent, revealing that segments of the population can be distinguished by their media repertoires.[38]

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What we know about the group in question is that they consume information from regional newspapers rather than national papers. Further, they seem to use social media channels such as Facebook and Telegram. We also know that many of them live in rural areas rather than urban areas, and show a tendency to vote conservatively. This data is crucial, as it will help us to find efficient ways to reach out to the undecided target group as part of the fight against conspiracy myths and misinformation, for example by addressing them via the same information channels they use.

Social media channels are often referred to as the main source of conspiracy myths. Indeed, they do play a major role in the vicious cycle of misinformation.[39] For example, one of the more prominent disseminators of conspiracy myths in German-speaking regions is the vegan celebrity chef Attila Hildmann, who uses the messaging service Telegram as a main channel for spreading his views on the pandemic.[40]

However, as Benkler et al. have shown,[41] social media platforms and channels are not alone to blame for the spread of falsehoods. This is particularly important to keep in mind, as social media is not the main source of information for most people, as shown in various studies worldwide. Since this and other research points in the same direction, it is likely that only focusing on combating misinformation on social media will not be enough.[42] In fact, Hildmann and others like him combine their online activities with real-life actions and thus, feature prominently in other media channels as well.

Another important parameter that should not be underestimated are personal interactions, which play a big influence in how we judge certain situations and how our opinions are formed.

Spillover effects from different spheres are common, and therefore, the tendency to blame social media channels alone and the belief that addressing their shortcomings would be enough to stop the spread of misinformation are short-sighted. If we really want to combat misinformation, we need a multilevel approach that starts with the origin of misinformation and conspiracy myths rather than with the spread.

One phenomenon that gained importance during the pandemic is the appearance of scientists who themselves spread misinformation, a group described as “science malingerers” by the German journalist Joachim Müller-Jung.[43] “Science malingerers” are scientists with an expert status who put forward arguments against the scientific consensus. They are particularly dangerous, as their expert credentials are used by people spreading and believing in conspiracy myths to gain credibility from the general public.

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7. A Multilevel Approach

Combining the knowledge on vulnerable target groups with the information as to how misinformation is spread, we propose a multilevel approach in tackling misinformation. To date, the main response to misinformation has been the implementation of scientific fact-checks in mainstream media. While these are useful and beneficial, they often target the wrong audience and fail to reach those who are skeptical about science and undecided if they can trust in science or not.[44]

Another step in the right direction are voluntary measures that platforms like YouTube, Google and Twitter have taken in recent years to combat misinformation on their channels. This has shown a positive effect in some cases, but at the same time, new channels, such as messenger apps, TikTok or alternative video platforms, have emerged as the new spreaders of disinformation campaigns. At present, there is limited data on the exact role these new platforms play. This, and some flaws in the effectiveness of the measures taken by the more "veteran platforms" mentioned above, show that while these developments are positive, they are far from sufficient. This is especially pertinent as figures suggest that misinformation spreads quicker than proven facts online and has a significantly broader reach. A study published in Science in 2018 came to the conclusion that "falsehood diffused significantly farther, faster, deeper, and more broadly than the truth in all categories of information."[45] An analysis by Oxford University supported those findings and showed that in Germany, misinformation on Facebook is shared six times more than trustworthy information.[46]

All in all, we have to think bigger and act faster, if we do not want misinformation to prevail. Thus, we propose a multilevel approach with four main goals that we will outline in depth below.

- Providing trustworthy information
- Supporting scientists in their personal communication
- Establishing educational measures
- Fostering discussions on regulations

These recommendations have the undecided group in mind, but cast a wide net with the aim of reigning in misinformation overall. They also cannot be viewed separately, and are not intended to replace current efforts, but to complement, enhance and better focus them.

7.1. Providing Trustworthy Information

Providing trustworthy information in a dynamic media environment that is under constant pressure is key to any successful fight against misinformation. Currently, this information is provided mostly by national media outlets that have science journalism departments and work closely with institutions such as the Science Media Center in Germany to provide content. Fact-checking instruments are in place at many of these channels and public trust in them is generally high.

> **Combining the knowledge on vulnerable target groups with the information as to how misinformation is spread, we propose a multilevel approach in tackling misinformation.**

However, as outlined above, it is crucial to reach those people who are undecided in their trust in these channels. Many of them do not use national media as their main source of information.[47] This is particularly true for people who have a low interest in and/or no personal or professional connection to science.

Thus, we see a need to work together with local news channels to address the undecided. Strengthening their science reporting and especially the way they choose their experts can be a crucial step forward in the fight against misinformation. This must be achieved through means that do not interfere with journalistic integrity. It calls for an intrinsic approach and close collaboration between different stakeholders in science communication. For example, research organizations, foundations and media outlets could work together in traineeship schemes to offer young journalists a hands-on education in science journalism.

Furthermore, improving the quality of science coverage on Wikipedia could be equally beneficial, as it is one of the main sources used by people to inform themselves about scientific topics. Strengthening the efforts of science communicators and research institutions, as well as individual scientists, to contribute to Wikipedia could therefore go a long way in providing more trustworthy information within the outlets used by our most crucial target group.

While these measures focus on providing better information, it is just as important to strengthen dialog, especially with the undecided. Various studies have shown that trust in science can be achieved through interpersonal experiences, meaningful discussions, process and methods-orientated communication and by emphasizing the orientation of science towards the common good.[48] We therefore need to foster interaction about these topics with the target group. This can only be achieved through the channels that the targeted individuals are actively using, a strategy that we have not focused on enough in the past. Setting up interactive formats in community spaces, like allotment gardens, is another venue for fostering dialog between scientists and the target audience in question. Projects like *Wissenschaft für Alle* (Science for All), *Wissenschaft kontrovers* (Science Controversy) and *Die Debatte* (The Debate), created by WiD, have shown in recent years that meaningful interactions are possible if science communicators pay more attention to the audiences' needs and leave their "scientific bubble" to interact with target groups in their own environment.

We see a need to work together with local news channels to address the undecided. Strengthening their science reporting and especially the way they choose their experts can be a crucial step forward in the fight against misinformation.

These communication efforts should emphasize the role of scientists in society as well as what defines an expert in a certain field, especially as confusion about both has caused problems during the pandemic. We are currently experiencing a diametrical crisis, in which on the one hand recognized scientists have been blamed for political decision-making, while at the same time, scientists from unrelated fields are taking center stage as authorities on the COVID-19 crisis.

Despite the above suggestions and examples provided, we still have not found an ideal way of reaching target groups with no or little interest and interaction with science. Addressing this difficulty should be an important goal for science communication moving forward.

Communication efforts should emphasize the role of scientists in society as well as what defines an expert in a certain field, especially as confusion about both has caused problems during the pandemic.

7.2. Supporting Scientists in their Personal Communication

For these formats to be successful, it is important to support different actors, and especially scientists, in their efforts to tackle misinformation and conspiracy myths. In our view, a key challenge is the interaction within open discussions with friends and family members and/or other people that have been exposed to misleading information. This is not due to the lack of general knowledge about issues but due to the fact that counter arguments are often tricky to formulate precisely when caught without preparation. Providing help to science advocates in such decisive interactions should be a priority in our future efforts as science communicators.

This support for scientists could, for example, be provided through a rapid-reaction fact- checking/ argumentation application that provides scientists with strategies to deal with false claims and information. To be successful, this application has to be available online and be able to provide rapid feedback as well as shareable content. These requirements can only be met if scientific organizations and their researchers team up with science communicators outside of their organizations to provide the information needed for those rapid response reactions.

Furthermore, scientists need to be supported in their efforts to communicate their work and have to be enabled to successfully communicate. Over the last decade scientists have become more involved in communication efforts and in creating and stabilizing trust as one of the more pressing goals of science communication; they play a crucial role in its future. However, the system has not caught up with this development with education on science communication still not being part of the curriculum at universities. This situation has to change if we want to improve the quality of science communication provided by scientists.

Scientists need to gain knowledge not only about how to communicate but also about ethical questions with regards to communication. They need to gain access to information on target groups, goals and pitfalls of communication as well as on their own role within society. This has proven to be crucial during the COVID-19 pandemic, as some scientists – Hendrick Streeck and Alexander Kekule, for example – have failed to properly define their roles, and therefore gained media attention even though they were speaking outside their realm of expertise.[49] Thus, improving the training scientist receive on science communication will go a long way in restoring the quality of science communication in general, especially with regards to crisis management. That being said, communication can only be successful if the media coverage on science also follows ethical rules.

7.3. Educational Measures

One of the most crucial long-term goals in the handling of false information is to build "*bullshit resilience*." Therefore, an integrated educational approach is necessary to the measures outlined before. As active and preventive measures, the educational approach targets younger people.

Building up resilience needs to start at a young age when opinions are formed and people start consuming news. We therefore support the notion that some form of training in media usage needs to be integrated into school curriculums. Moreover, we need to strengthen formats that bring students in touch with science, its methods and processes at an early age, to raise awareness for how science works

> **One of the most crucial long-term goals in the handling of false information is to build "bullshit resilience."**

For instance, this could be achieved via the integration of "Citizen Science" approaches, which encourage public participation in scientific research, in formal and non-formal education programs. This will ultimately lead to a better understanding of the media coverage of science and of debates about scientific results – an understanding that, judging by some of the public discussions during the pandemic, is currently sorely lacking.

As mentioned before, one crucial aspect of this is to raise awareness of the role that science and scientists play in our society. The COVID-19 pandemic has shown the importance of scientists' communicating their role and impacts within society. The lack of communication knowledge can lead to the rise of distrust, misconceptions and ultimately skepticism. Teaching this at a young age might prevent the rise of misconceptions in the future.

7.4. Fostering Discussions on Regulations

All measures outlined above will be insufficient, if we neglect the question of the media and information landscape that we would like to see in the future. A discussion of how reliable information should be disseminated and how the spread of misinformation and conspiracy myths should be curbed, must be followed by rules and legal regulations that better protect against exploitation of our information channels.

Steps taken in this direction by platforms like Twitter, YouTube or Facebook are voluntary and often remain directed at certain events, such as the US elections. This approach is flawed on two levels: Firstly, since the actions are voluntary, the platforms remain fully in charge of the content they are fact-checking, retaining power over the narrative and also held to no standard of truth. Secondly, the process is not transparent to the public. In a worst-case scenario, this could lead to platforms becoming decision makers without any previous dialogue on common goals.

To prevent this and to actually reshape the system towards a better dialogue, regulations are necessary in the upcoming years. However, these should not be installed without a prior debate within society. This debate needs to start sooner rather than later. The way science is mediated to the public can play a crucial role in supporting and fostering those discussions. Even though we believe regulations are necessary, we think they are best implemented as a complementary measure to the other activities proposed.

8. Concluding Remarks

All of the measures proposed above will only be successful if stakeholders in the scientific field and media system collaborate. Counteracting misinformation can best be achieved if science communication efforts are geared towards the common good and the common goal rather than towards promoting individual success stories or organizations. To accomplish these objectives, time and resources have to be invested. This is especially true for those activities that reach beyond the scientific system itself, as multiple stakeholders need to be involved in order for these efforts to be successful.

It is crucial that we start working on them as soon as possible and with all the power we have. Otherwise, we risk losing a fight that has the potential to change the world to a much greater extent than the pandemic we are currently facing.

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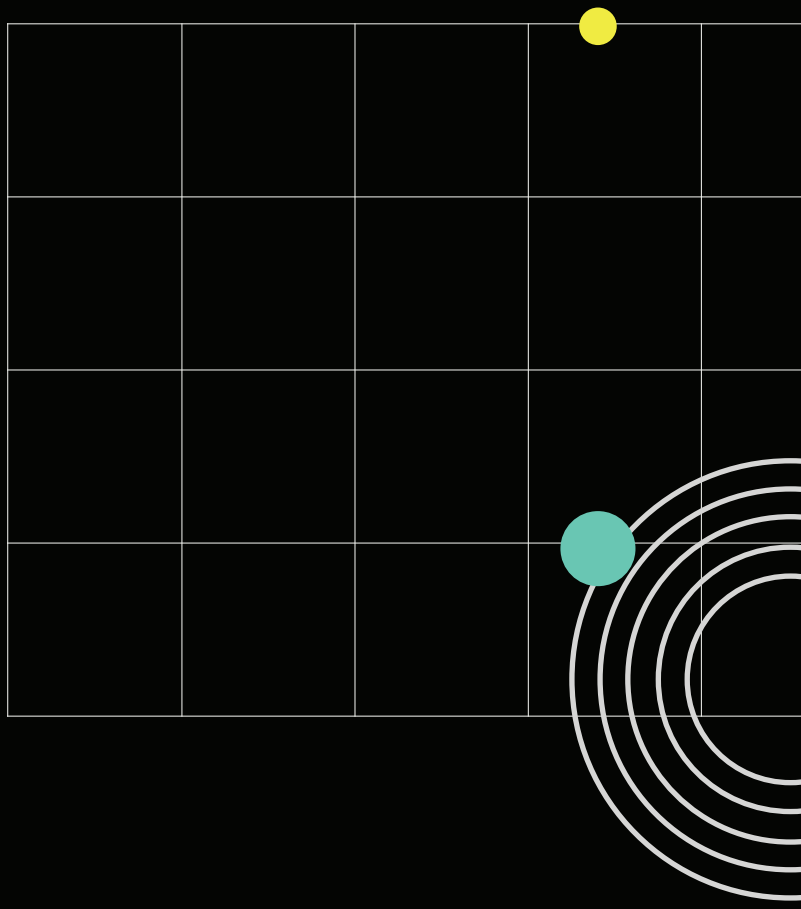

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