



Agency in urgency and uncertainty. Vaccines and vaccination in European media discourses

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ARTICLE INFO

Handling editor: Medical Sociology Office

ABSTRACT

Although Covid-19 was not the first pandemic, it was unique in the scale and intensity with which societies responded. Countries reacted differently to the threat posed by the new virus. The public health crisis affected European societies in many ways. It also influenced the way the media portrayed vaccines and discussed factors related to vaccine hesitancy. Europeans differed in their risk perceptions, attitudes towards vaccines and vaccine uptake. In European countries, Covid-19-related discourses were at the centre of media attention for many months. This paper reports on a media analysis which revealed significant differences as well as some similarities in the media debates in different countries. The study focused on seven European countries and considered two dimensions of comparison: between the pre-Covid period and the beginning of the Covid pandemic period, and between countries. The rich methodological approach, including linguistics, semantic field analysis and discourse analysis of mainstream news media, allowed the authors to explore the set of meanings related to vaccination that might influence actors' agency. This approach led the authors to redefine vaccine hesitancy in terms of characteristics of the "society in the situation" rather than the psychological profile of individuals. We argue that vaccine hesitancy can be understood in terms of agency and temporality. This dilemma of choice that transforms the present into an irreversible past and must be taken in relation to an uncertain future, is particularly acute under the pressure of urgency and when someone's health is at stake. As such, it is linked to how vaccine meaning is co-produced within public discourses.

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<https://doi.org/10.1016/j.socscimed.2024.116725>

Received 30 October 2023; Received in revised form 19 February 2024; Accepted 23 February 2024

Available online 28 February 2024

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1. Introduction

1.1. Vaccine hesitancy

Vaccine hesitancy is a long-lasting phenomenon. It is often identified by policymakers as a threat to public safety (E. Dubé et al., 2013, 2015; Galagali et al., 2022). Literally, a hesitant person is defined as: "slow to begin or proceed with an action because of doubt or uncertainty" (Merriam-Webster Dictionary, n.d.). In healthcare, however, a hesitant patient is much more active - refusing to make a decision or choosing not to be vaccinated. The World Health Organization (WHO) defines vaccine hesitancy as the delay in accepting or refusing safe vaccines despite the availability of vaccination services (WHO, 2015). The "3 Cs" model, based on comfort, confidence and convenience, first proposed by the WHO EURO Vaccine Communication Working Group in 2011 (MacDonald, 2015), implies both agency and passivity. Vaccine hesitancy can be demonstrated not only by refusal, but also by delay, slowness, and selectivity. The discussion on the definition of vaccine hesitancy focused more on the factors influencing the attitudes of individuals, led to the construction of "the set on a continuum between those who accept all vaccines without doubt, to complete refusal without doubt, with vaccine hesitant individuals the heterogeneous group between these two extremes" (MacDonald, 2015). However, it turned out not to be sensitive enough to detect a significant difference between delay and refusal. Those who decide to vaccinate but remain sceptical or uncertain about their decision also fall outside the scope of this definition. The problem of individuals' agency and passiveness in vaccine hesitancy was discussed in the literature as related to health capital (Schneider-Kamp, 2022). We argue that hesitancy, in a broader sense, is about the ways in which agency is involved in the structuring of time, particularly the relationships between past and future. The decision to vaccinate renders this moment in time past. It is irreversible. Hesitation, in its nominal sense, is held between an irreversible event in the past and the open possibility of an uncertain future. Of course, this feeling of being suspended in time is illusory - not deciding is also a kind of decision (Rabiej-Sienicka et al., 2022; Rudek and Huang, 2024; Rudek and Huang, 2023a,b), even if the individual is not aware of it. Time and temporality as a key to understanding meaning-making of an uncertain future in the context of the pandemic have recently been discussed in various ways (Chan et al., 2021; Tabrizi and Levina, 2022). The recent work of Harrison et al. (2022) particularly highlighted the importance of using time in constructing evidence for the safety and efficiency of Covid-19 vaccines. This work has opened a new way of thinking about the relationships between vaccine hesitancy and time. Nevertheless, there is still a gap in knowledge about hesitancy, which can be understood not only as a process consisting of different phases (Kumar et al., 2022), but also as a process related to more general temporal structures: past, present, and future orientation of human agency.

The aim of this paper is to better understand how vaccine hesitancy can be co-produced through media discourses. Rather than analysing vaccine hesitancy as it is directly discussed in mass media discourses, it examines how different actors visible in the public sphere mobilise symbolic resources (knowledge validation, authority, values, power) to make sense of vaccines. We suggest that the meaning-making process around vaccines is intertwined with vaccine hesitancy. According to recent studies, the sources of information used by patients can play an important role in vaccine hesitancy and decision-making (Mascherini and Nivakoski, 2022). Media discourses, which simultaneously refer to actual circumstances and speculate about possible scenarios, contribute to socially shared definitions of the situation (Thomas, 1923), embedding the vaccine somewhere between actuality and potentiality. Time, and in particular the way people live and experience it, is a key element in these processes (Harrison et al., 2022), especially because the media can construct urgency, or conversely, create the conditions for delaying decision-making.

1.2. Vaccine discourses and temporality

One notion that might clarify how a vaccine is defined is *agency*. We refer to Emirbayer and Mische (1998), who understand agency as a 'temporally embedded process of social engagement', informed by understandings of the past, present and future. Inspired by Hicks and Lloyd (2022), we concentrate not on information literacy but on discursive practices that construct social meaning in relation to temporal aspects. Therefore, the relational phenomenon of agency highlighted by the authors is particularly relevant. The connections between individual testimonies, institutional data and operating with patterns related to the whole populations are at the core of media communication. Operating with the orders of time creates narratives that contribute to the construction of meaning. The *past* constitutes experience. The *present* constructs the need for urgent action, which if rejected, or resisted can lead to delay. In turn, the *future*, which opens up the possibility of action, is linked to unavoidable uncertainties. Vaccination as a social practice is rooted in all temporal dimensions: the past provides the evidence of its effectiveness in overcoming or reducing the "old" diseases, the present frames it through procedures and routines, while the preventive nature of vaccination makes it look ahead.

This paper focuses on media discourses not as an effect on the audience, but as a representation of the public sphere. This means that we define the public sphere as a communication space shaped by specific normative rules about who should participate, on what occasions, what the form and content of their contributions to public discourse should be, and how actors should communicate with each other (Ferree et al., 2002).

In this study, we compare how the meaning of vaccines was constructed in seven European countries in the periods before and during the Covid era by analysing the media discourses in each country. The mainstream news outlets, which are widely distributed, are treated as communication spaces where specific knowledge is formed based on the *co-productionist* interaction between technology and society. The Covid-19 pandemic was an unexpected event that forced the power institutions of all European societies to react immediately, re-prioritising the public debate on vaccines and stimulating agency. As such, the pandemic created a unique opportunity to systematically observe how the expertise provided by various institutions met people's experiences, expectations, values, fears, and desires as reflected in media discourses.

2. Vaccine hesitancy and the media

Vaccine hesitancy has long been studied in the social sciences in the context of various vaccination programmes (flu, HPV and others) and childhood vaccination procedures. This phenomenon was explained through individual psychological characteristics (perception of disease as high or low risk) (MacDonald, 2015), trust in the authority of science (Sturgis et al., 2021), critical thinking skills (Cannito et al., 2022), or through societal variables such as trust in the healthcare system and medical institutions (Mesch and Schwirian, 2019).

For a long time, vaccine hesitancy has been understood in the light of the cognitive deficit theory (E. Dubé et al., 2015) as a consequence of people's ignorance, lack of expertise, and lack of critical thinking (Cannito et al., 2022). This claim has recently been undermined by understanding the position of vaccine hesitancy as a problem that cannot be solved by simply communicating more information on vaccines - and by just treating vaccine hesitant people as manipulable (E. Dubé et al., 2021). Media communication is a major focus of research on vaccine hesitancy (cf. (Hicks and Lloyd, 2022)), and is often blamed for fuelling it, for example by focusing on the scary and emotive stories associated with vaccination. Media sources are also accused of promoting cognitive biases and false objectivism, leading to vaccines being presented as controversial and taking a position on them as part of a two-sided debate (E. Dubé et al., 2018). Vaccine-hesitant people are thus understood as passive audiences affected by the media narratives. In

particular, vaccine-hesitant parents are often blamed for irresponsible delays in immunisation, which has recently been recognised as a form of epistemic injustice (Cassam, 2023).

Conversely, other studies have demonstrated that vaccine-hesitant parents are often highly educated and sceptical towards health authorities. They feel that they are not represented in the public debate and therefore create their own “islands” in the alternative, usually online, media spheres (Świątkiewicz-Mośny et al., 2023). Furthermore, Hobson-West work has revealed the consciousness and agency of vaccine-hesitant and vaccine-critical parents, underlining the role of risk and uncertainties (Hobson-West, 2003), and how Vaccine-Critical Groups question the idea of blind faith in public health advice (Hobson-West, 2007). Vaccine hesitancy can also be seen in the light of civic epistemologies (Jasanoff, 2007; Miller, 2004), which describe the influence of societal expectations towards knowledge production and on the handling of uncertainty (Rudek et al., 2023b).

The Covid-19 outbreak added new threads to the vaccination debate. In the first phase of the pandemic, the main focus was on producing an effective vaccine and then administering it in a fair and non-exclusive way. Advocates of vaccination as a public health intervention argued that high vaccination coverage was the safest way to ensure herd immunity (Cannito et al., 2022; Ceccato et al., 2021). The study of vaccine hesitancy at the time of Covid-19 provided a more nuanced picture of how information literacy was used by people to inform themselves about vaccines, concluding that “vaccine-hesitant and hesitant-influenced actions consequently form an agentic, informed performance that centres on protective and delaying strategies” (Hicks and Lloyd, 2022).

Our paper adds the temporal dimension to this debate, defining vaccine hesitancy in the context of the relationship between past and future. Receiving a vaccine makes this point in time belong to the past and at the same time determines the future (in terms of protection or adverse effects). As mentioned above, it is irreversible. Thus, hesitancy is related to the agency that is maintained between an irreversible, past event and an open possibility of the future.

Citizens often derive their confidence from pre-existing trust relationships, including their social networks, healthcare professionals, and public institutions or biomedical knowledge (Goldenberg, 2021; Larson et al., 2018). Some studies indicated a role for, among others, educational background, and employment status (Malik et al., 2020), while others found household income to be a statistically significant predictor of willingness to receive Covid-19 vaccination (Murphy et al., 2021). An in-depth study of Covid-19 hesitancy in the United Kingdom reported an important role for official recommendations, social norms about vaccination, and perceptions of effectiveness, risk, and ease of use (Sherman et al., 2021). Media discourses can be a vehicle for the co-production of these beliefs. They can also contribute to increased uncertainty about the strength of the scientific evidence for or against a particular risk (Capurro et al., 2018; Dixon and Clarke, 2013). The analysis presented here examines how the media co-produce the definitions of vaccines and vaccination in specific situations (before and during the pandemic). In order to answer this general research question, we propose some specific ones:

- What are the definitions of vaccines co-produced by the media and how do they relate to agency?
- Which social actors are privileged to have a voice and how do they relate to each other?
- How is the agency of actors intertwined with temporalities?

This article also examines which resources support actors’ positions and how they are linked to expressed public expectations. Finally, it reconstructs how justification is imagined in relation to vaccination and how it has been affected by the urgency of the pandemic. Focusing on the widely visible mainstream media, the paper explores how vaccine agency can be co-produced through related meanings.

3. Materials and methods

The results presented here are part of a larger research project VAX-TRUST. The project, funded by the European Commission under Horizon 2020, was directly related to the study of vaccine hesitancy, and was conducted in 7 European countries (Belgium, Czech Republic, Finland, Italy, Poland, Portugal, UK) selected for their geographical, cultural and economic diversity. For this paper, we refer only to the part devoted to public discourses in all 7 European countries.

The analysis followed a mixed-methods approach, beginning with quantitative data analysis, followed by qualitative data analysis. Provalis software (WordSTAT) supported the quantitative phase, while manual qualitative analysis was carried out using NVivo software. In line with the principle of objectivity, subjective evaluations were excluded unless explicitly stated as such. Data were gathered from seven countries: Belgium, the Czech Republic, Finland, Italy, Poland, Portugal, and the UK. For each country, vaccine-related keywords and vaccination discourses were identified (see Appendix 1). Subsequently, the retrieved texts were categorised on the basis of two analysis periods: before the WHO declared the start of the Covid-19 pandemic (01/04/2019-03/10/2020) and after the announcement (11/03/2020-10/04/2021). It is important to note that this analysis period includes the early phase of the pandemic. It is also worth mentioning that by the time the data collection for the analysis was completed, Covid vaccines were not fully available in most countries. This study therefore encompasses the initial stages of negotiating the significance of new vaccines and establishing media depictions of them. The Press Service collected data between April 01, 2019 and April 10, 2021. Appendix 1 contains a detailed list of the media analysed, while Appendix 2 provides a comprehensive description of the analysis process.

Within the overall framework of critical discourse analysis, this study is based on exploratory linguistic analysis, semantic field analysis, and contextual analysis. This three-way methodology enabled us to focus not only on the content (vaccine definitions, actors, resources), but also on the form of expression (how these elements were presented, interlinked, evaluated). Semantic field analysis allows researchers to capture the meanings conveyed in word networks, including how words relate to each other in terms of synonyms, opposites, and associations. It also reveals the hidden forces underlying the linguistic structures of the concepts under study. This is in line with Fairclough’s (2010) view of critical discourse analysis, which states that it should encompass work with language at multiple levels: linguistic, textual (including strategies of representation in the text, such as the roles of members of a discourse community and their interrelationships), and contextual. Its goal is to reconstruct social formation and its transformations (with representations of social actors, resources, and their use). Focusing on agency, this study examined individual and social factors associated with vaccination in discourses. The categories for coding these factors were taken from the scientific literature on vaccine hesitancy. Individual factors included references to vaccine considerations, emotions, experiences, and personal beliefs, while social factors pertained to shared knowledge (and non-knowledge), risk, values, group interests, rights, laws, and social imaginaries.

4. Results

4.1. From the future-driven discussion of disease prevention to the effective governance of vaccine distribution in the here and now

This section presents the synthesis of the results obtained in all the phases of the analytical work in a comparative perspective: exploratory linguistic research, semantic field analysis, and in-depth analysis of the agency of actors related to vaccine and vaccination and its temporal aspects.

The linguistic analysis aimed at a certain exploration of the data. Using the comparative lens, we made some careful preliminary

conclusions about the similarities and differences in the shifts of vaccine discourses affected by the Covid-19 pandemic (regarding the contextual and linguistic specificities of each country). These were then ascertained in a qualitative analysis.

First, as could be expected, vaccine discourses became Covid-19-centred during the pandemic. In its early stage, we noticed a significant increase in the frequencies of words related to Covid and coronavirus in discussions on vaccines and vaccination (Fig. 2), but also other vaccine-preventable diseases that were present in the pre-pandemic discourses (Fig. 1) were marginalised.

There were also more words related to vaccine production (AstraZeneca, Pfizer/BioNTech, laboratory, control, procedure, experiments, efficiency, new technology, mRNA, regulators), testing (trials, risk, evidence, safety, effects, data, side effect reporting) distribution (doses, hospitals, vaccination spots, price, availability) and management of vaccines (prevention, phases, state of emergency, logistics, supply, staff, populations) in the analysed period of the Covid-19 pandemic. In all the discourses analysed, we also observed a higher frequency of words related to the state and government representatives. This could indicate a more administrative type of discourse, focusing on the governance of vaccination. Individual experts were not mentioned as often as before the pandemic, while the work of scientific teams, laboratories or research centres was increasingly reported during the pandemic.

Words connoting temporalities (now, today, soon, too late, urgent, urgently), more frequent in all languages in the pandemic time discourses, suggest the pressure of time. However, this would require further linguistic research, taking into account the specificity of national languages.

The most visible change was the reorientation of the definition of vaccination issues as mainly related to parental decisions affecting children (less often - as in the case of influenza - to senior citizens' decisions). During the pandemic, preventive vaccination became one of the hot topics for all publics and an issue directly related to all societal groups.

The shift from discussing vaccine-preventable diseases to discussing types and producers of vaccines (within the hegemony of one disease) was also noticeable in all countries. Before the pandemic, the names of vaccine manufacturers were hardly mentioned, whereas during Covid-19, brands such as AstraZeneca, Pfizer, Moderna, etc. appeared.

4.2. Towards a common meaning - semantic fields of a vaccine in mainstream discourses

The comparative analysis of semantic fields is limited by the language specifics that go beyond the nominal meaning of words.¹ The

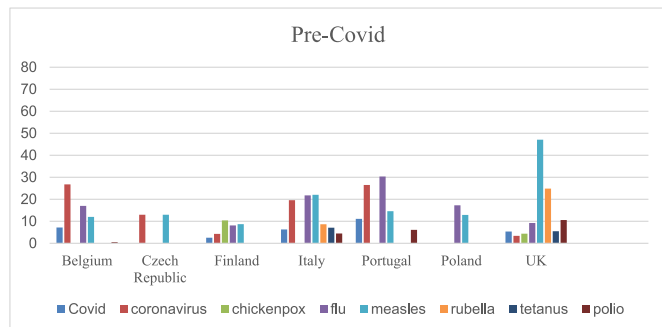


Fig. 1. Percentage of texts mentioning diseases in the pre-Covid period.

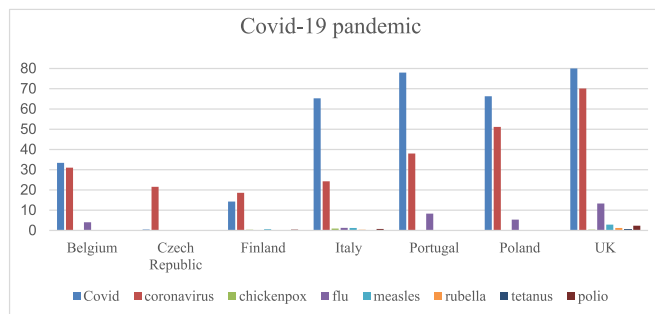


Fig. 2. Percentage of texts mentioning diseases in the Covid period.

definitions reconstructed by the country teams were translated into English, and even if the country author teams discussed them carefully, aware of the challenges of translation, some of the nuances may have been lost. Nevertheless, the material collected, and the semantic definitions reconstructed shed light on how vaccines related to the surrounding social reality and were a good starting point for understanding the role of social and individual factors in vaccine discourses.

Therefore, the comparison of semantic fields aimed at identifying the phenomena, including actors or institutions, but also figurative language that contributed to the created meaning of vaccines in the analysed discourses. The semantic field analysis allowed us to see and compare how vaccines were represented in the mainstream media and provided us with a compilation of views on vaccines. These views differed and competed for visibility within each sample. However, there were also significant similarities between the countries analysed in how vaccines were defined in mainstream discourses, both before and during the pandemic.

4.2.1. Pre-covid definitions

In the pre-Covid period, vaccines were often presented in the historical context of reducing or eliminating/eradicating serious diseases. Vaccines were described as “safety belts” (Czech Republic), or in terms of rights, as a citizens’ privilege (Finland). In Poland, vaccines were also associated with additional but more specific privileges, such as extra points in kindergarten admissions. In general, positive associations with civic and scientific progress predominated in all countries. The safety and effectiveness of vaccines were emphasised, mainly in terms of individual prevention and public health protection. The main definitional threads observed in all countries included: 1) vaccine as an achievement of civilisation; 2) vaccine as a tool to control old diseases, an efficient “weapon” against diseases; and 3) vaccine as a preventive benefit for the whole population (safety belts, protective umbrella). At the same time, vaccines were portrayed as threatened by fake news (control of information) and anti-vaccination movements. The following example from the UK shows how those movements’ actions may put lives and health of children at risk by contributing to a decrease in vaccination rates:

“As I watched the film, I wondered if there’s something to learn here about how we challenge the anti-vaccine conspiracy theories whose resurgence is putting children’s lives at risk. The World Health Organization this year ranked the anti-vaccine movement in its top 10 global health threats, while UNICEF has highlighted the low vaccination rates that have contributed to a 30% global increase in measles infection rates in just one year” (UK, The Guardian, 28.04.2019).

Vaccine was also a subject for taking action (*vaccines must be supported, promoted, should be obligatory*), put in the centre of attention of a number of different actors. For example:

(Our goal is) “to move the system of compulsory vaccination in the Czech Republic away from senseless politically motivated repression towards

¹ The detailed reconstruction of the semantic fields of vaccines in each country can be found in the anonymised report.

greater freedoms and greater security of vaccination" (Czech, *zpravy.iDNES.cz*, 22.01.2021).

At the same time, in most of the countries involved, the mainstream discourses before Covid presented vaccines as potentially suspect and sometimes linked them to side effects. The main difference between the pre-Covid and Covid periods was the degree of visibility of vaccine-sceptical positions. While the most visible definitions underlined the active protection provided by a vaccine (vaccines eliminate diseases, reduce risks, protect, immunise, etc.), the sceptical positions towards vaccines were less frequently reported in the mass media. Counter-narratives appeared in mainstream discourses as perceived voices against compulsory vaccination, for example in defence of individual freedom and of the right to make informed choices:

"I am not an anti-vaxxer, I am just fighting for the safety of vaccines and independent knowledge (Poland, *Wyborcza.pl*, 29.09.2019), or appealed to peoples' sense of comfort:

"People must feel comfortable when they decide to get vaccinated" (Portugal, *Publico*, 12.06.2019).

Interestingly, those counter-narratives, which are referred to, actually invoked some of the most basic values and rights. Those were the rights that not only should be the pillars of vaccination processes, but also constitute the core of patients' rights (see: eg. *Peled-Raz, 2017*). like freedom of choice or bodily integrity.

However, these dissenting voices were rarely discussed. In some countries, such as Poland, hesitant parents were strongly criticised: *Parents who do not vaccinate pose a risk to their own and other children. (Poland, Onet.pl July 01, 2019)*. In Belgium, the counter-arguments were rejected by criticising their unscientific nature: *"The 'anti-vaxxers' are afraid that their children will become autistic because of the vaccines or develop learning problems, or they believe that their children will become stronger if they go through the disease themselves. The group seems insensitive to scientific arguments that this is nonsense" (Belgium, DS, April 15, 2019)*. This way of refuting arguments seems to provoke even more questions, instead of addressing any possible doubts, apparently not really recognised in the media discourses.

However, in other countries, vaccines were sometimes associated with risks and justified doubts.

"He also said it is unfair to label dissenters as 'extremists' and 'anti-vaxxers' when they are concerned about the health and welfare of their children" (UK, *Daily Mail*, 10.09.2019).

This quote from the UK shows that some discourses showed more understanding for hesitant parents. Indeed, there were noticeable differences in the polarisation of positions towards vaccines in national media discourses. In some countries, such as Belgium, the opposing voices were more moderate, underlining the risks or unproven efficacy: *"Flu is a potentially deadly disease, especially for vulnerable populations, vaccination is a simple preventive measure, but without full protection" (Belgium, DS, February 19, 2019)*, while in other countries the sceptical voices were presented as more radical, sometimes even evoking associations with genocide or unjustified experiments on children (Italy, Poland): *"Vaccines? A free genocide" (Italy, *corrieredelveneto.corriere.it*, June 27, 2019)*.

This led to a higher or lower degree of polarisation of the definitions of vaccines in the public sphere. The semantic field definitions, even if strongly positive and persuasive in the mainstream discourses, reflected more polarised attitudes towards vaccines in the Czech Republic, Italy, Poland, Portugal. Here are some examples:

"Vaccines are the safety belt of the world" (Italy, *corriere.it*, 30.01.2020) vs "The vaccine we are experimenting with is the concentrate of our destiny and contains the code of our future" (Italy, *repubblica.it*, 03.01.2021).

"The vaccine is a great chance to immunise the society against infection, it's a hope to return to normality (Poland, *wyborcza.pl*, 10.01.2021) vs. "We didn't officially know the composition, side effects and contraindications. We didn't know anything about the coronavirus vaccine. If someone was looking for information, they used the Internet or the foreign press" (Poland, *se.pl*, 28.12.2020).

Meanwhile, in the UK and Finland, the created meaning of the vaccine addressed tensions in a more nuanced way:

"And we know that the introduction of new vaccines has not always been trouble-free. In 1955 in the US, there were more than 40,000 cases of polio — and ten deaths — in children given a defective vaccine. [...] But we should also remember that modern vaccines are safer than ever, and we should also take confidence in the fact that Pfizer's agent [...] is building on research over 20 years into strains of coronavirus that cause Sars and Mers" (UK, *Daily Mail*, 10.11.2020).

In Belgium, counter-arguments against vaccination in the pre-Covid-19 sample were mostly rejected by criticising their unscientific nature:

"The well-known virologist Marc Van Ranst was allowed to speak, and he parried the statements of the general practitioner: Apart from some redness at the site of the injection and some fever a few days later, there are no side effects. And people who claim that this leads to autism are mistaken. It has nothing to do with medicine, it has to do with scare tactics" (Belgium *HLN*, 11.4.19).

In Poland and Italy, vaccine hesitancy was often associated with a lack of *proper* knowledge. At the same time, "educated" patients were praised. However, being "educated" was only associated with taking a pro-vaccine attitude:

"If a patient uses proven knowledge, it is much easier to make joint decisions. An educated patient is a very valuable patient (Poland, *onet.pl*, 20.09.2019),

Similarly, in Italy vaccine hesitancy was understood as irresponsibility:

"Those who do not vaccinate their children are selfish people. By following their ignorance and superstition, they are harming their children and society" (Italy, *corrieredelveneto.corriere.it*, 19.06.2019).

The previous quote demonstrates a trend that was previously mentioned – a complete rejection of those who have doubts. This direction in discourses has resulted in extreme polarisation, effectively eradicating any doubts (including those of vaccine hesitant individuals) from mainstream media discussions.

4.2.2. The beginning of Covid-19

In this section, we summarise the similarities found across all 7 countries. It is mostly based on the figurativeness of the national languages and due to space limitation it is not possible to provide detail exemplifications. The interpretative analysis led us to the conclusion that at the beginning of pandemic, the authority of science was associated with hope and a return to a "normal" future. The popular metaphor of the "weapon" was not always expressed directly but was suggested by expressions such as "winning the battle", "invisible shield" or "defence against attack". In most of the discourses analysed, the vaccines against Covid-19 were described using these metaphors:

- vaccine as a weapon against the new virus.
- vaccine as a way to return to normality.
- vaccine as a passport to a secure future.
- vaccine as an act of solidarity.
- vaccine as a game changer.

At the same time, the safety and availability of vaccines was undermined by:

- rush in scientific research and production.
- competing countries and group interests.

Due to the pandemic, the definitions of vaccine were more closely related to Covid-19. We observed more references to economy, politics, or vaccine production processes. The dominant tone of the mainstream discourses remained mainly positive and persuasive (encouraging vaccination in the name of public safety and solidarity), but the counter-voices became more visible in all countries. On the one hand, in addition to the previous characteristic, we observed a greater focus on the future and hope. Vaccines – still presented as scientific achievements, tested and safe biotechnological products – were imagined as a passport to a safe future, a chance to return to normality and stabilise national economic and social life. On the other hand, elements of sceptical counter-narratives, reflected in the vaccine semantic fields, pointed to uncertainties and possible side effects in all the countries considered. Alongside the emphasis on the scientific nature of vaccine production, the issue of producers' profits became more visible. Interestingly, in all the reconstructed pandemic definitions, we observed elements referring to the role of the state administration in vaccine management. Sometimes they were critical, calling for better organisation of vaccine distribution or promotion, sometimes they stressed the need for proper regulation and referred to the public good, understood as the safety of the population. The latter was related to the controversy: states as regulators versus exerting control over the population.

In the Czech Republic, Finland and Poland, the geopolitical aspects appeared in the semantic definitions. This was clearly linked to suspicions about Russia and the Russian vaccine.

"He ascertained that the purchase of Sputnik V was like 'spitting in the face of European partners'" (Poland, wyborcza.pl, 2.03.2021).

"[a representative of the EMA] warns against rushing to approve the Sputnik V vaccine: 'It's like playing Russian roulette'" (Finland, hs.fi, 09.03.2021).

"Strong political words have already been addressed to Sputnik; for example, the head of Ukrainian diplomacy, Dmytro Kuleba, called it a 'hybrid weapon of Russia against Ukraine'" (Czech, zpravy.iDNES.cz, 08.01.2021).

Such sentiments seem to reflect a broader geopolitical outlook and resentments towards Russia. Although beyond the scope of this article, such attitudes would be worthy of further and more in-depth analysis.

In Belgium, Italy and Portugal, vaccines were most often linked to global issues such as world solidarity or sustainable development.

"We are concerned that without universal, sustainable, and equitable access to medical tools, the pandemic will last longer, severely impacting not only people, but also the ability of health systems to provide immunisation, care and treatment for other diseases, causing more death and suffering. Ending the monopolies aims to put lives before profits, which is why we are calling on countries to act quickly and make it a reality" (Italy, ilfattoquotidiano.it, 16.01.2021).

In Finland, Poland and the UK, the element of national interest appeared, as in the following examples:

"He added that Polish citizens 'will have guaranteed access to a Covid-19 vaccine'" (Poland, onet.pl, 25.11.2020).

"Populist President Vucic [of Serbia] criticised the EU for reserving vaccines for its own citizens and ignoring poorer nations" (Finland, yle.fi, 03.02.2021).

The peak of the vaccine crisis, with a soaring demand and an insufficient and above all uncertain supply, resulted in the recall of interests. In some countries these were particular, national interests, while in

others, a more pro-egalitarian and inclusive reflection appeared.

Looking at the national semantic fields of the vaccine created by the mainstream discourses during the pandemic, we can distinguish several dimensions:

- vaccine as a biomedical product: produced, tested, managed, distributed vaccine as a public good, as such should be widely accessible, transparently informed about
- vaccine as an opportunity to overcome the pandemic and return to normality.
- vaccine as a scientific achievement that protects life.
- vaccine as a commodity that brings profits and is part of an economic competition between companies.
- vaccine as a political tool to be used at the national and global levels.
- vaccine as being threatened by the anti-vaccination movements.

These dimensions were involved in the controversies concerning:

- control of the population
- genetic modification and unknown side effects
- hidden interests of political elites and private companies
- the propaganda of the dominant mass media

4.3. Mass media vaccine discursive landscapes

We begin this part of the analysis by identifying the actors who were visible in the public sphere, taking into account those who were marginalised or remained invisible. Focusing on the actors involved in the discourses, we also investigate their relationships, the resources used, and the social and individual factors that influenced vaccination decisions. Finally, we reconstruct the temporal aspects in which their agency was rooted.

4.3.1. Actors

We have distinguished five groups of actors (Fig. 3) in both periods of analysis. In this section we briefly discuss each group and show how the pandemic outbreak changed the vaccine discursive landscape.

Fig. 3 illustrates how some groups gained visibility and power through increased recognition, while others were marginalised or ignored. Actors employed diverse communication strategies, used symbolic resources and built relationships in different ways. It was therefore crucial to examine which actors were visible in media discourses in order to identify differences and similarities in the configuration of significant factors across countries.

4.3.1.1. International organisations. During the pandemic, international bodies became more visible in all analysed media discourses. The WHO and the European Medicines Agency (EMA), which in the pre-pandemic discourses were mainly mentioned as institutions providing definitions, hygiene recommendations and some basic education, were more often mentioned by governmental actors as main sources of information. They were used as authority figures in persuasive pro-vaccine discourses. In general, these international organisations framed the agency within a cognitive framework that legitimised vaccines as scientific achievements that met public expectations (validated, socially useful knowledge). They served as entry points for framing vaccines as universal, supranational goods for humanity. Interestingly, this kind of preventive action was based on both the past experience (old diseases, collective memories of previous pandemics) and future orientation, which meant that a return to the past could not be allowed.

In some countries, such as Belgium, Finland, and Poland, the WHO played an important role in the early stages of the pandemic. It was viewed as a powerful entity, declaring the pandemic, creating a sense of urgency, and influencing a common understanding of the current situation. The EMA was mentioned in relation to vaccine registration

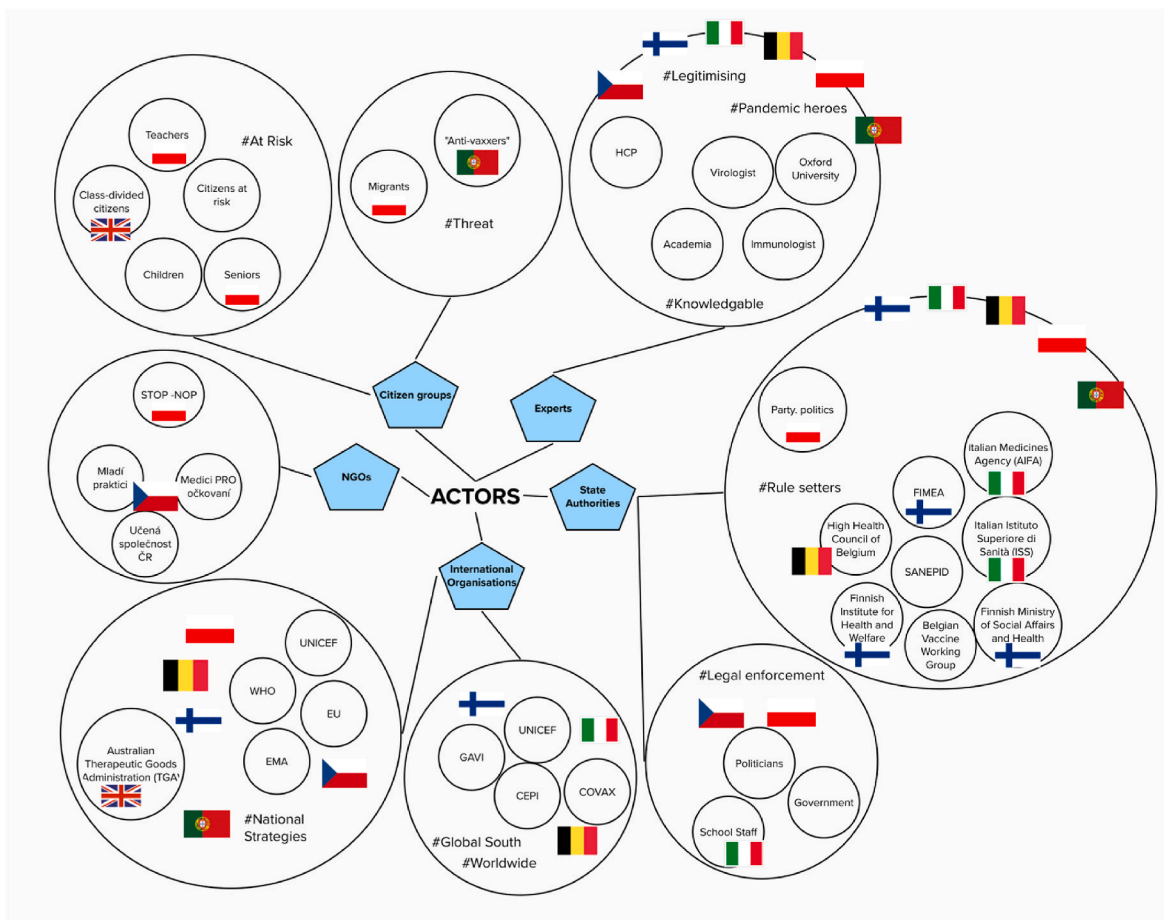


Fig. 3. The groups of actors involved in the vaccine discourses across countries.

procedures and the issuance of vaccination guidelines. Such actors were used in discourses to legitimise the pressure of time, which is evident in expressions such as "fighting against time" and "shrinking time". Previously, a return to the past (old diseases) was undesirable, but then "returning to normality" was one of the most widely used phrases worldwide. This change in the perception of time led to a recognition of urgency, which was essential to legitimise radical and rapid changes across all levels, including populations, institutions, and individuals. Some countries referred to international institutions to frame a more global context of vaccination. Gavi (Global Vaccine Alliance) appeared in the communication (Finland, Italy) as a universal need to protect children. The Belgian discourse referred to the WHO's COVAX programme and made it responsible for the equitable distribution of Covid vaccines worldwide.

Nevertheless, in the Czech discourse, the EMA, the WHO and the European Union were closely linked to the National Vaccine Strategy, providing statistical data essential for the authorities to manage the immunisation processes.

4.3.1.2. NGOs and local activists. National NGOs emerged as actors with more positive attitudes towards vaccination, sometimes even advocating for better access to vaccines. This type of agency was related to widely held values of solidarity and public responsibility. However, sometimes the same values served to adopt more sceptical positions. In the Czech Republic, some organisations, such as "Medici PRO očkování" (Doctors for Vaccination), Učená společnost ČR (Scientific Society of the Czech Republic), or Mladí praktici (Young GPs) were generally 'pro-vaccination', but critical of the government's approach to vaccines and the vaccination programme.

Some NGOs were represented in the discourse outside the framework

of the agency. In Portugal, the only NGO identified as opposing compulsory Covid vaccination, was not present as an active actor, but was only referred to, described, and ridiculed by the other actors. This contrasts with Poland. The *STOP NOP* association, which questioned the need for vaccination despite being active before the pandemic, was ignored by the mainstream discourse. This changed during Covid-19 and this actor became more visible. It also broadened its activities by forming wider "anti-pandemic" coalitions, e.g. with entrepreneurs and others affected by the pandemic restrictions, with whom it protested against the sanitary regime and vaccination.

4.3.1.3. State authorities and public administration. State authorities and policymakers did not play a particularly important role in the pre-Covid discourses. Although the importance and visibility of public policies and administrative actors differed, the same central pattern prevailed. National institutions, such as the Superior Health Council of Belgium, the Finnish Institute for Health and Welfare or the Sanitary and Epidemiological Station (Sanepid) in Poland, represented state authorities in the pre-Covid discourses: they stood as sources of knowledge on vaccination coverage or development and were described in the context of vaccination financing. In all countries, public health institutions were based on the knowledge of academia, virologists, epidemiologists, and international organisations.

Countries where childhood vaccination is compulsory, such as Poland, present an interesting case. Here, the health authorities were also a potential source of enforcement against those who did not vaccinate their children. In Italy, health institutions were shown to be a source of law that empowered school staff to enforce legal requirements for childhood vaccination. School staff as an actor was unique in Italy. Here, state authorities based their arguments on biomedical knowledge,

official data and statistics, and law. They provided health institutions and local school staff with arguments about the dangers of non-vaccination and justified the need to block admission to schools or kindergartens without the required vaccination records.

Governments, politicians, policymakers, and state organisations became more visible in the pandemic discourses. Governments had to react quickly, formulate new rules, and organise a new "pandemic order", providing official statistics to keep the public informed. Their main task, carried out in different ways in each country, became vaccine management. Politicians often quoted experts to justify their actions or legitimise new rules. For example, the Czech state was portrayed as being involved in promoting vaccination, campaigns, supply, building vaccination centres and making decisions about priority groups, relying on WHO and EMA recommendations to create the National Vaccine Strategy.

4.3.1.4. Experts: academia and HCPs. Before the pandemic, academic actors (virologists, immunologists) were portrayed as experts – in possession of correct and valid knowledge – in all the countries analysed. Their main role was to respond to the arguments of vaccine opponents, using reasoning based on scientific, usually biomedical, knowledge. At the same time, the voices of actors who disagreed with the experts' statements were either silenced, labelled, or ridiculed. Interestingly, expert knowledge was related to the risks associated with non-vaccination. This pattern characterised one of the most common communication strategies in the pre-Covid samples. In Poland, some experts also mentioned the economic benefits as an additional argument in favour of rotavirus vaccination.

Covid-19 media discourses still portrayed experts as powerful. They tended to influence government decisions and public opinion by speaking from a position of possessing legitimated knowledge and power. Academics, virologists and immunologists often spoke on behalf of institutions (e.g. Oxford University) and scientific communities that they represented, so their opinions were valid from an institutional point of view. Their position was predominantly used to legitimise the pro-vaccination positions. This kind of discourse served to create the rule of knowledge validation and to define who was *expected* to speak. The legitimacy of public governance is thus based on trust in the expert system. On the other hand, undermining the rules of knowledge validation (both in terms of their efficiency and their intention) leads to the emergence of new or different experts. Not only virologists and epidemiologists, but also public health authorities became more visible during the pandemic. They were presented as having the most reliable knowledge. Governments and state authorities often referred to expert knowledge to legitimise their actions and regulations. Experts commented, gave advice, and explained the unprecedented problems. They played a legitimising role in the discourses. In the Czech Republic and Portugal, it was clear that the voice of experts was given more space than before. Expert knowledge was also significant in the Belgian discourse. Their role was to expose the falsity of some sensational or "conspiracy theories". Discourses in Finland, Italy, and Poland can be described as expert-driven, referring to biomedical knowledge, expert knowledge, research, scientific and statistical data. In Italy, expert knowledge depended on the progress of vaccine research. The opinions of experts or health authorities often referred to tests and trials. Although in general experts promoted vaccines in the pandemic discourses, some hesitant experts also appeared.

HCPs were a key element of all pre-Covid discourses. They provided practical knowledge about vaccination schedules and legitimised the positive outcomes of childhood vaccination. They were portrayed as crucial: able to persuade people to vaccinate. HCPs employed biomedical knowledge, but also their own experience, or sometimes even emotions, such as fear, by showing the resurgence of diseases such as measles. In the UK, HCPs were key actors in commenting on vaccination policies. Their position of authority was based on their responsibility for

both policies and people's decisions about vaccination.

Doctors, nurses, and other healthcare professionals were on the front line of the pandemic across Europe. For this reason, their personal presence was more visible in the Covid-19 vaccination discourse, especially through individual stories and opinions expressed in the media. Doctors were portrayed as the heroes of the pandemic. They acted as experts in implementing vaccination strategies, commenting on their effectiveness, reporting on the situation from the bottom up (based on their daily experience) and discussing vaccination priorities. They were almost unanimously presented as pro-vaccine: with knowledge and competences, cooperating with state actors to support vaccine management, but also working with patients and observing the pandemic from a different perspective. They worked with the government on vaccination and persuaded those who were reluctant to vaccinate, as in Belgium, where their role was to legitimise vaccination as an effective, safe and necessary means of combating this crisis. They used not only expert knowledge, but also emotional tactics to motivate people, drawing on values such as solidarity with health professionals or respect for their hard work during the health crisis. The Polish discourse was similar, with doctors bravely fighting the pandemic and encouraging people to get vaccinated. There was no room for doctors to question any aspect of vaccination. But this was not the case everywhere. In some countries, such as the Czech Republic, there was space for hesitance or scepticism. In the UK, doctors' actions were evaluated either positively (e.g. reducing wastage of vaccine doses) or negatively (deliberately not using all available vaccine doses). In Finland, HCPs were mainly associated with vaccine management. This was also the case in Italy, where HCPs were frequently mentioned in articles about vaccination priority and their availability and commitment as voluntary vaccinators.

4.3.1.5. Citizens: individuals vs. society. In the pre-Covid era, citizens were constructed mainly as hesitant parents or those who openly resisted vaccination schemes. In most mainstream discourses, state authorities, experts, international organisations, and NGOs focused on presenting vaccines as protective tools for the safety of children. In contrast, vaccine opponents were characterised as individuals with only their stories to tell. By presenting lay knowledge and individual testimonies, the mainstream media integrated sceptics into the discourses. In this context, some groups were portrayed as a public threat – in most countries these were so-called anti-vaxxers, in some countries like Poland or Portugal those were migrants who had not followed the vaccination schedule.

In the UK, parents' attitudes to vaccination were seen through the lens of their class of work or where they lived. In Poland, on the other hand, religious attitudes were sometimes linked to vaccination practices. In Italy, the focus was on parents and school staff involved in persuading parents and monitoring the legal and administrative consequences of non-vaccination.

While in the pre-Covid discourses parents were the most visible and active citizens in all countries, during the pandemic they were marginalised and replaced by other vulnerable groups. Interestingly, during the Covid period, vulnerability was defined in terms of biophysical conditions (age, diseases, immunocompromise) or type of activity (teachers, health professionals, shop assistants, etc). The Czech media used the term "risk group" – and encouraged its members to be vaccinated against Covid-19. Belgian media referred to the "general population" (at the same time large groups of migrants and young people were marginalised, as "the discussion is taking place over their heads" (*Belgium: HLN, 1.2.21*)). In Poland, senior citizens (70+ and then 60+) and teachers became visible and active actors when the priority of vaccination was discussed.

During the pandemic, there was more space for citizens to share their experiences and testimonies. The latter served mainly as positive examples in support of vaccination, but stories of side effects were also published. However, during this period, broad coalitions promoting

positive attitudes towards Covid-19 vaccines were observed in all countries studied. State representatives, under time pressure, sought support from international organisations, NGOs and experts. Contrary to the pre-Covid period, when experts were often individual scientists, virologists or epidemiologists, during the pandemic experts often represented public institutions of biotech companies.

4.3.2. Agency involved in temporalities

The significant shifts in the pre- and Covid-19 vaccination discourses analysed can be observed in the temporal dimension. The most obvious change constructed in the latter is urgency - the need to “fight the virus”, to “act immediately” and the sense of “time shrinking”, or “lack of time”. However, there were some exceptions where time pressure was introduced as dangerous. It was related to trust or lack of trust in a particular subject, as in the example: “[a representative of the EMA] warns not to rush the approval of the Sputnik V vaccine” (Finland, *hs.fi*, March 09, 2021).

In the pre-Covid period, normative and preventive orientations were intended to influence parents’ individual choices. Although preventive measures are usually future-oriented (risk reduction), in this case the past was also involved. This type of discourse, legitimised by the powerful international institutions, appealed to the common good, understood as “not returning to the past”, which meant old diseases, high mortality and outbreaks spinning out of control.

“An example of a successful vaccination against a common disease is the measles vaccine. Before vaccination, all children got measles, a nasty childhood disease. But after the vaccination, there is no measles” (Belgium, DS, 17.2.2020).

However, past experiences become less tangible and can therefore lose their preventive power.

“The current generation of parents has never been confronted with serious infectious diseases such as poliomyelitis or diphtheria. Therefore, the attitude that it is superfluous to vaccinate children against such rare diseases is gaining ground” (Belgium, HLN, 2.12.2019).

As a result, the past success of the vaccine’s preventive power can turn out to be a future threat, as in the following example from the Czech media. This example also evokes the notion of a “rich Western” society, as if spoiled by the success of vaccination.

“On the other hand, the moods are changing in a rich Western society, where people no longer see the consequences of epidemics” (Czech, *novinky.cz*, 20.06.2019).

The past, if not prevented, can come back and become the present. In this sense, the past is not irreversible, but it can happen again, which is why it needs people’s agency and control. The following quotes illustrate how the media in different countries referred to past threats and presented them as possible future scenarios. Scenarios that we may not be prepared and able to control if vaccination programmes are compromised:

“Unfortunately, the threat of new epidemics is returning today. Even diphtheria cannot be considered completely eradicated. If we stopped vaccinating against it, it would certainly return, similar to what is happening now with measles” (Czech, *novinky.cz*, 25.07.2019).

“At a time when smallpox was disfiguring and killing thousands of people, the brilliant mind of this scientist realised that anyone who worked with dairy products and contracted cowpox (with very mild effects on humans) was immune to smallpox in its most serious form” (Portugal, *Público*, 6.12.2020).

At the beginning of the Covid-19 pandemic, the need for new vaccines – defined as a “weapon” – was presented as the most urgent need of all humanity. However, the acceleration of the processes of vaccine

invention, production and distribution was at odds with the slow and long-term processes of scientific and clinical validation of vaccines to which we were accustomed. The constructed urgency, efficient in legitimising the radical top-down solutions such as lockdowns, face masks and social distancing, was counter-productive in the case of confidence in the safety of new biomedical products. The tension between the uncertainties of new vaccines and their possible unknown long-term negative consequences, on the one hand, and the threat of an unknown new disease, on the other, led to a turn away from “securing the future” and a focus on the present in relation to the past. Contrary to the pre-Covid vaccine discourses, the past was now framed as “normal everyday life” instead of “dangerous time of old diseases”. This was expressed in all discourses in the desire to “get back to normal”.

Looking through the lens of media discourses, we can see anti-Covid vaccines as a bundle of inequalities, not only in terms of access to vaccines, risk of infection or possible side effects, but also in terms of agency. Some of the actors portrayed in the media discourses are privileged, with the ability to define the situations and deliberate on solutions, while others are simply called upon to act, which often means accepting the given solutions.

5. Discussion and conclusion

As we argued at the start of the paper, people who make or do not make decisions about vaccines are exposed to vaccine discourses. This exposition may be intentional (when people seek information) or unintentional (accidental exposure) (Gil De Zúñiga et al., 2017). In any case, the surrounding discourses influence the context in which people act. And not taking a decision, as has been argued, must also be considered as a kind of action. Media discourses mobilise different resources (statistics, individual experiences, emotions, values, mainstream scientific knowledge, and its undermining) that could co-produce both acceptance and controversy around vaccines. For this reason, it is important to encourage work which explores the way in which vaccination is covered in the mainstream media.

The process of vaccine production and distribution is complex, involving political, financial, technological, and scientific issues. The comparison of seven European media discourses has led to the conclusion that these discourses are closed in the “black box of technology”: there are numerous references to the processes of production and distribution, but the uncertainty surrounding them is minimised. This can be seen as a wider problem of media coverage of scientific risk and uncertainty (Ashe, 2013; Grant, 2007). If we define risk as a feature of areas where we have a good scientific basis for assigning probabilities, and uncertainty as areas where we have a well-defined sense of expected outcomes but little basis for assigning probabilities (Stirling, 2010), the observed marginalisation of the discussion of uncertainty may result in a situation where the mechanism of reducing uncertainty by transforming it into risk has not been initiated. This has consequences because the quantification of uncertainty in terms of risk, its calculable probabilities and ways of mitigating it has been a pillar of decision making (Cox, 2021; Rudek et al., 2023a; Rudek et al., 2023b) and a crucial process in dealing with the unknown. Moreover, in a situation of radical uncertainty, which refers to situations whose determinants are not well enough understood to be described in terms of probability or prediction (Kay and King, 2020), scientific prediction can lose its disciplinary power in favour of the testimonies of the past: unique but reliable through their materialisation. This observation of the media debate around vaccines may reflect important and more general public expectations about the ways in which important collective decisions are legitimised.

The pro-vaccine definitions reconstructed from the analysed mainstream discourses in the pre-Covid and Covid periods despite of being nuanced, reflected a certain shift from dealing with facts to referring to desires. Facts were understood as something constructed as having already happened, confirmed by the difference between the present and

the past. Vaccines, in particular, were presented as having proved their efficacy in the present by eliminating the old diseases. What was expected was simply to maintain this state of public safety. The perception of vaccines is based on experience and statistical data.

However, it must be emphasised that the mass media debate suggests not only the strictly scientific way of dealing with uncertainty, which would help to quantify probabilities and make predictions, but also the one that routinely and symbolically celebrates the authority of expert knowledge.

At the beginning of the pandemic the lack of sufficient data and, more importantly, the lack of previous experience make vaccine development much more future-oriented. The highly uncertain course of the pandemic led to a mobilisation of values to encourage people to take expected action.

Discourses in favour of vaccination provided metaphors based on the desired "return to normality" or the transition to a "safe future". The good of the population was at stake, and metaphors of the "weapon" to "fight the virus" supported the moral obligation to act bravely (despite of uncertain outcomes) in the "state of emergency".

Some social actors were reflected in media discourses as active actors: discussing, postulating, critically reviewing, contesting, expressing expectations, educating, or convincing others. Their communication agency helped to validate knowledge and legitimise decisions. In mainstream media discourses, the decision to vaccinate or not to vaccinate was usually portrayed as a simple and normatively defined choice, mostly driven by community concern. As we know from other studies, uncertainty and hesitancy are more likely to be found in social media discourses (Mascherini and Nivakoski, 2022; Puri et al., 2020; Świątkiewicz-Mośny et al., 2023; Wiysonge et al., 2022), where alternative reports are presented and the voice of experts sceptical about the efficacy or necessity of vaccines is heard. The separation of pro- and anti-vaccine discourses in different media communication spaces led to a situation where hesitant individuals were exposed to different types of rhetoric at different times. The pro-vaccine discourses, located mainly in the mainstream media, were closely related to the governance of the population. It is focused on controlling the circulation of both the virus and the vaccine. It made the issue more abstract, mostly based on numbers and statistics. The decision was constructed around the question of *how* and *why* to vaccinate, rather than *whether* to get a vaccine.

Moreover, in all the media discourses analysed, we observed to some extent a dangerous shrinking of the present under the urgency of the pandemic. However, this could be reflected in different communication strategies. Harrison et al. (2022) discussed in detail how evidence of the safety and efficacy of Covid-19 vaccines was staged in the news media by focusing on the temporality of vaccine development. Their work demonstrated "the ways in which media accounts of vaccine development both open up and delimit how we might understand the time-as-evidence of vaccine safety and efficacy" (Harrison et al., 2022). Our analysis of mainstream discourses not only confirmed the importance of time as evidence of vaccine safety, but also allowed us to problematise the temporality of vaccine discourses in terms of construed urgency. The source of tension, then, is the pressure to take decisions/actions under highly uncertain conditions.

In mainstream discourses, collective decisions were often presented as future-oriented (to protect the population, to fight the virus, to have a safe future). The dangerous present should be transformed into a desired safe future, which is a reproduction of the good past ("back to normality"). However, the critical voices reported in the media have noted however that the future, which is not based on path dependency, is increasingly uncertain. And that the current decisions, which are not (because they cannot be) based on the relevant knowledge (new virus, new vaccines), do not give us a passport to a better future. The vaccine discourses reflected people's fears and uncertainties, but also, under the pressure of time, the need to make decisions about themselves and their loved ones. The 'pro-vaccine' discourses, which prioritised institutional control over the population (information, dissemination of the virus),

left little room for discussion of doubts. They followed the strategic objectives of achieving mass vaccination, prioritising the effectiveness of preventive measures. This tendency of vaccine discourses became particularly visible at the beginning of the Covid-19 period, which created the call for effective mass action: the urgency of vaccine production and distribution. The vaccine, socially constructed as "*the fastest vaccine development in history*" (Czech, *zpravy.idnes.cz*, July 24, 2020), did not necessarily meet public expectations in terms of safety validation rules.

Our analysis demonstrated that temporality is significant in how mass media co-produce vaccine understanding. It works in several dimensions:

- **macro-historical temporality**, showing the history of previous pandemics, vaccinations successes, but also the interests of the pharmaceutical industry or errors in scientific procedures.
- **micro-historical temporality** expressed either in terms of different phases of Covid-19 (hope for vaccine - start of the pandemic, availability of vaccines but only limited, sufficient volume of doses vaccine but hesitancy) or in terms of *spatio-temporality* during the pandemic: transnationally shared experiences from different countries (with the consequences of COVID-19 as well as with the side effects of vaccines).

The actors identified across countries and time were always embedded in the social context and epistemic understandings of reality, and using the available resources: accessible knowledge, defined ignorance, trust in the health system, mechanisms of legitimising decisions. All these factors shape people's perceptions of what can be done and their expectations of what should be done. In the cases analysed, the constructed urgency coexisting with radical uncertainty meant that the latter aspect had no chance of establishing itself. People who were directly convinced of what should be done did not find space in the mainstream discourse to discuss what could happen. What could be the consequences of a decision (to vaccinate or not to vaccinate)? In this context, vaccine hesitancy can also be interpreted as a response to being caught between a defined urgent need for action, and the uncertainty associated with that action. It can thus be understood as a way of extending the present, preventing reality from becoming irreversible and keeping the future open.

CRediT authorship contribution statement

Aleksandra Wagner: Writing – review & editing, Writing – original draft, Visualization, Supervision, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Paulina Polak:** Writing – review & editing, Writing – original draft, Supervision, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Tadeusz Józef Rudek:** Writing – review & editing, Writing – original draft, Visualization, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Maria Świątkiewicz-Mośny:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Alistair Anderson:** Investigation, Formal analysis. **Marlies Bockstal:** Investigation, Formal analysis. **Luigi Gariglio:** Investigation, Formal analysis. **Jaroslava Hasmanová Marhánková:** Investigation, Formal analysis. **Ana Patrícia Hilário:** Investigation, Formal analysis. **Pru Hobson-West:** Formal analysis. **Juliana Iorio:** Investigation. **Aappo Kuusipalo:** Investigation. **Dino Numerato:** Investigation, Formal analysis. **Alice Scavarda:** Investigation, Formal analysis. **Pedro Alcântara da Silva:** Investigation. **Eva Soares Moura:** Investigation. **Pia Vuolanto:** Project administration, Investigation.

Data availability

Data will be made available on request.

Acknowledgements

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 965280.

The contribution of Dino Numerato and Eva Soares Moura was also supported by the NPO "Systemic Risk Institute" number LX22NPO5101, funded by European Union - Next Generation EU (Ministry of Education,

Youth and Sports, NPO: EXCELES).

Proofreading of this publication has been supported by a grant from the Faculty of Philosophy under the Strategic Programme Excellence Initiative at Jagiellonian University.

We would like to acknowledge the work of all partners engaged in the VAX-TRUST project that were involved in all the working packages and in particular prof. Mario Cardano of the University of Turin for his valuable remarks.

Appendix 1. Sample design

Research material from seven countries included:

1. Main news portals (based on their popularity, but also diversity) as a channel for the mainstream vaccine and vaccination discourse
2. 1–2 main websites of societal groups and organisations dealing with negative effects of vaccination

Per country to follow further the discussions in the hesitancy arenas that counter or question the necessity, safety or reasonableness of vaccination.

Table 1
Resources for national discourses and responsible partners.

Country	News portals
Belgium	www.standaard.be / www.hln.be / www.dewereldmorgen.be/
Czech Republic	www.idnes.cz www.aktualne.cz www.novinky.cz
Finland	www.yle.fi www.hs.fi www.iltalehti.fi
Italy	www.corriere.it www.repubblica.it www.ilfattoquotidiano.it
Poland	www.onet.pl www.wyborcza.pl www.se.pl
Portugal	www.publico.pt https://www.cmjornal.pt www.observador.pt
UK	www.bbc.co.uk/news www.dailymail.co.uk/home/index.html www.theguardian.com

The quantitative analysis was supported by the Provalis software (WordSTAT). The qualitative analyses were conducted within NVivo software. The data was retrieved by Press Service during April 01, 2019–April 10, 2021.

Table 3
The number of texts related to vaccine or vaccination analysed in given periods in chosen mainstream news portals

	01.04.2019–10.03.2020	11.03.2020–10.04.2021	Total
Belgium	291	5570	5861
Czech	323	3791	4114
Finland	701	5380	6081
Italy	381	8447	8828
Poland	457	6666	7123
Portugal	260	7458	7720
UK	671	7447	8118

The samples for qualitative analysis in each country were prepared in the unified way as randomised selection of texts that creates the corpora for pre-Covid-19 period and Covid-19 period. Each sample was calculated in the same way based on the principles: size of fraction 0,5%, maximum error 5%, and confidence level 95%. The period for the pre-Covid data collection was 01.4.2019–10.3.2020 and for the data during Covid pandemic it was 11.3.2020–10.4.2021.

Table 4
Final sample for qualitative analysis in each country

	Pre-Covid 01.4.2019–10.3.2020	Covid 11.3.2020–10.4.2021
Belgium	151	351
Czech Republic	175	349
Finland	248	359

(continued on next page)

Table 4 (continued)

	Pre-Covid 01.4.2019–10.3.2020	Covid 11.3.2020–10.4.2021
Italy	191	367
Poland	209	363
Portugal	155	365
UK	244	365

Appendix 2. Research procedure - note

Quantitative analysis of the vaccination discourse

The quantitative analysis aimed to find out what words were used in the vaccination discourse in each country and how they were interrelated. Identifying clusters of words led to an overall picture of the linguistic layer of the discourse. It inspired us to gain a deeper insight into the observed regularities and to formulate the assumptions driving further analysis.

Quantitative analyses were conducted separately for each country and based on the complete set of texts published by selected news portals in two time periods. All texts, including keywords, published in the defined periods were included in the corpus at this stage. The research procedure was standardised and carried out separately for each country by national teams. Within a country, two periods of analysis were compared (before the Covid-19 outbreak and during the Covid-19 pandemic). It consisted of three steps:

- 1) The frequency list of words used in all texts was created. Then, the list was cleaned up to keep only nouns, verbs, adjectives, and adverbs.
- 2) The next step was lemmatisation. Lemmatisation is a term borrowed from linguistics and refers to the process of grouping the inflected forms of a word so that they can be analysed as a single entity (Manning et al., 2008).
- 3) The final lists of words were defined as dictionaries and used for quantitative analysis (automatic topic extraction and identification of keywords, word frequencies, similarity and proximity analysis of keywords).

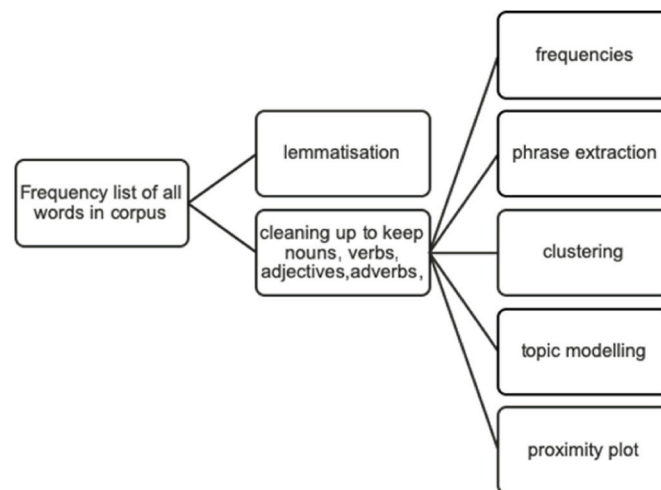


Fig. 1. The order of quantitative analysis

Qualitative analysis of media discourse on vaccination

The aim of the qualitative analysis of media coverage was to map the ongoing public debate at national level. Special attention was paid to hesitant and critical discourses around vaccines and vaccination. The qualitative analysis was intended to provide in-depth information about the discursive mechanisms that create the meaning of vaccine and vaccination and mobilise factors that might influence decisions to vaccinate or not to vaccinate.

We started this phase of analysis with semantic field analysis (Guilhaumou et al., 1994), which was carried out in all seven countries in the original languages (Flemish, Czech, Finnish, Italian, Polish, Portuguese and English). This approach assumes that language is not neutral and that the meanings of words are defined by the ways in which they are used. Thus, words and phrases related to the keyword “vaccine” were classified according to one of six categories: equivalents, oppositions, definitions, associations, actions of the subject, and actions towards the subject.

Table 1
Semantic field components, source: based on Wójcik et al., 2018

Components	Description
Equivalents	Expression synonymous to the key term.
Associations	Words somehow connected with the key term.
Oppositions	Antonymous expressions.
Definitions	Expressions which are used to characterise the term.

(continued on next page)

Table 1 (continued)

Components	Description
Actions of the subject	What the subject, i.e. the analysed word, does or what impact it has upon other entities.
Actions towards the object	How the subject is influenced/affected, what actions are performed upon the subject, etc.

This type of inventory was grouped into operational definitions according to the rule of inner coherence. These definitions addressed the following questions: How are vaccines defined? What are the equivalents of vaccines used in the discourses? What are vaccines opposed to? What are vaccines associated with? What actions of vaccines are described? What actions are performed or postulated for vaccines.

In the second step, the systematic analysis driven by the common codebook allowed for a deeper insight into the specificities of the discourses in different countries. However, the use of the common codebook had some limitations: the tendency to create a standardised tool that allows comparison means that the tool could have been less sensitive to subtle nuances of contextual differences in the use of categories. Therefore, each of the teams working on the national discourse was asked to relate the coded fragments to the socio-cultural context. The results of the comparative analysis required not only the work on the coded fragments, but also the comments and interpretations provided by the researchers.

The focus of the qualitative analysis was to identify who was talking about vaccines and who was excluded or marginalised, what kind of symbolic resources were used to justify the discursive positions and how the dialogue about vaccines and vaccination was created.

Focus of comparison

The final part of the analysis was a comparison of the data gathered in different countries. The aims of the comparative analysis were related to the following dimensions:

- Creating meaning – addressing the questions - what are the similarities and differences in meanings related to vaccines between countries?
- Understanding actors' agency rooted in temporal and other contextual factors.

Recognising the complexity and contextual sensitivity of making comparisons, we define comparative analysis as “the description and explanation of similarities and differences (mainly differences) in conditions or outcomes among large-scale social units, usually regions, nations, societies and cultures” (Smelser, 2003: 643). Consequently, we expect to find “different complexes of causes for similar and different rates and pattern” (ibid.) of vaccine discourses.

The methodology of qualitative comparative analysis is a research approach that focuses mainly on the systematic comparison of cases in order to find patterns of differences and similarities between cases (Hanckel et al., 2021). Specifically, it is a Comparative Case Study (CCS) approach (Bartlett and Vavrus, 2017), which is based on the iterative and contingent tracing of relevant actors and features.

The mainstream discourses were first compared through the categories of semantic field definitions, then the actors were investigated as operating in the context of the referred social, individual, and health system factors. Finally, the category of social actors visible in the vaccine discourse was analysed to further investigate the symbolic resources (values, knowledge, assigned ignorance, emotions, and power) associated with them.

In order to overcome the inconsistency associated with working in a heterogeneous research consortium, each country's case study was mapped to reconstruct the main categories and their mutual relations. The textual representations were then analysed in the context defined for the whole report. The data thus prepared were compared, and finally the similarities and differences (including uniqueness) observed were related back to the context of the original report.

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