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Journalists and scientists together: the public problem of science disinformation in Brazil

Fábio Henrique Pereira and Raphael Sandes de Oliveira

Abstract

This article analyzes the public problem of scientific disinformation in the Brazilian media covering the Covid-19 pandemic. A content analysis of 226 articles addressing disinformation as a problem was conducted in a quality newspaper (*Folha de S. Paulo*), a popular website (Metrópoles) and a science journalism magazine (*Pesquisa Fapesp*). The results suggest that the public debate has focused on spreading fake news during the Pandemic and its negative impact on public health. In addition, two opposing discourses, one populist and the other based on the scientific community and institutional normality, structured the public problem of science and disinformation in Brazil.

Keywords

Public perception of science and technology; Science and media; Science communication: theory and models

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Introduction

Discussions about the social effects of science disinformation have become part of the international public agenda in recent years. In Brazil, these discussions started focusing on the circulation of false content during outbreaks of dengue, yellow fever, the Zika virus, and climate change [Malinverni, 2017; Herte de Moraes, Beling Loose & Tourinho Girardi, 2017; Pinheiro, 2022; Teixeira, 2018]. However, they reached a new level with the Covid-19 health crisis. In fact, even before the pandemic, the World Health Organization (WHO) was issuing warnings about the risk of an infodemic, that is, "an overabundance of information, both online and offline. It includes deliberate attempts to disseminate wrong information to undermine the public health response and advance alternative agendas of groups or individuals" [WHO, 2020].

Disinformation, including scientific disinformation, could be classified as a *public problem*. In this way, we share the idea that public problems are socially constructed. As Blumer [1971, p. 298] explains, these "are fundamentally products

of a process of collective definition instead of existing independently as a set of objective social arrangements with an intrinsic makeup". In other words, although the circulation of disinformation is as old as science itself, it is the recognition, denunciation and mobilization carried out by a group of actors called "claimsmakers" that attracts the attention of a wider portion of society, which is in itself problematic. Thus, "a public problem arises by converting a social fact into an object of concern and debate, and eventually, of public action" [Neveu, 2015, p. 15].

What we can say is that scientific disinformation is particularly challenging to journalists and scientists as they aim to produce reports about the world and society that, if not "true", are at least verified and subjected to a series of rules, procedures, methodologies, and conventions in order that they be accepted by peer groups and the public. Other actors also act as claimsmakers in the debate on disinformation: politicians, policymakers, science communicators and associative entities, including international organizations. In this sense, we might consider science disinformation to be a transnational public problem. Its effects extend across borders and are enhanced by the dissemination of content on social networks.

Based on these premises, this article analyzes the construction of the public problem of science disinformation in the Brazilian media and its coverage of the first two years of the Covid-19 pandemic. Our focus is on the discourses about disinformation which journalists, along with other claimsmakers, seek to justify and popularize the problematic nature of this phenomenon based on its social impacts during the pandemic crisis.

Two sets of research questions guide our study:

- How has science disinformation been addressed by a sample of Brazilian media during the Covid 19 pandemic? What were the key issues associated with this public problem?
- Who were the main claimsmakers engaged in promoting and denouncing this problem in the Brazilian public space? How did they act in these discussions?

To answer these questions, we analyzed three media outlets: *Folha de S. Paulo*, *Metrópoles* and the magazine *Pesquisa Fapesp*. The analysis focused on the evolution of media coverage during the pandemic, the issues associated with disinformation, and the main actors who, as sources of information, helped create the problem.

This article proposes a theoretical-methodological framework on the construction of the phenomenon of disinformation in the public agenda, based on an association between the sociology of journalism and the constructivist sociology of public problems. It aims to go beyond the normative debates that tend to naturalize the problematic nature of this phenomenon and highlight the dynamics between the actors who raise awareness in society and the need for political decision-makers to react to this situation, this problem.

Covid and the Brazilian media

The Covid-19 pandemic was on the Brazilian media's agenda as of the second week of January 2020. The issue began to receive more attention when global society became aware of the disease, and how they followed its development and strategies to avoid contagion [Oliveira, Christino & Machado, 2021]. At first, the news focused more on the disease as it continued to spread, reaching countries such as India, Japan, the United States and Europe, while fear was continuing to grow in Brazil that it would eventually reach its shores. Due to the seriousness of the issue and the constant warning signs, news reports began to instruct people, groups and institutions in an attempt to build a collective agenda around this subject [Neto, Cardoso & Telo, 2021]. Consequently, not only did it have an impact on the areas of health, economy, education, and politics, but the pandemic also became a media event that was widely reported on and consumed. A study conducted by Cajazeira, Antoniutti, Souza and Cabral Neto [2021] on the main television news programs in Brazil, Jornal Nacional, showed that the news made the pandemic its single dominating theme and only included reports in its programming schedule that dealt with the theme and its consequences.

This behaviour was not restricted to the mass media. The internet and social networks also stood out as a space that produced, shared, and was searched for updates on the pandemic. The online space proved to be a shortcut in terms of disseminating information, mainly due to the speed and organic nature with which it circulates [Gomes Filho & Oliveira, 2020]. Out of this scenario, however, emerged the issue of trust in terms of the content shared on these platforms. For Barcelos et al. [2021], this type of material became dangerous due to the difficulty of identifying its origin and, consequently, the intentions behind sharing it. As Galhardi, Freire, Minayo and Fagundes [2020, p. 4202] states: "As in many parts of the world, there have been drastic changes to the daily lives of Brazilians, which have been accompanied by a dizzying growth of information released every day by the official media or social networks, which is not always accurate. This resulted in a growing circulation of rumours about the contagion, producing a second affliction associated with the pandemic: the spread of false news related to Covid-19 on social networks".

Media coverage also reflected the political polarization of society and the denialist stance adopted by then-president Jair Bolsonaro. As a result, most of the media adopted a confrontational position in relation to the federal government [Renault, 2020], which intensified as the presidency began to endorse the use of unproven medications as treatments [Tavares, Oliveira & Magalhães, 2020] and discredit the vaccines against Covid. The presidency did have the support of some loyal media outlets and disinformation structures that built and disseminated alternative "narratives" to scientific discourse [Oliveira, Evangelista, Alves & Quinan, 2021]. This political-media polarization was evidenced in the medical-scientific community as it was divided between those who supported the federal government and those who would align themselves with the hegemonic discourse of international science.

The public problem of disinformation

Disinformation is not new in the field of journalism [Tandoc, Lim & Ling, 2018] or science [Marleau & Girling, 2017]. Its increase has been associated with the emergence of a new, more fragmented media ecosystem that allows content to be personalized and customized according to audience interest, regardless of whether

that content is factual or not [Correia, Jerónimo & Gradim, 2019; Swire-Thompson & Lazer, 2020]. The effects of disinformation are further enhanced by political polarization [Aruguete & Calvo, 2020] and communication devices by populist governments, usually on the extreme right [Hameleers, 2020]. Lastly, the literature in the area has drawn attention to the role that platforms and their algorithms play in circulating content that has a strong emotional appeal, thus establishing a close relationship with audiences [Delmazo & Valente, 2018; Bakir & McStay, 2018].

The increasing amount of disinformation circulating in societies is accompanied by the media coverage of this problem — usually by the indiscriminate use of the expression *fake news*. Dealing with (and combating) disinformation, including scientific disinformation, has become a recurring theme in both public and media agendas [Humprecht, 2020], which partly explains the increased academic interest in the subject [Lee, 2016; Spohr, 2017] and its inclusion in the debate of public policy in some countries.

This strong societal interest warrants a sociological reading of the phenomenon, focusing on how social actors popularize it among public opinion. For this reason, we look at the constructivism of public problems as proposed by Neveu [2015] and based on the US sociological tradition of "*social problems*" [Best, 2010; Blumer, 1971; Gusfield, 1989]. According to Neveu, building a public problem is a process that develops in a temporal sequence and has five stages or "operations":

a. *Identifying* a situation that is likely to become a problem, and subject it to criticism, debate and action.
b. *Framing*, meaning the way social frames are mobilized to attribute meaning to everyday experiences and to define and present a problem.
c. *Justification of a problem*. When claimsmakers make "an initiative to legitimize the problems and demonstrate their evidential nature, the intolerable aspect of their relevance" [Neveu, 2015, p. 126]. The success of the justification depends on the ability of claimsmakers to mobilize arguments that go beyond personal interests or restricted groups, resorting to the idea of the common good.
d. *Popularizing*, which consists of inserting the problem into the public space and making use of resources to integrate it into the public and media agenda; and
e. *Developing* public policies. Neveu highlights the role of claimsmakers in mobilizing resources to raise awareness of political institutions, with the aim of inserting them into the public-government agenda and converting them into public policies. It also deals with the process of re-inserting these policies into the public agenda, their application in society, and their appropriation by the actors affected by the problem.

This article focuses on the justification and popularization phases of science disinformation, getting a better understanding of the resources mobilized by claimsmakers who promote it as a topic of common interest, through its inclusion in public and international media agendas.

Materials and methods

Our proposal was set up through a quantitative content analysis. The corpus consisted of informative and opinionated materials published in three media outlets: a quality paper[1] (*Folha de S. Paulo*), a popular website (*Metrópoles*) and a scientific journalism magazine (*Pesquisa Fapesp*). Each one of these media has different periodicity, editorial project and address to different audiences. Thus, *Folha de S. Paulo* has its content published in print and a web support. In the current version of its editorial project, *Folha* [2019] highlights, its "analytical, interpretative and opinionated dimension capable of illuminating the facts". In this same document, this newspaper emphasizes the role "of professional journalism to keep the distinction between news and falsehood". Created in 2015 as digital-born media, Metrópoles is the second most popular news portal in Brazil with 53.5 million unique visitors per month [Meireles, 2022] and 3.8 billion views on social media [Almeida, 2024]. The site is often accused of publishing clickbait content, adopting an editorial project that could be classified as a metric-driven sensationalism [Rodrigues, 2018]. Finally, *Pesquisa Fapesp* is a monthly magazine, published in print and digital versions. *Pesquisa Fapesp* [n.d.] describes itself "as the only news magazine specialized in covering scientific and technological production in Brazil" — which justifies, in our opinion, its inclusion in the corpus.

The choice of these media outlets stresses out three different ways of conceiving journalism: building and enlighten the public opinion (*Folha de S. Paulo*), capturing the audiences' attention (*Metropoles*), and promoting the role and the importance of science to the society, as well as publicizing the most recent advances of knowledge (*Fapesp Ciencia*). This could reflect on the way they represent science disinformation as well as they make room for the involvement of different segments of claimsmakers in this debate.

The sample size consisted of eight periods during the pandemic between the years 2020 and 2021 — up until the beginning of 2022 (Table 1). It covers: the WHO's declaration of an infodemic; the period in which Latin America became the global epicenter of the spread of the pandemic; the third phase of the testing process for the main immunizers currently in use against Covid-19; the approval of CoronaVac and AstraZeneca vaccines in Brazil; the start of immunization against Covid-19; the beginning and the resumption of the Pandemic parliamentary inquiry committee in the Brazilian Federal Senate; and the emergence of the omicron variant and the debates on childhood vaccination. All these periods sought to limit national and international pieces on the pandemic and the new "waves" of disinformation related to this phenomenon.

Although, *Folha de S. Paulo* and *Pesquisa Fapesp* also have a printed version, we decided to use the search engine of their web version to build our sample. We used the search tools in the selected newspapers to find articles containing the terms 'Covid-19' or 'Coronavirus' combined with 'disinformation', '*fake news*' or 'infodemic'. Then, we read through the entire corpus and excluded any articles that did not match the focus of this study from the sample. In the end, 226 items were analyzed.

At first, all items in the corpus were coded with the date, outlet name, title, author, journalistic genre, and sources for each text. We then looked for recurring terms

[1] Less commercial papers which provided idea-oriented news, beyond the simple reporting of facts [cf. Vehkoo, n.d.].

Table 1. Sample time frame.

Period	*Occurrence*	*Dates*
1	WHO's declaration of an infodemic	Feb. 12 to 26, 2020
2	Latin America became the global epicenter of the spread of the pandemic	May and June 2020
3	The beginning of the third phase of the testing process for the main immunizers currently in use against Covid-19	August 11 to 25, 2020
4	The approval of CoronaVac and AstraZeneca vaccines in Brazil	December 2020
5	The start of immunization against Covid-9 in Brazil	January 2021
6	The beginning of the Pandemic parliamentary inquiry committee in the Brazilian Federal Senate	April 15 to May 31, 2021
7	The resumption of the Pandemic parliamentary inquiry committee in the Brazilian Federal Senate	August 2021
8	The emergence of the omicron variant and the debates on childhood vaccination in Brazil	December 2021 and January 2022

and expressions which allowed us to define the main thematic categories. by using the Atlas.ti software to search for thematically significant nodes. They are:

Antiscience. This refers to political and cultural processes that discredit scientific activities and discoveries, which include the effects of political and social conservatism, political polarization, religious discourse, anti-quarantine activists, and anti-mask and anti-vaccination movements.

Science. This deals with the mobilization of scientific discourses as a way of problematizing and combating the infodemic. This category opposes disinformation as it pertains to science discourse a priori qualified as *true* or *credible*. It includes texts that inform about vaccines and protective materials, divulge reasoning behind the disqualification of scientifically unproven treatments, and that make mention of national policies to encourage the production and dissemination of scientific works.

Political instrumentalization of science. This category involves the political dimension (in a broad sense) of the pandemic crisis and the outbreak of disinformation associated with it. It covers the role of public agents who disseminated *fake news* (e.g., Bolsonaro) and those who combated it, the tensions within the public authorities regarding how the pandemic was communicated, and the public authorities' negotiations with international organizations (especially WHO) and the pharmaceutical industry.

Fake news or information disorder. This category was applied to the articles that do not contextualize the problem of science disinformation. On the contrary, it emerges as a matter of choice between a true or false narrative of the facts. Instead of pointing out to an external actor that should be accountable for this trouble (the politicians, the scientists, the anti-science movements, etc.), these articles seem to naturalize the spreading of "fake news", seen as a result of the post-truth/information disorder era in which the consumption of information is determined by mechanisms of selective perception, ideological bubbles, confirmation biases, algorithmic mediation, etc. The fake news or

information disorder category can be associated with the spreading of a significant amount of misleading content associated with the pandemic, including scientifically unproven Covid treatments (e.g., chloroquine), false treatments, etc.

Geopolitics of the Infodemic. This category covers the subjects that represented the international problem of disinformation during the pandemic, associated with denialist movements or conspiracy theories in other countries (especially China, the United States, and Russia).

These five categories were applied to the corpus items which received a primary and a secondary thematic classification. For the purpose of this article, we have only focused on the primary classification applied to each item. After that, we analyzed the origin of the claimsmakers who appeared as sources of information in the sample. Coding included the scope (national or international) of these sources and their degree of officiality and identification (identified, recognized or anonymous) [Lopes, Ruão, Marinho, Fernandes & Gomes, 2012]. We also adapted the typology proposed by Stroobant, De Dobbelaer and Raeymaeckers [2018] to identify the sector of origin for each source who participated in this debate. The codebook is available as Supplementary material.

Results

Our analysis was structured in three stages. The first stage presents an overview of the coverage and evolution of the media agenda for the analyzed periods. We then focused on themes associated with science disinformation. Lastly, we analyzed actions of the claimsmakers who acted as sources of information in the media throughout the public debate.

Characteristics of coverage

Table 2 below shows the distribution of the corpus by media outlet and coverage period. It reveals a strong concentration in *Folha de S. Paulo*, responsible for almost 70% of the texts published in the eight different analysis periods. On the other hand, the low participation of *Pesquisa Fapesp*, with only two articles, was noteworthy. This finding may be explained by the magazine's editorial project, which focuses more on scientific journalism and a more positive agenda for disseminating science discoveries.

The distribution of articles across the eight analysis periods is quite uneven, revealing peaks of greater concern with disinformation, probably in response to the

Table 2. Corpus distribution by media outlet and coverage period ($n = 226$).

Media	*1st Period*	*2nd Period*	*3rd Period*	*4th Period*	*5th Period*	*6th Period*	*7th Period*	*8th Period*	*Total*	*%*
FSP	6	28	9	21	31	23	15	21	154	68.14
Metrópoles	3	10	6	3	17	5	3	22	70	30.97
Fapesp	0	1	0	0	1	0	0	0	2	0.88
Total	9	39	15	24	49	28	18	43	226	100

Note: Pearson's chi-square test — p-value = .165.

increased dissemination of false content. There are three periods that stand out here: the moment when Latin America became the epicenter of the pandemic (2nd Period), which coincided with the spread of content promoting "early treatment" against Covid; the beginning of the immunization campaign in Brazil (5th Period), a moment that seems to have been accompanied by a strong mobilization of anti-vaccine groups; and the last period (8th), marked by the emergence of the omicron variant and a new public controversy around child vaccination.

This configuration of the debate suggests a strong capacity for articulation by the groups that disseminated disinformation. They were able to synchronize their actions on the political agenda (e.g., statements made by the President of the Republic), and build their own agenda for disseminating topics that could be the object of disinformation campaigns. Consequently, our data initially suggested that journalists and other actors involved in the debate on disinformation during Covid assumed a more reactive stance toward the circulation of false content in the public space. Basically, whenever there was greater dissemination of *fake news*, claimsmakers, in response, would work harder at denouncing the problematic nature of this phenomenon.

In terms of journalistic formats, our analysis shows a predominance of informative genres (news, minor and reportage), as they made up 75.2% of the items; about 60% of the entire corpus consisted of items classified as news. The other 24,8% are distributed among different opinion genres, such as comments, chronic and editorials. This overall distribution between information and opinion genres in the media seems to be related to the separation between the gatekeeper and the advocate journalism roles. The first one, hegemonic in our corpus, states that journalists must limit themselves to mediating the public debate. The second one is related to the journalists' commitment to defending different causes [Janowitz, 1975].

Whenever discussing disinformation, journalists gave priority to official sources who spoke on behalf of the state or institutions associated with it. They appeared in 65% of the items (Table 3). Identified sources that contained the name and institutional link in the text were present in 75% of the corpus (Table 4). The results show that the debates on the infodemic followed a similar pattern of "declaratory journalism" practised in Brazil, where coverage is dependent on official statements yet not always open to criticism or verification. In this way, the sources' statements are equated to the facts themselves and the audiences must draw their own conclusions about what has been said [Chagas & Cruz, 2022].

The predominance of informative genres and official sources suggest that journalists adopt a detached stance about the infodemic, letting to the claimsmakers the task of denouncing this problem. The journalists and the media are interested in promoting this debate, however avoiding a direct and explicit positioning. This could suggest an attempt to preserve the ideal of journalistic objectivity regarding the subject of science disinformation.

Table 3 also shows that specialized sources were identified in about one-third of the articles. This includes, institutional sources, linked to universities and medical and research associations, as well as non-institutional specialized sources, with no ties

Table 3. Classification of sources by degree of officialdom.

	Number of items	*%*
Does the material use official sources?	147	65.04
Does the material use specialized institutional sources?	78	34.51
Does the material use non-institutional specialist sources?	70	30.97
Does the material use other types of unofficial sources?	48	21.24
Does the material use other types of documentary sources?	76	33.63

Based on Lopes et al. [2012].

Table 4. Classification of sources by degree of official identification.

	Number of items	*%*
Are identified sources used?	170	75.22
Are unidentified sources used?	145	64.16
Are anonymous sources used?	21	9.29

Based on Lopes et al. [2012].

or affiliations, such as doctors. Of note is that, in our first four analysis periods, which cover the first year of the debate (2020), we observed a slightly more equal number of articles containing official sources (51) compared to articles containing institutional specialized sources (31). This changed in 2021 with a greater number of actors with links to the state participating in the debate, which seems to be a result of the evolution of the political and pandemic contexts (for example, the Parliamentary Inquiry Committee that was held in the Federal Senate).

Justifying the problem of disinformation

The thematic analyses show a greater number of texts that associate the problem of disinformation to the increased circulation of *fake news* in a context of *information disorder* (74). The anti-science, science and political instrumentalization categories remain relevant, showing a similar number of occurrences (54, 47 and 42, respectively). The geopolitical dimension of the infodemic is not mentioned nearly as much (9 occurrences) (Table 5).

Table 5. Distribution by period for topics concerning the debate on scientific disinformation ($n = 226$).

Topic	*1st Period*	*2nd Period*	*3rd Period*	*4th Period*	*5th Period*	*6th Period*	*7th Period*	*8th Period*	*Total*	*%*
Anti-science	1	4	0	**10**	6	**15**	9	9	54	23.89
Science	3	**16**	4	5	14	1	1	3	47	20.80
Political instrumentalization	1	9	5	3	**17**	1	1	5	42	18.58
Fake news or information disorder	2	9	3	7	10	10	7	**26**	74	32.74
Geopolitics	2	1	3	0	2	1	0	0	9	3.98
Total	9	39	15	25	49	28	18	43	226	

Note: Pearson's chi-square test — p-value $<$,001.

The stratification of this data shows that the distribution of categories is quite unequal over the periods, suggesting the different strategies employed to justify this problem in relation to the pandemic and the political context. The science category was heavily mobilized by claimsmakers in period 2, when the federal government's response to the increasing number of cases and deaths of Covid in Brazil was to promote the use of scientifically unproven treatments. In response, some of the actors participating in the debate took the opportunity to explain how science operates in order to oppose the discourse of other agents in the political and medical fields who advocated for the use of drugs such as chloroquine and hydroxychloroquine. In this case, the problematic nature of disinformation discourse is linked to the lack of respect for science protocols. A similar practice was used at the beginning of the immunization campaign (Period 5) when claimsmakers used science to discredit arguments from the anti-vaccine movements. The *political instrumentalization* category follows a pattern similar to that of the science one. According to our findings (which shall be detailed later in this text), most of the discussions about disinformation in Brazil were staged between the opposing political and scientific fields.

Another strategy consisted of associating the disinformation problem with the increased circulation of *anti-science* discourse. This was particularly evident with the strong polarization in the public debate between supporters and detractors of the Bolsonaro government, for example, the opposition between public authorities and scientific institutions over the approval of the AstraZeneca and CoronaVac vaccines (Period 4), and the accusations of the government's mismanagement of the pandemic during the parliamentary inquiry committee's investigations in the senate (Period 6). In both these cases, the anti-science label was used to classify the type of disinformation discourse and to judge groups who were aligned with this political position.

The role of claimsmakers

Journalism plays a key role in mediating the public debate, both in the selection of sources and in the definition of interpretative frameworks that allow the media to participate in the social construction of reality. Information sources are mobilized to directly express their arguments and points of view on a given topic in the public space. Additionally, they have their own interests and develop their own strategies to access the media agenda [Schlesinger, 1990]. We can say then that the debate about a public problem in the media is the result of a negotiation between two groups of claimsmakers: the journalists, who try to make their positions visible by assuming the role of mediators in these discussions, and the sources, who are able to access the media space and participate in justifying and popularizing the problem of scientific disinformation among the public opinion.

In general, the media outlets we analyzed used a large number of claimsmakers to structure their debates: 819 sources were identified in the sample. News sources appeared in 90% of the items. Some texts used up to 11 different sources of information, although most used between one and three.

One aspect about the role of claimsmakers in the debate is their geographical distribution, between national and international sources. This allows us to

Table 6. Distribution of national and international sources by period ($n = 819$).

	1^{st} Period	2^{nd} Period	3^{rd} Period	4^{th} Period	5^{th} Period	6^{th} Period	7^{th} Period	8^{th} Period	Total
National	14	88	27	51	115	68	36	128	567
International	6	59	17	16	36	26	21	22	203
No classification	0	0	2	8	3	10	9	14	49

visualize the interlocutions between the Brazilian and international public agendas and the ability of different actors to operate transfers between themes associated with the public problem, contributing to its transnationalization [Hassenteufel & de Maillard, 2013]. Counting the number of sources used in the debate shows a predominance of national actors (567 or 2.51 per article) in relation to international ones (203 or 0.90 per article). This data initially suggests a nationally-centered nature of the discussions, which can be explained by a professional culture of journalism guided by criteria of proximity behind selecting which themes will be covered and the difficulty of newsrooms accessing international sources on a daily basis.

This finding, however, becomes more complex when we cross the total volume of sources with the evolution of the debate over the eight periods of analysis (Table 6). These data suggest that that the media coverage was structured in two moments. The first one, which covers the year 2020 and the first three analysis periods, shows a more balanced relationship between national and international claimsmakers. At this moment, scientists and international organizations seem to have a greater ability to guide the debate. As of period 4 there is a rise in debates on disinformation associated with vaccines — which extends throughout 2021 and early 2022. At that time, the debate about disinformation in the Covid pandemic was nationalized. It became increasingly associated with Brazil, particularly the actions of the federal government, the role of anti-science and anti-vaccination groups, and the role of professional structures that spread false content.

Regarding the sector of origin of the claimsmakers, our analysis reveals a strong presence of government institutions (present in 100 articles) and political decision makers (present in 88 articles), followed by academics (61) and medical personnel (5) (Table 7). If we include sources from universities, associations of health professionals and hospitals and scientific associations, and scientific journals in the analysis, we can conclude that coverage was structured between two poles: the political-governmental and the medical-scientific. An analysis of the occurrences between these variables showed these two main sets of sources to be present in the same article in around half of the cases, which may suggest political actors and doctors/scientists being used as contrasting voices in the debate over disinformation and science.

There are two other actors that also have a significant presence: international associations (47 stories) and the media itself (43), including specialized media (15). This data supports our findings that there was an initial transfer of this problem at the beginning of the pandemic by transnational claimsmakers. This data further suggests that the media also played a hand in constructing this problem, going beyond simply mediating the debate.

Table 7. Classification of sources by sector and distribution of their activities per analyzed period ($n = 226$).

Sector of source	*1st Period*	*2nd Period*	*3rd Period*	*4th Period*	*5th Period*	*6th Period*	*7th Period*	*8th Period*	*Total*
Academics	1	14	6	4	13	7	5	11	61
Ordinary citizens	0	2	0	5	3	5	4	1	20
Policy makers	3	12	8	8	18	14	5	20	88
Medical personnel	1	6	0	8	4	6	6	19	50
Generalist media	2	3	2	5	12	8	4	7	43
Specialized media	0	1	3	1	1	2	4	3	15
Scientific journals	0	12	1	4	3	1	2	0	23
Government institutions	4	15	7	7	14	12	8	33	100
Scientific associations	0	3	1	2	3	3	0	2	14
Associations of health professionals and hospitals	3	10	3	2	4	3	1	11	37
International organizations	4	15	4	2	3	9	3	7	47
Association of non-health-related professionals	0	1	0	1	5	1	1	3	12
Universities	0	4	1	3	2	0	2	1	13
Other sources	1	8	1	9	26	4	0	1	49

Based on Stroobant, De Dobbelaer and Raeymaeckers [2018].

Looking at the distribution of these sources by publication period, the data shows that, while some actors such as academics, scientific journals and scientific associations have a more or less regular presence throughout the eight periods analyzed, claimsmakers from the medical and political-governmental fields are more present in the media during specific periods of the pandemic (2, 5 and 8), which were times when there was an increase in the number of Covid-19 cases.

These observations suggest a division within the medical-scientific community in terms of forms of public intervention. Academic sources play a more regular role, participating throughout the debate on disinformation in the pandemic. Medical personnel, on the other hand, intervene in a similar way that policy-makers and government institutions do, appearing at specific times during the pandemic. Our hypothesis is that these three groups of actors are more likely to be invited to participate at times of insecurity or fear during the pandemic, usually a result of an increase in the volume of information/disinformation.

This trend is reflected in the thematic categories in which actors from the political and medical sectors again show similar behaviors. In this case, they participate in the media by addressing the problem of disinformation in discussions on Fake news or information disorder and, to a lesser extent, anti-science rhetoric (Table 8). Actors from the scientific field (academics, universities, scientific journals and scientific associations) spread their participation throughout the different thematic categories of the debate, placing a little more emphasis on the use of science as a tool to discredit the infodemic.

All this suggests the relationships among claimsmakers in the political, academic and medical sectors are much more complex. The idea of a large medical-scientific

Table 8. Classification of sources by sector and thematic category ($n = 226$).

	Anti-science	*Science*	*Political instrument-alization*	*Fake news or information disorder*	*Geopolitics*	*Total*
Academics	15	17	11	16	2	61
Ordinary citizens	10	2	2	6	0	20
Policy makers	27	16	18	22	5	88
Medical personnel	16	12	3	17	2	50
Generalist media	12	7	5	16	3	43
Specialized media	5	1	2	6	1	15
Scientific journals	5	11	4	2	1	23
Government institutions	20	18	15	42	5	100
Scientific associations	3	5	1	2	3	14
Associations of health professionals and hospitals	8	9	4	14	2	37
International organizations	7	15	4	17	4	47
Association of non-health-related professionals	1	3	2	6	0	12
Universities	2	4	2	5	0	13
Other sources	8	12	10	18	1	49

Based on Stroobant, De Dobbelaer and Raeymaeckers [2018].

community acting in a coordinated way is not entirely true, since academics and physicians seem to diverge or even compete in certain moments of the public debate. In fact, even though they recognize the problematic nature of disinformation, these actors have their own frames on its causes and effects, which they interpret based on their interests and political-ideological positions. Disinformation for a scientist who discredits the misleading nature of the use of scientifically unproven drugs is not the same for a doctor who defends the autonomy of his category to prescribe hydroxychloroquine. However, both support the need to fight fake news while both claim that the other spreads it. This also occurs in sectors such as politics and government, which are made up of segments of specialists and public managers, but also populists and science deniers.

Thus, the analysis of claimsmakers cannot be limited to just identifying their sector of origin; it must include investigating alliances and dissent and the formation of subgroups within each sector. All of this makes our research methodologically complex. It also suggests the important role the media play as arbiter for these alliances and conflicts, as it has the power to select the sources that will effectively participate in this public debate.

Discussions and conclusions

This article investigated debates about scientific disinformation during media coverage of the Covid-19 pandemic. Using an approach linked to the sociology of public problems, our study sought to identify the role that national and international claimsmakers have played in converting this theme into a problem. To do this, we analyzed a corpus of 226 media articles that addressed disinformation as a problematic situation in the context of science communication for the pandemic.

It is not our goal to categorize disinformation content; we want to understand how it was framed and discussed by the different actors who participated in the debate. *Fake news*, *fake science*, and denialist and anti-science discourses are included in our study if they provoke some kind of reaction from these claimsmakers when they publicly pronounce on this situation in order to sensitize public opinion and policy makers about the need to promote some type of change.

Discrediting disinformation content and *fake news* that circulated during the pandemic, causing negative effects on public health was, in fact, the main theme behind debates among the different claimsmakers. This is probably explained by how accessible this kind of theme is in the media and its ability to generate public interest and provoke polarized reactions among the public. What's more, journalists feel more comfortable associating the problem of science disinformation with simply disseminating false content. This type of argument follows aspects of the group's ideology, who contrast *fake news* with the "true", "verifiable" and "credible" discourse of professional journalism, as if the infodemic were just an offshoot of the crisis in media legitimacy.

Other themes appear in the debate. Claimsmakers who carried the *anti-science* and *science* arguments were able to point out the lack of scientific literacy, the lack of knowledge of how the field of science works, and the lack of credibility surrounding the academic discourse as causes of science disinformation. They used the debate on this phenomenon as a way to educate public opinion on scientific knowledge and its role in combating the increased circulation of false content.

The debate on science disinformation in Brazil had a strong political dimension to it. Not only because of the number of texts that associated disinformation with political-ideological issues, but also because the debate on the infodemic was built into the polarized environment of Brazilian society. In fact, science disinformation made political headlines during the pandemic. Groups who aligned themselves with the federal government politicized the issue, placing themselves on the side of an anti-science argument that opposed academic discourse. What is more, as this debate evolved in the media it merged politics with the pandemic. Disinformation about vaccines could not be dissociated from scientific denialism or political decisions to delay the purchase of immunizers, or even from movements made by the federal government to discredit (or even boycott) child vaccination. On a more subtle level of analysis, we can say that the debate on disinformation in Brazil was the stage for the confrontation between two types of discourse: one with a more populist nature and the other closer to the dynamics of the scientific environment and institutional normality. It was mainly through these two discourses that claimsmakers from various sectors sought to state (and denounce) the problematic nature of disinformation in the pandemic.

The debate was structured between two main fields of claimsmakers, one linked to the medical-scientific field and the other to the political field. A transitory analysis would suggest a simple opposition between these sectors, meaning that the denialist and false discourses released by the federal government would be countered with arguments conveyed by sources in the academic and health sectors. But the data shows that the debate between these actors was more complex than that. It suggests that claimsmakers from the medical field intervened in a very similar way to claimsmakers from the political field. In a way, you might say that

the more direct challenge for doctors and politicians were the effects of disinformation in the pandemic. Doctors were often placed in a more prominent position during the health crisis as they had to deal with contamination cases, which could be greater or lesser depending on a particular region's belief in the use of immunizers or social distancing measures. Policy makers and government institutions, on the other hand, are much more aware of the pandemic in terms of how it affects public opinion, and they handle public communication strategies better than other actors, including the use of disinformation content to intervene with the public.

Academics appear to have sought another standard of action, regularly intervening in the debate based on their field of expertise. They had an important opening on the part of journalism. Indeed, there seems to have been a kind of alliance between journalists and scientists, both of whom sought to support each other's role as producers of a "credible" account of the world. These self-supporting mechanisms do not necessarily change how the media covers science but demonstrate the effects of temporarily using scientists to support the public credibility of scientific discourse. This depended on the academic community socializing with the conventions of journalism, something that not everyone was able to do. In fact, during the data encoding process, we observed a large number of academic sources that did not necessarily translate into a diversity of actors, as newspapers often prioritized statements from particular individual sources that were better able to convey messages between the fields of science and science communication (e.g., Atila Iamarino, Natalia Pasternak and Pedro Hallal).

These findings and the various pathways they open up raise the need for us to continue our studies and better understand the construction process of this public problem. We are currently working on four avenues of investigation. The first is to complement our textual analysis with more qualitative methodologies in order to reveal the nuances of discourses made by the claimsmakers in the media. Secondly, we are expanding the corpus by analyzing texts about science disinformation that circulated in digital platforms. Thirdly, we believe it important to understand the motivations and practices of the claimsmakers identified in the textual analysis by conducting in-depth interviews with them. Lastly, we would like to explore the transnational dimension of these phenomena by conducting comparative ambition studies.

These avenues of investigation do not detract from the merit of this work. Quite the opposite, they reveal the theoretical-methodological potential of our study program, which combines *newsmaking* traditions with the sociology of public problems. In addition, this approach allows us to move away from the normative nature of discussions about disinformation, showing how its insertion into the public debate comes on the heels of actors who are truly interested in promoting this theme as something potentially problematic that deserves the public's attention. Finally, our proposal helps to shed light on the role of journalists in a debate that touches on fundamental issues in terms of their ideology and professional culture.

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Authors

Fábio Henrique Pereira is Chair of Scientific Journalism at Laval University (Canada). He is associate researcher in Communication at University of Brasilia. He authored the books *Jornalistas-intelectuais no Brasil* [*Intellectual-journalists in Brazil*] and *As diferentes maneiras de ser jornalista* [*The different ways of being journalists*]. He is coeditor of *Sur le journalisme* journal.

 fabio-henrique.pereira@com.ulaval.ca

Raphael Sandes de Oliveira has an undergraduate degree in Organizational Communication from the University of Brasília (UnB) and a specialization in New Interactive Media from the Federal University of Goiás (UFG).

 raphael.sandes@gmail.com

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