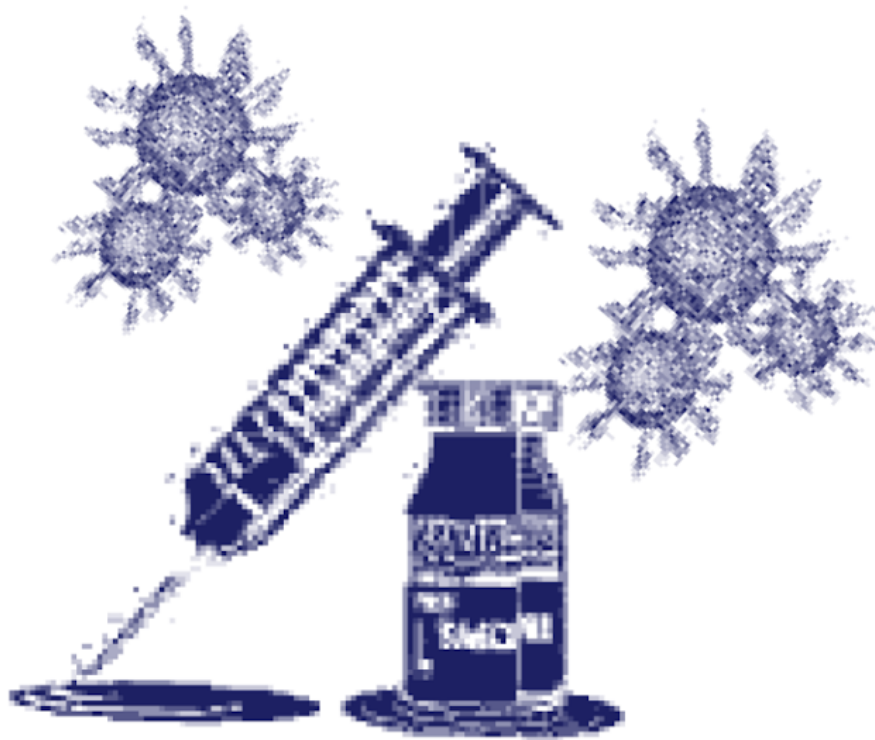


# (PSEUDO)SCIENCE AND THE PUBLIC SPHERE

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Scientific Claims about  
Covid-19 on Twitter



Rio de Janeiro, July 2021

Support



Embaixada  
da República Federal da Alemanha  
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# **(PSEUDO)SCIENCE AND THE PUBLIC SPHERE**

Scientific Claims about  
Covid-19 on Twitter

Rio de Janeiro

**FGV DAPP**

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## EXECUTIVE SUMMARY

### **Abstract:**

The study analyzes publications on Twitter that claim scientific status in order to bring forth arguments of authority in messages regarding Covid-19, including the adhesion or criticism of protective measures, the application or non-application of vaccines, degree of danger of the virus, among others. The 3.3 million posts that compose the corpus of the research were published between January and May 2021. Of the four identified clusters, the one that garnered the most engagement mainly dealt with the defense of early treatment and was positioned in the right-wing conservative field in alignment with the government of Jair Bolsonaro. The other three clusters reacted to this, including health professionals, sanitary authorities, epidemiologists, journalists, as well as progressive and left-wing influencers. In the group aligned with the government, the longevity of links that resort to science in order to argue about Covid-19 was 150% higher than in the other three clusters identified, which indicates that, despite not always grounding themselves in scientific parameters in order to base their arguments, the right-wing conservative cluster explores the status of science in order to defend their point of view.

### **Keywords:**

Covid-19; Twitter; science; pseudoscience; public sphere.

## SUMMARY OF RESULTS

1. The cluster that attracted the highest volume of interactions (41.5%) on Twitter was composed of users aligned with the conservative right-wing field, defending early treatment protocols for Covid-19. This is not the first, but the third cluster in terms of quantity of profiles connected with each other. Therefore, even with 21.5% of the profiles, this group worked separately as a vector of messages that preach the efficacy of early treatments. The most populous cluster, with 29.6% of profiles, was composed of health professionals, scientists and sanitary authorities that allude to the lack of evidence of the early treatment protocols, among other topics, and is the third in terms of interactions (11.6%). The second cluster in interactions (34.5%) and profiles (24.9%) is represented by the left-wing field, with criticisms directed to the federal government. In turn, the smallest cluster (9.5% of profiles and 7.7% of

interactions) is composed of epidemiologists, journalists and infectology associates who also criticized the management of the pandemic by the Jair Bolsonaro administration.

2. Among the five domains with the most mentions, responses and retweets by the cluster that defends the early treatment, all are vehicles of the conservative right-wing media and hyperpartisan. Domains of websites of the traditional press occupied the five first positions of the cluster connected to the health professionals and sanitary authorities, sharing the space with websites editorially oriented to the left, in groups of opposition to the government, and to the right, in the group more connected to the center-right wing.
3. The average lifespan of links in circulation about the subject was of 100 hours in three of the four clusters. An exception happened in the cluster supporting early treatment, where the duration increased to 250 hours. Considering the ten most lasting links, the cluster defending early treatment is the only one where controversial URLs that propagate pseudoscience could be identified. Those are anonymous websites that are constantly refuted and invalidated by the scientific community. The most durable link circulated for 159 days and it is an example of this practice in defense of the early treatment, as well as others with longer lifespan. In turn, the three less durable links circulated for around 85 days and are all from the media outlets.
4. The cluster favorable to the early treatment was the one that isolated most exclusive/predominant domains. That means that, in 44% of the links, 90% of the mentions, responses and retweets occurred inside the cluster itself. A significant percentage of isolation of informative sources occurred in the cluster that gathers users who criticize the government and who are aligned with the left wing, where 31% of the links circulate predominantly.
5. It is also worth noting, also, that the cluster that defends the efficacy of the early treatment was the group that most shared six of the fourteen scientific domains that were shared among all of the clusters.



## PRESENTATION

This is the fifth policy paper in the ambit of the project [Digitalization and Democracy in Brazil](#), a partnership between the Department of Public Policy Analysis of Fundação Getulio Vargas (FGV DAPP) and the Embassy of Germany in Brazil. Until 2022, a series of applied research and initiatives, such as seminars and workshops, will be developed with the goal of amplifying the understanding and seeking resolutions of complex problems that involve the relationship between politics, democracy, social media platforms – in special, the flux of messages, the public discussion, and the collective measure that is grounded in potentially deceitful, extremist and antidemocratic information. The project seeks to add efforts to build knowledge and develop mechanisms to slow down online threats, and fortify democratic values in Brazil.

The Covid-19 pandemic moved to the center of the public and political discussion matters related to the scientific methods and knowledge. Alongside the need for understanding the virus and slowing down its spread in a global scale, the superabundance of stories and controversial and false facts, as well as the popularity of pseudoscientific fallacies, became the source of global concern, being labeled an infodemic by the World Health Organization (WHO)<sup>1</sup>. In countries already marked by the political polarization and radicalization in the last few years, such as Brazil, the pandemic paved the way for crises of many types – sanitary, political, and humanitarian –, which compromise the formulation and efficacy of public policies, illustrated by the more than 500 thousand deaths in 15 months in the country, from March 12th 2020 to June 19th 2021<sup>2</sup>.

Ideas that are contrary to the recommendations of social distancing, to the use of masks, and to the vaccination are widespread online and acquire social capillarity, especially in niches aligned with the government of President Jair Bolsonaro (no party), defender of the

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<sup>1</sup> See in: <https://www.who.int/health-topics/infodemic>. Access in: jul. 19. 2021.

<sup>2</sup> See in: <https://www1.folha.uol.com.br/equilibrioesaude/2021/06/brasil-chega-a-500-mil-mortes-por-covid.shtml>. Access in: jul. 19 2021.

early treatment. Although controversies are part of the construction of the scientific knowledge, which, in itself, is non-dogmatic and opposed to absolute truths, part of the flood of posts scattered online goes against the orientation of international organisms in agreement with the scientific community. Despite that, the same discourse, labelled as negationist or anti-science, have been resorting to the scientific, as well as/or pseudoscientific, sources and repertories in search of epistemic legitimacy.

Researches indicate that scientific evidence has been mentioned by negationist networks in platforms such as YouTube to minimize the gravity of the pandemic, to confront the news, and to sustain conspiratorial beliefs – “Chinese weapon”, “Biblical plague” – since the first apparition of the virus, with direct participation of leaders of opinion and specialists, such as pastors and doctors, and certain scientific grammar (MACHADO et al., 2020a; OLIVEIRA, 2020). Studies have also revealed that the defense of medications without scientific evidence, especially chloroquine, azithromycin and ivermectin, tend to be recurring mentions among contradictions and conspiracy theories, with high political bias (MACHADO et al., 2020b; ARAÚJO; OLIVEIRA, 2021) and of a convenient contact with the scientific grammar (ARAÚJO; OLIVEIRA, 2021). For some time, authors have been showing that the conspiratorial belief over science, such as in the case of climate change, tend to be “immune to falsifications”, because alternative or conflicting evidence are always brought to the table to accommodate and critically amplify the scope of conspiracy (LEWANDOWSKI; GIGNAC; OBERAUER, 2013, p. 3).

In that context, this research seeks to understand in what way the demands of science are incorporated in the discursive disputes over Covid-19 on Twitter. Here, we defined demands of science as affirmations, allusions and questionings that are grounded in studies, scientific hypothesis, or authorities that operate under a logic in the scientific field. In other words, we seek to understand, through a case study on Twitter, the social use of the statute of scientific authority in environments that are not organized by the logic of functioning and in the time of science. For that, this study recruits procedures of analysis of social media on the internet (for example, RECUERO, 2017; RUEDIGER, 2017),

with focus on the relationship between clusters and links, and analyze a corpus of 3.3 million of tweets.

In a first moment, we collected and classified data relative, in a broad sense, to the debate on Twitter regarding the Covid-19 pandemic in Brazil, and, most specifically, to the manifestations that demand scientific statute for the defense of positions and assertions regarding the disease and its treatment. For the collation of the broader debate on the Covid-19 pandemic, we elaborated a list of keywords, executed in a script of data collation via interface of applications programming (API) of Twitter.

From this initial collation, we elaborated a syntax of search – or a group of terms, expressions and phraseologies, articulated through logical operators – for the classification of posts that referred to the discourse of a supposedly scientific quality. The elaboration of this syntax had been oriented to enunciates that made formal reference to allegedly scientific studies, works and research; the positioning or declarations of actors alluded as researchers or scientists; or, yet, to the practice of science in a broader sense. It was executed through the application of this syntax as a filter in the entire group of initial data, where only the publications that had positive results in the comparison with Boolean operators of syntax were kept.

Through the free Gephi application (Gephi Consortium) and based on the sharing of posts among profiles, a graph was elaborated for the representation of the interactions among users engaged in the target debate. The amplification also enabled the identification of profile groupings based on the comparison of the volume of interactions outside and inside the communities. For the sake of consistency, we considered the groups that garnered at least 5% of the profiles engaged in the debate, which resulted in four communities.

The document is organized into three parts in addition to this presentation and conclusion. In the first part, we will have a discussion on the logistics of organization and the legitimacy of the scientific field as a source of knowledge. Next, we will mobilize authors connected to the literature regarding digital culture, in a reflection on the communicative dynamics in networks that change the paradigms of authorities

consecrated in fields of specific knowledge. In the third part, we will present the results of the study in three subsections. In the first subsection, we will use the map of interactions of the corpus in order to identify the main communities involved in this debate, characterized through an analysis of domains and most shared links by each of them. Next, we will perform an analysis of the “lifespan” of links by cluster. Lastly, we will seek to identify the sources of information of each cluster, analyzing the level of exclusivity/predominance in the sharing of domains by cluster.

## **THE SCIENTIFIC FIELD AS A SOURCE OF LEGITIMATE KNOWLEDGE**

The use of the term “scientific” and the quality of authority that it normally conveys are attributed to its norms and parameters, limited by theories, methods and the scientific community itself. It is important to emphasize, before anything else, that it is the role of science to be in constant debate, reflection and construction, which reinforces and offers robustness to the scientific knowledge. We do not intend to present an exhaustive framework in this discussion. Before properly heading to the description and more detained analysis of the data, however, it is worth having a brief theoretical and conceptual incursion that is aimed to the understanding of the specific characteristics that define the scientific field, as well as situating some studies that have been focusing on the topic of science in the context of the Covid-19 pandemic.

Every undertaking of research boils down to a reduction or an attempt of objective representation of a specific phenomenon that is permeated with limitations and theoretical choices and methodologies presented to the researcher. However, the scientific field performs under specific conditions and it is circumscribed to the social reality, which implies that several external factors might play a part in the field. The degree of autonomy attributed to the scientific work, however, is fundamental in order for the very premises of the scientific field to orient and confer reliability and validity to its results, insofar as “the legitimacy of science and the legitimate use of science are permanent reasons in the fight of the social world” (BOURDIEU, 2004, p. 17).

The scientific field is delimited by and subject to its own principles of verification and specific norms – “if you wish to triumph over a mathematician, it is necessary to do it mathematically by demonstration or refutation” (BOURDIEU, 2003, p. 32) –, but not only by that. The validity and severity of a hypothesis or theory must be scrutinized and allowed by the scientific community, which constitutes the field (KUHN, 1970). In this perspective, it is in line with the theories and methods accepted and shared by a relevant share of

scientists of given field of knowledge that science advances and produces significant contributions.

Science and the scientific method, however, are notably reflexive, dynamic and continued, which allows for new processes of rupture, which open up new “paradigms” (KUHN, 1970). Anyhow, the expertise, the accumulation and the scientific tradition are indispensable for its evolution, which, in general, happens by the exclusion of a set of hypotheses and/or competitor theories, in other words, by the criteria of falsifiability (CHALMERS, 1993). It is also important to emphasize the role of theories that must orient all of the steps of a scientific project. “(...) a very good theory will be one that makes very broad affirmations regarding the world, and that, in consequence, is highly falsifiable, and resists the falsification every time it is tested” (CHALMERS, 1993, p. 60). In this way, “the undertaking of science consists in the proposition of highly falsifiable hypotheses, followed by deliberate and tenacious attempts to falsify them” (CHALMERS, 1993, p. 62). The author also highlights that those theories that are tested and said to be falsifiable before the scientific community must be necessarily rejected, which incites to the improvement of the theoretical propositions, following the norms and methods scientifically accepted.

Reinforcing the quality of reflexivity of science, it is through “attempt and error” that scientific knowledge is advanced. “(...) Reflexivity is a particularly effective means of reinforcing the hypotheses to conform to the truth by reinforcing the mutual censors and by providing the principles of a technical critic, which allows to control more attentively the factors that are susceptible of altering the direction of investigation” (BOURDIEU, 2004, p. 123). In this perspective, and retrieving the distinguishing criteria of science, it is of the utmost importance that the work realized inside the logic of science itself has a relative degree of autonomy; in other words, that it advances independently of interests and external pressures to its fundamental principles.

## **DIGITAL CULTURE AND THE CONTESTATION OF THE EXPERT PARADIGM**

The appeal to the scientific statute in the dispute of narratives around Covid-19 helps to think in the repercussions of the emergency of the participative culture in the digital context. In 2006, Henry Jenkins discussed the topic by analyzing the development of a collective intelligence in spoiling processes of the reality show Survivor. Spoiling is a practice of disclosing parts of movies and series before they are officially exhibited. Since the show was entirely recorded before going on air, fans dedicated themselves in the complex process of checking for clues in order to try to guess what would come next, often times even before the new season debuted. By analyzing the spoiling in Survivor, Jenkins (2013, np) talks about a production that “is television for the era of the internet – made to be discussed, dissected, debated, previewed and criticized” and discusses how this new paradigm would affect the status of the until then absolute expert paradigm.

Jenkins used to see the emergency of a collective intelligence under the optic of Pierre Lévy, referring himself “to this capability of virtual communities to boost the combined expertise of their members” when the field in question is so broad and complex that “it is impossible for a single human being, or even a group of people, to dominate all of the knowledge, all of the abilities” (JENKINS, 2013, np). For the author, the knowledge retained by individuals remains “set”, ready to be shared “when an occasion comes up”. On the other hand, in the expert paradigm, the knowledge is detained by a voice of authority, generally with formal education in its field of specialty, which centers the production and diffusion of knowledge, creating an “interior” where those who detain the knowledge participate, and an “exterior” reserved to those who consume the information shared by the experts. Using the argument of Peter Walsh, Jenkins also points out that the expert paradigm uses “rules on how to access and process information, rules established through traditional disciplines” (JENKINS, 2013, np).

The paradigm of the participation generated unprecedented challenges in the world by diluting these rules in new codes that define the credibility and trust that a shared knowledge deserves. Fifteen years after the reflection of Jenkins, the world is seen

submersed in a crisis originating in, mainly, the free circulation of disinformation strategically placed and disseminated to reach political goals, in a scenario in which the common people have great difficulty in dealing with the epistemological crisis introduced by the informational chaos. In the Covid-19 crisis, the world had to deal with a instigation of the pandemic motivated by the profusion of publications with supposed specialists who were allegedly working on uncovering conspiracies on vaccines and medicine, or fighting against a “left-wing globalism” from the WHO. This scenario reveals some concerning effects that emerged from the culture of participation in the last decade and half.

Jenkins had an optimistic expectation regarding the emergency of this new paradigm in detriment of the expert paradigm, especially when fans “decided to spoil the government, instead of television” (JENKINS, 2013, np). However, the author recognizes that Lévy never deeply discussed the scale in which communities of knowledge, as he proposes, could operate. Nowadays, we can affirm that, by gaining global scales and exploring the anonymity of the social media, the participative culture brought challenges to the democracies around the whole world.

In his work, Jenkins pointed out that in this culture, by then emerging, the communities of knowledge are formed by filiations – voluntary, temporary and tactical – from people who seek to supply emotional and intellectual needs. “For being tactical, they tend to not last besides the tasks that propelled them” (JENKINS, 2013, np), affirms the author, anticipating, even if superficially, ways of performing on media now explored by bots that simulate human behaviors that are characteristic of the participative culture in order to achieve political goals.



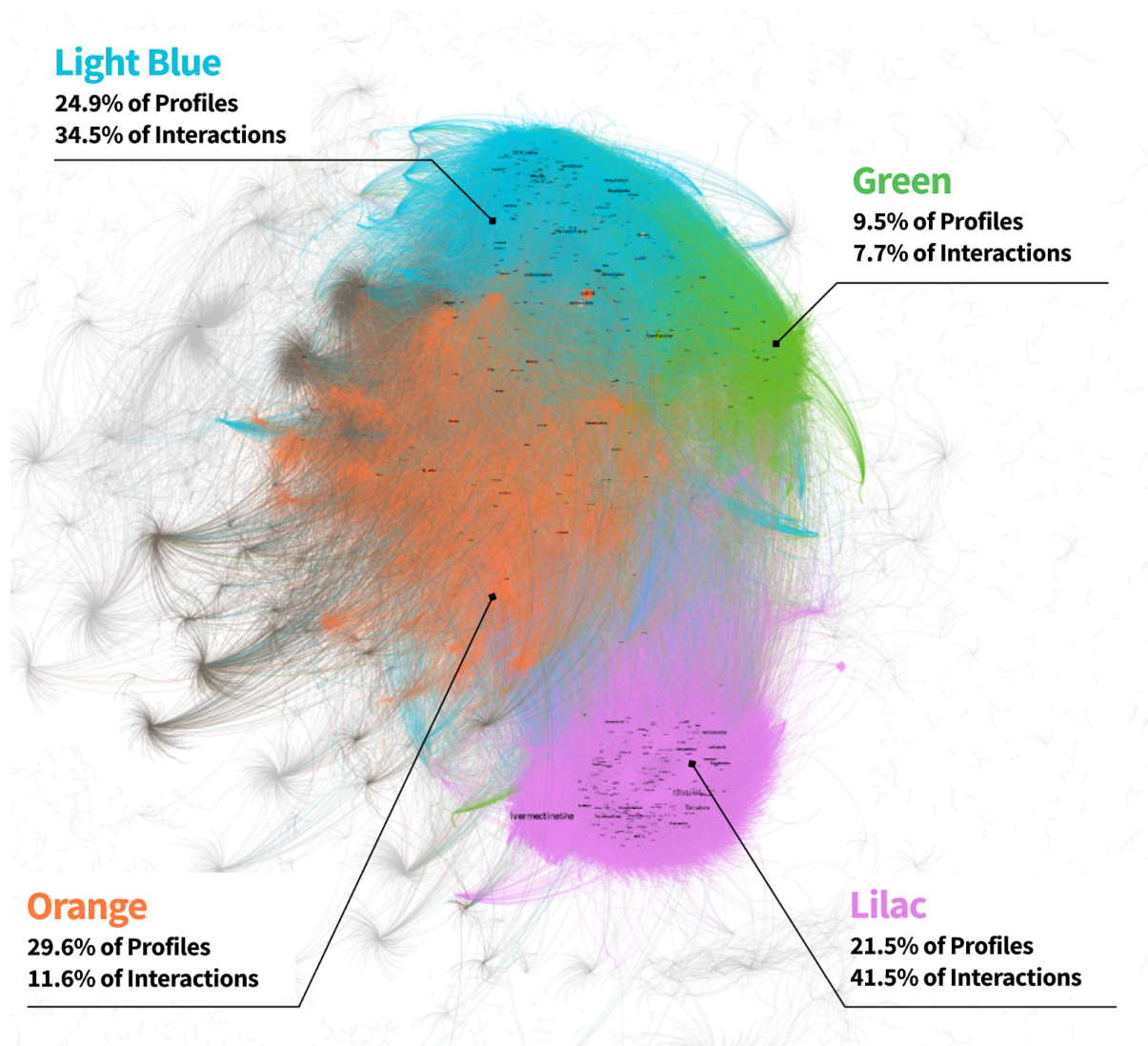
## RESULTS AND DISCUSSION

### 1) Analysis of the Map of Interactions

In the general debate about Covid-19, more than **3.3 million of posts on Twitter** that claim some scientific foundation for their respective assertions and stances were identified.

**Figure 1 – Map of Interactions in the Debate over Covid-19 on Twitter,  
with Scientific Claims**

Analysis period: from January 1st to May 31st, 2021



Source: Twitter | Elaborated by: FGV DAPP

**Orange – 29.6% of Profiles | 11.6% of Interactions**

Mobilized by health professionals and other sanitary authorities, the group contests the recommendations of the supposed early treatment, alluding to the lack of scientific evidence on the efficacy of the respective medicine. Furthermore, posts raise doubt to the reports of success of the medicine in the treatment of the disease and reinforce alert that Covid-19 does not behave as a normal flu, insisting in other demands, such as the use of masks and hand sanitizers.

**Light Blue – 24.9% of Profiles | 34.5% of Interactions**

Group lead by left-wing politicians, celebrities and social activists that oppose President Jair Bolsonaro attributed the delay of the immunization of the population against Covid-19 to the lack of trust of the federal government in the vaccines and its inertia in the acquisition of them. At the same time, while insisting in the urgency of the vaccination, posts criticize the favoring, by the government, to medicine that compose the labeled “early treatment” whose efficacy against the disease is not scientifically backed.

**Lilac – 21.5% of Profiles | 41.5% of Interactions**

Orbiting right-wing politicians, conservative bloggers and digital influencers, the group defends protocols of early treatment against Covid-19. Posts resort to personal reports of recuperation from the disease to studies and declarations from international specialists, as well as their approval in foreign countries, in the effort of basing the efficacy of the medicine. Some posts also question the accusation of this posture as being negationist, with the argument that negationism would be the impediment of access of the population to this early treatment.

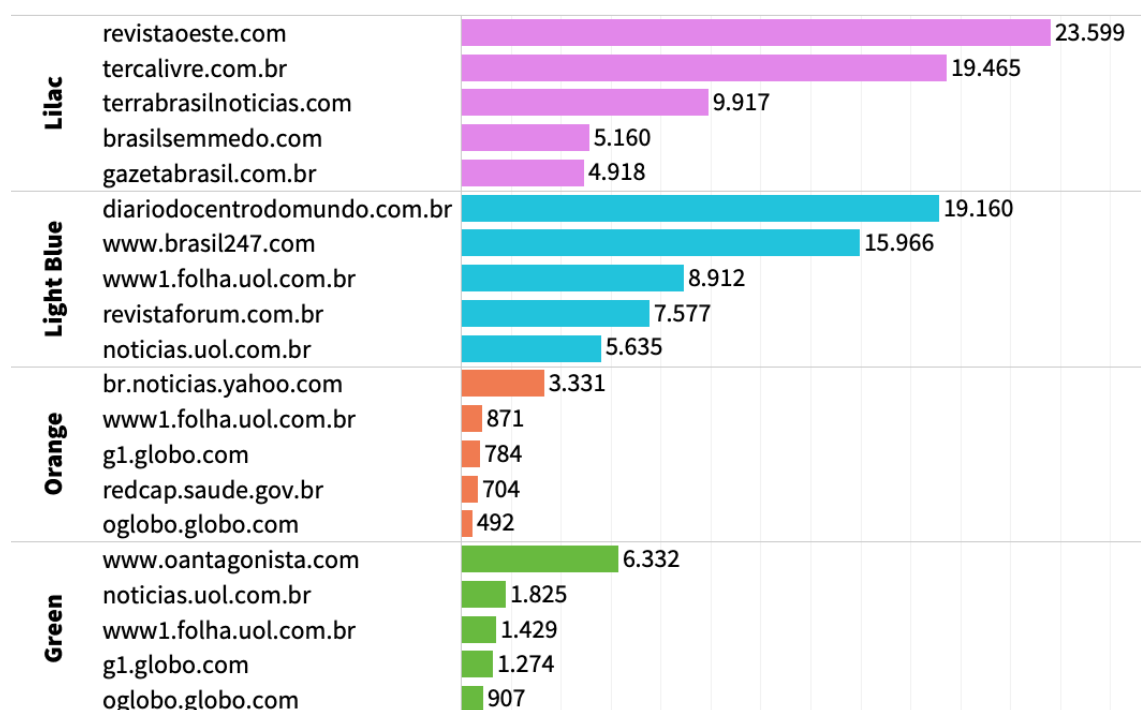
**Green – 9.5% of Profiles | 7.7% of Interactions**

Mobilized by epidemiologists, journalists and infectology associations, this group comments on the inefficacy of the use of ivermectin and chloroquine as early treatment against Covid-19. The group also criticizes the federal government for insisting in the production and propaganda of these medicine, as well as depreciating the investment in

vaccines and in a plan of vaccination for Brazilians. Posts label the government's posture as negationist and highlight cases of supporters of the government who are in favor of the early treatment, but who vaccinated in other countries.

**Figure 2 – Domains with most Mentions, Responses and Retweets by Cluster**

Analysis period: from January 1st to May 31st, 2021



Source: Twitter | Elaborated by: FGV DAPP

The graph above presents the domain with most mentions, responses and retweets by cluster. In the Lilac cluster, the presence of hyperpartisan and conservative websites is predominant — such as *revistaoeste.com* and *tercalivre.com.br*. They tend to demand minimum participation of the State and, throughout the pandemic, published articles in support of the federal government. Another group that draws attention by the presence of partisan websites is the Light Blue group, which brings forth news channels from the left wing, whose identification is marked by progressive ideals and defense of the democracy — highlights are *diariodocentrodomundo.com.br* and *www.brasil247.com*. This group presents criticisms to the federal government in regards to the adopted measures to fight

the pandemic and in the insistency on the narrative in favor of drugs of the early treatment.

The groups Green and Orange are domains marked by traditional websites of communication — for example: *www1.folha.uol.br*, *g1.globo.com*, *oglobo.globo.com* — which spread information on vaccines, contest the use of preventive medicine against Covid-19, and emphasize the high investment of the Brazilian government in the purchase of chloroquine. It is worth noting that the link *www.oantagonista.com* — with wide circulation in the Green domain — despite being an informative channel with public editorial positioning to the right wing, spread information emphasizing the inefficacy of the drugs used as preventive treatment against Covid-19 and the possible damage that such medications can bring to the health.

Seeking more detailing of the clusters, the graph below presents the links that obtained more mentions, responses and retweets in each one of them. Among the domains analyzed, the Lilac cluster is presented as the most expressive, with highlights to the website *revistaoeste.com*.

**Figure 3 – Links with most Mentions, Responses and Retweets by Cluster**

Analysis period: January 1st to May 31st, 2021

Lilac	Ivermectina reduziu internações por covid na Cidade do México	revistaoeste.com	6.743		
	Hidroxicloroquina pode reduzir hospitalizações em até 60%, aponta e..	tercalivre.com.br	3.819		
	Autoridades médicas defendem o uso de Ivermectina no tratamento d..	redetv.uol.com.br	3.583		
	Cloroquina e ivermequitina poderão ter protocolo do Ministério da Sa..	revistaoeste.com	3.411		
	Médico Francês voltou a atestar que hidroxicloroquina funciona contr..	revistaoeste.com	3.289		
Light Blue	Mayra Pinheiro, conhecida como 'Capitã Cloroquina', recorre ao STF p..	oglobo.globo.com	2.709		
	Em Miami, Edir Macedo toma vacina da Janssen contra Covid-19	br.noticias.yahoo.com	2.273		
	Americanos começam a processar quem receitou cloroquina	diariodocentrodomundo.com...	1.600		
	Capitã cloroquina' pede ao STF direito para ficar em silêncio na CPI	noticias.uol.com.br	918		
	Jovem pastor bolsonarista que fazia propaganda da cloroquina e iver..	diariodocentrodomundo.com...	887		
Orange	Em Miami, Edir Macedo toma vacina da Janssen contra Covid-19	br.noticias.yahoo.com	3.295		
	Teste no App TrateCov	redcap.saude.gov.br	704		
	Baiana descobre problema no fígado por causa do uso excessivo de re..	g1.globo.com	292		
	Engraçado; maconha pode, cloroquina não pode', diz Bolsonaro sobre ..	folha.uol.com.br	224		
	Saúde desviou 2 milhões de comprimidos de cloroquina para Covid, e ..	folha.uol.com.br	183		
Green	EUA ultrapassam meta de Biden de 100 milhões de doses de vacina se..	g1.globo.com	557		
	Exército usa dinheiro da vacina para gastos sigilosos e compra de clor..	oantagonista.com	556		
	Em Miami, Edir Macedo toma vacina da Janssen contra Covid-19	br.noticias.yahoo.com	531		
	Médico que se automedicou com hidroxicloroquina morre após parad..	noticias.uol.com.br	402		
	Capitã Cloroquina recorre ao stf por direito ao silêncio na CPI da Covid	oantagonista.com	378		

Source: Twitter | Elaborated by: FGV DAPP

An important piece of data in the graph above is that, while the Green, Orange and Light Blue domains circulate information in the traditional Brazilian media — *www1.folha.uol.br*, *oglobo.globo.com*, *g1.globo.com* — the Lilac cluster, through hyperpartisan news channels, mobilizes links that bring forth foreign authorities (from the fields of Health/Administration/governmental institutions) in order to give credibility and an effect of “scientificity” to early treatment.

An analysis of the headlines of main links of each cluster also shows a difference in relation to the tone and goals of the publications of the Lilac group in relation to the others. While the Lilac cluster is marked by links that bring forth allegedly scientific elements that seek to affirm the efficacy of treatments against Covid-19, the links shared by the other three clusters adopt a reactive tone, responding the topic imposed by the Lilac group. This characteristic brings the Green, Orange and Light Blue groups together, despite the presence of websites of alternative media with more polarized editorials among the domains with most repercussion.

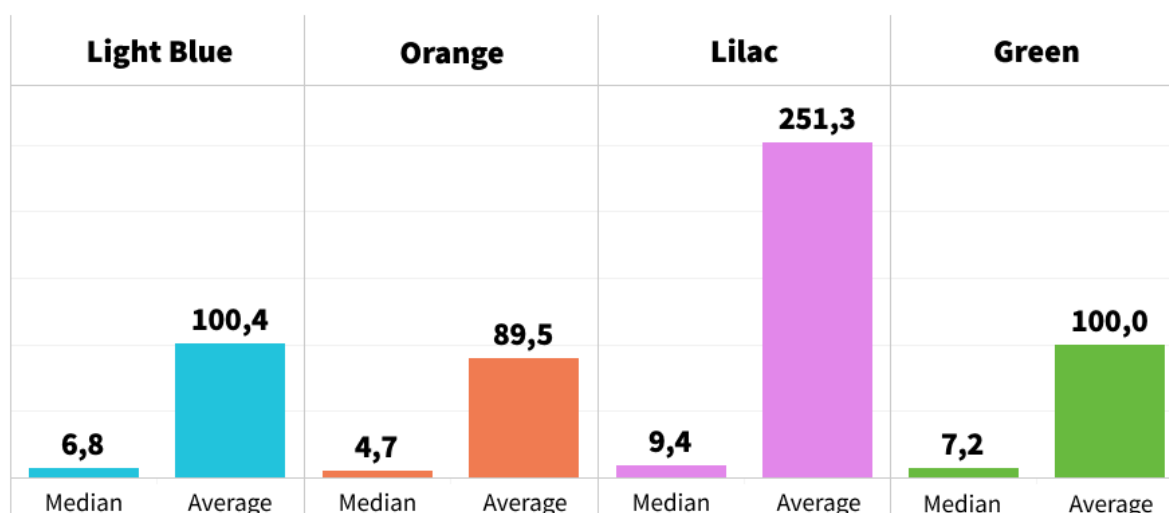
## 2) Analysis of Lifespan of Links

This section examines the lifespan of circulation of the links used for the scientific claims on Covid-19 on Twitter. For that, we took into consideration the difference, in hours, between the last and the first time the link appeared in a tweet in the analyzed period, independently of how many times it was later shared by some of the users. For that, we used a group of 40 links with the ten longest lifespans in each cluster with at least two shares. Next, we examined the accumulation of days of circulation of the links. In this way, it was possible to advance the understanding of the habits of sharing of content anchored in links, that evidence a typical headline text (clickbait or not), according to the genesis of functioning of different clusters. In the two observed levels, the data composed of links belonging to the Lilac cluster differ from the rest.

This analysis evidence that the average of duration of the links is around 250 hours in the Lilac cluster, 100 hours in the Light Blue and Green clusters, and 89 hours in the Orange one. The Lilac cluster, whose average is more than double, is the one that attracted most interactions and defended the early treatment in the online conversation on Twitter. The other three clusters point to an average pattern of around 100 hours, with average time being a little shorter in the largest grouping (Orange) who gather users connected to the field of Health who refute the idea of early treatment. The calculation of the median, in turn, signals the central tendency of temporal distribution, which we also applied in this analysis in order to control distortions due to the accentuated volume of data. Thus, in all of the clusters, the central lifespan of the links was lower than 10 hours, with higher duration in the Lilac grouping and lesser duration in the Orange one.

**Figure 4 - Lifespan (in hours) of Tweets with Scientific Claims on Covid-19**

Analysis period: January 1st to May 30th, 2021



Source: Twitter | Elaborated by: FGV DAPP

Therefore, the most lasting URL circulated for 159 days on Twitter, but all of the ones that are reported in the sample of this research were shared for at least 8 days (Figure 4). Among the ten URLs with most days of circulation, five are from the Lilac cluster, while 4 are from the Light Blue and one is from the Green clusters, which evidences the existence of endogenous ecosystems where circulate information that is controversial and refuted by the scientific mainstream and national and international health authorities.



In order to illustrate the strength of this topic in the Lilac online community, the URL that is on the top of the list is <https://ivmmeta.com/>, with 159 days of lifespan. It is a website that systematizes and publicizes studies in defense of the early treatment against Covid-19<sup>3</sup>. The account on Twitter was banned<sup>4</sup> and the project accuses the platform of censorship<sup>5</sup>. The scientific results in favor of early treatment disclosed by this page, which were used as source of information by other channels classified as negationist and hyperpartisan, have already been checked and disproven by the major fact-checking initiatives in Brazil.

The project Aos Fatos has been alerting that this anonymous website discloses meta-analysis, which are synthesis of results of academic researches, but with crass errors of methodology and with no scientific severity, since they group “incomparable studies and applied the drug in different doses and control groups”<sup>6</sup>. The website was mentioned, alongside another connected to it, in the “Manifest for Life”, an advertisement signed by doctors who are in favor of the early treatment and publicized in newspapers of great circulation in Brazil in February of 2021<sup>7</sup>. The fact-checking agency Lupa considered that the text of the manifesto is based on false data, in inconclusive studies and in analysis without scientific approval<sup>8</sup>. <https://hcqmeta.com/>, which appears as the third most lasting link in the Lilac cluster, with 153 days, is one of the most interconnected URLs in the website<sup>9</sup>, which is a constant source of attention from scientific institutes<sup>10</sup> who are concerned by the widespread of false data and information in strategic networks.

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<sup>3</sup> The website claims to have a goal to cover the most promising early treatments against Covid-19. See in: <https://c19early.com/>. Access in: jul. 19 2021.

<sup>4</sup> See in: <https://twitter.com/CovidAnalysis>. Access in jul. 2021.

<sup>5</sup> See in: <https://ivmmeta.com/twitter.html>. Access in jul. 2021.

<sup>6</sup> See in: <https://www.aosfatos.org/noticias/e-falso-que-novo-estudo-comprova-eficacia-da-ivermectina-contracovid-19/>. Access in jul. 2021.

<sup>7</sup> See in: <https://www.poder360.com.br/midia/jornais-publicaram-anuncio-pago-de-tratamento-precoce-contracovid-19/>. Access in jul. 2021.

<sup>8</sup> See in: <https://piaui.folha.uol.com.br/lupa/2021/02/23/anuncio-medicos-pela-vida-covid-19/>. Access in jul. 2021.

<sup>9</sup> See in: <https://www.aosfatos.org/noticias/sites-que-embasam-manifesto-por-tratamento-precoce-adotam-metodologias-duvidosas/>.

<sup>10</sup> See in: <https://www.revistaquestaodeciencia.com.br/artigo/2021/04/07/levar-site-c19study-serio-e-mentir-para-si-mesmo>.

Another URL of primary source, [virologyj.biomedcentral.com/](http://virologyj.biomedcentral.com/), keeps its prolonged circulation in online communities in favor of the early treatment in Brazil and in the world. With 146 days of circulation, the way that the study of 2005 has been used in posts of social media was rebutted by the fact-checking agency *Reuters*. By verifying the case, Reuters informs that the “study that proves efficacy of the chloroquine for Covid-19” has a verdict the status of false. The verification clarifies that the experiment was performed in animals and not in humans, having the focus on Sars-CoV (Severe Acute Respiratory Syndrome), a different disease from Sars-CoV-2, and it was a source of concern in that time. The agency reiterates that the studies are inconclusive on the efficacy of the hydroxychloroquine and chloroquine drugs, and that the adverse effects have been alerted<sup>11</sup>. Additionally, the URLs of the homepage *pleno.news*, a website owned by a conservative and evangelic media group known for publicizing deceitful content<sup>12</sup>, and the blog <http://www.papodepeso.com/>, are on the list of the ones who circulate the most in the Lilac cluster, both with 149 days of duration.

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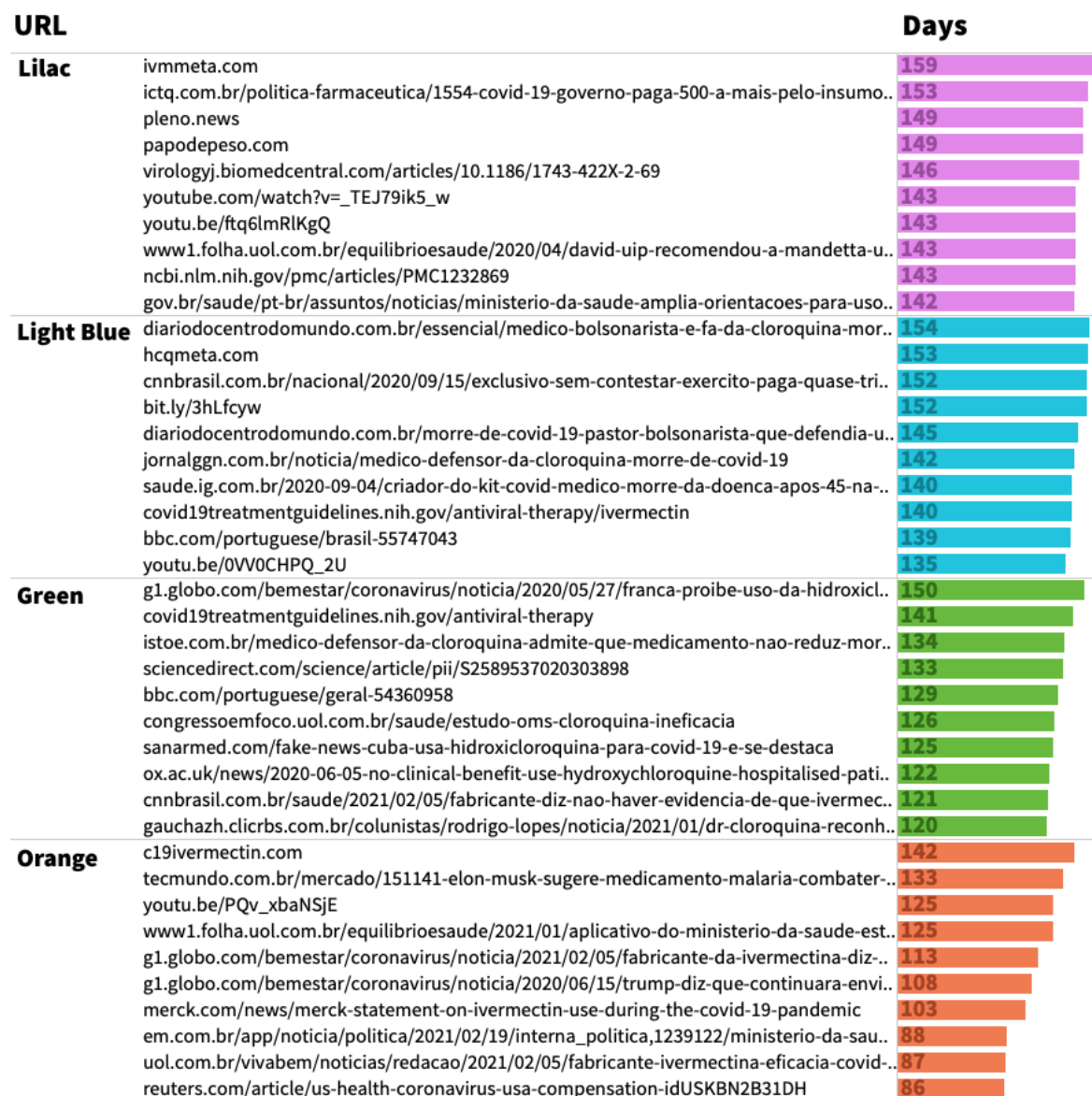
<sup>11</sup> See in: <https://www.reuters.com/article/uk-factcheck-chloroquine-sars-covid-19-idUSKCN2512A7>.

<sup>12</sup> See in: <https://apublica.org/2020/08/grupo-de-midia-evangelica-que-pertence-a-senador-bolsonarista-e-um-dos-que-mais-dissemina-desinformacao-afirmam-pesquisadores/>.



**Figure 5 – Lifespan (in Days) of URLs with Scientific Claims on Twitter**

Analysis period: January 1st to May 30th, 2021



Source: Twitter | Elaborated by: FGV DAPP

The list of URLs by lifespan (in days) can be seen on Figure 5. Other three links with presence on the Light Blue cluster are among those who accumulated more average lifespan. On the top, there is the link *diariodocentrodomundo.com.br*, a news channel that editorially aligned with the left wing, with a news story that a doctor who defended the early treatment against Covid-19 and who criticized the WHO died from Covid-19, a fact

that was disclosed by other mediums<sup>13</sup>. Next, there is the page *ictq.com.br*, from the Institute of Science, Technology and Quality, an institution of higher education who specializes in the pharmaceutical market and who is accredited to the Ministry of Education<sup>14</sup>. The last URL that most lasted on the Light Blue cluster was *istoe.com.br*, a traditional weekly magazine who notified the death of a pastor and activist for the early treatment. Among the ten URLs, there is still one of the Green cluster, from the news channel *g1.globo.com*, regarding the prohibition of the use of the hydroxychloroquine drug in countries such as France and Italy. Among the most lasting URLs, those who are the source of contradictions and claims refuted by the scientific community were therefore present only in the Lilac cluster.

### 3) Analysis of Predominance of Domains

This section investigates the pattern of sharing of informative sources of the clusters identified in the map of interactions. For that, we cross examined the domains with the sharing of the clusters. Among the publications that made scientific claims in the debate on Covid-19, we identified 1156 domains that generated around 300 thousand mentions, responses and retweets.

The first analysis realized uses a metric of exclusivity/predominance of the domains shared by profiles of each cluster. We use, alongside the idea of exclusivity, the proposal of predominance, because the clusters can share domains with whom they disagree, in posts that criticize them. Therefore, a domain was defined as exclusive/predominant when it obtained 90% of its shares in just one cluster<sup>15</sup>.

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<sup>13</sup> See in:

<https://www.correiobraziliense.com.br/brasil/2021/01/4898512-medico-que-defendia-cloroquina-e-criticava-oms-morre-de-covid-19.html>. Access in jul. 2021.

<sup>14</sup> See in:

<https://emec.mec.gov.br/emec/consulta-cadastro/detalhes-ies/d96957f455f6405d14c6542552b0f6eb/MTk5MDk=>. Access in jul. 2021.

<sup>15</sup> Domains that were shared just once were not taken into consideration.

**Figure 6 – Exclusive/Predominant Domains by Cluster**

Analysis period: January 1st to May 31st, 2021

Cluster	Exclusive/Predominant	# of Domains	%
Lilac	328	743	44
Green	35	461	8
Orange	8	291	3
Light Blue	234	749	31

Source: Twitter | Elaborated by: FGV DAPP

In Figure 6, we observe that the Lilac and Light Blue clusters present the most variety of distinct domains, with little more than 740 unique domains. These clusters are also the ones who presented the largest number of exclusive/predominant domains, with 44% and 31%, respectively. The Green and Orange clusters, besides presenting a lower number of shared domains (461 and 291, respectively) also obtained a very low rate of exclusive/predominant domains.

This data helps to better understand the dynamics established by the clusters identified in the analysis. The Lilac group is presented as the most isolated in relation to the informative sources, which converges with the observation realized in the previous section, which refers to the strong presence of hyperpartisan websites among its links with most mentions, responses and retweets. The presence of vehicles of the traditional press, which is increasingly intensified throughout the groups Light Blue and Green to Orange, seems to relate to a more integrated pattern in relation to the more usual sources of information in the political discussion.

Still exploring the relation between exclusivity/predominance and the integration of domains shared by the clusters, we analyzed the domains that were shared between all of the clusters. Of the 1156 identified domains, only 156 were shared at least once among all of the clusters, and, from these, more than 50% of the domains re from vehicles from the traditional press.

In this list of shared domains among all of the clusters, 14 domains from scientific magazines and international sanitary authorities are found. Figure 6 shows the distribution of sharing of these domains by cluster.

**Figure 7 – Distribution of Sharing of Domains of Magazines and International Scientific Authorities by Cluster**

Analysis period: January 1st to May 31st, 2021

<b>Domains</b>	<b>Lilac</b>	<b>Green</b>	<b>Orange</b>	<b>Light Blue</b>
medrxiv.org	82%	4%	4%	11%
sciencedirect.com	77%	14%	5%	5%
who.int	68%	8%	4%	20%
amjmed.com	67%	13%	8%	13%
thelancet.com	62%	17%	7%	14%
ncbi.nlm.nih.gov	61%	12%	2%	24%
covidtreatmentguidelines.nih.gov	29%	18%	18%	35%
nejm.org	25%	45%	10%	20%
nature.com	25%	28%	12%	35%
papers.ssrn.com	17%	33%	17%	33%
infarmed.pt	14%	21%	14%	50%
merck.com	9%	21%	20%	50%
jamanetwork.com	8%	48%	12%	32%
fda.gov	6%	50%	9%	36%

Source: Twitter | Elaborated by: FGV DAPP

It is worth noting that the Lilac group, which presented topical patterns and more peculiar dynamics of interaction, is also highlighted as the cluster that gathered the largest part of sharing more times than the others (in six of the fourteen cases), and that also obtained the largest percentage of sharing of the cases, oscillating between 82% and 61% of concentration, while the other clusters added, at most, 50%. Despite having been

identified as clusters with influence of epidemiologists and researchers, the Green and Orange groups did not obtain a higher presence in the sharing of international scientific domains.

The data gathered throughout the study show a picture in which the Lilac group is marked by i) a higher endogeny regarding the informative sources; ii) by the higher lifespan of shared links; iii) by posts focused in scientifically confirm the efficacy of medicine associated to the early treatment; iv) for having domains and links originated in websites of the alternative, hyperpartisan media among the most shared URLs; v) by the presence of pseudoscientific websites, which have made claims proven false by projects of fact-checking, by journalism in general and by people from the stablished scientific community.

By analyzing them together, these findings allows us to infer that the use of websites from magazines and presumably scientific international authorities served to base the dissemination of perspectives on the Covid-19 pandemic that did not go through the informative filters of the traditional press and by the screen of the stablished scientific community. The circulation of news that made mentions to supposed episodes of success in the use of the early treatment in other countries, through hyperpartisan or pseudoscientific websites, corroborates the argument that this group is constituted actively around their own ecosystem of information, grounded on the direct selection of sources and allegedly scientific international reports. However, as we saw in the second and third section of the document, the logics of organization of the scientific field operated through very distinct codes of those who organized the public debate, especially the digital one. Therefore, a scenario is created in which the scientific claims become input in the disputes between the mediations with different degrees of compromise with its logic of functioning.

## CONCLUSIONS

The study continues the efforts to investigate how the public debated around discourses that mobilize the scientific statute mediated by platforms of social media in the context of the Covid-19 pandemic happened in Brazil. From January 1st to May 31st of 2021, we analyzed a corpus that gathered more than 3 million posts on Twitter, encompassing more than 42 thousand links, the focus of analysis in the study. Generally, it was possible to observe that the scientific claims had been strongly directed towards the topics of early treatment against Covid-19, more specifically, the debate was marked by stances that were either favorable or against to the use of drugs of the early treatment, with the sanitary measures and vaccination being topics that were tackled peripherally. The data confirm, yet, the predominance of profiles and groups aligned with the federal government, in presence and engagement. This segment recurs to arguments allegedly scientific in order to validate and defend treatments and medications repeatedly refuted by the scientific community. The expressive presence of channels of the hyperpartisan media — frequently pointed out as responsible by the circulation of deceitful information — reinforces the emphasis in the political dispute around the topic. Furthermore, the links originated in scientific magazines, when mobilized, barely follow the nexus that reigns the scientific field, or are originated in pseudoscientific websites, being constantly proven false by the press and stablished scientific institutes. In the other observed groups, the dispute around the topics also remains predominantly limited by sources that take political-partisan stances, such as when informative channels of the left or right-wing fields, which have loyal audiences, mobilize a criticism to the federal government or to the conspiracy theories. Also, it is highlighted the isolation of informative sources mobilized in the distinct groups, indicating that the information circulates very restrictively in specific groups — this endogenous characteristic is specially noted in the community that defends the efficacy of the early treatment, but also in the left-wing cluster. Thus, it is possible to understand that the claims of scientific legitimacy were incorporated in the discursive dispute that characterized the political scenario of the country, but it manifests itself

particularly around a dissonant cluster that denies the scientific knowledge established to defend the cause of the early treatment.

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