

# SCIENCE HEALTH (DIS)INFORMATION ABOUT COVID-19 ON BRAZILIAN TWITTER (X):

a preliminary analysis

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**Eixo temático:** Altimetria e Webometria

**Modalidade:** Resumo expandido

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**Abstract:** During the COVID-19 pandemic, science communication was a weapon to cause distrust toward public health. Therefore, this work aims to produce an instrument capable of categorizing tweets related to COVID-19 in different Brazilian communities of attention networks. The methodology consisted of creating a categorization tool through a Systematic Literature Review, the collection and clusterization of the publications and their tweets, and, finally, the instrument's test with a random sample. Hence, 21 categories embrace two axes. Most contributions were for Prevention, Treatment, Anti-science discourse, and Conspiracy theories. However, the sample revealed more engagement with Treatment, mentions of Authorities, and Anti-science discourse.

**Keywords:** Health disinformation. COVID-19. Science communication. Twitter (X).

## 1 INTRODUCTION

The COVID-19 pandemic has brought a state of uncertainty about the veracity and quality of the large mass of information produced and disseminated, called infodemic by the World Health Organization. Hence, social media — business models based on user attention and algorithms — has been the key source of circulation, dispute, and appropriation of information about the coronavirus, as well as the spread of disinformation, fake news, and hate speech (Pereira; Continguiaba, 2023; Recuero; Soares, 2021).

Several studies have identified disinformative content and their engagement on the web concerning the pandemic: its themes, the actors involved (including authorities), and the use of links, videos and images with anti-science discourse and conspiratory theories (Araújo; Oliveira, 2020; Bastani *et al.*, 2021; Gehrke; Benetti, 2021; Oliveira, 2020; Recuero *et al.*, 2021; Reis; Alves, 2022; Rossini; Kalogeropoulos, 2021; Santiago; Araújo, 2023). The result is the creation of a narrative against a common enemy — traditional media, public and research institutions, opposite parties — that wants to deceive and profit.

However, while attacking science, scholarly communication also has been produced and shared as a form of politicization and conversion of the people (Berg, 2023). As Araújo and Oliveira (2020, p. 202, our translation) emphasize in their study: “[...] the values of scientific authority are activated in a process of appropriation of scientific discourses to propagate information that corroborates their own arguments or confirmation bias, [...]”.

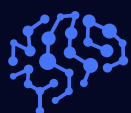
Thence, in this conflict papers, scientists, politicians, journalists, and science journals were used and, at other times, purposely validated misinterpreted data or inconclusive studies challenging and denying recommendations of public health institutions and international organizations as a way of justifying the non-adoption of social isolation and lockdown.. “[...] the populism of leaders in countries such as Brazil [...], together with the denial of scientific progress and the decontextualized defense of individual freedoms, typical of a neoliberal market, politicized the use of chloroquine [...]” (Caponi *et al.*, 2021, p. 85, our translation).

In the context of altmetrics studies, as a field is interested in the attention, circulation, and interaction of scientific information on the social web, these aspects should be considered since they can contribute to a better understanding of what practices and actions corroborate alternative metrics. On this basis, the primary question of this paper is: how are the networks of communities of attention in Brazil configured around health research about COVID-19 shared on social web sources?

Wherefore, this work aims to produce and propose a tool — using a Systematic Literature Review (SRL) — capable of categorizing science communication on Twitter (X) related to COVID-19 (dis)information of different Brazilian communities of attention: their indicators and interactions.

## 2 METHODOLOGY

The research consisted of three stages. The first — carried out in December 2022 — was the identification of publications about COVID-19. Thus, the descriptors “coronavirus”, “SARS-CoV-2”, “COVID-19”,



and “2019nCoV” were searched in Dimensions. With these, through Altmetric Explorer, the DOI list was imported and filtered by mentions only on Twitter (X) from accounts in Brazil between 2020 and 2022. Then, through Twitter(X)’s API, user, and tweet information were retrieved to obtain descriptions and complete tweets. At last, Gephi analyzed and clustered the mass of tweets in 236 clusters.

The second — carried out from June 2023 to January 2024 — was a SRL to create the instrument. Therefore, the terms “health misinformation” AND “COVID-19” AND “social media” — present in the abstract and title — were used to retrieve all open-access articles and preprints in Dimensions produced between 2020 and 2023, which resulted in a total of 1,083 publications. Of these, 80 were extracted and analyzed in search of categories and their descriptions or, at the very least, examples.

The third stage — executed from January to February 2024 — was a preliminary analysis and classification with Google Sheets of a random sample of 1,786 tweets from the larger cluster — which contains 79,948 tweets — representing around 2.25%. With the removal of repeats and errors, the test handled 501 tweets related to 203 papers — from a total of 2,068 publications, corresponding approximately to 9.8%.

### 3 RESULTS AND DISCUSSION

For SLR, 19 articles met the criteria, which gave 118 categories in total. Of these, the aggregation of 113 formed 20 proposals. Table 1 systematizes the research contributions and provides an overview of how studies about COVID-19 misinformation on social media are categorized based on two axes of analysis: publication themes and tweets content.

As seen, Bastani *et al.* (2021) provided the majority of subsidies for the production, especially the publication themes. Regarding the first ax, Prevention and Treatment had the most contributions. Meanwhile, in the second one, Conspiracy theories and Anti-science discourse presented the preponderance of theoretical basis.

**Table 1** — SLR of the articles with categories

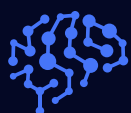
		Bastani <i>et al.</i> (2021)	Berdida <i>et al.</i> (2022)	Chen <i>et al.</i> (2021)	Chen <i>et al.</i> (2022)	Chlipidza <i>et al.</i> (2021)	Chong <i>et al.</i> (2022)	Gabarron; Oyeveni; Wynn (2021)	Geronikolou; Chrousos (2021)	Gerts <i>et al.</i> (2021)	Hughes <i>et al.</i> (2021)	Kalichman <i>et al.</i> (2021)	Lee <i>et al.</i> (2023)	Osborne <i>et al.</i> (2022)	Pickles <i>et al.</i> (2021)	Sahana Sule <i>et al.</i> (2023)	Skafle <i>et al.</i> (2022)	Theivendrapillai <i>et al.</i> (2023)	Ugarte; Young (2023)	Yang <i>et al.</i> (2021)
Publication theme	Prevention																			
	Protection and mitigation strategies																			
	Vaccine side effects																			
	Treatment																			
	Nature																			
	Pathology																			
	Transmission																			
	Epidemic forecast																			
	Epidemiology																			
	Diagnosis																			
Tweet content	Conspiracy theories																			
	Religious discourse																			
	Sarcasm																			
	Extremism																			
	Authority																			
	Informative tweets																			
	Question																			
	Socioeconomic impacts																			
	Anti-science discourse																			
	Anti-vaccine movement																			

**Source:** The authors (2024).

However, during the tweet content analysis, it was necessary to create another category — called Other — covering tweets with sharing intentions. Table 2 presents the proposed tool with category descriptions and its validation with a random sample. There were no quantity limitations on the application of the categories.

**Table 2** — Instrument of categorization and test with a random sample

Category	Description	Articles	Tweets
Treatment	Treatment efforts and remedies to treat and cure, and the development of the vaccines. Recommendations for consuming unconfirmed herbal treatments and poisonous substances, diets, and consumption of daily supplements.	53	178
Vaccine side effects	Concerns about potential safety aspects: vaccines are harmful, cause infertility, chronic illness, changes in DNA, physical deformities, mental illness. Vaccine-induced infections and deaths.	76	171



Category	Description	Articles	Tweets
Prevention	Health caution and advice terms. Vaccine effectiveness and hesitancy. No need for other doses or boosters of the vaccine. Development of trained or herd immunity. Recommendations for consuming unconfirmed herbal treatments and poisonous substances, diets, and consumption of daily supplements.	27	59
Protection and mitigation strategies	Prevention's subcategory. Control, mitigation and management strategies, including: quarantine, mask-wearing, social distancing, travel restrictions, and healthcare system's capabilities for confronting the disease.	19	46
Epidemiology	Incidence, prevalence, mortality, inpatient and recovery rates, predicting the future trends. Severity of the disease and risk factors.	14	23
Nature	Descriptions or claims about the source of the virus; its living context, structure, the periodic and seasonal behavior.	6	17
Diagnosis	COVID-19 assessment through symptoms, test results and radiological features. Symptoms, clinical signs, prognosis, the cycle of the disease and commune period, and the disease side effects. Diagnosis methods.	9	11
Transmission	Characteristics and modes of COVID-19 transmission.	6	7
Epidemicforecast	The estimation on the trend of COVID-19 spread and related modeling approach.	1	5
Pathology	Nature's subcategory. Mutations and variants of SARS-CoV-2.	1	1
Authority	Political, public, research and communication entities. Use as scientific validation, attacks, and/or sharing.	107	221
Anti-science discourse	Rejection of science and the scientific method. Fake experiences of patients or healthcare providers. Misinterpreted data and inconclusive scientific results as facts. Use of survivorship bias and downplaying.	80	164
Anti-vaccine movement	Anti-science discourse's subcategory. Movement that sees vaccines as a threat to the freedom of expression, useless or unnatural.	72	129
Other	Tweets with only the link of the publication, its title and link, sharing intentions, and/or reactions (e.g. MEU DEUS! <a href="https://t.co/30sTtigmEx">https://t.co/30sTtigmEx</a> ).	53	83
Conspiracy theories	Sinister, technology-related (5G, microchip), and/or man-made origins of the disease. Secret societies and hidden power structures (e.g. China, corrupt elites, traditional media, Big Pharma, general depopulation).	26	46

Category	Description	Articles	Tweets
Extremism	Distrust in state and international institutions, and democratic decision-making processes. Besides, distrust in public policies recommended by health institutions. The legitimization of the use of violence. Anti-communism and anti-press discourse.	20	38
Sarcasm	Sarcastic rhetoric, and aggressive statements.	21	29
Informative tweets	Tweets disseminating scientific results following health recommendations, verified and proven studies, and specific events.	15	17
Socioeconomic impacts	Impacts on the economy and everyday life, implications on specific populations, local impacts within hospitals, schools, work, home. Revenues for companies due to unemployment, famine, economic downturn, bankruptcy, and efforts of government funding.	2	2
Religious discourse	Use of religious expressions, especially Christians. Fake religious or traditional narratives about the disease and its mechanism. Association of the disease with divine punishment.	2	2
Question	Questions about the disease, therapeutic and preventive methods, its characteristics, spread, symptoms, and other information.	1	1
TOTAL:		203	501

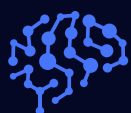
**Source:** The authors (2024).

As seen, themes involving alternative treatments possess the highest engagement. On the other hand, those covering the supposed side effects of the vaccines are higher in number but have almost the same engagement as Treatment. Regarding the content of the tweets, those mentioning authorities, anti-science discourse, and anti-vaccine movement are prominent.

Thus, the fact that the categories Prevention and Conspiracy theories did not feature so strongly in the tweets shows how, in Brazil, the concern of users was to validate and share supposed treatments and cures for the disease — hydroxychloroquine, ivermectin, azithromycin — without the need for other preventive methods. Discourses that line with the policy adopted by the Bolsonaro government and its “kit Covid” health agenda.

As a way of discrediting and labeling the vaccines as dangerous, it was the target of studies claiming that people died or contracted other diseases after taking them, especially children, as a way of appealing to the emotional. Another highlight was the experimental nature of the vaccines, which brought the association with unethical human experiments, scenarios also observed by Pereira and Cotinguiba (2023).

Another relevant issue is that almost half of the tweets featured mentions of authorities validating, sharing, or attacking them. The US company Pfizer was the most attacked because of the supposed side effects involving its vaccine content. Concerning prestigious journals, the British Medical Journal and The Lancet were the most mentioned since their published studies were associated with health disinform-



mation. As for public figures, former president Jair Bolsonaro was the most cited, and users appropriated science communications to back his claims.

## 4 CONCLUSIONS

Therefore, science is a weapon in this information war exploited to cause distrust, noncompliance, and even hatred toward public health and, consequently, fundamental rights. Consequently, COVID-19 didn't disappear, people aren't using masks or isolating, and vaccines are seen as ineffective, which caused a chain reaction for other diseases previously eradicated in Brazil, such as polio, or even the rise in dengue cases and use of the same conspiratorial and extremist discourse about the recently developed vaccine.

Overall, the instrument efficiently covered both the tweets and publications investigated. Moreover, the unlimited number of categories applied opens up the scope for further studies, for example, "How many anti-science tweets mentioned authorities? Or used extremist narratives?". On that account, this proposal, when settled, may be helpful in other research that analyzes interactions with publications about other diseases on social media.

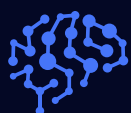
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