

Impacts of the infodemic on COVID-19 for Brazilian health professionals

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Abstract This article aims to analyze the effects of the COVID-19 infodemic from the perspective of Brazilian health workers regarding the patients, measure the impacts of fake news on health professionals, and verify the perception of health multidisciplinary teams regarding the authorities' stance. This cross-sectional study is nested in the research "Health Professionals' Working Conditions in the Brazilian Context of COVID-19". The nationwide non-probability sampling included 15,132 professionals who worked in the COVID-19 frontline in health institutions of 2,200 Brazilian municipalities. Approximately 91% of respondents believed that fake news is an obstacle in fighting the SARS-CoV-2 virus; 76.1% declared they had seen patients who expressed faith in fake news about COVID-19; 29.3% agreed that the health authorities' stance about COVID-19 was consistent and enlightening, and 62.6% disagreed about this. The respondents believe that the COVID-19 infodemic confused patients, impaired adherence to PHC measures, and stirred people's negative behavior vis-à-vis the pandemic. The lack of clarity of the authorities' stance influenced the COVID-19 infodemic process.

Key words Infodemic, Pandemics, Fake news, COVID-19, Working conditions

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Introduction

Human history is marked by pandemics, crises, instabilities, and, consequently, manipulations, lies, falsehoods, and self-declarations that do not sustain themselves over time but harm while they occur. Leaders, politicians, and retinues lie about adversaries, create nonexistent problems, publicize false progress, and flaunt fictitious accomplishments. The positions adopted by ostensive strands can be generally classified as misinformation, disinformation, and mal-information¹. Contemporaneously, they can also be classified as fake news, that is, false news. Regarding this study, it is specifically false content created deliberately and intentionally to the detriment of scientific evidence to manipulate, deceive, and change the status of public opinion for political, economic, or ideological reasons².

Above all, the dispute over communication hegemony is as old as humanity. However, it gained even more poignant contours from the popularization of cell phones, the Internet, social networks, and instant messaging applications, which are currently used by most people³, and is even the primary source of information⁴.

Assuming this hyperconnectivity and its effects, in 1970, Alvin Toffler coined the term “information overload” to designate situations in which people or groups would receive higher volumes of information than they can process and assimilate. The concept argues that exposure to many results on a specific subject would lead to cognitive overload, which, in turn, would hinder or even prevent proper decision-making at critical moments⁵.

Years passed, and Toffler’s observation materialized, as can be seen empirically. As the World Wide Web evolved, the Internet, social networks, and applications delivered increasingly more data and information to users, revealing informational excess, which, paradoxically, led people and communities to misinformation, confusion, anguish, and impotence. This situation has become a severe issue for public health since the fiction on screens is a web of misinformation and has started to undermine the decision-making process and people’s adherence to interventions, treatments, medicines, and simple health measures.

Faced with this reality, Gunther Eysenbach (2002) proposes to establish infodemiology as a discipline and research methodology, as a kind of epidemiology of (mis)information in health, to study the phenomenon, identify knowledge gaps,

mark highly qualified contents and help users to obtain quality information on the Internet^{6,7}. The concept of infodemic is born from infodemiology, which means the exponential increase in (accurate or not) information on a given health issue in a short period caused by a specific event, which hampers the retrieval of reputable sources and reliable guidelines when this is necessary to protect oneself and the community⁸.

As is known, currently, infodemics are strongly amplified by social networks and instant messaging applications, spreading rapidly like a highly contagious and lethal virus⁹. This is precisely what happened when the disease caused by the new coronavirus (COVID-19; subject) reached pandemic status (specific event). To portray the situation, 361 million videos, 19,200 articles, and 550 million tweets were published on the Internet in March 2020 alone with the terms *coronavirus*, *corona virus*, *covid19*, *COVID-19*, *covid_19*, or *pandemic*⁸.

The event’s impact and, especially, the fake news on the subject could be identified in Brazil after the infodemic COVID-19 was officially declared. A survey of 329 false news regarding SARS-CoV-2, verified by the fact-checking services of Portal G1 and the Ministry of Health from January 1 to June 30, 2020, confirmed that fake news about COVID-19 released in the first six months of the pandemic is characterized by political positioning content, misinformation about infections and deaths, and ineffective measures to prevent and treat the disease. In the fact-checking period, data from Google Trends evidenced an increase of 34.3% in the search for terms identified in the fake news examined by the two agencies¹⁰.

According to a survey by the Oswaldo Cruz Foundation (Fiocruz)¹¹ conducted from April 11 to May 13, 2020, 24.6% of the fake news about COVID-19 that circulated on social networks and messaging apps at the time claimed that the disease was a political strategy, 10.1% taught home methods to prevent new coronavirus infection, 10.1% advocated the use of chloroquine and hydroxychloroquine as treatment, and 7.2% argued against social distancing policies.

The most significant fake news conveyed by highly engaged profiles with deleterious effects on Brazilian public health was that vaccines against COVID-19 alter human DNA¹², lockdown does not work, messenger mRNA vaccine has a chip, chloroquine is effective in treating COVID, ivermectin and azithromycin are effective against COVID, and mask reduces body oxygenation.

In June 2021, amid the chaos of misinformation prevailing on online social networks and messaging apps¹³ when Brazil reached 508,000 deaths recorded by COVID-19, research indicated that 400,000 of these deaths could have been avoided had there been official clarification campaigns without prevailing widespread misinformation about the use of masks, social distancing, medication, and vaccines.

Given this context and evidence, the present study aimed to analyze the effects of the COVID-19-related infodemic from the perspective of Brazilian health workers regarding the patients, measuring the impacts of fake news for professionals who worked on the pandemic-coping frontline and verify the perception of professionals of the multidisciplinary health teams vis-à-vis the stance of the authorities on the subject.

Methods

This exploratory, cross-sectional, quantitative nationwide study with non-probabilistic sampling counted on the participation of 15,132 professionals from 14 health professions who worked on the COVID-19 pandemic-coping frontlines in public and private health institutions from 2,200 municipalities across the country.

Regarding the infodemic study, the questionnaire contained three assertions among other questions: "Fake news in health is an obstacle in the fight against the new coronavirus"; "I attended a patient who believed in fake news about COVID-19"; and "Health authorities' positions on COVID-19 have been consistent and enlightening". Respondents had the following response options: Agree, Disagree, Neither agree nor disagree, or Did not respond.

The data are included in the survey "Health Professionals' Working Conditions in the Brazilian Context of COVID-19"¹⁴ conducted by the Center for Strategic Studies (CEE) of the Oswaldo Cruz Foundation (Fiocruz) (seem number 4.081.914, CAAE number 32351620.1.0000.5240). They were transcribed into a spreadsheet and tabulated using the descriptive statistics of the variables, where mean, median and standard deviation were analyzed. The results were presented in boxes and tables.

The research database was established from the online questionnaire, applied between June and December 2020, based on closed-ended questions, computed on the Research Electronic Data Capture (RedCap) platform and stored on

the server of the Institute of Scientific and Technological Communication and Information in Health (ICICT) by Fiocruz. The computer programs used to generate the statistical data were Excel and Microsoft SQL Server. The research was disseminated through social networks and institutional contacts through national and regional entities that gather health workers.

The cross-sectional design allowed for obtaining reliable data from reality, which led to trustworthy, robust, and hypothesis-generating conclusions. These conclusions can be investigated in even more advanced research based on the picture of variables found at a given time¹⁵ regarding the excerpt this article proposed to explore, with a 5% error margin and 95% confidence level.

The research adopted the non-probabilistic snowball sampling method, which uses the social networks of the stakeholders involved to access the study's community target audience so that the choice of participants did not follow a random model nor statistical control of the studied population's representativity. The applied questionnaire was self-completed and freely disseminated.

Results

Most of the professionals who participated in the study were female (77.6%), and 82.4% were aged up to 50. Regarding ethnicity/skin color, 57.7% of professionals declared themselves white and 33.9% brown. As observed in Table 1, nurses (58.85%), professionals from the Southeast (38.10%), and who worked in public hospitals (34.50%) prevailed. Within the possible range, these rates statistically represent the composition of the Brazilian population and the multidisciplinary health teams that work in the country.

Most of the 15,132 professionals who participated in the study agree that "Fake news in health is an obstacle in the fight against the new coronavirus" (91.62%), and most of professionals assisted patients who believed in fake news about COVID-19 (76.05%). On the other hand, most professionals disagree that the health authorities' stance on COVID-19 was consistent and enlightening (62.62%). See the data summarized in Figure 1, presented below, according to the three assertions allocated to the respondents.

The professionals' agreement index for the study's assertions was similar across different Brazilian regions, higher for Assertion 1 ("Fake

Table 1. Sociodemographic profile of the surveyed public. Brazil, 2021.

Variables	n (%)
Profession	
Nurses	8,905 (58.85)
Doctors	3,424 (22.63)
Physical therapists/occupational therapists	864 (5.71)
Dentists	816 (5.39)
Psychologists	241 (1.59)
Pharmacists/Biochemists	239 (1.58)
Social workers	231 (1.53)
Nutritionists	95 (0.63)
Hospital managers	58 (0.38)
Speech therapists	50 (0.33)
Biomedical scientists	26 (0.17)
Physical educators	24 (0.16)
Biologists	20 (0.13)
Veterinarians	10 (0.07)
Engineers (Work safety. Hygienist)	5 (0.03)
Undergraduates (Medicine, Nursing, and others)	124 (0.82)
Region	
North	1,831 (12.10)
Northeast	3,738 (24.70)
Southeast	5,765 (38.10)
South	2,255 (14.90)
Midwest	1,543 (10.20)
Professionals by type of establishment	
Public hospital	5,221 (34.50)
Primary Health Care Units	3,889 (25.70)
Private Hospital	1,695 (11.20)
Polyclinic/Clinic/Specialized Center	847 (5.60)
Non-profit hospital	757 (5.00)
Emergency Service Units	757 (5.00)
Field hospital	469 (3.10)
General administration	363 (2.40)
Emergency mobile care service	257 (1.70)
Remote care	212 (1.40)
Private office	151 (1.00)
Therapeutic Diagnostic Support Service	91 (0.60)
Education and research institution	76 (0.50)
Trade/industry	61 (0.40)
Long-term care facility	45 (0.30)
Prison system (socio-educational system)	30 (0.20)
Military/security area	15 (0.10)
Pharmacy/grugstore	15 (0.10)
Oil industry	10 (0.07)
Auditing/expert	12 (0.08)
Self-employed	07 (0.05)
Other	61 (0.40)
Did not respond	91 (0.60)

Source: Special tabulations created for this number theme based on the research "Working Conditions of Health Professionals in the Context of COVID-19 in Brazil" - ENSP-CEE/Fiocruz, 2020/2021.

news in health is an obstacle in the fight against the new coronavirus") and lower for Assertion 3 ("Health authorities' positions on COVID-19 have been consistent and enlightening) (Table 2).

As for the first statement, the difference between the highest and lowest percentage among all regions surveyed was only 1.7%. On the other hand, while 24.1% of professionals in the Southeast agreed that the health authorities' positions on COVID-19 were consistent and enlightening, the rate of agreement with this statement reached 37.2% in the North. In the North, 71.7% said they had seen patients who believed in fake news about COVID-19. The rate of health workers who agreed with this statement reached 78% in the South (Table 2).

We should emphasize that professionals showed a higher disagreement rate for Assertion 3 in all Brazilian regions. The rate of professionals who disagreed that, in Brazil, the positions of health authorities on COVID-19 were consistent and enlightening are, respectively, Southeast (68.4%), South (65.5%), Midwest (64.3%), Northeast (55.7%), and North (53.7%) (Table 2).

Regarding Assertion 1, we observed that the professionals who most agree that false health news is an obstacle in the fight against the new coronavirus are women (71.23%), aged 36-50 years (39.83%), and white (52.96%) (Table 3).

In Assertion 2, professionals who said they had seen patients who believed in fake news about COVID-19 were also predominantly female (59.13%), in the 36-50 age group (32.74%), and white (44.58%) (Table 4).

In Assertion 3, we observed that most professionals believe that the health authorities' positions on COVID-19 need to be more consistent and enlightening. Regarding negative responses to this statement (disagree), most professionals were female (48.14%), aged 36-50 years (27.60%), and white (37.91%) (Table 5).

Nursing and medicine correspond to 81.48% of the surveyed public. Comparing the opinions of these two categories reveals noteworthy differences and similarities regarding the research topics. While both professions respond similarly regarding Assertion 1, we observed differences concerning the other questions in the survey: 82.4% of medical professionals state that they have treated patients who believed in fake news about COVID-19 since 74.1% of nursing professionals confirm this assertion. On the other hand, 18.3% of medical professionals agree that the health authorities' positions regarding the disease were consistent and enlightening, while

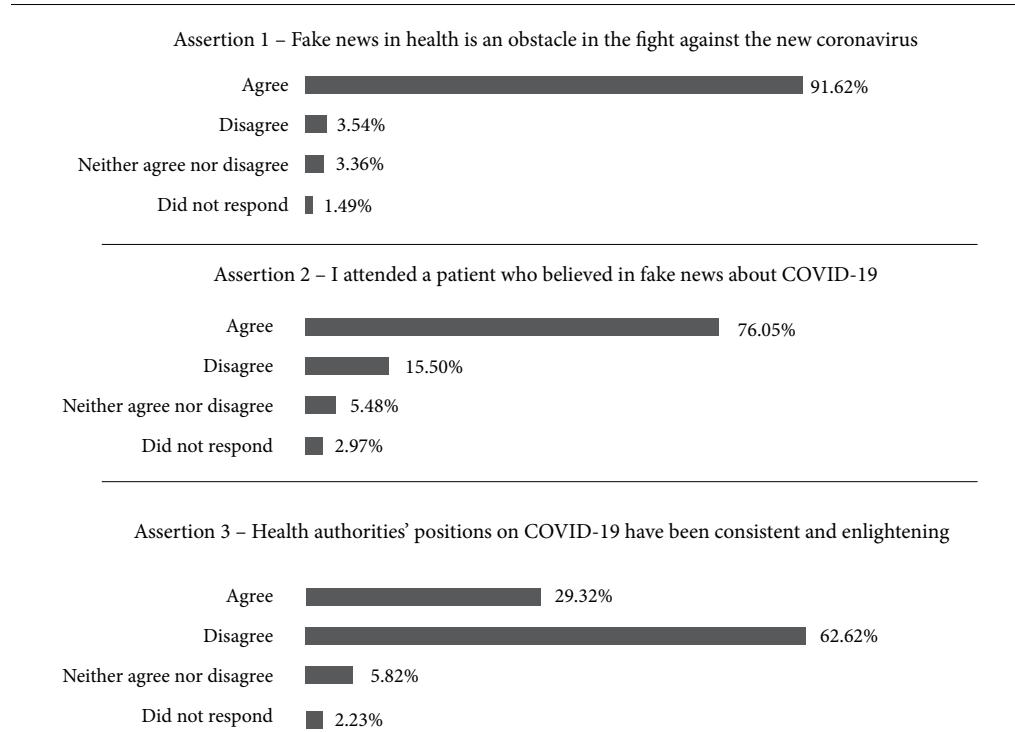


Figure 1. Distribution of health professionals' responses to assertions related to the infodemic about COVID-19. Brazil, 2021.

Source: Special tabulations created for this number theme based on the research "Working Conditions of Health Professionals in the Context of COVID-19 in Brazil" - ENSP-CEE/Fiocruz, 2020/2021.

32.4% of nurses corroborate this statement (Table 6).

Discussion

The research results explored in this article portray the disinformation environment around Brazil's fight against the COVID-19 pandemic. Approximately 91.62% of the 15,132 health professionals interviewed nationwide said fake health news prevented combating the new coronavirus. Only 3.54% disagreed with this statement. The impacts of this perception on fake news are noticeable, as 76.05% of health professionals reported having seen patients who believed in fake news about COVID-19. We observed that 15.50% said they had not identified this behavior, which is increasingly present in society. Furthermore, 62.63% of health professionals state that the health author-

ties' positions on COVID-19 needed to be more consistent and enlightening.

The researched setting was conducive to the deleterious effects of the infodemic, and the authorities significantly contributed to the informational chaos that settled in Brazil after the pandemic. Only 29.32% of Brazilian health professionals who responded to the survey's questionnaire agree that the health authorities' positions on COVID-19 were consistent and enlightening, which indicates, among other things, that when deniers hold positions of power, authorities deny scientific consensus, ignore human rights, and drive citizens to irrationality and death¹⁶.

The results of this study allow us to observe relevant regional similarities and disparities. The feeling that fake news is an obstacle to facing the pandemic is uniform and practically consensual across the country. However, significant dif-

Table 2. Distribution of the number of health professionals for the answers to the assertions related to the infodemic about COVID-19, by geographic region. Brazil, 2021.

North ¹	Agree		Disagree		Neither agree nor disagree		Did not respond		Total	
	n	%	n	%	n	%	n	%	n	%
Fake news in health is an obstacle in the fight against the new coronavirus.	1,656	90.5	73	4.0	62	3.4	39	2.1	1,830	100
I attended a patient who believed in fake news about COVID-19.	1,313	71.7	343	18.7	107	5.8	67	3.7	1,830	100
Health authorities' positions on COVID-19 have been consistent and enlightening.	681	37.2	982	53.7	115	6.3	52	2.8	1,830	100
Northeast ²	Agree		Disagree		Neither agree nor disagree		Did not respond		Total	
	n	%	n	%	n	%	n	%	n	%
Fake news in health is an obstacle in the fight against the new coronavirus.	3,439	92.2	131	3.5	105	2.8	56	1.5	3,731	100
I attended a patient who believed in fake news about COVID-19.	2,779	74.5	619	16.6	207	5.5	126	3.4	3,731	100
Health authorities' positions on COVID-19 have been consistent and enlightening.	1,345	36.0	2,078	55.7	214	5.7	94	2.5	3,731	100
Midwest ³	Agree		Disagree		Neither agree nor disagree		Did not respond		Total	
	n	%	n	%	n	%	n	%	n	%
Fake news in health is an obstacle in the fight against the new coronavirus.	1,405	91.4	56	3.6	63	4.1	14	0.9	1,538	100
I attended a patient who believed in fake news about COVID-19.	1,175	76.4	231	15.0	89	5.8	43	2.8	1,538	100
Health authorities' positions on COVID-19 have been consistent and enlightening.	434	28.2	989	64.3	85	5.5	30	2.0	1,538	100
Southeast ⁴	Agree		Disagree		Neither agree nor disagree		Did not respond		Total	
	n	%	n	%	n	%	n	%	n	%
Fake news in health is an obstacle in the fight against the new coronavirus.	5,287	91.7	206	3.6	191	3.3	83	1.4	5,767	100
I attended a patient who believed in fake news about COVID-19.	4,476	77.6	834	14.5	302	5.2	155	2.7	5,767	100
Health authorities' positions on COVID-19 have been consistent and enlightening.	1,388	24.1	3,946	68.4	314	5.4	119	2.1	5,767	100
South ⁵	Agree		Disagree		Neither agree nor disagree		Did not respond		Total	
	n	%	n	%	n	%	n	%	n	%
Fake news in health is an obstacle in the fight against the new coronavirus.	2,068	91.7	69	3.1	87	3.9	31	1.4	2,255	100
I attended a patient who believed in fake news about COVID-19.	1,760	78.0	314	13.9	124	5.5	57	2.5	2,255	100
Health authorities' positions on COVID-19 have been consistent and enlightening.	584	25.9	1,477	65.5	153	6.8	41	1.8	2,255	100

¹ Questions submitted to 1,830 health professionals from the North region. ² Questions submitted to 3,731 health professionals in the Northeast region. ³ Questions submitted to 1,538 health professionals from the Midwest region. ⁴ Questions submitted to 5,767 health professionals in the Southeast region. ⁵ Questions submitted to 2,255 health professionals from the South region.

Table 3. Distribution of health professionals' answers to assertion 1, by gender, age group, and ethnicity/skin color. Brazil, 2021.

Assertion 1 – Fake news in health is an obstacle in the fight against the new coronavirus	Agree n (%)	Disagree n (%)	Neither agree nor disagree n (%)	Did not respond n (%)
TOTAL	13,864 (91.62)	535 (3.54)	508 (3.36)	225 (1.49)
Gender				
Male	3,057 (20.20)	123 (0.81)	115 (0.76)	55 (0.36)
Female	10,778 (71.23)	410 (2.71)	392 (2.59)	168 (1.11)
Did not respond	29 (0.19)	2 (0.01)	1 (0.01)	2 (0.01)
Age group				
Under 25 years	722 (4.77)	06 (0.04)	11 (0.07)	14 (0.09)
26-35 years	4,720 (31.19)	145 (0.96)	128 (0.85)	68 (0.45)
36-50 years	6,027 (39.83)	273 (1.80)	274 (1.81)	82 (0.54)
51-60 years	1,825 (12.06)	98 (0.65)	67 (0.44)	34 (0.22)
61 years and above	564 (3.73)	13 (0.09)	28 (0.19)	24 (0.16)
Did not respond	6 (0.04)	0	0	3 (0.02)
Ethnicity/skin color				
White	8,014 (52.96)	289 (1.91)	303 (2.00)	123 (0.81)
Black	838 (5.54)	39 (0.26)	21 (0.14)	16 (0.11)
Brown	4,683 (30.95)	199 (1.32)	163 (1.08)	78 (0.52)
Indigenous	29 (0.19)	0	2 (0.01)	0
Yellow	280 (1.85)	7 (0.05)	17 (0.11)	4 (0.03)
Did not respond	20 (0.13)	1 (0.01)	2 (0.01)	4 (0.03)

Source: Special tabulations created for this number theme based on the research "Working Conditions of Health Professionals in the Context of COVID-19 in Brazil" - ENSP-CEE/Fiocruz, 2020/2021.

ferences are noted, such as a high percentage of professionals in the North who believe that the authorities give consistent and clarifying statements about COVID-19.

Above all, it can be concluded that the epidemic of misinformation, mal-information, fake news, and conspiracy theories motivated by political, economic, and social interests of radical and sectarian factions has left an indelible mark on public opinion regarding measures to combat COVID-19 in Brazil. Therefore, fake news has contributed to the human and health tragedy that has affected the country. With an air of contemporaneity, it shifted from a regime of truth based on institutions to a condition deregulated by political stakeholders, dogmas, intimacies, and personal experiences¹⁷.

People's beliefs directly affect preventive and care behaviors. Widely disseminated in Brazil, COVID-19-related fake news affected these beliefs, mainly because of the dissemination and promotion of miraculous or unproven forms of prevention, and treatment without scientific ba-

sis, discouraging social distancing and discrediting of vaccines. This horde of misinformation has polluted people's decision-making regarding health measures.

The scale production of untrue content could have improved people's search for official sources and accurate news about the pandemic. While they were also a source of information, the Instagram, Facebook, Twitter, and WhatsApp platforms became the primary vectors for disseminating and sharing rumors, fake news, and misinformation about COVID-19.

This content, which can be transmitted even incidentally, is increasingly becoming known as the intentional production and dissemination of false information to deceive people. At this core, the infodemic affects more severely defenseless people, who have little resistance or no critical reflection regarding what they receive daily through their cell phones¹⁸.

The intentional spread of fake news has become a deliberate defrauding of reality¹⁹. This is not necessarily a novelty if not for the expo-

Table 4. Distribution of health professionals' answers to assertion 2, by gender, age group, and ethnicity/skin color. Brazil, 2021.

Assertion 2 – I attended a patient who believed in fake news about COVID-19	Agree n (%)	Disagree n (%)	Neither agree nor disagree n (%)	Did not respond n (%)
TOTAL	11,508 (76.05)	2,345 (15.50)	829 (5.48)	450 (2.97)
Gender				
Male	2,538 (16.77)	527 (3.48)	183 (1.21)	102 (0.67)
Female	8,948 (59.13)	1,813 (11.98)	642 (4.24)	345 (2.28)
Did not respond	22 (0.15)	5 (0.03)	4 (0.03)	3 (0.02)
Age group				
Under 25 years	625 (4.13)	83 (0.55)	24 (0.16)	21 (0.14)
26-35 years	4,018 (26.55)	678 (4.48)	259 (1.71)	106 (0.70)
36-50 years	4,954 (32.74)	1,130 (7.47)	399 (2.64)	173 (1.14)
51-60 years	1,465 (9.68)	367 (2.43)	107 (0.71)	85 (0.56)
61 years and above	443 (2.93)	85 (0.56)	39 (0.26)	62 (0.41)
Did not respond	3 (0.02)	2 (0.01)	1 (0.01)	3 (0.02)
Ethnicity/skin color				
White	6,746 (44.58)	1,258 (8.31)	467 (3.09)	258 (1.70)
Black	686 (4.53)	147 (0.97)	56 (0.37)	25 (0.17)
Brown	3,815 (25.21)	874 (5.78)	280 (1.85)	154 (1.02)
Indigenous	21 (0.14)	6 (0.04)	3 (0.02)	1 (0.01)
Yellow	222 (1.47)	56 (0.37)	22 (0.15)	8 (0.05)
Did not respond	18 (0.12)	4 (0.03)	1 (0.01)	4 (0.03)

Source: Special tabulations created for this number theme based on the research "Working Conditions of Health Professionals in the Context of COVID-19 in Brazil" - ENSP-CEE/Fiocruz, 2020/2021.

Table 5. Distribution of health professionals' answers to assertion 3, by gender, age group, and ethnicity/skin color. Brazil, 2021.

Assertion 3 – Health authorities' positions on COVID-19 have been consistent and enlightening	Agree n (%)	Disagree n (%)	Neither agree nor disagree n (%)	Did not respond n (%)
TOTAL	4,436 (29.32)	9,477 (62.63)	881 (5.82)	338 (2.23)
Gender				
Male	868 (5.74)	2,174 (14.37)	233 (1.54)	75 (0.50)
Female	3,558 (23.51)	7,285 (48.14)	644 (4.26)	261 (1.72)
Did not respond	10 (0.07)	18 (0.12)	4 (0.03)	2 (0.01)
Age group				
Under 25 years	228 (1.51)	453 (2.99)	49 (0.32)	23 (0.15)
26-35 years	1,412 (9.33)	3,208 (21.20)	346 (2.29)	95 (0.63)
36-50 years	1,985 (13.12)	4,176 (27.60)	372 (2.46)	123 (0.81)
51-60 years	652 (4.31)	1,234 (8.15)	81 (0.54)	57 (0.38)
61 years and above	159 (1.05)	401 (2.65)	32 (0.21)	37 (0.24)
Did not respond	0	5 (0.03)	1 (0.01)	3 (0.02)
Ethnicity/skin color				
White	2,282 (15.08)	5,736 (37.91)	521 (3.44)	190 (1.26)
Black	292 (1.93)	550 (3.63)	49 (0.32)	23 (0.15)
Brown	1,762 (11.64)	2,971 (19.63)	276 (1.82)	114 (0.75)
Indigenous	8 (0.05)	17 (0.11)	4 (0.03)	2 (0.01)
Yellow	89 (0.59)	184 (1.22)	30 (0.20)	5 (0.03)
Did not respond	3 (0.02)	19 (0.13)	1 (0.01)	4 (0.03)

Source: Special tabulations created for this number theme based on the research "Working Conditions of Health Professionals in the Context of COVID-19 in Brazil" - ENSP-CEE/Fiocruz, 2020/2021.

Table 6. Comparison of responses from the two largest categories surveyed (Medicine and Nursing). Brazil, 2021.

Assertion 1 – Fake news in health is an obstacle in the fight against the new coronavirus	Agree n (%)	Disagree n (%)	Neither agree nor disagree n (%)	Did not respond n (%)
TOTAL	11,267 (91.38)	452 (3.66)	430 (3.48)	180 (1.45)
Profession				
Medicine	3,166 (92.5)	96 (2.8)	121 (3.5)	41 (1.2)
Nursing	8,101 (91.0)	356 (4.0)	309 (3.5)	139 (1.6)
Assertion 2 – I attended a patient who believed in fake news about COVID-19	Agree n (%)	Disagree n (%)	Neither agree nor disagree n (%)	Did not respond n (%)
TOTAL	9,417 (76.38)	1,898 (15.39)	659 (5.34)	355 (2.87)
Profession				
Medicine	2,821 (82.4)	359 (10.5)	149 (4.4)	95 (2.8)
Nursing	6,596 (74.1)	1,539 (17.3)	510 (5.7)	260 (2.9)
Assertion 3 – Health authorities' positions on COVID-19 have been consistent and enlightening	Agree n (%)	Disagree n (%)	Neither agree nor disagree n (%)	Did not respond n (%)
TOTAL	3,513 (28.49)	7,818 (63.41)	725 (5.88)	273 (2.21)
Profession				
Medicine	625 (18.3)	2,546 (74.4)	191 (5.6)	62 (1.8)
Nursing	2,888 (32.4)	5,272 (59.2)	534 (6.0)	211 (2.4)

Source: Special tabulations created for this number theme based on the research "Working Conditions of Health Professionals in the Context of COVID-19 in Brazil" - ENSP-CEE/Fiocruz, 2020/2021.

nential dimension it has reached through instant messaging applications and social networks such as Instagram, Twitter, and Facebook²⁰. Significant effects of fake news on public health are expressed daily by anti-vaccine movements, distrust of health professionals, abandonment of treatments, drug use without proper guidance, and belief in miraculous cures, among other events. These occurrences strongly affect older adults over 65, who are up to seven times more likely to believe and share false news²¹.

Disinformation confuses by involving fragments of truth in its formulation, and conspiracy theories work by offering the comfort of a simple explanation in times of uncertainty⁴. The use of scientific jargon in the structure of fake news is a relevant validation factor²². A study carried out using the "*Eu Fiscalizo*" app from March 17 to April 10, 2020, showed that 65% of the fake news filed by the app taught homemade methods to prevent the spread of COVID-19, and 20% addressed homemade methods for curing the disease.

Approximately 71.4% of these fake news had the name of the Oswaldo Cruz Foundation (FIO-

CRUZ) as the official source of information. The institution's reputation is used illegally to legitimize misinformation about medicines, vaccines, and public health in a context where 62% of Brazilians do not know how to discern whether information is false or true²³.

Above all, the increase in disinformation is related to political, social, and economic turmoil²⁴. The epidemic of false, disinforming, or misleading content about COVID-19 is not isolated and is part of a plague that affects public health and other sectors of the economy. These lies relativize scientific consensus, promote false cures, discredit vaccines, promote diseases, and endanger life²⁵. Even before the COVID-19 pandemic, the infodemic about vaccines was already causing hesitation in Brazil.

In 2015, the National Immunization Program (PNI) vaccinated 95% of the target population against various diseases. Since then, vaccine adherence has dropped dramatically, and abstention has reached record levels in the pandemic. In 2020, the immunization rate reached just 66% and set the alert for advancing previously controlled diseases, such as polio. The Ministry of

Health argues that two main factors for vaccine hesitation are fake news and misinformation produced by conspiracy and anti-vaccine groups²⁶.

We observed free circulation on a global scale of inaccurate information and false news about all aspects of the pandemic, from the origin of the virus and its transmission mechanisms and ineffective treatments to the dissemination of miraculous cures. The same fake content is replicated, translated, and circulated in different countries. The speed and fluidity of this untrue information contaminate people's behavior and increase risks.²⁷ In this regard, the brain is not absolutely accurate. The mind also behaves irrationally and is carried away by fallacies, uncertain conclusions, and confirmation biases. Information that confirms pre-existing beliefs is greatly valued^{28,29}.

We live in a mediated humanity, with human experiences synthesized through electronic screens. Everything is conveyed through images, whether text, audio, photo, or video, and images have always been open to differing interpretations³⁰. To some extent, the pandemic and the infodemic have strengthened as antibodies and firewalls have failed³¹. The most damaging consequences of this confluence and information overload have been expressed through incorrect, premature, or late decisions, decision fatigue, stress, interruption of necessary measures, and loss of productivity. As a result, people began to feel more anxious, depressed, exhausted, and unable to meet essential demands^{32,33}.

Disinformation is an undesirable update of ir(reality) and makes informational chaos prosper. It introduces the decay of universal truths, promotes rising doubts, and distorts the relationship with knowledge. In this sense, disseminating false information about the new coronavirus is relevant in advancing the pandemic³⁴. The situation triggered by the new coronavirus pandemic is incomparable and unprecedented because of the volume it reached, driven by a unique aspect: the availability and enormous popularity of cell phones, instant messaging applications, and social networks.

Nowadays, there are dialogic gaps between knowledge essential to understanding complex landscapes. Disinformation has become an obstacle to public health policies, both as an instrument to legitimize fallacious therapies and as a tool for disseminating anti-scientific content. Health crises that raise the risk of extermination show erratic behavior, susceptible to indoctrination by denialism, intolerance, and dogmatism. Thus, universal contagion becomes a social

event, revealing anti-scientific contours, values, and attitudes restricted to attention and engagement metrics without any commitment to the emerging reality³⁵.

During a pandemic, misinformation can cause persistent transmission, distrust of governments, hesitation about vaccines and treatments, violence against health professionals, stigmatization of infected people, and exacerbation of segregationist sentiments³⁶. Health professionals argue that the infodemic associated with high workloads, lack of PPE, and family distancing can generate negative emotional indicators, such as anguish and depression³⁷.

Conclusion

According to the results of this research, the infodemic COVID-19 confused people, undermined adherence to health measures and stimulated people's negative behavior vis-à-vis the pandemic. The lack of clarity and contradictions in the authorities' stance influenced the infodemic process on the new coronavirus. The truth was relativized, and the dispute of narratives contaminated the public debate on the subject. This (mis)information environment harmed public health responses and adversely impacted the work of most health professionals covered by this research.

The COVID-19 pandemic has shown the need to establish a permanent dialogue with communities to build a perennial relationship of trust, knowledge, and recognition of public health and good health practices. In short, area educators, health professionals, and scientists must speak to the population with a more straightforward and accessible language so everyone understands them. One can explain consistently and in an enlightening way everything true or false about pandemics, vaccines, and public health through videos, illustrations, children's books, storytelling, arts, games, and the Q&A mechanism. It is crucial to mitigate fake news if it is not enough to eradicate it.

In this sense, besides being a problem on a global scale, the COVID-19 infodemic setting has become an opportunity to find and use new preparedness and response tools regarding the health information ecosystem that involves society. Health emergency response strategies evolve as communication and the world change. This global convergence of theories, methods, and practices for managing infodemics fills a knowl-

edge gap in health research. It contributes to formulating public policies that will help health authorities monitor, assess, and respond to the problem, now and in the future.

Promoting good information, listening to people's desires, and social listening have been practical tools for understanding the narratives and feelings shared on social media. If, on the one hand, it is already known that it is impossible to eliminate an infodemic, on the other hand, we are fully aware that we can control it at levels that are less harmful to the community. Therefore, adapting, developing, validating, and evaluating

new communication practices based on the best available evidence is necessary to prevent, detect, and respond to misinformation in health efficiently and pragmatically.

Limitations

This study has limitations, such as the cross-sectional design, which prevents the analysis of cause-and-effect relationships and self-reported data from non-randomly selected participants.

Collaborations

NP Freire and ICKO Cunha searched the literature and participated in the conception and design of the study. NP Freire collected data and performed statistical analyses. NP Freire wrote the manuscript, and all authors critically reviewed the text for intellectual content. NP Freire, ICKO Cunha, FRG Ximenes Neto, FL Vargas, BKA Santiago and LG Lourenço participated in the review of data and intellectual content until the final version of the manuscript. All authors had full access to all study data and were responsible for the decision to submit for publication.

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