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# Impact of disinformation on the dynamics of the COVID-19 pandemic in Brazil

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## Abstract

# Aim:

To examine the association between the spread of disinformation ("fake news") and the incidence of new COVID-19 cases in Brazil between March 2020 and December 2022.

# Subject and Methods:

This study presents an ecological time-series analysis examining the association between the spread of disinformation (“fake news”) and the incidence of new COVID-19 cases in the country between March 2020 and December 2022. We analyzed 194 items of fake news that had been verified by fact-checking agencies, and examined them using dynamic regression with ARIMA errors (ARIMAX), adjusted for socioeconomic variables, social media use and the residential mobility index. Residential mobility was assessed as a potential mediator of the relationship between disinformation and COVID-19 incidence.

# Results

Vaccines were the main topic of disinformation, followed by chloroquine/hydroxychloroquine, masks, and ivermectin. Peaks in fake news coincided with milestones in the vaccination campaign. In the total effect model, which assesses the impact of disinformation when controlling only for economic factors, disinformation showed a positive and statistically significant association with new COVID-19 cases ($\beta = 57.963$, $p < 0.05$). When estimating the direct effect, with mobility included as a mediator, partial mediation was observed, as disinformation remained statistically significant ($\beta = 44.565$, $p < 0.05$), even when controlling for mobility.

# Conclusion

Disinformation not only affected adherence to social isolation measures but also intensified household and individual risks through additional direct behavioral mechanisms, independent of mobility patterns. These findings underscore the epidemiological impact of the infodemic during the COVID-19 pandemic in Brazil.

## Introduction

On January 30, 2020, the World Health Organization (WHO) declared a Public Health Emergency of International Concern due to the SARS-CoV-2 virus (WHO 2020). In addition to the social and economic impacts that accompanied the rapid spread of the virus around the world, this period was also marked by the widespread production and dissemination of false information about the disease, its origin and methods of prevention and treatment. The massive circulation of disinformation and conspiracy theories

during the pandemic forms part of the phenomenon that the WHO has termed an “infodemic” - a term used to describe the risks arising from an overabundance of information, especially false or misleading information, in the context of epidemic outbreaks, which can compromise the social and health response (Tentolouris et al. 2021). In the case of COVID-19, the infodemic was characterized by an intense and continuous flow of both true and false information, which hindered the public’s access to guidance based on evidence and undermined compliance with measures to address the crisis. This unstable information environment contributed to the erosion of public trust in health institutions, the scientific community and vaccination campaigns (Lancet Infectious Diseases 2020). In Brazil, the course of the pandemic was heavily influenced by political and communication factors that affected the public health response. Studies conducted by the Observatory for the Containment of COVID-19 in the Americas (Touchton et al. 2021) analyzed the implementation of ten non-pharmacological interventions, such as school closures, mobility restrictions, information campaigns and recommendations for the use of masks and found that the Brazilian federal response was the least stringent among the eight Latin American countries analyzed. In the absence of consistent national coordination, the adoption of these measures varied widely across states, with implementation later and less rigorous by governors ideologically aligned with the federal government than by opposition governors, suggesting the role of political factors in the conduct of the nation's pandemic response. This institutional context was accompanied by an increase in the spread of disinformation about COVID-19 and vaccines. Documentary records, such as the COVID-19 Pandemic Archive in Brazil (SoU_Ciência 2025) and the Timeline of the Federal COVID-19 Dissemination Strategy (Ventura and Reis 2021), show that ideas such as the supposed herd immunity through infection, the use of drugs without proven efficacy, and false content related to vaccines were widely disseminated and incorporated into the public debate, delaying the adoption of measures to contain the pandemic. The spread of this content may have contributed to the high mortality rate recorded in the country, where more than 700,000 people lost their lives due to COVID-19. Comparative evidence also points to possible impacts of this phenomenon: in an ecological study involving six Latin American countries, researchers examined the relationship between indicators of exposure to disinformation and COVID-19 mortality, as well as institutional strategies for addressing the infodemic. The authors observed that countries with greater trust in social media content and a greater inability to recognize fake news generally had higher COVID-19 mortality rates, although they did not conduct analyses of causal association (Lazarus et al. 2024). The effects of the systematic and continuous circulation of false information remain significant, particularly regarding vaccination uptake, but must be understood within a broader context of determining factors. Despite the successful track record of the National Immunization Program (PNI), which has been responsible since 1973 for the control and elimination of various vaccine-preventable diseases, the decline in vaccination coverage - already observed before the pandemic - intensified during this period. Evidence indicates that, since at least 2016, there has been a decline in adherence to PNI vaccines, which has been associated with multiple factors, including the influence of disinformation and anti-vaccine movements. In addition, problems with the implementation of the PNI, difficulties in access and socioeconomic factors have been associated with incomplete vaccination schedules (Barata et al. 2020; de Araújo Veras 2020; Sígolo et al. 2026). During the pandemic, this situation may have been exacerbated by additional factors,

including disruptions to health services, the reallocation of resources and social distancing measures. Although the initial phases of the COVID-19 vaccination campaign in 2021 saw high uptake, the intensification of the infodemic and the strengthening of anti-vaccine narratives may have contributed to a subsequent decline in vaccination coverage (Eagan et al. 2023; Sígolo et al. 2026). Vaccination data point to a disturbing trend: between 2021 and 2023, vaccine hesitancy regarding the COVID-19 vaccine increased significantly, reaching over 56% among children (Nieves-Cuervo et al. 2021).

This study investigates the impacts of false information related to the public health emergency caused by SARS-CoV-2, propagated between 2020 and 2022, on the dynamics of the COVID-19 pandemic in Brazil. Our hypothesis is that the deliberate dissemination of false information contributed, among other factors, to creating confusion among the population, possibly leading to an underestimation of the severity of COVID-19 and the adoption of ineffective preventive measures. Furthermore, it is possible that the disinformation spread during this period played a role in undermining trust in science and vaccines. These factors, taken together, may have influenced the high number of cases and consequently deaths from the disease. The investigation was conducted using a time series of fake news stories debunked by fact-checking media outlets each month between 2020 and 2022. These data were correlated with the number of new COVID-19 cases in order to assess the impact of the volume of fake news on fluctuations to the incidence of COVID-19 in Brazil, considering population mobility as the primary mechanism mediating this effect. Thus, the study aims to contribute to the understanding of the sociopolitical and communicational factors that fostered scientific denialism and distrust in science and vaccines in Brazil, and to support the development of evidence-based strategies to combat disinformation and strengthen public trust in science today.

# Materials and Methods

### Study plan

This is an ecological time-series study with a quantitative approach, designed to investigate the relationship between the spread of false information about COVID-19 from March 2020 to December 2022 and epidemiological outcomes in Brazil. The study analyzed the association between the monthly volume of fake news verified by fact-checking agencies and the incidence of new COVID-19 cases, while accounting for population mobility as a possible mediating variable and socioeconomic indicators and social media use as potential confounders. The primary outcome of the study was defined as the increase in new COVID-19 cases due to exposure to disinformation, mediated by increased mobility.

### Data on reports of fake news

The data was collected directly from the public databases of two prominent and widely recognized fact-checking organizations in Brazil: Agência Lupa (affiliated with the UOL Group) and Aos Fatos.

These sources were selected due to their national relevance, established track record and systematic organization of a public and accessible archive of their verified information. The time frame

defined for the study spans the period from March 1, 2020, to December 31, 2022. This interval covers the most critical years of the pandemic, from its onset through the stabilization phase, allowing us to capture the dynamics of disinformation throughout the event's entire cycle. The units of analysis consisted of individual fact-checking items (verification reports) published by the two websites during the period established.

Data collection was conducted manually and systematically by accessing these agencies' repositories. An intentional keyword sampling technique was applied, using the internal search function of the web pages (Ctrl+F command) to locate, in the titles of the articles, the occurrence of the following keywords related to the main controversial topics of the pandemic: Vaccine; Chloroquine or Hydroxychloroquine; Ivermectin; Mask. Each item whose title contained one or more of the listed keywords was selected for the study. For each selected item, the following data were extracted: title, publication date, fact-checking agency (Lupa or Aos Fatos) and topic (classified based on the identified keyword).

The cataloged data were organized into a computer spreadsheet. For the time-series analysis, the publications were grouped by month and year of publication, allowing visualization of the frequency and temporal distribution of fact-checks for each topic investigated. The analysis focused on identifying peaks of activity, trends of growth or decline, and any seasonality in the circulation of disinformation for each topic.

**Epidemiological data**

Epidemiological data on confirmed COVID-19 cases in Brazil were collected from the official databases of the Ministry of Health, which record data from the State Health Departments. New COVID-19 cases, organized by epidemiological week, were aggregated to the respective months according to the correspondence between weeks and months in the 2020, 2021 and 2022 epidemiological calendars, provided by SINAN (Notifiable Diseases Information System). In cases where a single epidemiological week spanned days from two different months, the total number of cases for that week was attributed to the month with the greater number of days. Although the 2021 epidemiological calendar consisted of 52 weeks, the Ministry of Health's records included a 53rd week, covering the days January 1 - January 2, 2022. Considering that new cases are recorded after confirmation of a positive test result and that the agency itself links such data to the previous year, it was decided to attribute these cases to December 2021.

**Residential mobility index**

To analyze changes in population mobility during this period, we used data from Google's COVID-19 Community Mobility Reports, using the "home" category as an indicator of social isolation. We collected the mobility data available for the period covered by this study, i.e. from March 2020 to October 2022 (when Google ceased providing mobility data).

**Data on socioeconomic status and the number of social media users**

The socioeconomic indicators were obtained from the database of the Institute of Applied Economic Research (IPEA), with the aim of incorporating a variable of economic context into the analytical models. Monthly data on real average income for all types of work were extracted for the period from March 2020 to December 2022. This variable was chosen because it reflects the economic capacity of the population and serves as a representative indicator of the level of economic activity, a factor that can influence both population mobility and information-seeking behavior, as well as exposure to the virus.

In addition to economic data, information was collected on the number of active Facebook users — used as a control variable for social media usage — obtained through the NapoleonCat Stats analytics tool, which provides detailed monthly estimates of the platform's user base.

Facebook was chosen because of its widespread penetration in Brazil during the period covered by this study. The social network was the platform most widely used by Brazilians for news consumption in 2020 and 2021, and the third most widely used in 2022 (Newman et al. 2020, 2021, 2022).

The inclusion of these variables enabled control of potential confounding biases arising from differences in exposure to information and in the economic behavior of the population. We considered that the number of active social media users could affect the extent and speed of fake news dissemination, while economic fluctuations could influence mobility patterns and perceptions of risk.

**Statistical analysis**

In this study, we adopted a time series analysis approach to investigate a possible relationship between the volume of disinformation (fake news) and the number of new COVID-19 cases. The data, collected monthly from March 2020 to December 2022, totaled 34 initial observations. The variables analyzed included: new COVID-19 cases (dependent variable), residential mobility index, number of news stories containing disinformation (exposure), average income from all jobs (socioeconomic variable), and number of Facebook users (control for social media activity).

All data series were subjected to the Augmented Dickey-Fuller (ADF) unit root test to determine whether each series was stationary, that is, whether its statistical properties remain constant regardless of when the series is observed. Based on the results, transformations were applied to achieve stationarity, where mobility was used without differentiation, new cases and news containing disinformation were subjected to first differences, and Facebook users required second differences. Due to the differentiations and the inclusion of one-month lags to capture temporal effects, the effective sample for modeling was 29 months.

The inclusion of this one-month lag in the model is justified by the expected epidemiological and behavioral cycle, in which exposure to disinformation is followed by a change in behavior, which in turn leads to an increased risk of transmission, exposure to the virus, the incubation period, the onset of

symptoms, and, finally, the reporting of the case in the health information system. This process aims to mitigate this temporal effect in the analyses and the possibility of reverse causality.

The analysis was based on a DAG (Figure 1), which identified economic variables as potential confounders and mobility as a mediator of the relationship between disinformation and new cases. To isolate these effects, two Dynamic Regression models with ARIMA errors (ARIMAX) were estimated:

- Total effect model, adjusted only by the economic confounder; and
- The direct effect model, which additionally includes the mediator (mobility) to verify whether disinformation has a residual impact beyond the incentive to travel.

Estimates were performed using R software (forecast package), and model quality was verified using the Ljung-Box test on the residuals, ensuring that there was no remaining autocorrelation.

# Results

The first stage of the analysis consisted of a thematic characterization of the 194 items of fake news analyzed in the study. Of the total, 59.28% (n = 115) referred to vaccines, 15.98% (n = 31) to chloroquine or hydroxychloroquine, 15.46% (n = 30) to the use of masks, and 14.95% (n = 29) to ivermectin (Fig. 2A). Vaccines remained the predominant topic throughout the entire period, accounting for 45.95% of fake news in 2020, 64.89% in 2021, and 76.92% in 2022 (Fig. 2B). Percentages exceed 100% as individual news items could address more than one topic simultaneously. False narratives about masks, present in 2020 and 2021, disappeared in 2022 (Fig. 2B), coinciding with the easing of mandatory mask requirements and the progress of vaccination (Brasil 2022; OPAS 2022).

a - Percentage distribution of the thematic categories of the items of disinformation related to COVID-19 analyzed in this study, verified by the agencies Lupa and Aos Fatos, from March 2020 to December 2022

b - Annual percentage distribution, by topic, of the instances of COVID-19 disinformation used in this study, fact-checked by the agencies Lupa and Aos Fatos, from March 2020 to December 2022

The temporal distribution of fake news revealed intense dissemination activity in July 2020 (n = 15), December 2020 through January 2021 (n = 33), May through June 2021 (n = 21), and October 2021 through January 2022 (n = 36) (Fig. 3). Most of these peaks coincided with important milestones in Brazil's vaccination campaign, such as the start of mass immunization in December 2020, the beginning of vaccination for priority groups in January 2021, the expansion of vaccination to the general public between May and June 2021, and the release of clinical trial results followed by the request to Anvisa for emergency authorization of pediatric vaccines between October and December 2021 (Brasil 2021; Instituto Butantan 2022).

Although a partnership between the pharmaceutical company AstraZeneca and the University of Oxford in the United Kingdom for the development and production of COVID-19 vaccines was announced in late

June 2020 (Justiça Federal do Paraná 2026), the July 2020 peak in disinformation coincided with increasing social and political pressure to relax social isolation measures. Given that this period preceded an increase in the number of cases in 19 of Brazil's 26 states, as well as the Federal District, leading to a rise in the total number of cases, it is possible that the greater volume of disinformation spread during this period may have contributed to an increase in the number of COVID-19 cases in Brazil. To investigate the correlation between the spread of disinformation and the increase in the number of cases, we conjecture that disinformation may have influenced social behavior, inducing the population to relax isolation measures and, consequently, increasing the risk of infection. To test this hypothesis, we analyzed population mobility data from Google's COVID-19 Community Mobility Reports. The results indicate that after July 2020, time spent at home decreased and in the following months we observed an increase in the number of cases (Figure S1). To assess whether disinformation influenced social behavior and increased virus transmission, we investigated the association between the total volume of fake news and the number of new COVID-19 cases during the same period. According to the DAG in Fig. 1, we assume that exposure to fake news may have led to an increase in the number of new cases, with mobility acting as a mediator.

A preliminary stationarity analysis revealed the complex nature of the time series during the emergency phase of the COVID-19 pandemic. While the residential mobility index fluctuated around a constant mean, the series for new cases and disinformation only became stationary after the first differentiation. Structural variables, such as income and social media users, demonstrated stronger inertia, requiring two differentiations for complete removal of their trends. In the total effect model, which assesses the impact of disinformation when controlling only for economic factors, as per the DAG, the disinformation variable showed a positive and statistically significant association with new COVID-19 cases ($\beta = 57{,}963$, $p < 0.05$) (Table 1). In this scenario, the coefficient suggests that for every additional unit in the monthly variation in the volume of disinformation, there was an average increase of approximately 58,000 in the variation in new cases in the following month. In other words, the acceleration in the circulation of fake news was associated with a corresponding acceleration in the infection curve. When estimating the direct effect, with the inclusion of mobility (mediator), a phenomenon of partial mediation was observed (Table 2). The disinformation variable remained statistically significant ($\beta = 44{,}565$, $p < 0.05$), even when controlling for mobility. Mobility, in turn, proved to be a strong predictor of new cases ($\beta = 295{,}680$, $p < 0.01$), but did not fully nullify the effect of disinformation.

Table 1
Total effect model, unadjusted for mobility, i.e., including its effect

| ***Variable*** | ***Coefficient (β)*** | ***Z-score*** | ***CI 95% (Lower)**** | ***CI 95% (Higher)**** |
|---|---|---|---|---|
| *Income (lagged)* | 3,322 | 2.36 | 563 | 6,081 |
| **Disinformation** | **57,963** | **2.39** | **10,492** | **105,434** |

Table 2
Direct-effect model, adjusted for mobility. Disinformation remains significantly associated with new COVID-19 cases

| *Variable* | *Coefficient (β)* | *Z-score* | *CI 95% (Lower)* | *CI 95% (Higher)* |
|---|---|---|---|---|
| *Mobility* | 295,680 | 3.57 | 133,310 | 458,050 |
| *Mobility (lagged)* | -247,975 | 3.34 | -393,615 | -102,336 |
| *Income (lagged)* | 4,446 | 3.69 | 2,082 | 6,809 |
| **Disinformation** | **44,565** | **2.04** | **1,852** | **87,278** |

Based on these results, it is clear that the disinformation was not just a byproduct of the pandemic, but a potential active driver in the acceleration of COVID-19 cases, operating through two simultaneous mechanisms (Fig. 4). The robustness test reinforces this causality, as the number of Facebook users did not explain the variation in cases, isolating the effect on the “message” rather than the “medium.”

# Discussion

The thematic profile of the disinformation analyzed indicates that vaccines became the central target of false narratives throughout the pandemic. This finding is consistent with previous investigations of disinformation circulating on social media, websites and messaging applications in Brazil, which also identified vaccination as the predominant topic between 2020 and 2022 (Galhardi 2023). The progressive increase in vaccine-related disinformation suggests a strategic adaptation of false narratives in response to advances in the national immunization campaign.

The temporal concentration of disinformation around critical milestones of vaccination reinforces this interpretation. Peaks observed during the launch and expansion of vaccination campaigns, as well as during discussions surrounding pediatric immunization, suggest attempts to generate uncertainty and distrust precisely when public adherence to vaccination was most important. The timing of these events supports the hypothesis that disinformation functioned not merely as a reaction to pandemic developments, but as an active component of the sociopolitical environment surrounding the public health response.

The statistical analyses provide evidence supporting an association between disinformation and increases in COVID-19 incidence. The significant effect observed in the total-effect model indicates that acceleration in the circulation of fake news was accompanied by acceleration in the number of new infections. These findings are compatible with the theoretical framework represented by the DAG, according to which disinformation may influence individual and collective behaviors that affect transmission dynamics.

The mediation analysis revealed that part of this association operated through population mobility. The reduction of the disinformation coefficient after the inclusion of mobility indicates that false narratives

may have encouraged the relaxation of social isolation measures, increasing opportunities for viral transmission. By promoting messages that minimized the severity of COVID-19 or questioned the necessity of preventive measures, disinformation may have reduced risk perception and encouraged the resumption of social and economic activities.

However, mobility did not fully explain the observed relationship. The persistence of a statistically significant direct effect after adjustment suggests that disinformation also operated through additional behavioral pathways. Exposure to false narratives may have encouraged behaviors such as abandoning mask use, relying on ineffective treatments, delaying medical care, or disregarding other preventive recommendations. These mechanisms could increase infection risk even among individuals who did not substantially change their mobility patterns.

An important finding was that the number of Facebook users did not explain variation in COVID-19 cases. This result suggests that the epidemiological impact observed was related not to social media use itself, but to the content circulating within these platforms. Social media can serve both beneficial and harmful functions; therefore, the critical factor appears to be exposure to disinformation rather than simple platform utilization.

As previously noted, the predominant content of these fake news items attacked vaccines rather than social distancing. This points to a complex behavioral phenomenon: the disinformation may have created a widespread climate of distrust in science and the institutions. Our results indicate statistically that exposure to disinformation may have been capable of altering a measurable physical behavior (mobility). Therefore, in line with recent literature (Loomba et al. 2021; Muric et al. 2021; Carrieri et al. 2023; Eagan et al. 2023; Sígolo et al. 2026), this same dynamic of distrust in institutions may have affected people's decision to get vaccinated, given that this was the primary target of the disinformation. Consequently, the disinformation discouraged adherence to proposed public health measures, whether isolation or immunization.

These findings should also be interpreted within the Brazilian political context between 2020 and 2022. During this period, narratives promoting herd immunity through infection and treatments without proven efficacy received substantial visibility in public debate (Ventura and Reis 2021; SoU_Ciência 2025). Institutional and political reinforcement of such messages may have amplified the effects of disinformation, reducing perceived risk and encouraging behaviors that increased exposure to SARS-CoV-2.

The impact of disinformation on adherence to public health measures has been demonstrated by studies that primarily assess vaccination uptake. Exposure to anti-vaccine content online can lead to vaccine hesitancy and refusal (Loomba et al. 2021; Muric et al. 2021). The use of social media as a source of information is associated with lower trust in science and vaccines, leading to greater vaccine hesitancy, as these platforms facilitate the spread of false information (Carrieri et al. 2023). Based on our results, we suggest that continuous and systematic exposure to false narratives may have affected trust in science, public health measures and probably vaccines.

We believe that the statistical associations identified in the study suggest evidence of the impacts of disinformation during the pandemic. However, it is important to note that using fact-check reports as a measure of the circulation of fake news, although valid, may underestimate the actual volume of disinformation, as it captures only content that has been reported and verified. Furthermore, this study has limitations inherent to the use of aggregated data and a short time series of 29 months, which reduces its statistical power and requires caution when generalizing the findings. Another important limitation of this study is the lack of control for the emergence of Variants of Concern (VOCs), such as Omicron (early 2022). Since these variants were more transmissible, it is likely that part of the variance in new cases during these peaks is explained by viral dynamics, and not exclusively by behavioral factors mediated by disinformation. Unobserved variables, such as political-ideological orientation, may act as residual confounders.

Our study helps demonstrate that, in response to the infodemic observed in Brazil and around the world, it is urgent to implement real-time surveillance systems to monitor false narratives, thereby enabling more proactive communication responses. Health authorities should anticipate spikes in disinformation during important moments and launch robust educational campaigns. Currently, in the Brazilian context, a specific focus is needed on combating disinformation about COVID-19 vaccines for children, given the low uptake of COVID-19 vaccines in this age group (Instituto Questão de Ciência et al. 2025). Campaigns targeting parents, with clear messages that debunk the most common fake news and highlight hospitalization data for the disease, are essential. At the same time, long-term investments in health education and literacy are fundamental to empowering individuals and communities, making them more resilient to disinformation in the future.

## Conclusion

This study demonstrates that disinformation related to COVID–19 in Brazil between 2020 and 2022 was a persistent, reactive phenomenon strategically articulated around critical moments in the pandemic, especially during the vaccination campaigns. Analysis of the fake news revealed a communication agenda aimed at weakening control measures and undermining public trust in science and public health measures. Time-series analysis indicated a positive and statistically significant association between the volume of fake news and the emergence of new cases of the disease, showing that the infodemic produced measurable epidemiological effects on the Brazilian population between 2020 and 2022. The findings indicate that the disinformation operated through a partial mediation of urban mobility. The disinformation encouraged people to ignore social isolation, thereby increasing the movement of people and, consequently, viral transmission. However, the persistence of a direct effect of disinformation on the number of cases, even when mobility was controlled, suggests that it is highly likely that false narratives induced risky behaviors, such as abandoning the use of masks and adopting treatment without proven efficacy.

Despite the study’s limitations, the findings reveal a consistent association between disinformation, social behavior and epidemiological outcomes.

Combating future public health crises requires the integration of information management with epidemiological surveillance. It is necessary to strengthen real-time narrative monitoring systems and make ongoing investments in health literacy, enabling the public to identify and reject fraudulent content that endangers lives and public health.

## Declarations

# Author Contribution

Author ContributionsL.S.P: Conceptualization, Methodology, Supervision, Data Curation, Investigation, Formal Analysis, Writing – Original Draft, Visualization, Writing – Review & Editing.C.F.S.: Investigation, Data Curation, Formal Analysis,, Writing – Review & Editing.I.N.S.: Data Curation, Formal Analysis, Software, Statistical Analysis, Visualization, Writing – Review & Editing.M.C.F.S.: Data Curation, Validation, Formal Analysis, Writing – Review & Editing, Reference Management.V.M.S.: Investigation, Formal Analysis, Writing – Review & Editing.S.S.S.: Project Administration, Conceptualization, Methodology, Funding Acquisition, Formal Analysis, Supervision, Writing – Review & Editing.All authors read and approved the final version of the manuscript.

# Data Availability

The datasets and R script used and analyzed during the current study are publicly available in the Domus Dados repository at: https://hdl.handle.net/20.500.12682/rdp/HOJUEJ.

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# Figures

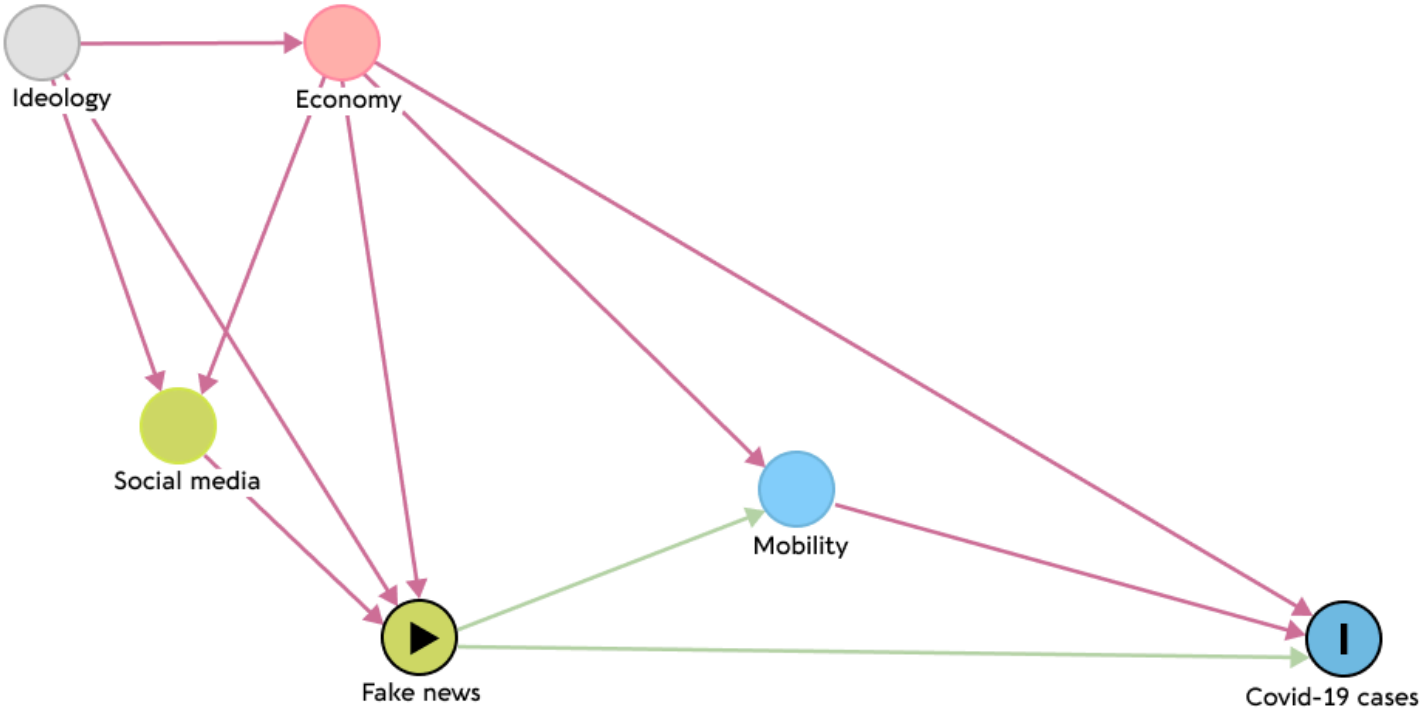



**Figure 1**

Directed Acyclic Graph (DAG) representing the study's theoretical causal model. The nodes symbolize the variables analyzed: fake news as the primary exposure, COVID-19 cases as the outcome, and mobility as the mediating variable. The arrows indicate the assumed causal relationships. The green arrows highlight the causal pathway of interest (the direct effect of fake news and its impact on mobility), while the pink arrows represent routes of confusion and influences from antecedent variables. Factors such as economics, ideology and use of social media were included in the model as structural determinants that influence exposure and the dynamics of the pandemic

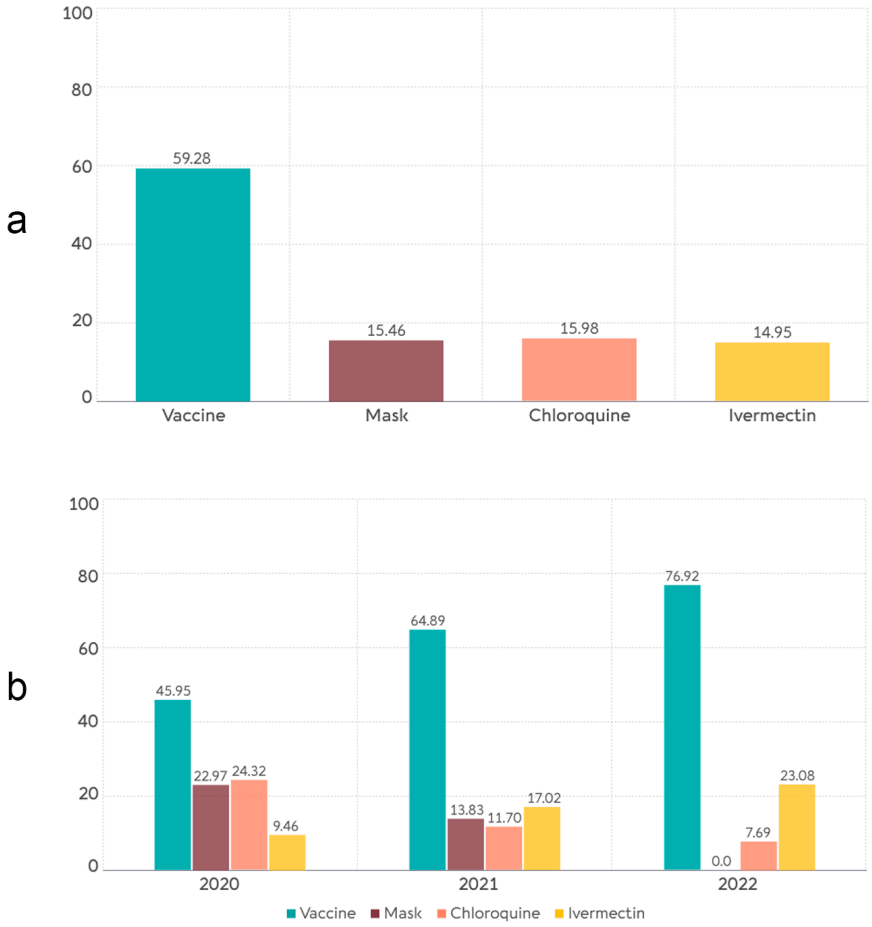



**Figure 2**

Thematic breakdown of fake news related to COVID-19 from March 2020 to December 2022

a - Percentage distribution of the thematic categories of the items of disinformation related to COVID-19 analyzed in this study, verified by the agencies Lupa and Aos Fatos, from March 2020 to December 2022

b - Annual percentage distribution, by topic, of the instances of COVID-19 disinformation used in this study, fact-checked by the agencies Lupa and Aos Fatos, from March 2020 to December 2022




**Figure 3**

Time series of disinformation related to COVID-19 in Brazil. Time series of the monthly volume of disinformation related to COVID-19 fact-checked by the agencies Lupa and Aos Fatos between March 2020 and December 2022

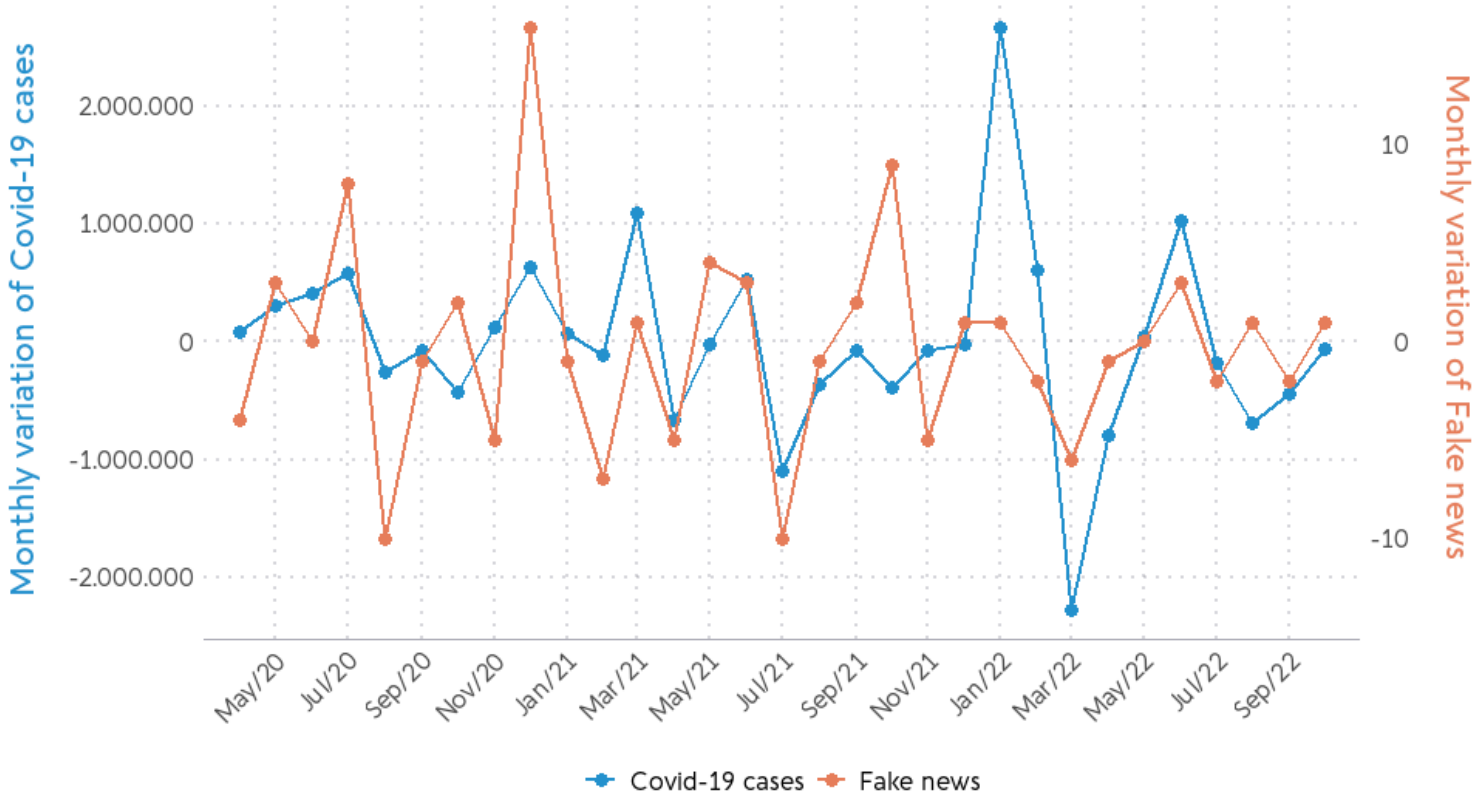



**Figure 4**

Temporal dynamics between disinformation and incidence of COVID-19. Differentiated time series (I(1)) of the monthly variation in new COVID-19 cases (blue line, left axis) and occurrences of fake news (red line, right axis), for the period from April 2020 to October 2022. Differencing was applied to ensure the series was stationary and to test the correlation between the monthly fluctuations of both variables

## Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- Table2.docx
- Table1.docx
- FigS1.jpeg
- FigS2.jpeg
- FigS3.jpeg