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Fake News and vaccine hesitancy in the COVID-19 pandemic in Brazil

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Abstract *This paper presents the evolution of fake news disseminated about vaccines and the SARS-CoV-2 virus and its adverse impacts on the current Brazilian health crisis. This quantitative, empirical study is based on the notifications received by the Eu Fiscalizo app, through which the Instagram, Facebook, Twitter, and WhatsApp platforms were identified as the principal means for disseminating and sharing rumors and misinformation about COVID-19. We observed large-scale circulation of fake news about vaccines directly related to the Brazilian political polarization, which became prevalent four months after the first COVID-19 case was recorded in the country. We can conclude that this phenomenon was crucial in discouraging the adherence of segments of the Brazilian population to social distancing and vaccination campaigns.*

Key words *Fake news, Pandemic, COVID-19, Vaccines, Vaccine hesitancy*

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Introduction

Misinformation in the COVID-19 pandemic

Fake news about pandemics, vaccines, and public health finds fertile ground to proliferate in Brazil, given a hyperconnected population[1], most of whom do not recognize the logical differences between fake and accurate news[2]. The simple exercise of verifying the source of information seems to be an insurmountable hurdle for most of the population. Especially when it comes to miraculous cures, fanciful events, and conspiracy theories about vaccines, the vacuum caused by the substandard education and the State's absence opens space for malicious subjects and institutions to plant doubts in the people's collective consciousness and lead them to question uncontroversial scientific consensus[3,4].

This process has become especially dangerous during the most significant pandemic of the last 100 years. Since COVID-19 took hold in Brazil in March 2020, the large-scale production of fake news about the new coronavirus has hindered the general population's access to official and accurate news on the subject. Indeed, the exponential volume of fake news about the SARS-CoV-2 virus led the World Health Organization (WHO) to coin the term infodemic[5] to designate a true, deliberate or incidental misinformation epidemic that significantly contributed to increasing infection risks, encouraging relaxing social distancing, and promoting distrust regarding vaccines.

An infodemic occurs when information and guidelines contradicting scientific knowledge are widely disseminated, affecting the response to a health crisis[6]. Because it is a relatively recent phenomenon, few large-scale empirical investigations on the spread of misinformation or its social origins[7] are available. However, the term fake news is knowingly used freely to indicate both rumors and false information presented in the form of "news", circulating mainly on social networks[8]. However, we should preserve the distinction between information that is merely poorly checked or without scientific basis and that which is deliberately false and intentionally disclosed to achieve the interests of specific individuals or groups[9].

Social networks currently operate as an extension of the human being in digital space, where people meet, interact, work, and have fun, creating relationships based on political, artistic, professional, religious, ideological, and other affinities. As in reality, not rarely, misinformation can appear in these spaces incidentally, even due to the lack of quality of the information itself. However, intentionally producing and distributing fake news and messages to deceive, take advantage, and cause malice for political, financial, or ideological reasons[10] is increasingly common. At this point, the phenomenon breaks the civil sphere and invades the criminal sphere[11].

Inverted trend

The National Vaccination Program (PNI), coordinated by the Ministry of Health in cooperation with state and municipal secretariats, is today among the most comprehensive globally. Brazil offers the most significant number of free vaccines: 15 for children, nine for adolescents, and five for adults and older adults. However, recent data reveal a reversed historical trend of greater vaccine acceptance in the country.

Throughout the 20th century, the Brazilian population went from distrust and hostility to strong vaccine adherence, associated with the success of campaigns to eradicate diseases such as poliomyelitis and smallpox and drastically reducing the incidence of other vaccine-preventable diseases, such as measles, tetanus, diphtheria, and rubella[12].

Although the term "vaccine" appeared almost a century earlier, with the studies of English physician Edward Jenner on the protective effect of cowpox (*Variolae vaccinae*) on the health of peasants, who became immune to smallpox, they began to be mass-produced only at the end of the century the 19th century, emerging as an instrument for the global fight against diseases[13].

In Brazil, the arrival of mass vaccination was associated with hygienist measures that reconfigured the urban fabric of cities and coercive health policies, such as forced vaccination, including authorization to enter households. In 1904, mandatory vaccination against smallpox triggered a popular uprising in the then capital of the Republic, Rio de Janeiro, which became known worldwide as the *Vaccine Revolt*. However, the severity of the disease and the outbreaks that ravaged the country in that historical period made the population not delay in adhering to vaccination[14].

While the vaccine was associated with state violence at the onset of the 20th century, it was close to national consensus at the end of that century and was associated with successful advertising actions, festive and attractive campaigns, and a central symbol called *Zé Gotinha*.

Currently, one in five fake news circulating in Brazil is about vaccines. Fake news about immunizers, with distorted statistical data about contagion, death, and cure and about homemade COVID prevention and cure methods predominantly use the name of FIOCRUZ as a source of information, with the deliberate intention of defrauding the name of the institution and giving trustworthiness to deception, in a criminal, deliberate manner[1].

Vaccine hesitancy

The very success of the PNI is pointed out, paradoxically, as one of the causes of its crisis because diseases become unknown as they no longer circulate, and people's engagement is reduced[15]. Thus, vaccine hesitancy spreads through fertile ground and is currently articulated across social networks.

During the pandemic, public statements by the President of the Republic Jair Bolsonaro contributed to legitimizing vaccine hesitancy, giving greater visibility and scope to his arguments. Although articulated mainly through social networks, the hesitant individuals themselves are not a homogeneous group. They may refuse only one or several vaccines for several reasons, among which are the beliefs that *a) The vaccine contains toxic elements; b) the child's immune system is immature to deal with so many vaccines; c) vaccines are part of a commercial conspiracy by the pharmaceutical industry; d) natural immunity is better; e) most diseases are harmless to most children; f) vaccine-preventable diseases were reduced by improving health conditions, and not because of vaccination; g) the release of virus by residues, after the administration of a live virus vaccine, can lead to illness*[16].

In the case of COVID-19, the belief that vaccines have not been sufficiently studied, given their fast development, is one of the factors associated with vaccine hesitancy, besides distrust about the vaccine's origin and political-ideological factors.

A survey conducted on January 22, 2021, with class A, B, and C Brazilians revealed that, even in the face of misinformation on the subject, most people (72%) intend to take the vaccine against COVID-19, and 43% declared not having any preference for any laboratory and that they would take any vaccine approved by the health authorities[17]. However, a significant percentage declared a preference for a laboratory, 15% for the Oxford vaccine, developed by AstraZeneca; 12% for the Pfizer/BioNTech vaccine; 6% for CoronaVac; and 4% for Indian vaccine COVAXIN.

However, we should note that non-vaccination does not always result from vaccine hesitancy, defined as a delay or deliberate refusal of the vaccine[16]. An empirical study with Brazilian babies in a vaccination delay situation in Cuiabá (MT) points to the unavailability of the vaccine in the reference unit as a cause, per those responsible. Demographic factors, such as the age of the mother or primary caregiver, are also associated with the propensity to adhere or not to vaccination[6].

Methodological path

This paper refers to a quantitative empirical study on the flow of misinformation produced and disseminated about vaccines and the SARS-CoV-2 virus, reported by the *Eu Fiscalizo* app users. The creation of this app was part of researcher Claudia Galhardi's post-doctoral work at the National School of Public Health (ENSP), supervised by Minayo and supported by the Research Support Foundation of the State of Rio de Janeiro (FAPERJ)[18].

The application was developed so that the population could detect, evaluate, and notify inappropriate content broadcast by communication and entertainment channels: commercial open TV, pay TV, streaming service, electronic games, cinema, shows, advertisements, social networks, websites, and messaging apps.

To clarify and oppose the fake news disseminated about the new coronavirus reported in *Eu Fiscalizo*, we counted on the collaboration of pulmonologists and researchers from the National School of Public Health (ENSP), Margareth Dalcolmo[19] and Patrícia Canto[20], and the Journalism and Communication Research Center (NUJOC) of the Federal University of Piauí. The partnership established between the *Eu Fiscalizo* of Fiocruz and the NUJOC reduced misinformation and contributed to citizens obtaining clarifications quickly about the scientifically correct ways to address the COVID-19 pandemic.

In this study, we worked with a sample of 253 checks on vaccine and COVID-19. When developing a study proposal and during the phases of research, the researcher works with the usefulness of the available methods, given the essential information to fulfill work objectives[21]. Quantitative Content Analysis[22] was adopted as an investigation technique and applied in checks on vaccines and COVID-19 from March 26, 2020, to March 31, 2021 (Figure 1).

We applied Cohen's Kappa coefficient test to ensure the quality of the analyzed data. Two collaborators participated and analyzed and coded the units of analysis at this stage of the investigation, using the reduced percentage of the total sample (20%)[23]. The level of consensus reached among the coders was "excellent agreement", validating the data presented in the investigation.

Results

The production of fake news about vaccines has become increasingly prevalent among the Brazilian population with the pandemic development compared to fake news about other public health topics. We can observe this elevation in the Graph 1.

Considering the general approach to vaccines, without distinction of any of them, we can see the leading platforms used to generate discredit regarding immunizers in the Graph 2.

Without a doubt, the most reviled immunizer was CoronaVac. The Graph 3 shows which media mainly were used to disseminate fake news about the immunizing agent produced by Butantan in partnership with Sinovac.

However, other immunizers also suffered from the wave of fake news and misinformation about immunizers. The vaccine produced by Fiocruz in partnership with the University of Oxford was also attacked on digital platforms (Graph 4).

Likewise, the Pfizer vaccine has become an emblem of fake news about adverse effects absolutely without statistical relevance. The following digital platforms predominated as a source of misinformation about this immunizer (Graph 5).

Discussion

We should review how Brazil addressed the pandemic at the outset to understand the vaccine

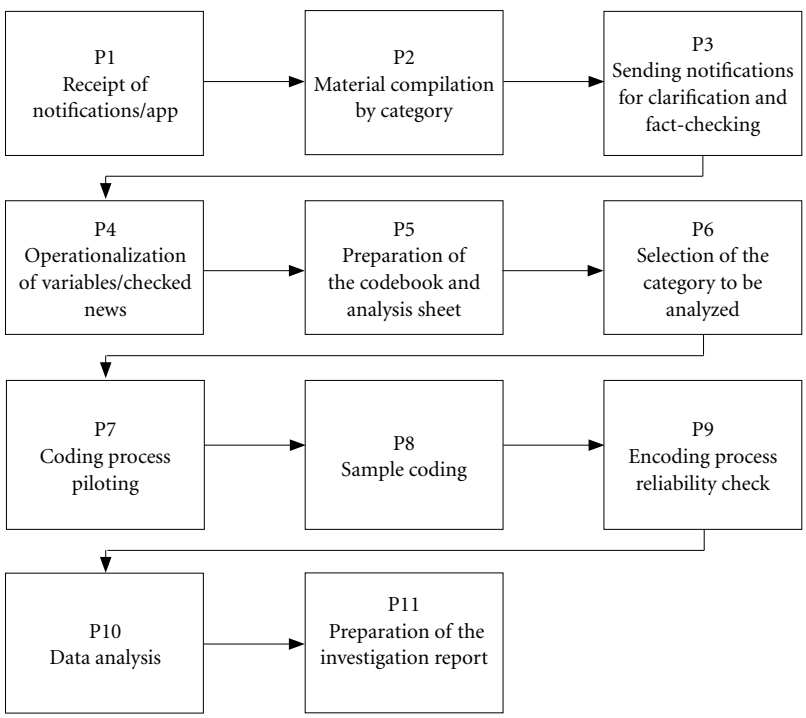
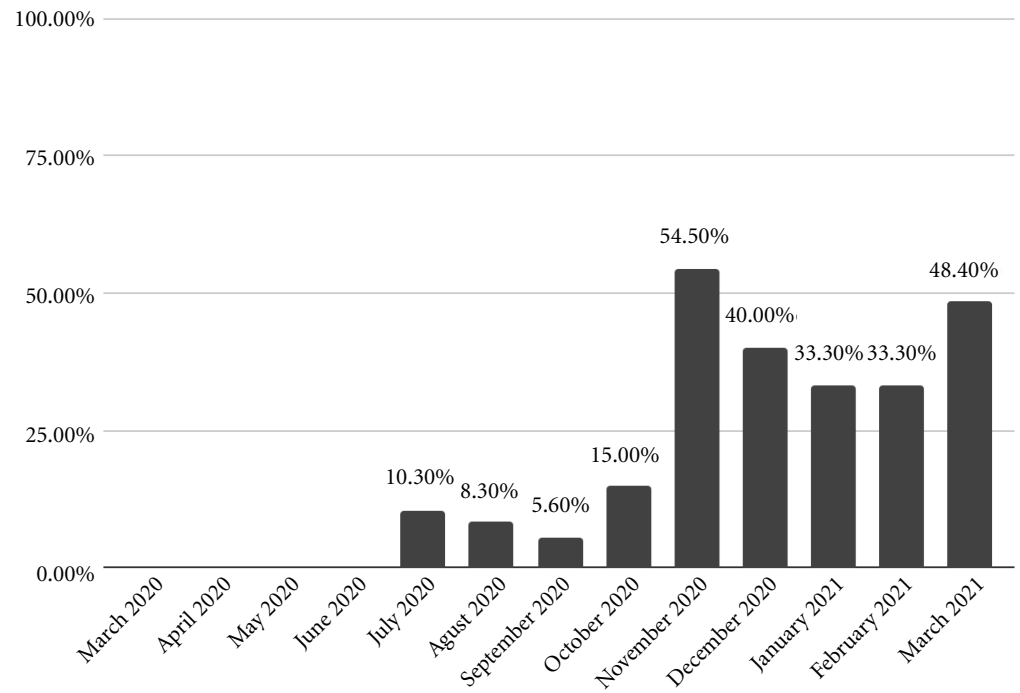


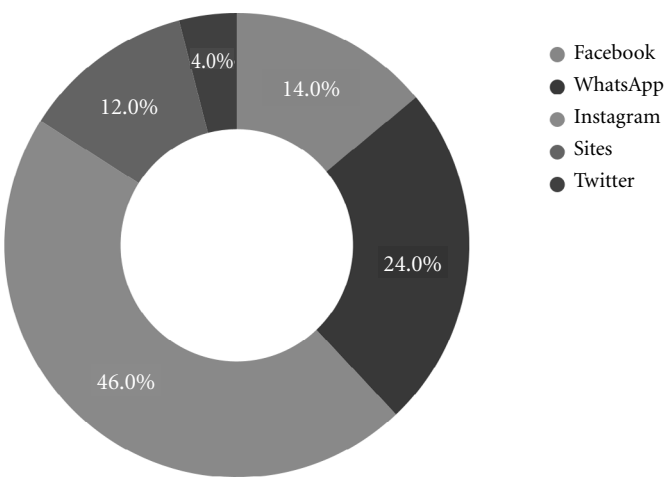
Figure 1. Analysis methodological design.

Source: Authors.



Graph 1. Proportion of fake news disseminated on social networks and messaging apps about vaccines, compared to the total of fake news verified in the Eu Fiscalizo app, from March 26, 2020, to March 31, 2021.

Source: Authors.



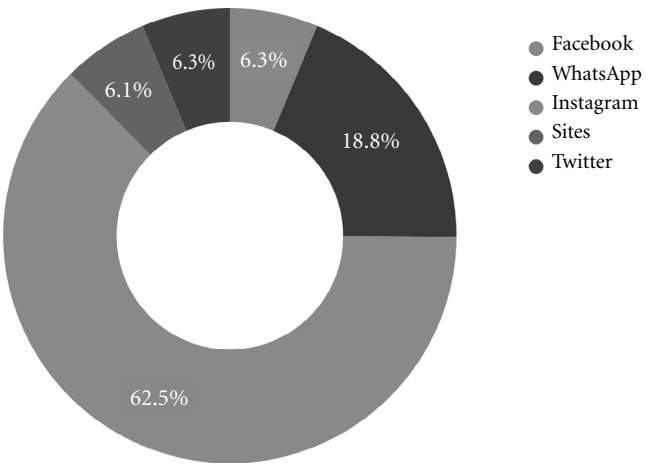
Graph 2. Most used digital media to disseminate misinformation about vaccines, from March 26, 2020, to March 31, 2021.

Source: Authors.

hesitancy backdrop. Mobility restrictions were gradually established due to the infection speed, based on Chinese and European experience, following the WHO and the Ministry of Health guidelines.

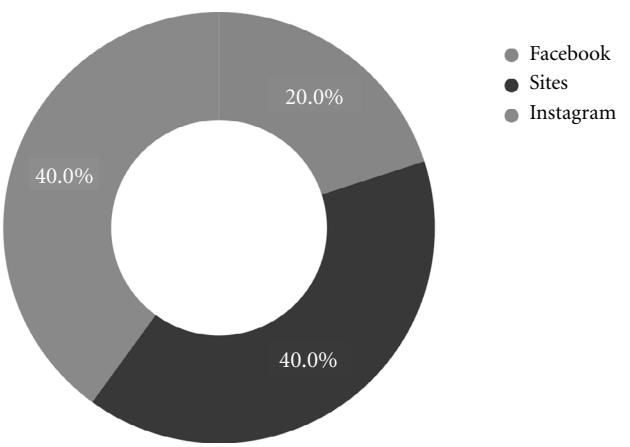
The Federal District was the first federative unit to implement social distancing measures when it interrupted public network classes on March 11, 2020, and decreed the suspension of commercial activities. Similar actions were taken in the states of São Paulo, on March 16, and Rio de Janeiro, on March 17 – followed by others. Brazil recorded its first COVID-19 death on that same day, March 17. The country confirmed 301 cases of the disease at the time, but the case-death curve continued to spiral exponentially.

On the part of the Ministry of Health, the public explanations given daily by then Minister Luiz Henrique Mandetta and his representatives underlined the need to reinforce isolation so as



Graph 3. Most used platforms for disseminating misinformation content about the CoronaVac immunizer, from March 26, 2020, to March 31, 2021.

Source: Authors.



Graph 4. Most used digital means to disseminate misinformation about the immunizing agent AstraZeneca, from March 26, 2020, to March 31, 2021.

Source: Authors.

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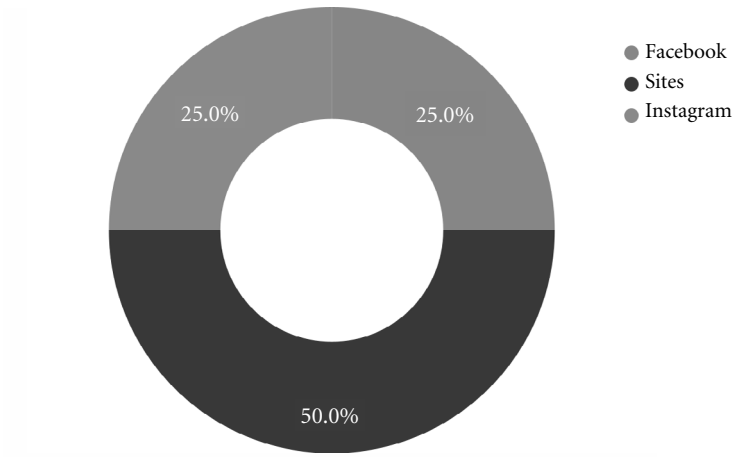

Graph 5. Most used digital means for disseminating misinformation content about the Pfizer immunizer, from March 26, 2020, to March 31, 2021.

Source: Authors.

not to saturate the Unified Health System (SUS). At the same time, a war was raging between the governors and President Jair Bolsonaro, fueled by accusations of overpricing in the construction of field hospitals and the President's criticism regarding the social distancing measures recommended by his Minister of Health. Polarization began to feed the growing circulation of fake news about implementing measures to combat COVID-19[24].

Based on the stance of President of the Republic Jair Bolsonaro, denialism and vaccine politicization[25] contributed to confusing the population and increasing vaccine hesitancy. The President stated that he would not be vaccinated, unlike the leaders of the most diverse countries, who were the first to set an example in their campaigns. Bolsonaro boasted that the vaccine had no proven effectiveness, it would not be mandatory, and highlighted its possible side effects.

The President also despised CoronaVac, the immunizer manufactured by the Butantan Institute in partnership with the Chinese pharmaceutical company Sinovac, fighting a political dispute with Governor of São Paulo, João Doria, and disallowing the Minister of Health, Eduardo Pazuello, who had announced the purchase of about 46 million doses of CoronaVac, provided that the National Health Surveillance Agency (ANVISA) would approve it.

The country's leading political leader's behavior led primarily to vaccine discrimination based on political-ideological issues, making xenophobia a significant part of the population towards the Chinese people blatant. Cases of people who wanted to choose the brand of vaccines were recorded in at least 70% of Brazilian municipalities, and 53.1% of people refused to take Coronavac[26].

In a setting clouded by uncertainty and political disputes, even the first person to be vaccinated against COVID-19 in Brazil, the 54-year-old nurse from São Paulo, Mônica Calazans, became the target of fake news[27]. The São Paulo government applied the first dose of CoronaVac minutes after ANVISA approved the emergency use of the vaccine, with massive media repercussions. However, in the following hours, news began to circulate on social networks stating that the nurse had participated in the vaccination studies and, thus, was already immunized. She indeed participated as a volunteer in the third phase of the vaccine's clinical trials but did not receive the immunizer at that time as she was part of the control group receiving a placebo.

Another episode that marked the onset of vaccination in the country was the case of nurse Nathanna Faria Ceschim, fired from the Santa Casa de Misericórdia of Vitória (ES) after posting a video on social media mocking CoronaVac.

In the video, which went viral, Nathanna, inside the Santa Casa, without wearing a mask, said: "I took (the vaccine) because I want to travel, and not feel safer. A vaccine with 50% security is not a vaccine to me. I took water"[28].

In January 2021, when the country had more than 200,000 deaths from COVID-19, dubious information about vaccination continued to escalate the spread of the virus in Brazil, confusing and encouraging citizens to ignore the recommendations of official bodies. More than 1.5 million people have not returned for the necessary second booster dose from the start of vaccination against COVID-19 to April 2021. The main reasons raised in studies for such absenteeism were the belief in false information about immunizers, fear of adverse reactions, vaccine shortages, confusion about dose intervals, and difficulty accessing vaccination rooms[7].

The fake news infodemic reaches masses of the population with little resistance and who are unable to defend themselves from the flood of disinformation they receive daily on their cell phones. According to the Massachusetts Institute of Technology data, fake news has a 70% greater potential to go viral than accurate news. Where an actual post reaches an average of 1,000 people, a fake one can reach between 1,000 and 100,000 users[7]. However, social networks are not, per se, designed for this purpose. The algorithms are not designed to discredit vaccines specifically. It turns out that conspiracies and fantasies stir strong emotions and generate audience, clicks, and engagement, valuable currencies nowadays[3].

Final considerations

The health-disease process highlights the dialogue between biology and the individual's social condition from the anthropological perspective. Elements inherent to all human beings, such as the newborn's sucking reflex, escape the domain of customs. The health-disease process, in turn, encompasses biological, psychological, and social factors. It is built within specific health and life conditions, subjective singularity, and belief system[29].

Thus, adherence to vaccination is subject to the imagination and social mechanisms that decisively influence the propensity of a given community to be vaccinated or not. The main factors affecting such a decision are the confidence in vaccines' relevance, safety, efficacy, and compatibility with one's religious values – aspects that the Vaccine Confidence Index (VCI) aims to capture. Countries with higher percentages of agreement with statements that vaccines are safe, relevant, and effective have a higher percentage of people interviewed who report having vaccinated their children[30]. Confidence in vaccines is more significant in Africa, Latin America, and the Indian subcontinent, suggesting that recent coexistence with vaccine-preventable diseases is an adherence factor.

Brazil has historically shown a population with great confidence in vaccines, measured by the VCI. However, adherence has declined in recent years. In November 2015, more than 90% of respondents fully agreed with the statement "vaccines are important". In November 2018, this percentage dropped to 80-89.9%.

Complete agreement with the assertions "vaccines are safe" and "vaccines are effective" dropped further during the pandemic, from 70-79.9% to 60-69.9%[24]. The deteriorated confidence continues to escalate and has reached unprecedented levels, above all, because of a novelty: the infodemic of fake news that overwhelmingly reaches society through electronic devices. When analyzing health-related fake news during the pandemic, we should emphasize that in-depth longitudinal studies should be conducted and be associated with continuous monitoring of the disinformation ecosystem in several areas of knowledge.

Collaborations

CP Galhardi, NP Freire, MCM Fagundes, MCS Minayo cunha ICKO Cunha searched the literature and participated in the study's outline and design. CP Galhardi and NP Freire collected data and performed the statistical analysis. CP Galhardi, NP Freire, MCM Fagundes and MCS Minayo prepared the manuscript, and all authors critically reviewed the text for intellectual content. CP Galhardi, NP Freire, MCM Fagundes, MCS Minayo cunha ICKO Cunha participated in reviewing data and intellectual content until the manuscript's final version. All authors had full access to all study data and were jointly responsible for the decision to submit for publication.

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