

Bounded Rationality, Disinformation, and Infodemic in COVID-19 Times

Antonio Roazzi , Ana Iza G. Sobral , Alanny N. de Santana ,
Nathália Patrícia T. B. de Melo , Robson Savoldi  & Rodrigo E. N. Silva 

Universidade Federal do Pernambuco, Recife, PE, Brasil.

ABSTRACT – Infodemic is defined by excessive content of different qualities associated with a specific subject and has relevant consequences. The COVID-19 pandemic is unprecedented, exacerbating the search for information and creating some risks, including not recognizing the veracity and quality of the disseminated content. In this context, this study reflects on the pandemic phenomenon and its psychosocial impacts from the cognitive perspective of limited rationality, understanding the excess of information through decision-making based on heuristics. It is challenging and undeniable that it is up to the authorities to combat and reduce the spread of Infodemic.

KEYWORDS: COVID-19; infodemic; bounded rationality; disinformation; decision-making

Racionalidade Limitada, Desinformação e Infodemia em Tempos de COVID-19

RESUMO – A Infodemia caracteriza-se por uma quantidade excessiva de conteúdos de diferentes qualidades e credibilidade, associadas a um assunto específico e que tem provocado importantes consequências. O fato da pandemia da COVID-19 não ter precedentes, exacerba a busca por informação e geram alguns riscos, dentre eles, o de não se reconhecer a veracidade e qualidade do conteúdo disseminado. Nesse contexto, o presente estudo apresenta reflexões sobre o fenômeno pandêmico e seus impactos psicossociais a partir da perspectiva cognitiva da racionalidade limitada, compreendendo a demasia de informações pela via das tomadas de decisão baseadas em heurísticas. É desafiador, como também incontestável, o fato de que cabe às autoridades o combate e a diminuição da disseminação da Infodemia.

PALAVRAS-CHAVE: COVID-19; infodemia; racionalidade limitada; desinformação; tomada de decisão

The world's population experienced a highly worrying period due to the COVID-19 pandemic, mainly due to the rapid transmissibility of the virus and the emergence of new strains that present themselves more aggressively and accentuate the consequences. In Brazil, the new variants of the virus that causes COVID-19 reaffirm the need to maintain prevention and vaccination measures. However, it is becoming increasingly clear that the use of available protection measures, particularly individual ones, is declining (Benito *et al.*, 2021).

Nonetheless, it should be noted that the Coronavirus has not only caused an unprecedented crisis in the health

and economic systems but has also been causing a wave of misinformation due to a sharp increase in the circulation of fake news (Barcelos *et al.*, 2021). This massive network of disinformation knows no borders and reaches citizens worldwide daily, who encounter rumors and manipulated information that find, in social networks, fertile ground to be exponentially amplified. This phenomenon contributes to feeding a general climate of uncertainty, insecurity, instability, and a sense of powerlessness, the effects of which are not only relegated to the context of virtual relationships but also have repercussions on health, the economy, and even geopolitical scenarios.

As a result of all these implications, human civilization has been going through probably the most critical juncture of this millennium, whose impacts have reached its physiological, social, and mental aspects, a phenomenon called “coronaphobia” (Dubey *et al.*, 2020). Besides the context of disenchantment brought about by the disease itself and accentuated by the need for physical isolation, coronaphobia is also fueled by the multiplication of misinformation because, in addition to confusion, it also spreads fear and hinders correct responses about the outbreak (Depoux *et al.*, 2020).

A similar situation was experienced in 2003 when the epidemic caused by Severe Acute Respiratory Syndrome (SARS) was initially identified in Asia. However, due to its rapid spread and high mortality rate, it reached more than 25 countries (Wu *et al.*, 2009). Based on these previous experiences, some physical and psychosocial alterations were made. Physically, one notable change was social isolation. In Brazil, they took place from restrictive measures, including the closure of schools and universities, the prohibition of significant events and agglomerations, the restriction of travel, and the use of public transport until the complete ban of circulation on the streets (Aquino *et al.*, 2020). In some European and Asian countries, measures even involved curfews in entire cities at night and could even lead to arrests for violating rules (Williams & Cañon-Montañez, 2020). Psychosocial changes, on the other hand, can be predicted for the current context, such as an increase in the number of individuals with anxiety, panic, and anguish (Wu *et al.*, 2009; Dubey *et al.*, 2020).

Additionally, the twenty-first century is marked by the popularization of digital social networks, which contributes to the rapid dissemination of information and disinformation (Depoux *et al.*, 2020). It is understood here that social networks represent a new trend of sharing contacts, information, knowledge, and content through websites on the Internet. Consumers of content—texts, images, sounds, and videos—are also producers of information. Thus, social networks that act on the Internet as interactive platforms, enabling two-way communication between users through the sharing of content, differ from mass communication media, being predominantly forms of unidirectional communication, where information is transmitted vertically from sender to receiver, without the same interactivity offered by social networks. This difference also stems from the type of information control. While on social media, anyone can create and share content, meaning that there is a wide diversity of sources and perspectives available, allowing users to have greater control over the type of information they consume and share, in mass media, content is produced and controlled by a limited number of media organizations resulting in a lower diversity of voices and perspectives, since these

organizations tend to have greater editorial control over the content that is broadcast. The type of reach and audience further differentiates the two types of communication. While social networks on the Internet have a global reach and allow users to connect with people from different parts of the world with the ability to reach a vast and diverse audience, mass communication media, such as television, radio, and newspapers, have more limited reaches, often segmented by specific geographic region or demographic (e.g., Castells, 2000, 2009; Chadwick, 2017; Ellison *et al.*, 2007; Livingstone & Lunt, 2014; Park & Thelwall, 2009; Santos & Santos, 2014).

This information pandemic can be called the “Infodemic.” According to Kalil and Santini (2020, p. 5), “The Infodemic is characterized by an excessive quantity and variety of information of different quality and credibility (some false, some inaccurate, some evidence-based).” While popularizing the term, Costa Junior (2020) describes it as an excess of information that may or may not be accurate and stimulates deep feelings and emotions.

Based on the Pan American Health Organization (PAHO, 2020),¹ the report “Infodemic and COVID-19 - Information as an Instrument against myths” provides a complete definition of the phenomenon, describing it as a high increase in information on a given subject that can multiply in a short period and exponentially, due to a specific event, like the current pandemic.

In this situation, rumors and misinformation arise, as well as the manipulation of information with dubious intent. “In the information age, this phenomenon is amplified by social networks and spreads more rapidly, like a virus” (Article 19, 2021, p. 7). The World Health Organization (WHO, 2020) even stated that this Infodemic can be as threatening as the virus itself, especially considering the spread of fake news and conspiracy theories (WHO, 2020).

Thus, in the face of this long-lasting pandemic, it is worth exploring the still little-known but already frightening effects of the Infodemic and the aspects that facilitate its dissemination (Sánchez & Valdés, 2020). Thus, the present theoretical study aims to reflect on this phenomenon and its psychosocial impacts from the cognitive perspective of bounded rationality (Simon, 1957), understanding the information pandemic through heuristics. To this end, initially, the context of uncertainties in which the current Infodemic emerges and its consequent repercussions will be addressed, and subsequently, reflections on heuristics as ways of understanding and dealing with information excess will be presented.

¹ Available at: <https://iris.paho.org/handle/10665.2/52054> (Accessed on 06/28/2021)

INFODEMIC AND UNCERTAINTY IN TIMES OF COVID-19: PSYCHOSOCIAL REPERCUSSIONS

According to B.F. Skinner's (1904-1990) Radical Behaviorism, the accumulation of knowledge about human behavior, allows the production of behavioral repertoires that increase its predictability and control, generating a sense of security regarding the known (Skinner, 1974), a sensation that in pandemic times is in short supply. In this specific period of pandemic emergency, people live in deep uncertainty about the near future, leading to a series of insecurities. Because of this, the search for information intensifies, and the need to read each article, see each news, listen to the daily live press conferences, watch "lives" and "talk shows" in which the subject is addressed, and be aware of all posts are identified, precisely to strengthen the sense of intelligibility, control, and effectiveness.

In a feedback process, time and attention are increasingly captured by digital information technologies that become part of everyday habits. Thus, companies in the digital market, such as social media, develop a series of persuasive tactics to capture people's attention to make the use of their services a habit (Bentes, 2018). An automatic behavior triggered by situational cues is things we do with little or no conscious thought (Eyal, 2014). This behavior is also aggravated during significant social repercussions and global impact, such as COVID-19.

The need to reduce uncertainty and make the surrounding environment minimally predictable, at least to the point of allowing more sensible behavior to be guided, has been exacerbated precisely by the lack of familiarity with something similar. This is because something of a similar proportion had only happened more than a century ago, with the Spanish flu (for more information, see Goulart, 2005).

However, it should be noted that the first risk that arises from this exaggerated form of news search is the fact of not perceiving conflicting information, imaginative hypotheses and interpretations, rumors, news about new research that gives sensationalist results, second, third, and fourth-hand news, and distortions related to them. In this sense, it should be noted that between January 24 and 27, 2020 alone, about 13,000 publications on social networks such as X (before known as Twitter), Facebook, and Reddit had propagated conspiracy theories about the virus, relating it, for example, to biological weapons (Sánchez & Valdés, 2020).

Regarding denials and contraventions of the distancing norms recommended during the pandemic, Sykes and Matza (1957) reject the prevailing paradigm that deviations from the norm are unusual social anomalies pertinent to an aberrant subculture, unlike the deviators of norms who interpret them as guidelines rather than inviolable rules.

In addition, deviant behavior can be justified in advance, in the opposite way of supposing that the argumentation would always come post-hoc (Harris, 2020). This mechanism is part of the field of the "neutralization theory," intuiting that the behavior of proactively neutralizing a rule even before the execution of the deviant action or rationalizations of the divergent behavior after its implementation, make up the modalities of explicitness of this behavior (Maruna & Copes, 2005; Fritzsche, 2005), understanding that neutralization and rationalization are distinct cognitive mechanisms (Kaptein & van Helvoort, 2019).

Sykes and Matza (1957), in this sense, identified five individual neutralization techniques: the first is the "denial of responsibility," which refers to the attitude of affirming that digressive behavior does not indicate deviation; the second, the "denial of harm," falls on the position of calling attention to the fact that the behavior did not cause any visible harm, which is very similar to the third tactic, the "denial of the existence of victims." The fourth strategy is to strive to attack the defenders of the broken regulations, *i.e.*, "condemn the condemners"; finally, "appeal to the highest loyalties" indicates the behavior of resorting to other norms that justify the behavior in question (Harris, 2020). For example, Harris (2020), in his study on the behavior of individuals who violate lockdown rules during the COVID-19 pandemic and how they neutralize or justify their guilt using neutralization theory as a conceptual lens, found that individuals neutralized guilt in two main ways: by denying deviance, *i.e.*, rejecting the idea that they were violating lockdown rules, and denying the lockdown norm, questioning its validity or relevance.

Each of these examples highlights a myriad of recurrent actions during the pandemic: the association of defenders of the norms with parties or political figures that transgressors oppose making up the fourth strategy. In Brazil, this tactic is evident in the speeches given by the previous President of the Republic, Jair Bolsonaro, and some of his supporters, who associate the recommendations coming from science with strategies of a communist threat that would be fed by politicians from the progressive camp, such as the Workers' Party (PT) and traditional media outlets in the country, such as Rede Globo (Borges, 2021).

Those, on the other hand, who claim that the non-use of masks and the possibility of conducting activities prohibited during the pandemic are part of the constitutionally provided right to come and go seem to be resorting to the fifth strategy and so on. Psychoanalysis associates such positions with defense mechanisms of the ego (I), elucidated when feelings related to specific contents are ostensibly threatening,

which would push the invading content to the region of the unconscious where the repressed thoughts reside. For example, Jung, in his multiple interests in the mind, was interested in the psychology of deviant behavior and the analysis of the defense mechanisms used by people to deal with internal conflicts and, similar to the theory of neutralization, aimed to understand better how individuals deal with guilt and responsibility for their deviant actions (Jung, 2014). Most people, while motivated to understand, do not have the skills to enter the merits of the measures' effectiveness, the information's plausibility, and the exhortations' validity. This is because the correct interpretation of the message is based on elements available in their reality - returning here to Skinner's behavioral repertoires, that is, based on their social experience, which never resembled that lived in this period (Bú *et al.*, 2020).

In addition, it is noteworthy that scientific research in the medical field takes a long time to provide consolidated and reliable results (Castro, 2003; Moraes, 2022) and even longer to be able to consider the aspects and levels of knowledge and language of the population, which would be to ensure knowable communication capable of disseminating constructive, truthful information that contributes to the prevention and fight against COVID-19. Even more so in this context of waiting and uncertainties, the infodemic and its negative social consequences are installed (Zarocostas, 2020). In research conducted in England by Allington *et al.* (Allington *et al.*, 2020; Allington & Dhavan, 2020), a negative relationship was observed between belief in conspiracy theories about the coronavirus and compliance with public health guidelines. Respondents who believe that the virus was created in a lab comparatively are less inclined to wash their hands, stay at home, and practice social distancing. In addition, 37% of people who relate their symptoms to 5G mobile networks – a rumor that recently circulated on the Internet – do not believe there is a valid reason to maintain voluntary home confinement.

Thus, there has been a feeling of powerlessness in the face of the circulation of a virus whose origin has not yet been fully known, accompanied by news dissemination. Such excess encompasses a wide diversity of information, some contradictory and others devoid of any foundation, but incessant and insistent about this virus and how to deal with it, which, instead of ensuring correct and more accessible information, often translates into misinformation, being a factor of stress and anxiety and increasing the feeling of vulnerability, precariousness and impotence in the face of a new, contagious virus that can be deadly for a significant portion of the population (*e.g.*, Gisondi, Aslani, Behmanesh, Davoodi, Garavand, & Shams, 2022; Barber, Faust, Raja, Strehlow, Westafer *et al.*, 2022; Orso, Federici, Copetti, Vetrugno & Bove, 2020).

The Internet is a well-known virtual interaction that facilitates the rapid acquisition of information and direct communication, connecting approximately 3.5 billion

people daily². Its usage has enabled the dissemination of crucial COVID-19 information, including prevention methods, contagion details, symptoms, and consequences, which is a positive aspect (Rovetta & Bhagavathula, 2020). However, measures implemented by various countries to slow the spread of the virus, such as isolation and social distancing, have disrupted people's routines and sense of normalcy. Additionally, home confinement for a segment of the population has altered the dynamics of social media use. While some people can stay home, others from lower social classes must leave their homes to earn a living. Consequently, social media is now also used for work, leisure, and maintaining connections, leading to increased screen time (Malta *et al.*, 2020). This surge in screen time further disrupts essential everyday experiences: "Today, we live in a world very poor in interruptions, poor in between and in-between times" (Han, 2015, p.53).

The SARS-CoV-2 epidemic uniquely highlights a coincidence between virology and virality. Virus and information, including misinformation, have spread so rapidly that they have caused widespread outbreaks and panic in the population (Depoux *et al.*, 2020). Studies show that this pandemic has severely impacted mental well-being (Wu *et al.*, 2009; Yes, 2004). Feelings of entrapment, helplessness, and loss of control and autonomy are some factors that have intensified during this pandemic (Depoux *et al.*, 2020).

Although the effects of the SARS-CoV-2 virus are more strongly associated with physiological aspects, the reverberations triggered by containment measures have created a multitude of repercussions that are part of the field of psychology and psychiatry (Rodríguez-Rey *et al.*, 2020). Especially in individuals who, especially at the beginning of the pandemic scenario, had psychiatric conditions or needed institutionalized care, there was an adverse affectation due to the scenario established by the spread of the disease, erupting in the lives of these individuals, altered patterns of sleep and wakefulness, social rhythms, and accentuation of emotional responses (Prickett *et al.*, 2020; Moreno *et al.*, 2020; Chatterjee *et al.*, 2020).

Constantly facing information overloads, predominantly negative valence, can generate collective hysteria and cause immediate, long-lasting, intense, and limiting psychological consequences, such as irritability, confusion, loneliness, depression, insomnia, and suicide (Depoux *et al.*, 2020). Hawryluck *et al.* (2004) conducted a study during the first SARS pandemic, in which it was shown that a period of quarantine could lead to psychological distress that, in the long term, would be associated with illnesses such as depression and Post-Traumatic Stress Disorder. An increase in the number of suicides posthumously after the protective

² Data from We Are Social's Digital 2019 report and Hootsuite.
Retrieved from: <https://datareportal.com/reports/digital-2019-brazil>

quarantine measures came into effect was noted. In India, the investigation of 72 cases of suicide led to the conclusion that the most alarming reason for the incidence of the act of taking one's own life would be the fear of infection (Raj *et al.*, 2021), which has to do with the need for social belonging, associated with the interrupted/prohibited activities during the quarantine.

As isolation, loneliness, and lack of intergroup support are indicators of poor fulfillment of the need to belong to a group, the practice of social distancing inadvertently leads to feelings of loneliness which, in turn, are risk factors for suicidal ideation and self-destruction attempts (Calati *et al.*, 2019; Li & Wang, 2020). The COVID-19 outbreak can also give rise to stigmatizing factors such as fear of isolation, racism, discrimination, and marginalization, with all its social and economic ramifications (Dubey *et al.*, 2020). Knowing this, the WHO has issued specific psychosocial considerations to decrease the stigma of COVID-19. The guidance provided is regarding the veracity, quality, and accuracy of information found on social media, as well as its over-obtaining, alerting us to the need for it to be carefully checked and analyzed (WHO, 2020).

The pandemic of information and news about COVID-19 has increasingly taken on unusual dimensions. This overload of news that, instead of reassuring, creates even more problems - also because the information and studies presented to the public undergo mistaken simplifications - is added to a plethora of news in the social, economic, and political spheres, also accompanied by fake news, also including improbable news of international conspiracies, often instrumentalized by social networks that manipulate information. The term "fake news" is not entirely adequate to describe the current complex issue of online disinformation since the news is not always untrue, but much more often, it mixes truths with falsehoods. It is a weapon with which certain groups can interfere in the circulation of information and attack or cause damage to traditional media and, especially, independent media. From this perspective, the term disinformation can be characterized as all false or misleading information constructed, presented, and promoted to intentionally cause public damage for shady purposes aimed at manipulating the truth of objective facts (Guess *et al.*, 2018).

This information pandemic is fueled by the fact that little is known about the new strains of Coronavirus. Despite the experience of epidemiological studies on the virus, there are still many uncertainties (Henriques *et al.* 2020).

It should also be noted that traditional medical and epidemiological thinking is based on a standard curve, a clinical pattern usually manifesting everyday, average events. The infrequent events would be in the caudal portion, the narrowest part of a Gaussian curve; however, the larger the population in any space, the greater the probability that, at some point in history, catastrophic events will happen, circumjacenties made explicit through a "fat curve" (Conass, 2020).

The medical and scientific community, as well as epidemiological institutes, has demonstrated that the perception that probabilistic thinking applied to the narrow tail, that is, to everyday life in typical situations, is not suitable to be employed in events whose impact is scalable; this does not mean blaming the areas above for a slow response, but calling attention to the fact that even the way to apprehend the intricacies of the pandemic caused by SARS-CoV-2 is challenging (Conass, 2020).

To an unsuspecting mind, it may seem paradoxical to attribute powerful and reassuring capacities to science. However, science advances through approximation and experimentation, often highlighting what we do not know and what we can still discover. Science plays a crucial role in addressing uncertainties and expanding our knowledge. Through rigorous experimentation and continual questioning, science helps us understand complex phenomena and uncover new areas for exploration. It is a dynamic process that continually evolves as new evidence and discoveries emerge. In a world filled with vast amounts of information and uncertainty, our brains rely on heuristics, or mental shortcuts, to make decisions and solve problems efficiently. Heuristics simplify complex problems, allowing us to navigate our environment more effectively. These mental shortcuts are essential for coping with the sheer volume of information we encounter daily. Heuristics are not only used in scientific research but also play a vital role in our daily lives. From quick decision-making in emergencies to routine tasks like shopping and planning, heuristics help us function more efficiently.

While heuristics are useful, they can also lead to biases and errors in judgment. Understanding these limitations is crucial for improving decision-making processes. Awareness of potential biases can help us critically evaluate our choices and seek additional information when necessary. In the next topic, we will delve deeper into specific heuristics and their applications in various fields, illustrating their significance in scientific and everyday contexts.

INFORMATION AND HEURISTICS: A WAY TO UNDERSTAND THE INFODEMIC

According to classical decision-making theory, we always react to stimuli rationally, based on analysis and considerations, ensuring that decision-making is based on the conscious and critical examination of available information

(Kahneman, 2012). However, the limits of this rationality have now been recognized. Theorists such as Simon (1957), Tversky and Kahneman (1974), and Kahneman (2012) argue that human choices are neither completely nor satisfactorily

explained by the model of the purely rational human being. Instead, individuals often rely on heuristics—mental shortcuts that allow for quick decision-making without exhaustive information processing.

Recent studies further support the notion that decision-making is influenced by bound rationality. Doreswamy and Horstmannshof (2023) highlight that human decision-makers have limitations such as computational capacity, knowledge, and memory usage, which impact their ability to process information comprehensively. Additionally, the affect heuristic, where emotions influence decisions, underscores the departure from purely logical decision-making. Savioni, Triberti, Durosini, *et al.* (2023) note that understanding decision-making processes in various life choices can provide a starting point for future research, suggesting that the integration of heuristics in decision-making models can lead to more accurate representations of human behavior. Furthermore, the gap between intent and impact in decision-making, as discussed by Alaoui (2024), emphasizes the variability between individuals' intentions and their actual outcomes, influenced by heuristics and cognitive biases.

According to the theory of dual cognitive processing, the information we access is processed by two systems in different ways: System 1, which is fast and works through mental shortcuts (heuristics); and System 2, which is slower, more analytical, and rational. System 1, due to its characteristics, is the main vehicle for forming opinions based on heuristics and biases. These heuristics rely on clear, fast, and simplistic rules, which serve as indicators satisfying criteria for decision-making (Gigerenzer & Gaissmaier, 2011). These indicators include social endorsement, a sense of belonging to a group, and the harmonization of informational content with the individual's ideologies, functioning as anchoring elements for decisions (Bohan & Xiao, 2018; Jost *et al.*, 2018).

From this perspective, the difficulty in providing accurate answers and analyzing information related to the COVID-19 outbreak and the infodemic can be understood through dual cognitive processing theories, specifically considering System 1, marked by heuristics. Faced with an enormous amount of information, individuals often rely on these cognitive shortcuts. For example, when confronted with a message on a complex subject for which one lacks expertise, a heuristic based on the source's characteristics might be applied: *"if the source is an expert, they must be right."*

This heuristic is known as anchoring, where subjects use a reference point, called an anchor, to provide evaluations. Often, the anchor is made up of a well-known event: it can be a family member or a prestigious, qualified, respected, credible, trustworthy, or expert/specialized source. Subsequently, accommodation occurs – the phase of analysis and integration of all available information, that is, people are influenced by the information initially provided, by the characteristics of the situation in which the judgment is requested (*e.g.*, Chapman & Johnson, 2002; Epley & Gilovich, 2001; Tversky & Kahneman, 1974). Thus, with the reduction of

uncertainty and the creation of shared realities with the members of their respective identification groups as beacons (Jost *et al.*, 2018), the use of heuristics leads subjects to decisions based on false information, as long as they comply with the indicators above. This provides an economy of cognitive efforts, since the indicators are based on the principle of sufficiency for judgment (Marques, 2020), which is a principle compartmentalized into three different criteria: the accuracy of the decision; how congruent it is concerning the subjects' beliefs; and how much it fits within the subject's social perspectives and objectives (Marques, 2020). From the mid-twentieth century onwards, the scientific literature began to focus more closely on the studies of supposed "mental failures" – cognitive biases – and these were shaped in inferior positions with a normative hierarchy of possible cognitive performances, seen from the perspective of the reasoning advocated by science.

However, such ideas have been remodeled, having as their cornerstone the understanding of biases as substantial consequences in hominid evolution, namely, from a heuristic value, cognitive shortcuts, which usually work in many circumstances, allowing for quick decision-making, which would have been advantageous for survival in ancestral environments (Gigerenzer & Gaissmaier, 2011); understood as a reflection of the reallocation of psychic resources in tasks to which these tendencies were not designed initially; arising from patterns of responses that, despite being biased, they would have lower error costs than unbiased responses (which is explained by the theory of error management biases); from this, evolutionary taxonomy of cognitive biases could be concatenated (Haselton *et al.*, 2015).

The use of human cognitive functions in unnatural environments, combined with error management bias theory (Haselton *et al.*, 2015), tends to favor biases that reduce costly survival errors. Even if these biases increase error rates, they reduce overall costs. From a heuristic perspective, it is important to recognize that both time and processing capacity for information are limited. This limitation has conditioned humans to gradually make judgments that deviate from the standards advocated in probabilistic theories or simple logic.

Tversky and Kahneman (1974) demonstrated this with the "gambler's fallacy," where a bettor believes that the more they lose, the more likely they are to win next time. The effort required to employ a more sophisticated strategy often outweighs the potential benefits of improved precision (Arkes, 1991). Additionally, adaptive decisions in the past, where choices frequently implied life or death, had to be made quickly. This need for rapid decision-making partly explains why problem-solving differs under pressure or reduced motivation (Ebenbach & Keltner, 1998).

For these reasons, it has been suggested that the content and direction of biases are not arbitrary but are designed to serve adaptive interests. Evolutionary novel problems often elicit biases, especially in situations requiring statistical predictions from probabilistic information. This requires

an abstraction in mathematical terms that overwhelms the sensory inputs of humans. Furthermore, in nature, information is typically presented in the form of frequencies, a format with which humans are more accustomed to recognizing and managing information (Haselton *et al.*, 2015).

Kahneman and Tversky (1973) demonstrated that heuristics are a primary cause of errors in probability assessment, leading to systematic mistakes in estimating probabilities. In contemporary times, the problem of the infodemic, characterized by the exponential increase in information complexity and density, can be better understood through these cognitive biases. The infodemic, particularly evident during the COVID-19 pandemic, highlights the impact of cognitive biases on information processing and decision-making. Recent studies have shown that cognitive biases such as the anchoring effect, confirmation bias, and availability heuristics significantly influence how individuals interpret and respond to information (Berthet, 2022; Korteling, Paradies & Meer, 2023). These biases can lead to the spread of misinformation and hinder effective decision-making. Understanding these cognitive biases is crucial for developing strategies to mitigate their effects. For instance, training programs to reduce cognitive biases have shown promise in improving decision-making accuracy (Acciarini, Brunetta & Boccadelli, 2021). Additionally, employing “nudges” can help guide individuals toward more rational and informed decisions by subtly altering the way information is presented (Kakinohana & Pilati, 2023).

Thus, it is precisely under these conditions that relying on the heuristics of specialists reveals a strategy for reducing complexity, which is exceptionally functional and adaptive, promoting the trivialization of the observed reality. However, for this to happen, it is necessary that the “experts” be recognized as such. So, who are the experts to trust? Weeks before the pandemic outbreak, Bichara and Koehler (2019) suggested in a study that the post-truth phenomenon establishes a new psychic model of society. In this model, the success and dissemination of an idea are no longer conditioned to its practical effectiveness or internal consistency. Instead, its affective involvement becomes paramount, measured by digital tools such as shares, likes, and views in digital media outlets. These platforms often privilege more radical positions over moderate ones, distancing divergent conceptions and creating virtual social bubbles (Bichara, 2020). This dynamic underscores the importance of critically evaluating information and recognizing the influence of cognitive biases on our perceptions and decisions.

The Internet is often referred to as a horizontal communication system due to its decentralized and open nature. Unlike traditional media platforms such as television or newspapers, which typically have a top-down hierarchical structure where a few entities control content and dissemination, the Internet facilitates broader participation and diverse voices. This decentralized structure

empowers individuals and communities, allowing for greater inclusivity and the amplification of a wide range of perspectives (Swaroop, 2024). Recent developments in decentralized social networking platforms further enhance this horizontal nature by addressing privacy concerns and reducing censorship (Shilina, 2023). These platforms leverage blockchain technology to ensure user data privacy and empower users with more control over their content and interactions. Moreover, the role of social media in promoting inclusivity cannot be overstated. Using hashtags, trending topics, and user-generated content, social media platforms have become powerful tools for amplifying diverse voices and fostering a sense of community among marginalized groups (Swaroop, 2024). This inclusivity is crucial in a world where diverse perspectives are often underrepresented in traditional media.

The concept of the spectacle society (Debord, 2003), as discussed by Bichara and Silva (2016), has been remodeled to include the idea of a diffuse spectacle. This concept, born from the premises and contradictions of a capitalist society focused on diversity and individuality, highlights the horizontality of the Internet due to its decentralized and open nature (Gotham & Krier, 2008). Unlike traditional media platforms such as television or newspapers, which typically have a top-down hierarchical structure where a few entities control content and dissemination, the Internet facilitates the coexistence of multiple narratives. These narratives serve the purposes of the current financial organization in unique and individualized ways (Bichara, 2020).

This decentralization makes it difficult, if not impossible, for an integrative narrative to mobilize the collective effectively. Instead, mobilizing actions of a denialist nature become disintegrating forces, causing chaos and fear. This, in turn, weakens individual consciousness and strengthens “herd thinking.” These dynamics are well within the framework of society refined by Debord (2003) and further analyzed by Bichara and Silva (2016). Recent studies have shown that the proliferation of diverse and often conflicting narratives on the Internet can lead to fragmented social consciousness, further complicating collective action (Siddiqui, 2023; Kaplan, 2012).

Taking this issue into account, the recognition of the importance of responding to infodemic led the WHO to convene over 110 experts at a scientific conference in July 2020. This culminated in the acknowledgment that combating the epidemic of disinformation requires a coordinated and multidisciplinary response (Garcia & Duarte, 2020). This response is based on “infodemiology,” the science of infodemic management (Eysenbach, 2002). Four key pillars were defined: monitoring the information disclosed, enhancing digital health literacy and scientific understanding, promoting fact-checking and peer review, and ensuring accessible and timely communication (Eysenbach, 2020).

The uncertainty regarding the effectiveness of measures to curb the virus spread was mainly due to the scant initial

evidence of when the virus began spreading to countries outside China. It is important to note that evidence demonstrates the rationality of decision-making processes; these processes are means, not ends. Science itself does not conclude with the presence or absence of evidence, although this is undeniably a crucial aspect of producing scientific knowledge, based on empirical observation (both direct and deductive) of observed realities and phenomena. However, far removed from the *modus operandi* of scientific construction, the lay public often attributes excessive value to evidence. This leads to the principle of extreme plausibility guiding decision-making when empirical evidence is absent or insufficient. Recent studies have emphasized the need for a nuanced understanding of scientific processes among the public to prevent the misinterpretation of scientific data and improve public health responses (Infodemiology.com).

Considering the prior knowledge that disease transmission occurs through close contact between people, social distancing emerged as a plausible measure in unprecedented circumstances such as those caused by COVID-19. However, significant doubt arose regarding the real benefits of adhering to social distancing rules due to a scarcity of evidence. This skepticism weakened the argument for social distancing, even though the benefits were more predictable, the potential harms were uncertain and could lead to severe consequences.

The emphasis on punctual evidence neglects the systemic nature of recommendations from health bodies and institutions (Conass, 2020). The principle of asymmetry applies in situations where the positive effect of a given measure is unknown. In such cases, even if there is no direct evidence of benefits, the hypothesis that there are benefits should be valued more significantly than the potential harms (Conass, 2020). This rationale supports the use of masks. Although there may be doubts about their advantages, such as the increased frequency of touching one's face, the systemic positive effects outweigh these concerns.

No one possesses solid and certain knowledge in this specific area yet, as many gaps need to be filled. Nonetheless, virologists, researchers, and institutions with political responsibility for decision-making based on technical-scientific committees remain the most reliable experts currently available. Recent studies continue to underscore the effectiveness of social distancing and mask-wearing in reducing transmission rates and managing public health crises (Neuwirth & Gruber, 2022; Murphy Lim, Mills, Wong *et al.*, 2023).

To all this is the conception of disease as a common stigmatized trait, a repercussion notably observed during the SARS outbreak in the early twenty-first century (Oaten *et al.*, 2011). Individuals infected with COVID-19 can remain asymptomatic, unknowingly spreading the virus and thus avoiding stigma. However, those whose infections are diagnosed often face blame and discrimination, reminiscent of the stigma experienced during the Acquired

Immunodeficiency Syndrome (AIDS) epidemic in the 1980s and 90s (Powell *et al.*, 1998). Stigma, in this sense, can extend even to those who do not contract the virus but are perceived to be non-compliant with protective guidelines.

Another emerging phenomenon is the identification of characteristics that may indicate potential carriers of the virus, leading to increased prejudice against people of Asian descent and manifestations of systemic racism (Chou & Feagin, 2015). This prejudice was exacerbated by the actions of certain leaders and public figures. For instance, the then-president of the United States, Donald Trump, referred to SARS-CoV-2 as the "Chinese virus," highlighting its origin in China and inadvertently fueling xenophobia (Kurohi, 2020). Recent studies emphasize the ongoing need to address and mitigate stigma associated with infectious diseases, as it has profound implications for public health and social cohesion (Saeed *et al.*, 2020; Akbari.Mohammadi *et al.*, 2023).

Institutionally, there have been instances of denying basic civil rights, such as companies refusing to serve customers of Asian descent, preventing individuals with these racial characteristics from boarding public transportation, or even subjecting them to moral harassment in work environments (A3PCON, 2020). Across Europe, Anti-Asian aggression has led to a record number of reports of online harassment and racial targeting (Roberto *et al.*, 2020). Notably, in many cases, the harassed individuals were neither Chinese citizens nor had any Chinese kinship.

Stigmas can serve as a cognitive basis for social groupings, where individuals become involved through the prior acceptance of the categories defined within the group. Self-classification within these conglomerates is strongly influenced by comparisons that establish concepts of what differentiates this group from others, simultaneously creating the external group. Such differentiation accentuates similarities within the community while highlighting differences from those outside it. The mere existence of a diverse group can trigger intergroup competitions (Stets & Burke, 2000; Tajfel *et al.*, 1986).

Considering that categorization is a fundamental cognitive tool and that social categorization is easily remembered, harmful attributions of behavior result from stereotyping. The stronger the identities inside and outside respective groups, the more radical the stigma factor becomes (Haslam *et al.*, 1995). The maximum representations of these psychological mechanisms during the pandemic were the protests mobilized by Asian communities worldwide, reacting to the symbolic – and even physical – violence inflicted on them (Chen, Zhang & Liu, 2020; Zhou, Banawa, & Oh, 2021, 2023). Recent studies highlighted the pervasive nature of stigma during infectious disease outbreaks, emphasizing the need for comprehensive strategies to address and mitigate these effects (Saeed, 2020; Akbari *et al.*, 2023).

The anti-vaccination movement, which gained momentum when vaccines for diseases such as mumps, rubella, and measles were falsely accused of triggering

autism, significantly impacted the pandemic. This effect was exacerbated by using bots to spread both true and false information through the media (Vignoli *et al.*, 2022). According to Mesquita *et al.* (2020), fake news spreads faster and more widely than true news, primarily because humans are more inclined to share untruths quickly. Pennycook *et al.* (2018) explain this phenomenon by noting that repeated exposure to information (*e.g.*, seeing it in multiple news outlets) increases its perceived truthfulness, a concept known as the “illusory truth” effect.

Strategies involving artificial intelligence technologies, particularly Natural Language Processing (NLP) and Machine Learning (ML), have been suggested to combat the issue of misinformation on the Internet. NLP focuses on how computers can understand and process human language, while ML involves algorithms that enable computers to learn and improve from data without explicit programming. Applying these technologies to social media tools can help identify fake profiles created to spread misinformation, thus aiding in distinguishing true information from false

information (*e.g.*, Hauch *et al.*, 2015; Garcia *et al.*, 2022; Shu *et al.*, 2017). However, current measures to address the relentless flow of fake news remain limited and insufficient (Mesquita *et al.*, 2020).

The primary strategy to minimize the infodemic and escape the “cacophony” of the information environment is to verify the source and accuracy of the information, trust official sources, and prioritize quality over quantity. It is essential not to succumb to the temptation of sensationalized and misleading narratives that resemble a noir soap opera plot.

Linden *et al.* (2020) highlight strategies for coping with COVID-19 misinformation based on behavioral sciences. One such strategy, psychological inoculation, operates on a principle similar to vaccines. This approach suggests that exposing people to news that warns about misinformation can help develop psychological resistance to fake news. This mechanism functions like a vaccine, preparing individuals to recognize and resist misinformation, thereby strengthening their defenses against it (*e.g.*, Raquel *et al.*, 2023).

CONCLUDING REMARKS

The uniqueness and complexity of the COVID-19 pandemic highlight the necessity of seeking evidence-based knowledge through integrative and multidisciplinary actions to generate effective solutions. The pandemic has shown that the virus, while a direct health threat, is not the only challenge we face. Addressing disinformation requires understanding its origins and updating the rules of the digital ecosystem. This involves promoting a more active role for intermediaries and citizens to limit the spread of unfounded and false news (*e.g.*, Ishizumi *et al.*, 2024; Naeem & Boulos, 2021; OECD, 2020; Zhou *et al.*, 2023).

In this context, social distancing does not necessarily mean isolating oneself or avoiding all interactions. It is both possible and necessary to use this time to connect with others constructively through social media. Choose to follow and engage with people who can be sources of inspiration rather than misinformation. This is an ideal time to set and pursue personal goals, marked by a constant need for stimulation to become more proactive, productive, and positive. This approach can help alleviate fear by reactivating coping skills. Amid the health crisis, there is a growing interest in understanding the potential long-term impacts of the post-Coronavirus era.

The pandemic caused by SARS-CoV-2 has unveiled a broader spectrum of crises that our contemporary society is already facing. Among these is the socio-environmental collapse, which empirically demonstrates global capitalism’s physical and systemic limitations. This is evidenced by the need for innovations in Earth system governance to moderate capitalism’s impacts on the global environment (Bichara, 2020; Turner, 2021). Additionally, zoonotic diseases

such as SARS-CoV-2, swine flu, and avian flu are known to be bred at the intersection of economics and epidemiology. They arise from the zoonotic transfer – when infectious diseases jump from animals to humans – primarily due to increased proximity and regularity of contact between species, creating an environment conducive to disease evolution (*e.g.*, Bardhanet al., 2023; Mishra *et al.*, 2021). Recent trends show that over 70% of zoonotic diseases have originated in wildlife, attributed to environmental changes, changes in hosts and their behavior, and changes in pathogens.

The pressures exerted by agroecological and urban landscapes within the capitalist system result in closer interaction with virulent strains. This reflects the increasingly invasive agroeconomic ventures into ecosystems, leading to a scenario that verges on irreversibility due to the extent of destruction. Scientific literature provides ample evidence, with numerous publications and studies explicitly addressing the issue (Bichara, 2020; Latour, 2017).

Furthermore, it is incumbent upon relevant authorities to combat and mitigate the spread of the Infodemic, particularly disinformation. This is crucial because, in addition to physical illness, a pandemic fraught with uncertainties – coupled with changes in living conditions and occupational performance – can profoundly affect individual survival by directly impacting psychosocial aspects. The Cuban Journal of Health Sciences Information, in an editorial titled “Disinformation in times of COVID-19” (Sánchez-Tarragó, 2020), underscores that technical and instrumental skills related to accessing, using, and disseminating information in mass media are insufficient. Instead, there is a need for reflective actions and skills that encourage the evaluation of consumed

information. This involves fostering a political and social consciousness that enables a critical, appropriate, and realistic interpretation of observed phenomena. Recently, UNESCO policy briefs have assessed the COVID-19 'Disinfodemic', identifying several types of coronavirus disinformation and responses that often affect freedom of expression worldwide (UNESCO, 2023). The World Health Organization has also emphasized the importance of training health workers to identify and address health misinformation and tailoring health information and digital literacy initiatives to specific populations (WHO, 2022).

In conclusion, the COVID-19 pandemic has exposed the fragility of our global health systems and highlighted the critical role of accurate information dissemination.

To navigate through and beyond the pandemic, authorities, media, and individuals must foster an environment of collaborative critical thinking and evidence-based decision-making. Combating the infodemic requires a multifaceted approach that includes strengthening digital literacy, promoting transparent communication, and implementing robust regulatory frameworks to curb misinformation. By embracing these strategies, we can mitigate the psychosocial impacts of disinformation, enhance public resilience, and ensure a more informed and healthier society in the face of future crises. The lessons learned from this unprecedented time underscore the imperative for continued vigilance and innovation in managing health threats and the information landscape surrounding them.

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Corresponding Author

Antonio Roazzi
roazzi@gmail.com

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