




From Naive Interest to Shortage During COVID-19: A Google Trends and News Analysis

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Abstract. Google Trends is a web-based tool for analyzing audience interests, tracking the popularity of events, and identifying emerging trends that could become a crowd purchase intention. The tool performs different combinations of trending queries and related topics at a given time and location until structured data, charts, and maps show a tendency, most relevant articles, and interest over time, among others. We consider data from January 2018 to December 2022, representing three typical times of the normal period before the pandemic, the outbreak period, and the widespread period. The analysis explored when people were more interested in certain products and when news about their scarcity appeared. The results showed that the pandemic gradually changed people's shopping concerns, which spread more throughout the week that the pandemic began. The study case used a validation process that compared real online data obtained from searches with offline data from official news portals of the same period. The comparative analysis established a relationship between trends and the scarcity of Ivermectin and face masks.

Keywords: Google Trends · Google News · COVID-19 · Search Interest · Scarcity

1 Introduction

The COVID-19 pandemic has left an indelible mark on people worldwide. It triggered widespread social and economic disruption, with business closures, job losses, and unrest across all industries. The implementation of quarantines as social distancing measures drastically altered daily routines and interpersonal interactions. As countries implemented various restrictions and lockdown measures to contain the spread of the virus, people turned to the internet for multiple purposes: remote work and learning, telemedicine, entertainment and media consumption, online shopping, information seeking, and virtual socializing, leading to a surge in online activities.

The pandemic stimulated research in developing technological tools for health areas, education, and electronic commerce [14, 23, 24]. It also sparked increased interest in information related to COVID-19, including updates from health authorities, guidelines, and research results. People searched for news, medical information, prevention measures, and vaccination updates [20]. Hence, understanding the interests, doubts, and opinions people expressed and disseminated online during this period can be useful for planning responses to seemingly sudden events [4].

During crises like COVID-19, Google Trends data can inform us about people's concerns and interests in times of uncertainty [2]. We can explore concerns and topics that were top of mind for people during the pandemic by analyzing interest searches and pairing this data with online news in the same time frame to enhance the understanding holistically. Therefore, an exploratory study is proposed through two words that resonated during the pandemic: "ivermectin" and "face mask" using Google Trends and News API.

Having established the context, the following section describes related studies highlighting the importance of Google Trends analytics. The data collection details in the methodology section are defined, covering keyword selection, designated time frame, and geographic scope. Then, the results are characterized via trend charts and news headlines. Subsequently, the discussion section analyzes these findings, clarifying their implications between these two sources, and, finally, the conclusion section summarizes the fundamental conclusions of this exploratory study.

2 Background

Google first launched GoogleTM Trends in May 2006, and since then, it has been available to the general public and has continuously updated and expanded its features to provide more robust and insightful data analysis tools [23]. Over the years, Google Trends has become widely used to track public interest and awareness of specific topics or events [18]. By examining search volumes and patterns, practitioners can understand the popularity and fluctuations in interest over time [23]. This information can be useful for studying public sentiment, identifying emerging trends, or monitoring the impact of public health campaigns or awareness initiatives [11, 15].

Google Trends has been used in public health issues to find relationships between symptomatology and outbreaks during and after the COVID-19 pandemic [1, 4]. Many studies have analyzed patterns related to Mpox in endemic and non-endemic countries. The authors observed search queries related to symptoms, self-diagnosis, and treatment options to understand public health concerns and monitor the spread of diseases [22]. This can aid in focusing resources and addressing crucial questions to advance scientific understanding of the virus [6, 17]. This information helps gauge public engagement, identify areas where misconceptions or misinformation exist, and tailor public health communication campaigns accordingly [11]. By monitoring search queries related to COVID-19

symptoms or related terms, researchers have identified geographical hotspots or spikes of interest that may indicate potential outbreaks in specific regions [8].

Google Trends has also provided insights into information-seeking behavior through search trends to examine common queries, popular keywords, and related topics within the psychology [9] and e-commerce [18,26] domains. This kind of analysis can help in designing targeted interventions, creating educational resources, or tailoring communication strategies to meet the information needs of the public better. As forecasting data have been employed for predictive analytics by examining historical search trends, models to forecast future trends or predict outcomes in public opinion, consumer behavior, or market trends [15]. This can be valuable for businesses, social sciences, and public policy planning. Monitoring public sentiment and concerns by analyzing search trends for keywords related to mental health, anxiety, or social issues can provide insights into a crisis's emotional and psychological impacts [1]. This information can guide the development of support systems and mental health interventions.

To study the impact of policies, interventions, or significant events on public behavior or interest, it could be used to compare and assess search patterns before and after specific events, such as volatility markets [18], evaluate the effectiveness of interventions, measure changes in public attitudes or behaviors, and inform policy decisions [12]. Combined with news analysis, it could provide a comprehensive platform for monitoring news articles related to events from various sources. Researchers can analyze news articles' content, themes, and coverage to gain insights into media narratives, the dissemination of information, and the representation of different perspectives [25]. This can aid in understanding public discourse and media influence during the pandemic.

3 Materials and Methods

3.1 Google Trends

Google Trends, a Google Inc. portal, generates data available in real-time on geographical and temporal patterns according to specified keywords. Although it mirrors the search interest in particular topics, it increasingly allows people worldwide to explore global reactions to prominent events [19–21]. A spike for a specific topic does not reflect that a subject is somewhat “popular,” only that, for some unspecified reason, there appear to be many users performing a search about a topic. It is important to note that while Google Trends provides valuable insights, researchers should consider its limitations. Google Trends represents the search behavior of Google users and may not fully capture the entire population's behavior.

Google Trends provides weekly information on the search frequency of keywords in the Google search engine. The search keyword is analyzed based on the searcher's category and location. In addition, this tool provides “Popular Searches” and “Top Charts,” including top and rising searches that contain the search keyword [13]. This information is current and compares trends by providing past weekly charts. To measure and compare the popularity of search

terms or topics over time, it uses the search volume index (SVI), which provides a relative value that indicates how much search interest there is for a specific term compared to the baseline period. The SVI captures the level of interest in a particular search term on a scale of 0–100. The baseline period, set to 100, serves as a reference point. Any value above 100 indicates higher search interest than the baseline period, and any value below 100 indicates lower search interest.

3.2 News API

News API (application programming interface) is a simple HTTP REST for searching for and retrieving articles, headlines, and other documents related to the news, both live and historical. This kind of API utilizes the HTTP protocol for communication; through this method, GET uses URLs to identify and access specific news. Being stateless, the server does not store client-specific information between requests, making each request independent and self-contained. It allows searching for articles with any combination of the request parameters: *q*, the keyword to search for in the article title and body; *searchIn*, the fields to restrict the *q* search; *from*, a date for the oldest article allowed; *to*, a date for the newest article allowed; *language*, the 2-letter ISO-639-1 code of the language to get headlines for; *sortBy*, the order to sort the articles in.

- *q*: “ivermectina”; “tapabocas”
- *searchIn*: ‘title’
- *from*: 2018-01-01
- *to*: 2022-12-31
- *country*: ‘co’ (Colombia)
- *sortBy*: ‘publishedAt’
- *language*: ‘es’ (Spanish)

3.3 Data Analysis

The present study aimed to explore the search terms “ivermectin” and “face mask,” which garnered significant attention amid the COVID-19 pandemic. The term “ivermectin” was specifically chosen due to its medical relevance, public intrigue surrounding prospective treatments, and the starvation of this medication. On the other hand, the term “face mask” was chosen to represent consumer behavior and public health mandates, reflecting not only adherence to protective measures but also the tangible societal ramifications of supply shortages. These terms collectively unfold as portals to decipher people’s health concerns, resource constraints, and their rippling repercussions across societal fabrics, rendering them apt focal points for this exploration. And since we were interested in a local analysis of Colombian territory, those search terms were used in Spanish. In addition, a third search term, “milk,” was chosen as a control group in an experiment. This term suggests a “typical” trend since it is a consumer item belonging to the family basket that did not present a shortage in the pandemic, which could offer a contrasting viewpoint. Finally, a time window of 5 years is

selected to explore a broader panorama before and during the pandemic, from January 1, 2018, to December 31, 2022.

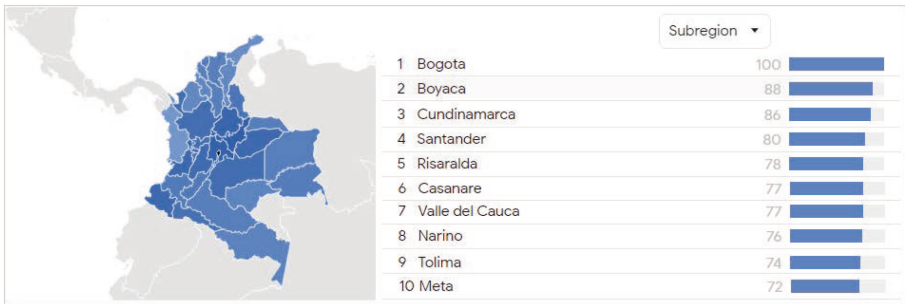
Given the above, structured data from web searches was collected in a simple query with the following parameters:

- Search terms: “ivermectina”, “tapabocas”, “leche”;
- location: Colombia
- time: From 2018 to 2022
- Others: “All Category” and “Web search”

4 Results



(a) Keyword “ivermectina”



(b) Keyword “Tapabocas”

Fig. 1. Interest by Colombian subregions. The darker blue area signifies a higher proportion of all queries. (Color figure online)

In Colombia, interest in the general search terms “ivermectin” and “mask face” for the last five years showed an increased trend for both search terms in the general category during the COVID period compared to the years before the pandemic. The results presented are normalized to represent relative popularity

rather than absolute search volumes. Thus, corresponding the search interests of different terms or topics over time and across other regions is easier.

Figure 1 provides a visual summary of geographical distribution by regional administrative and economic divisions (departments). It depicts where the largest concentration of web searches are from people interested in the “ivermectin” and “face mask” terms during the 2018–2022 timeframe. Fig. 1a shows the departments with the highest SVIs for the term “ivermectin.” Amazonas, Atlántico, and Sucre are the three departments that top the list. Fig. 1b shows the subregions with the highest SVIs for the term “face mask.” The first is Bogota, Colombia’s capital district and the most populous city, marked with a cross in the center of the map. It should be noted that values are calculated on a scale from 0 to 100, where 100 is the location with the most popularity as a fraction of the total searches in that location, and a value of 50 indicates a location that is half as popular. A value of 0 indicates a location with insufficient data for this term. A higher value means a higher proportion of all queries, not a higher absolute query count.

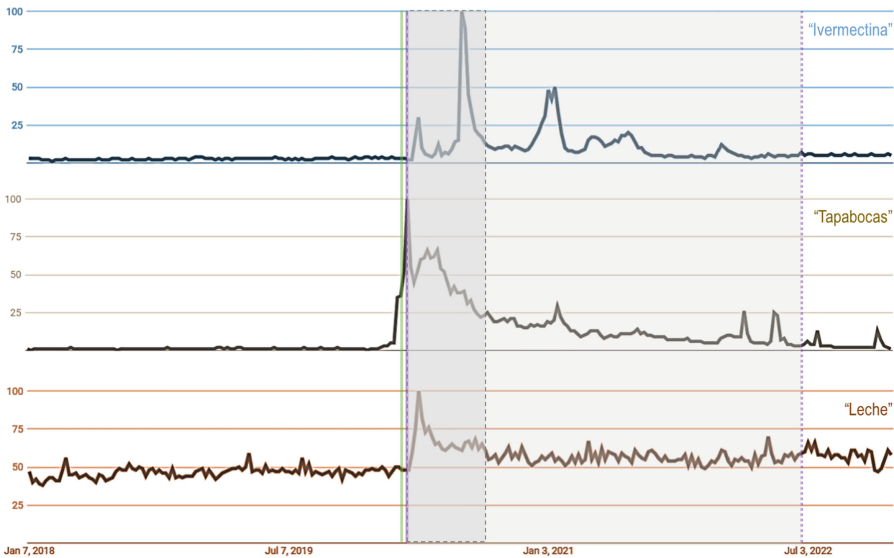


Fig. 2. From top to bottom, Google Trends results for the keywords “ivermectin”, “face mask”, and “milk” between 2018 and 2022.

Figure 2 illustrates the interest of three different terms on Google web searches: “ivermectin” at the top, “face mask” in the middle, and “milk” at the bottom. As the figure shows, a green line corresponds to the first week of March, in which the first case of COVID-19 in Colombia was officially confirmed. It matches the biggest spike in the chart for the term “face mask.” Two weeks earlier, which witnessed an increase in the line, news was reported about the

shortage of face masks in the country, as Table 2 shows. The purple line close to the dotted line is the week in which the vital simulacrum of the quarantine was established in the capital. The first dotted line marks the official start of the quarantine, and the second dotted line indicates the end of the quarantine.

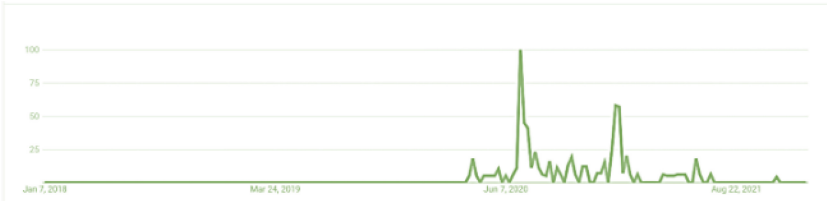
The keyword “milk” was used as a control term since it is part of the family basket and for which we anticipated a monotonous trend, whereas, for the other two terms, we expected peaks with an upward trend in times of pandemic. However, the three terms presented a search peak just at the beginning of the pandemic in Colombia, the period in which the World Health Organization named coronavirus disease COVID-19. The face mask’s bottom graph shows peaks from the third month of 2020 to the present, roughly coinciding with Ivermectin. This is simply because the face mask had a higher volume of internet searches, possibly because it became a must-wear product.

Figure 3 illustrates the interest of five related queries with “ivermectin” suggested by the tool due to their popularity. Fig. 3a shows the combination with the term “COVID-19,” which only started to trend at the end of 2019. Fig. 3b represents the combination of the term “price.” The tendency line comprises several little temporal spikes before the quarantine period but three big spikes during quarantine. Fig. 3c reflects “how to take the ivermectin.” This tendency line is similar to the above, with more little spikes before quarantine and bigger spikes during quarantine. Fig. 3d shows a tendency line of stationary spikes related to “what is ivermectin for” that are more numerous during the outbreak. And finally, Fig. 3e shows spikes related to “ivermectin contraindications”. Both Fig. 3d and 3e are highly related.

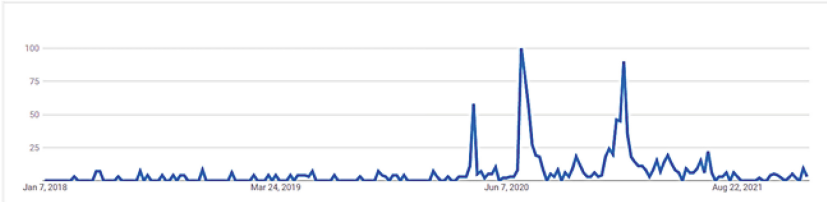
Table 1 shows that news about general communication discourages people from using Ivermectin and from talking about the scarcity of the pharmaceutical, while Table 2 lists news about face mask scarcity during the entire pandemic period. Both Table 1 and Table 2 show the news chronologically.

The highest SVI in the five years of observation for face masks and milk was at the beginning of the pandemic when the quarantine was made official, and the use of face masks for citizens became mandatory; clearly, this would indicate that people were concerned about health and food safety. Although the search interest for “ivermectin” is not at its highest in the observation window, comparing its SVI with those of the other terms, a few weeks later, it is already beginning to show signs of great public interest. Even it is noted that the keywords related to “ivermectin price” and “how to take ivermectin” were gaining popularity during the pandemic.

Now, when comparing two different sources of information, some indications can be observed to analyze. The first news about Ivermectin scarcity appeared in October 2020. Although the mask was sold out from the beginning of the pandemic, the Ivermectin was not, and maybe there was a chance that the search interest could give a sign of its future shortage. However, this trend is not easy to detect by the human eye due to the changing nature of this kind of data, which is affected by the complexity of online interactions and societal uncertainties.



(a) Keyword "ivermectin COVID-19"



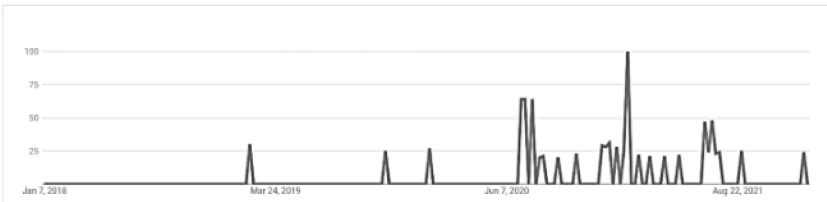
(b) Keyword "ivermectin price"



(c) Keyword "how to take ivermectin"



(d) Keyword "what is ivermectin for"



(e) Keyword "ivermectin contraindications"

Fig. 3. Google trend local web searches for terms related to "ivermectin" for the last five years. The y-axis is the SVI from 0 to 100, and the x-axis is the time scale.

Table 1. News headlines retrieved by News API regarding “ivermectin”

(1)	Ivermectin is not tested in Colombia to treat patients with COVID-19 <i>Source:</i> La República <i>Date:</i> 10-02-2020
(2)	National Government Does Not Recommend Ivermectin As a Treatment for COVID-19 <i>Source:</i> La FM <i>Date:</i> 13-07-2020
(3)	Invima gave free rein to the study to apply Ivermectin in the department of Valle <i>Source:</i> El Tiempo <i>Date:</i> 13-07-2020
(4)	Ivermectin and other drugs without proven efficacy against the Coronavirus that are promoted in Latin America <i>Source:</i> BBC <i>Date:</i> 14-07-2020
(5)	The laboratory that produces ivermectin denies that it works against COVID-19 <i>Source:</i> El Espectador <i>Date:</i> 5-2-2021
(6)	What is Ivermectin, and why is there an increase in cases of poisoning in Colombia? <i>Source:</i> AS Colombia <i>Date:</i> 21-6-2021
(7)	Misinformation about COVID-19 leads to shortages of Ivermectin, a drug for animals <i>Source:</i> The New York Times <i>Date:</i> 30-9-2021
(8)	Ivermectin: How fake science invented a ‘miracle’ drug against COVID-19 <i>Source:</i> El Tiempo <i>Date:</i> 8-10-2021

5 Discussion

Our analysis of Google Trends data on the key search terms chosen for this study from January 2018 to December 2022 revealed a national online interest in “facemask” went from irrelevant to a topic of national concern due to the shortage that it had already presented before the first case of COVID was confirmed in the country. The largest trend is concentrated in the departments of the Andean region of the country, where the largest number of inhabitants and the most economically important cities are located. “ivermectin” was of greatest

Table 2. News headlines retrieved by News API regarding “face mask”

(1)	The demand for face masks skyrocketed, and they are becoming scarce in Bogota <i>Source:</i> Portafolio <i>Date:</i> 27-02-2020
(2)	With used bra cups and corn cobs, children make face masks: Are they hygienic? <i>Source:</i> Pulzo <i>Date:</i> 9-3-2020
(3)	Because of Trump, Colombia could run out of N95 masks <i>Source:</i> Semana <i>Date:</i> 27-3-2020
(4)	Face mask: if you don't know how to use it, it's better not to touch it <i>Source:</i> AS colombia <i>Date:</i> 3-4-2020
(5)	What is the most effective mask against Coronavirus? <i>Source:</i> El País Cali <i>Date:</i> 14-10-2020
(6)	The Bogota Mayor's Office recommended that citizens use surgical masks - and not cloth ones. What is the difference? <i>Source:</i> Semana <i>Date:</i> 27-1-2021
(7)	Manufacturer of N95 masks has 30 million units that, despite its effectiveness, cannot sell <i>Source:</i> Semana <i>Date:</i> 18-2-2021
(8)	Face mask waste increased by 9,000% between March and October 2020 <i>Source:</i> El Espectador <i>Date:</i> 9-12-2021

interest to the departments of the coastal regions and the Amazon region, which was the most affected by fatal cases of COVID-19.

Ivermectin is an essential medicine for treating infections or parasitic diseases. It is primarily known for its effectiveness in treating onchocerciasis caused by the parasitic worm *Onchocerca volvulus*, transmitted through the bites of black flies. In combination with other drugs, it is used to treat lymphatic filariasis, a parasitic infection caused by filarial worms, including *Wuchereria bancrofti* and *Brugia malayi*. It has also demonstrated its effectiveness in treating strongyloidiasis, an intestinal infection caused by the roundworm *Strongyloides stercoralis*. In some cases, it is used to treat scabies, a highly contagious skin infestation caused by the mite *Sarcoptes scabiei*. Additionally, Ivermectin has been used to

treat other parasitic infections, such as certain mites, lice infestations, and some helminthic infections [7]. However, it is ineffective against viral infections, such as COVID-19, and the World Health Organization and other health authorities have not recommended its use [5].

The dynamic surge in search interest for “ivermectin” observed during the pandemic underscores the profound influence of media coverage, online interactions, and societal uncertainties on public health-related information seeking. Analyzing this trend illuminates the intricate interplay of digital platforms and human behavior in disseminating and shaping medical narratives. The extensive news coverage spanning mainstream media and social platforms triggered an amplified curiosity about exploring Ivermectin as a potential COVID-19 treatment avenue. Furthermore, the rising tide of misinformation often propagated through online discussions and social media significantly increased search interest. The pandemic-induced anxiety and the dearth of definitive treatment options catalyzed this phenomenon as individuals sought to safeguard their well-being in an era of unprecedented health risks. This intricate web of factors demonstrates the need for computational models that can delineate the trajectories of information diffusion and unravel the fine-grained dynamics of public engagement with health-related content during crises.

This exploratory study exemplifies the critical role that intelligent algorithms and data analytics play in developing algorithms capable of discerning between reliable and dubious sources of information that can empower users to make informed decisions [3]. Moreover, as the pandemic has highlighted the speed and scale of information propagation, studying information cascades in a public health context could offer new insights into collective sensemaking and response patterns. Ultimately, the digital traces left behind during such critical junctures constitute a rich resource for computational researchers as they strive to comprehend the intricate relation between technological affordances and human behavioral responses in shaping the landscape of information dissemination.

5.1 Limitations

We understand that other search engines exist besides Google and that phrases and search volumes may change among regions. Additionally, digital infrastructure for internet coverage and accessibility varies within Colombian territory, as Fig. 4 shows. According to data from the World Bank, Fig. 4a is a heat map of internet use [10]. In Fig. 4b, it is easy to appreciate that there is no digital inclusion in all territories; the departments of the Andean and Atlantic regions are highlighted, whereas the Amazonic and Pacific regions are not [16]. Thus, the study may have some limitations. Given these restrictions, care must be taken to avoid assuming that the data displayed are absolute and precise. We suggest identifying research opportunities to delve into this area.

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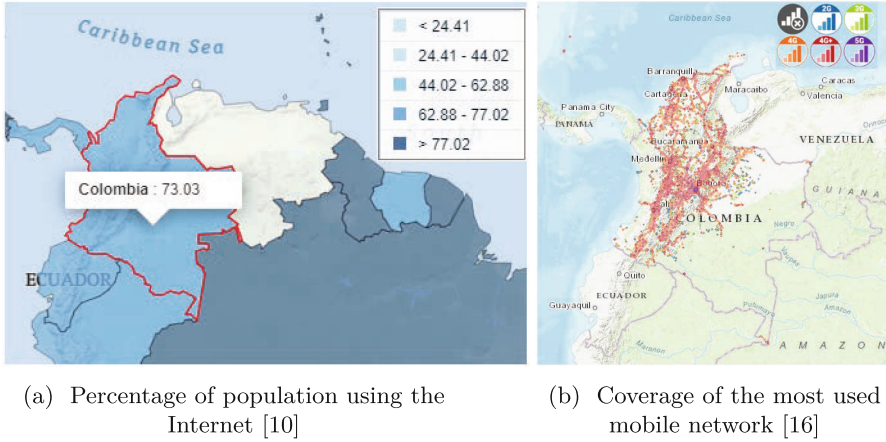


Fig. 4. Cartography of Internet availability in Colombia

6 Conclusions

The convergence of data harnessed from disparate sources is a testament to the evolving landscape of information consumption. A more nuanced panorama unfolds by juxtaposing the trends mined from Google Trends with official news sources. The prominent spike in “ivermectin” searches during the COVID-19 pandemic is an outstanding example. This confluence of information streams elucidates the intricate interplay between media coverage, digital dialogues, societal anxieties, and the pursuit of reliable medical information. It accentuates the pivotal role computational models play in deciphering these complex interactions. It offers a glimpse into the potential of machine learning algorithms to discern credible sources amid the misinformation environment, ultimately advancing our capacity to make informed decisions.

Moreover, this hybrid approach to data analysis revealed another noteworthy peak in search interest related to “facial mask,” occurring within a similar time window. It underscores the innate connection between information-seeking behavior and emerging circumstances as individuals navigate by searchers. The ability to extract such nuanced insights from the web underscores their potential in shaping informed responses across sectors as diverse as public health, commerce, and governance.

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