



# Impact on online research on celebrities' uncommon diseases: the curious case of Justin Bieber and Ramsay Hunt syndrome

Omar Enzo Santangelo<sup>1</sup> · Vincenza Gianfredi<sup>2</sup> · Sandro Provenzano<sup>3</sup>

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## Abstract

**Aim** We investigated how to use Internet user searches to gauge the impact of a celebrity illness on global public interest. **Methods** The study design is cross-sectional. Data on Internet searches were obtained from Google Trends (GT) for the period between 2017–2022 using the search words “Ramsay Hunt syndrome” (RHS), “Ramsay Hunt syndrome type 2,” “Herpes zoster,” and “Justin Bieber.” The frequency of specific page views for “Ramsay Hunt syndrome,” “Ramsay Hunt syndrome type 1,” Ramsay Hunt syndrome type 2,” Ramsay Hunt syndrome type 3,” “Herpes zoster,” and “Justin Bieber” were collected via a Wikipedia analysis tool that shows the number of times a specific page is viewed. Statistical analyses were performed using the Pearson ( $r$ ) and Spearman's rank correlation coefficient ( $\rho$ ). **Results** GT data, in 2022, show a strong correlation for Justin Bieber and RHS or RHS type 2 ( $r = 0.75$ ); similarly, Wikipedia data show a strong correlation for Justin Bieber and the others explored terms ( $r > 0.75$ ). Furthermore, the correlation was strong between GT and Wikipedia for RHS ( $\rho = 0.89$ ) and RHS type 2 ( $\rho = 0.88$ ). **Conclusions** The peak search times for the GT and Wikipedia pages were during the same period. Useful new tools and analyses of Internet traffic data may be effective in assessing the impact of announced celebrity uncommon illnesses on global public interest.

**Keywords** Ramsay Hunt syndrome · Herpes zoster · Google trends · Medical informatics computing · Wikipedia · Global public interest · Celebrities

## Introduction

Recent research has demonstrated that celebrity disclosure of their own illnesses, also uncommon, can increase public interest in the specific disease, changing the public's health-related knowledge, attitudes, behaviors, and status outcomes (Hoffman et al. 2017). Celebrity endorsements

can generate large publicity for health campaigns by virtue of the spokes-persons' visibility, public interest, and perceived newsworthiness (Hoffman et al. 2017). Several mechanisms through which celebrities influence public health-related behaviors have been assessed in a previous systematic meta-narrative analysis (Hoffman and Tan 2015). Among them biological, psychological, and social mechanisms can serve as carriers of positive social change prompting information-seeking and preventative behaviors. At the same time, the celebrities' “power” to sway public opinion can equally be a cause for spreading false information (Hoffman and Tan 2015). In the past decade, technological advances have aided in the population's empowerment of health information; and new opportunities, enabled by the underlying availability and scale of internet-based sources (IBSs), have paved the way for novel approaches to public health knowledge (Barros et al. 2020, Santangelo et al. 2023). Internet-based sources (e.g., web encyclopedias, microblogs, search queries, and other social media) are characterized by providing

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✉ Omar Enzo Santangelo  
omarenzosantangelo@hotmail.it

Vincenza Gianfredi  
vincenza.gianfredi@unimi.it

Sandro Provenzano  
provenzosandro@hotmail.it

<sup>1</sup> Regional Health Care and Social Agency of Lodi, ASST Lodi, piazza Ospitale 10, 26900 Lodi, Italy

<sup>2</sup> Department of Biomedical Sciences for Health, University of Milan, Via Pascal, 36, 20133 Milan, Italy

<sup>3</sup> Local Health Unit of Trapani, ASP Trapani, 91100 Trapani, Italy

unstructured information from multiple sources and have proven to be a very important source for trend analysis of various topics related to health, being a method of assessing the public interest in them. The use of these sources for public health purposes is also known as “infodemiology” (a portmanteau of information and epidemiology) or “info-veillance” (crisis of information and surveillance) (Eysenbach 2009), and beneficial effects, in the healthcare field, can be envisioned as previously shown and it can be envisioned that its implications on analysis will be positive in the healthcare field, as has been known for infectious diseases (Gianfredi et al. 2021a, Provenzano et al. 2021, Santangelo et al. 2021), Internet-based surveillance systems (Santangelo et al. 2020, 2022), and revelations regarding the effects of the recent Covid-19 pandemic on mental health (Gianfredi et al. 2021b). Further fields of study could focus on search traffic data to analyze trends of different uncommon medical conditions that affect celebrities. Systematic mining of internet searches also helped to understand the impact of chronic progressive inflammatory diseases (such as rheumatoid arthritis) on the population (Mahroum et al. 2018, Wu et al. 2019). A recent study on Fedez (famous Italian rapper) used Google Trends (GT) and Wikipedia searches to gauge the Italian public’s interest in pancreatic cancer by assessing the changes in popularity of the disease’s search terms after the singer disclosed his diagnosis of a neuroendocrine pancreatic tumor in March 2022 (Gianfredi et al. 2023).

Considering all the above, particularly focusing on the opportunity to enlarge evidence on uncommon medical conditions, we took advantage of the celebrity’s announcement (Justin Bieber) of having Ramsay Hunt syndrome to evaluate the public interest on this uncommon pathology. In June 2022, Justin Bieber a very popular Canadian pop singer, explained in a video posted on his verified Instagram account that he has Ramsay Hunt syndrome (CBC News 2022a). Ramsay Hunt syndrome type 2 (also known as herpes zoster oticus or geniculate ganglion herpes zoster) is a rare and late complication of herpes zoster in which reactivation of latent varicella zoster virus (VZV) infection in the geniculate ganglion of cranial nerve VII occurs (Crouch et al. 2022). Less than 1% of zoster cases involve the facial nerve and result in Ramsay Hunt syndrome (Sommer et al. 2018). There are two main signs and symptoms of Ramsay Hunt syndrome: a painful red rash with fluid-filled blisters around the ear and facial weakness or paralysis on the same side as the affected ear. A rash around the mouth can also rarely be seen. The diagnosis is clinical (Paiva et al. 2017).

The purpose of the study was to inquire about the related digital searching behavior of the world population regarding an uncommon pathology such as Ramsay Hunt syndrome.

## Materials and methods

The study design is cross-sectional. A variety of tools and statistical/computational approaches were used, including massive data mining of Google Trends (GT) and Wikipedia. Internet search data was obtained through GT, which is based on Google Search, in fact this is the most used Internet search engine in the world. With GT, it is possible to analyze the popularity of search topics on Google; the tool shows graphs to compare the search volumes of different queries over time and space (Google Trends 2023).

On 03 February 2023 the GT and Wikipedia data were extracted. The selected period was between 1 January 2017 and 31 December 2022 for searches on Google Trends using the search words “Ramsay Hunt syndrome,” Ramsay Hunt syndrome type 2,” “Herpes zoster,” and “Justin Bieber.”

The authors extracted two time intervals that partially overlapped. The first-time interval extracted comes from 1 January 2017 to 31 December 2022, with monthly aggregated data (the authors decided on this time interval in order to have a medium-long term comparison). The second time interval extracted comes from 1 January 2022 to 31 December 2022, with weekly aggregated data (the authors chose this time frame to focus on 2022, the year Justin Bieber reported having Ramsay Hunt syndrome). GT shows Relative Search Volume (RSV), which is a relative index that changes based on the selected period. It is calculated as the percentage of queries related to a particular term for a specific position and period of time, the range is between the values 0 and 100, 100 indicates the maximum searches, 0 the minimum. Through the RSV, it is possible to make direct comparisons of the search volumes between the selected search terms. Wikipedia, on the other hand, allows you to determine the number of times a given page is viewed (Wikipedia 2023); it is possible to extract the daily data and subsequently aggregate them according to the needs, for example, aggregate them so that they are superimposable with the GT data. For Wikipedia considering that there are 4 pages for Ramsay Hunt syndrome, data have been extracted for the pages “Ramsay Hunt syndrome,” “Ramsay Hunt syndrome type 1,” “Ramsay Hunt syndrome type 2,” “Ramsay Hunt syndrome type 3,” to evaluate whether there has been an increase in searches also for other pages related but not directly connected with the disease that struck the singer Justin Bieber; furthermore, the data relating to the visualization of the pages “Herpes zoster” and “Justin Bieber,” the study period is between January 1, 2017 and December 31, 2022. In GT, the words “Ramsay Hunt syndrome,” Ramsay Hunt syndrome type 2,” and “Herpes zoster” are reported as specific words in the “Illness,” which identify the specific topic in GT. “Justin Bieber” is a specific word of the “Singer” section, which identifies exactly that

topic. In GT, the arguments “Syndrome and Ramsay Hunt syndrome type 1” and “Ramsay Hunt syndrome type 3” were not present under “Illness”; therefore, these two search terms could not be evaluated. The databases can be downloaded from Wikipedia and GT in CSV format.

Statistical analyses were performed using the Pearson correlation coefficient ( $r$ ) and Spearman’s rank correlation coefficient ( $\rho$ ). By rule of thumb, a correlation is high if  $r > 0.7$ , moderate if the value of  $r$  is between 0.3 and 0.7, and weak if  $r < 0.3$  (Mukaka 2012). The Google search terms were correlated to each other and then the same was done for Wikipedia searches. Comparisons were initially performed considering the first extraction (data from from January 2017 to December 2022), then extracting and considering the data of last year (2022). Finally, considering the same period, the terms/pages “Ramsay Hunt syn-drome,” “Ramsay Hunt syndrome type 3,” and “Herpes zoster” were correlated between Google Trends and Wikipedia. Data were analyzed using STATA statistical software version 14 (StataCorp 2015). The statistical significance level used for the analyses is 0.05.

## Results

Google Trends searches and Wikipedia page views show a temporal correlation.

Table 1 shows the correlation between the search terms Justin Bieber, Ramsay Hunt syndrome, Ramsay Hunt syndrome type 2, and Herpes zoster in Google Trends. No statistically significant correlation was found for Justin Bieber and Ramsay Hunt syndrome or Ramsay Hunt syndrome type 2 in the period 2017–2022, while the correlation was strong for Justin Bieber and Ramsay Hunt syndrome ( $r = 0.75$ ) or Ramsay Hunt syndrome type 2 ( $r = 0.75$ ) in the year 2022. No statistically significant correlation was found for Justin Bieber and Herpes zoster in the year 2022, while the correlation was moderate in the period 2017–2022.

The correlation was moderate for Herpes zoster and Ramsay Hunt syndrome or Ramsay Hunt syndrome type 2 in both periods.

Table 2 shows the correlation between the Wikipedia pages viewed for Justin Bieber, Ramsay Hunt syndrome, Ramsay Hunt syndrome type 1, Ramsay Hunt syndrome type 2, Ramsay Hunt syndrome type 3, and Herpes zoster. No statistically significant correlation was found for Justin Bieber and Ramsay Hunt syndrome, Ramsay Hunt syndrome type 1, Ramsay Hunt syndrome type 2, or Ramsay Hunt syndrome type 3 in the period 2017–2022; in the same period the correlation was moderate for Justin Bieber and Herpes zoster ( $r = 0.38$ ).

For the year 2022, the correlation was strong for Justin Bieber and the other searched terms ( $r > 0.75$ ). The correlation was strong for Herpes zoster and Ramsay Hunt syndrome, Ramsay Hunt syndrome type 1, Ramsay Hunt syndrome type 2, or Ramsay Hunt syndrome type 3 in the year 2022.

Table 3 shows the correlation between the search terms Ramsay Hunt syndrome, Ramsay Hunt syndrome type 2, and Herpes zoster between Google trends and Wikipedia. The correlation was moderate between GT and Wikipedia for Ramsay Hunt syndrome ( $\rho = 0.32$ ) and for Ramsay Hunt syndrome type 2 ( $\rho = 0.43$ ), while the correlation was strong for Herpes zoster ( $r = 0.72$ ) in the period 2017–2022. In 2022, the correlation was strong between GT and Wikipedia for Ramsay Hunt syndrome ( $\rho = 0.89$ ) and for Ramsay Hunt syndrome type 2 ( $\rho = 0.88$ ), while no statistically significant correlation for Herpes zoster was seen.

Search peaks for GT term searches and Wikipedia page views occur over the same time period (see Figs. 1 and 2). Considering the year 2022, “Bieber” is the search word that is most associated with “Ramsay Hunt syndrome.” For Herpes zoster search term, Ramsay Hunt syndrome is the third queries associated in Google Trends (Fig. 3).

**Table 1** Pearson’s correlation coefficient ( $r$ ) for Google Trends search terms in the world from 1 January 2017 to 31 December 2022 and from 1 January 2022 to 31 December 2022

	Years 2017–2022, based on 72 observations (monthly observations)				Year 2022, based on 52 observations (weekly observations)			
	JB_GT	RHS_GT	RHS type 2_GT	HZ_GT	JB_GT	RHS_GT	RHS type 2_GT	HZ_GT
Justin Bieber_GT	1				1			
Ramsay Hunt syndrome_GT	0.06	1			0.75*	1		
Ramsay Hunt syndrome type 2_GT	0.06	1*	1		0.75*	0.99*	1	
Herpes Zoster_GT	-0.54*	0.42*	0.43*	1	0.27	0.49*	0.49*	1

\* $p < 0.001$ , JB, Justin Bieber, RHS, Ramsay Hunt syndrome, HZ, Herpes zoster, GT, Google Trends

**Table 2** Pearson's correlation coefficient ( $r$ ) for the Wikipedia page in the English language viewed in the world from 1 January 2017 to 31 December 2022 and from 1 January 2022 to 31 December 2022

	Years 2017–2022, based on 72 observations (monthly observations)			Year 2022, based on 52 observations (weekly observations)		
	JB_Wiki	RHS_Wiki	RHS type	JB_Wiki	RHS_Wiki	RHS type
Justin Bieber_Wiki	1			1		
Ramsay Hunt syndrome_Wiki	0.09	1		0.76*	1	
Ramsay Hunt syndrome type 1_Wiki	0.11	0.99*	1	0.79*	0.99*	1
Ramsay Hunt syndrome type 2_Wiki	0.08	0.99*	0.99*	0.80*	0.99*	0.99*
Ramsay Hunt syndrome type 3_Wiki	0.05	0.99*	0.99*	0.76*	0.71*	0.75*
Herpes zoster_Wiki	0.38*	0.08	0.09	0.79*	0.97*	0.98*
						0.75*
						0.97*
						1

\* $p < 0.001$ , JB, Justin Bieber; RHS, Ramsay Hunt syndrome; HZ, Herpes zoster; Wiki, Wikipedia.

**Table 3** Spearman's rank correlation coefficient ( $\rho$ ) for Wikipedia page in English language viewed in the world from 1 January 2017 to 31 December 2022 and from 1 January 2022 to 31 December 2022

	Years 2017–2022, based on 72 observations (monthly observations)		Year 2022, based on 52 observations (weekly observations)	
	RHS_Wiki	RHS_GT	RHS_Wiki	RHS_GT
RHS_Wiki	1		1	
RHS_GT	0.32**	1	0.89*	1
RHS type 2_Wiki		RHS type 2_GT	RHS type 2_Wiki	RHS type 2_GT
RHS type 2_Wiki	1		1	
RHS type 2_GT	0.43*	1	0.88*	1
HZ_Wiki		HZ_GT	HZ_Wiki	HZ_GT
HZ_Wiki	1		1	
HZ_GT	-0.72*	1	0.25	1

\* $p < 0.001$ , \*\* $p < 0.01$ , JB, Justin Bieber, RHS, Ramsay Hunt syndrome, HZ, Herpes zoster, Wiki, Wikipedia, GT, Google Trends

## Discussion

The purpose of this work was to evaluate how an uncommon disease can become “famous” following a statement from a celebrity. In this study, we evaluated the hypothesis that in June 2022 the announcement of Justin Bieber influenced the behavior of internet users by increasing searches on an uncommon disease such as Ramsay Hunt syndrome. The authors decided to make a specific focus on 2022 because it is the year in which Justin Bieber declared having had this disease; in fact, in this year the strongest correlations between the search words emerge. Subsequently, we decided to arbitrarily extend the observation period from 2017 to 2022 to understand if there were searches already correlated over time, regardless of the celebrity's declaration. However, as the results show, there is no correlation in the previous timeframe; therefore, it is likely that the search peaks are due to the announcement made in 2022. Similar results were already found in analogous studies (Mahroum et al. 2018; Wu et al. 2019; Gianfredi et al. 2023). Our results show that Google Trends and Wikipedia searches data helps identify global public interest in different public health topics including uncommon diseases or related clinical and diagnostic aspects. Moreover, the singer reported having had Ramsay Hunt syndrome type 2, caused by the reactivation of the Herpes zoster virus. Because of that, we also evaluated, when possible, whether this statement also had an impact on Herpes zoster research and on other types of Ramsay Hunt syndrome. It was possible to precisely investigate Ramsay Hunt syndrome and Ramsay Hunt syndrome type 2 on GT because these two search terms were specifically linked to the disease section, this was not possible to do with Ramsay Hunt syndrome type 1 and 3. On the contrary, on Wikipedia all the terms were available (specifically Ramsay Hunt syndrome, Ramsay Hunt syndrome type 1, type 2, and type 3). For this reason, we also verified whether the announcement (related to type 2 syndrome) also had an influence for the

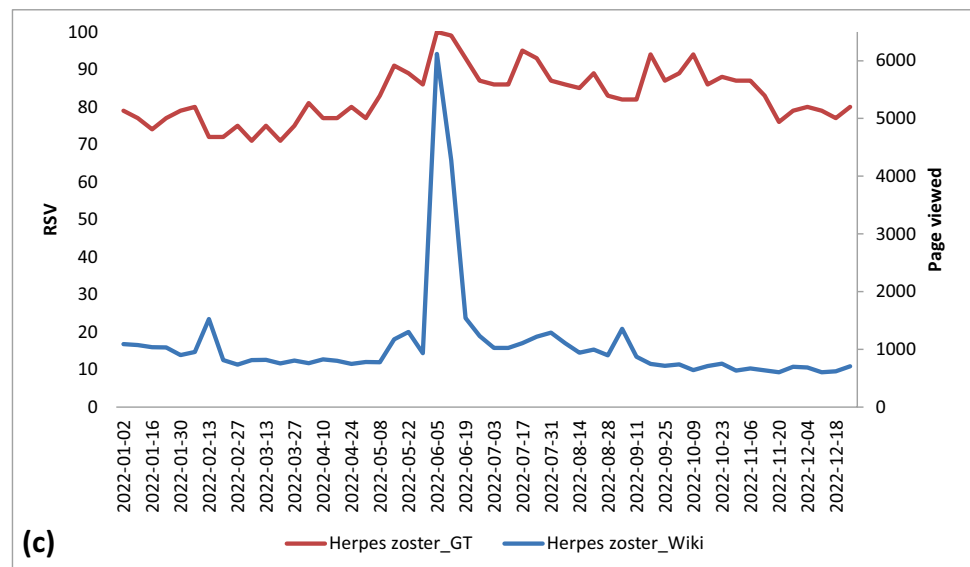
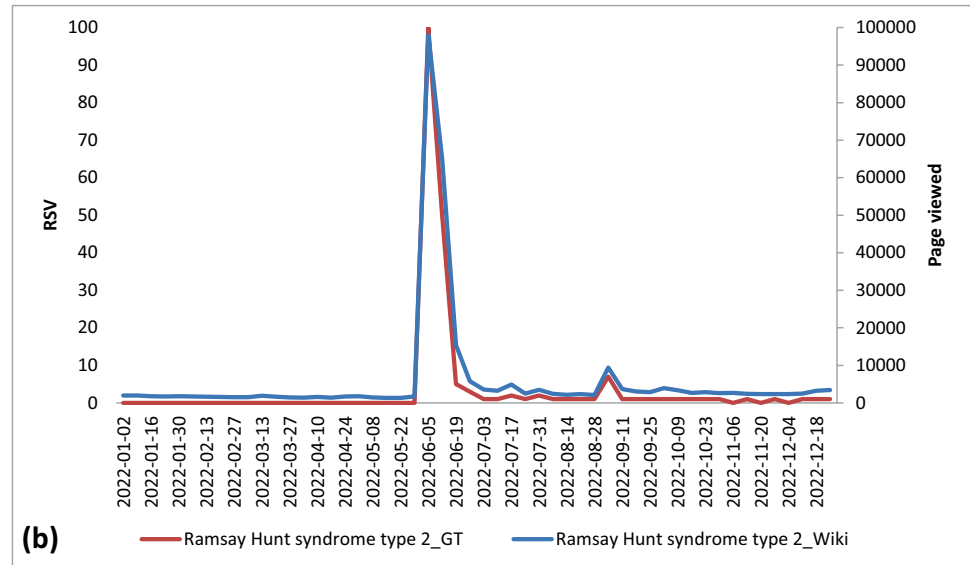
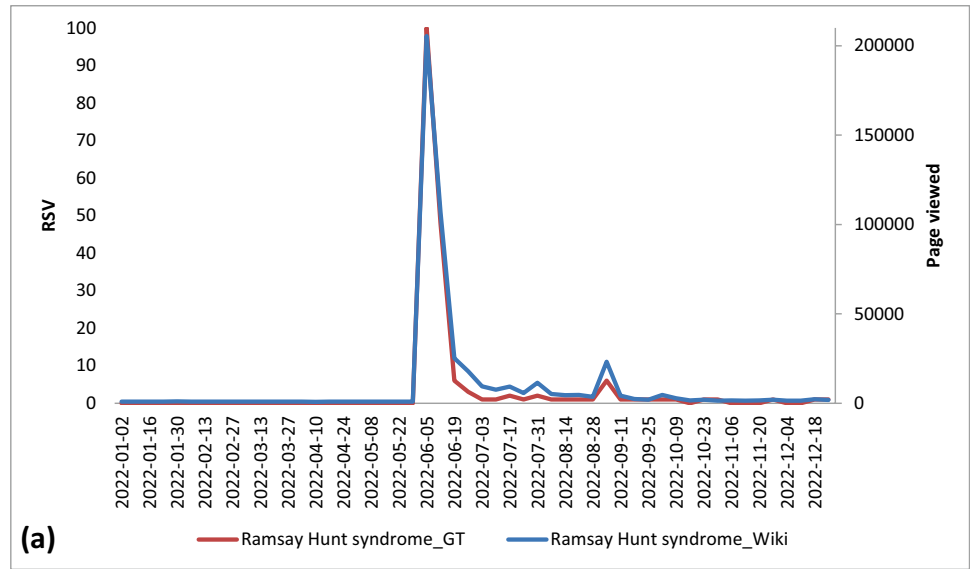
other types of syndrome. This was the case for Wikipedia as there is a strong correlation between the various types of Ramsay Hunt syndrome. Further, analyzing the period 2017–2022, a statistically significant correlation did not emerge between the search for the Herpes zoster page and the various types of Ramsay Hunt syndrome. On the contrary the correlation is strong in 2022 alone, this could be due to the fact that users first searched for the Ramsay Hunt syndrome on Google search engine, and later they consulted the Wikipedia page and the related causes, including the reactivation of the virus Herpes zoster.

Lastly, our results show that the internet search peaks in the same time periods considering both Google Trends and Wikipedia pages. In particular, a higher peak was registered in June 2022 (relating to the announcement of the diagnosis of Ramsay Hunt syndrome) and a less accentuated peak was recorded in September 2022 (relating to the announcement to cancel the remaining dates of the world tour over continued health concerns) (CBC News 2022b).

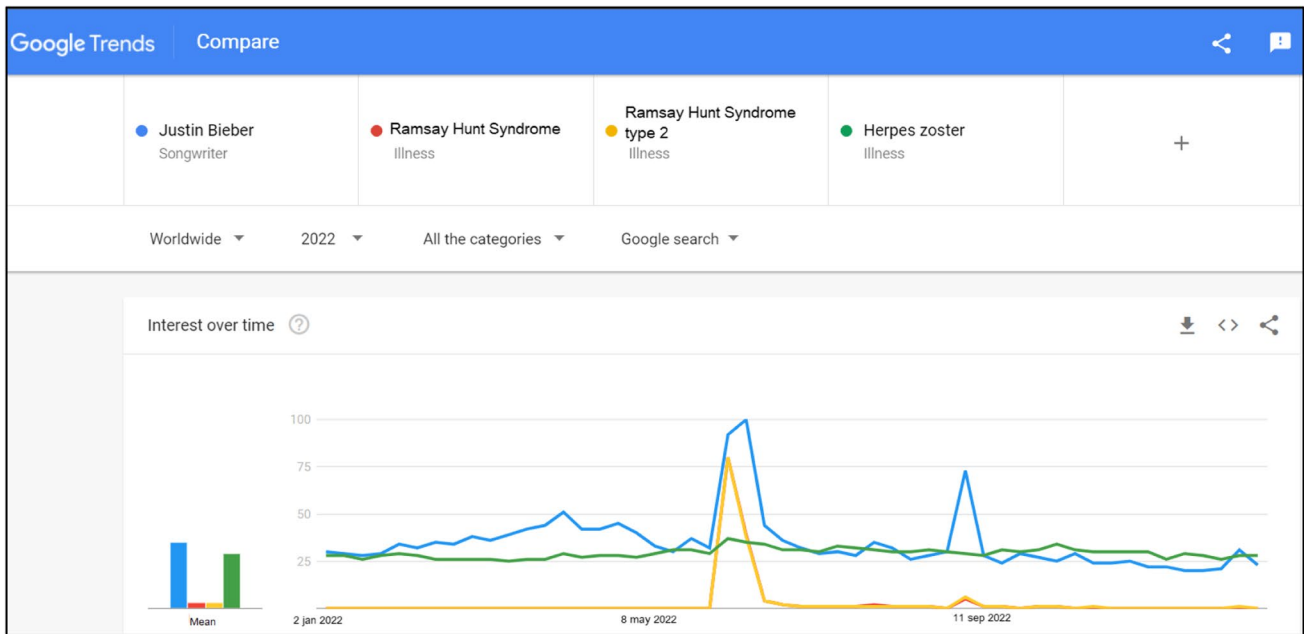
## Strengths and limitations

In the literature, at this time, this represents the first study examining the worldwide volume of searches for Ramsay Hunt syndrome. Being the first study on the subject could be a strong point, even if the article has limitations that are reported below. First, other search engines have not been considered and of course the GT data and Wikipedia are not the only sources available to Internet users looking for information. Despite the increasingly large number of users and the massive use of them, even more than Google, they are not universal. However, Google is the most popular search engine; (Statcounter GlobalStat 2023) even if it is limited by the fact that the user's characteristics are not provided (the data are anonymous and do not allow analyzing the categories of users), the same is true for Wikipedia; therefore, it is not possible to profile users. Nevertheless,

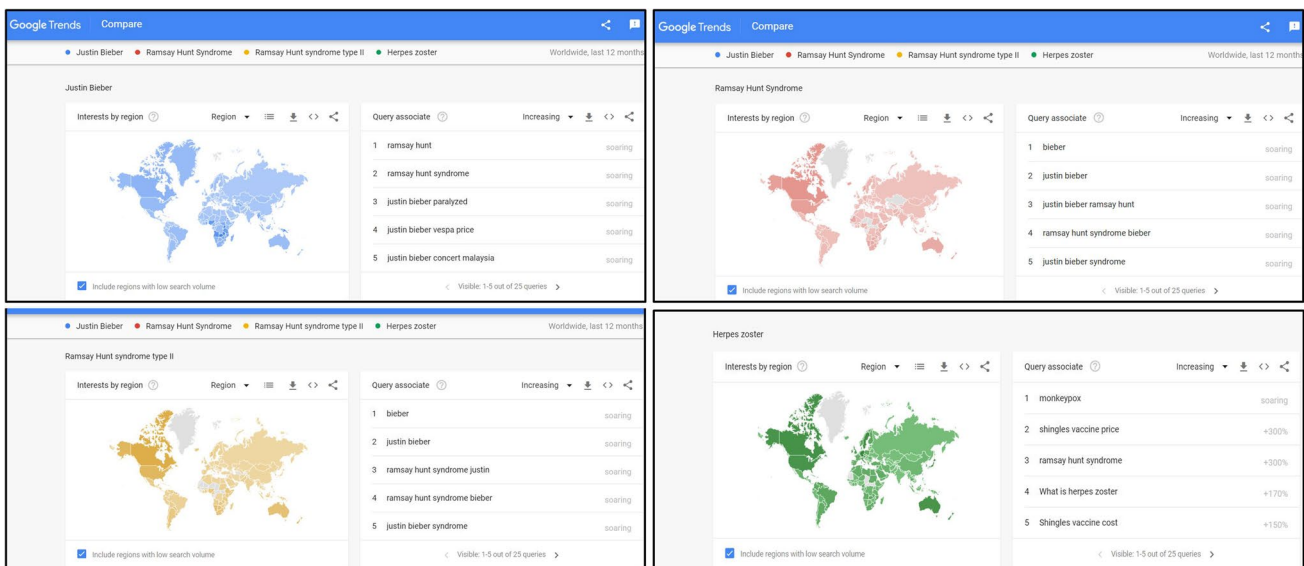
**Fig. 1** Comparison of Google Trends and Wikipedia search term curves: comparing the word “Ramsay Hunt syndrome” (a), “Ramsay Hunt syndrome Type 2” (b), and “Herpes zoster” (c). Period analyzed from 1 January 2022 to 31 December 2022; data were aggregated weekly







**Fig. 2** Temporal correlation between Google Trends-based query volumes for “Justin Bieber”, “Ramsay Hunt syndrome,” “Ramsay Hunt syndrome type 2,” and “Herpes zoster” in the world from 1 January 2022 to 31 December 2022



**Fig. 3** The top five queries on Google Trends connected with “Justin Bieber,” “Ramsay Hunt syndrome,” “Ramsay Hunt syndrome type 2,” and “Herpes zoster” in the world from 1 January 2022 to 31 December 2022

these tools can still provide a wide range of opportunities to scientists and policymakers. In fact, owing to these new data flows, new lines of research have emerged that can be used to study health topics, and thus even uncommon diseases can be explored from this new point of view. Even if with some limitations, infodemiological evaluation can help institutions understand the motivations and behaviors

of the population when they seek information of a health-related nature (Mavragani 2020). However, the results can be distorted by accidents or sudden events that focus attention on a topic, especially if the number of observations is low (Mavragani 2020). Furthermore, the validity and accuracy of this type of analysis is not always adequate because it does not evaluate the content of the sought information.

Therefore, considering what has been shown above, with this type of study, to date, it is not possible to demonstrate that the sample is representative (both in terms of size and characteristics). While considering our results promising and encouraging for future research, given the current limitations, this new approach should be integrated with traditional analytical methods (e.g., questionnaires).

## Implications for public health and future directions

This study shows that Justin Bieber's diagnosis has caused an increased interest toward Ramsay Hunt syndrome, in terms of online research.

This article highlights knowledge regarding the impact of the celebrity announcement on Ramsay Hunt syndrome diagnosis and the resulting volume of online searches. Internet searches can be an important source for generating hypotheses about knowledge, attitudes, and practices in public health topics that show a correlation between celebrity uncommon illnesses and the growing volume of related searches.

Mass media and social networks can increase people's curiosity and entice people to search for certain information on health. Therefore, it is appropriate that authoritative and institutional sites always have updated and correct information. This will contribute to providing useful information to users and in countering the widespread phenomenon of fake news, in this case associated with health topics. Considering the global impact that a celebrity can have in increasing interest and awareness of health issues, it would be appropriate to establish partnership with celebrities to spread correct and up-to-date health-related information. The current study should be intended as a preliminary pilot study, calling for future research in the field. For instance, Internet users' interest on other uncommon diseases should be explored, as well as interventional studies assessing the efficacy of educational campaigns performed in partnership with celebrities.

## Conclusions

To conclude, this is an innovative research study analyzing the Internet research volume on health-related topics. We assessed the impact of a celebrity's announcement of an uncommon disease diagnosis, i.e., the Ramsay Hunt syndrome, on Internet searches disease-related volume. Our results show a statistically significant correlation among the two, demonstrating that it is possible to arouse people's curiosity about raised health-related topics with media events. Probably, in the future, this approach might be used to assess the efficacy of health educational campaigns by measuring Internet users' interactions on the web.

**Authors' contributions** Conceptualization, Omar Enzo Santangelo; methodology, Omar Enzo Santangelo; software, Omar Enzo Santangelo; validation, Omar Enzo Santangelo; formal analysis, Omar Enzo Santangelo; investigation, Omar Enzo Santangelo; data curation, Omar Enzo Santangelo, Vincenza Gianfredi and Sandro Provenzano; writing—original draft preparation, Omar Enzo Santangelo, Vincenza Gianfredi and Sandro Provenzano; writing—review and editing, Omar Enzo Santangelo, Vincenza Gianfredi and Sandro Provenzano. All authors have read and agreed to the published version of the manuscript.

**Data availability** The data is freely accessible on Google Trends and Wikipedia replicating the methodology of this study.

**Code availability** Not applicable.

## Declarations

**Consent for publication** Not applicable.

**Ethics approval** Not applicable.

**Consent to participate** Not applicable.

**Conflicts of interest** The authors declare no conflict of interest.

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