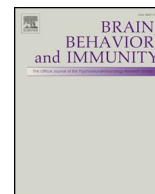




Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



Correspondence

The second worldwide wave of interest in coronavirus since the COVID-19 outbreaks in South Korea, Italy and Iran: A Google Trends study



Dear Editor,

Cases of pneumonia had been reported globally (Chen et al., 2020) that were caused by the novel coronavirus that is now known as COVID-19 (World Health Organization, 2020a). Many cases have resulted in death. There have been reported cases in 185 countries and territories, including Italy (n = 156,363), Iran (n = 73,303) and South Korea (n = 10,537) in the end of April 12, 2020 (Dong et al., 2020). It took over three months to reach the first 100 00 confirmed cases, 28 days to climb one million and only 13 days to reach 2 millions. (World Health Organization, 2020b).

On 11 February 2020, the official names were announced for the virus responsible for COVID-19 (previously known as “2019 novel

coronavirus” or “2019-nCoV”) and the disease it causes. The official name of the disease is coronavirus disease (COVID-19); the virus itself is called severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (World Health Organization, 2020a).

Currently, Google offers its Trends service, which acts as reverse data engineering and allows data on users’ searches to be collected, which in this case is interest in the COVID-19 epidemic. Google Trends (GT) data can be used to forecast the trends of reporting new cases.

The methodology follows the principles presented by (Mavragani and Ochoa, 2019) that describe how to select the appropriate keyword (s), region(s), period, and category. Data is collected from GT and is normalized. High interest in a search query is expressed by 100, whereas a lack of interest or insufficient data is expressed by 0. GT

Coronavirus reported cases and Google Trends data from 15 January to 12 April, 2020 in China, South Korea, Italy, Iran and Worldwide

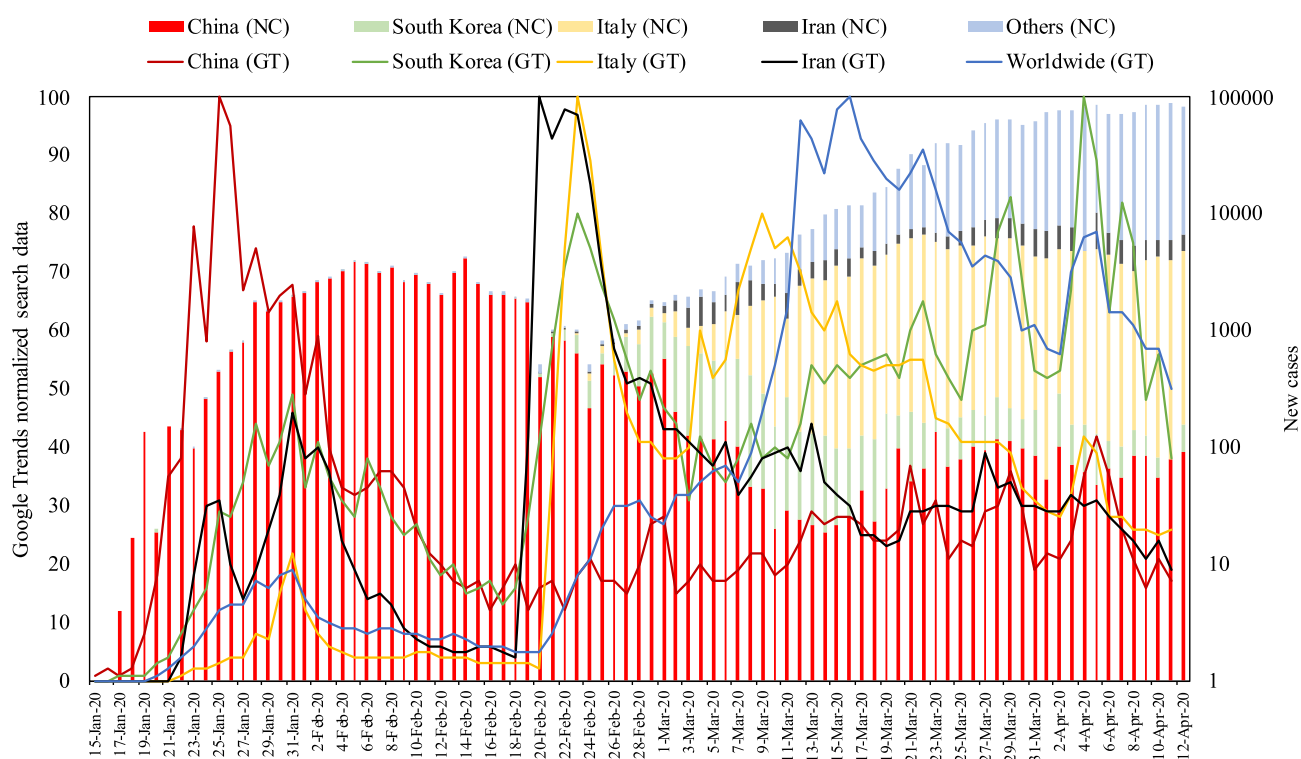


Fig. 1. Coronavirus reported cases and Google Trends data from 15 January to 12 April 2020 in China, South Korea, Italy, Iran and Worldwide.

<https://doi.org/10.1016/j.bbi.2020.04.042>

Received 13 April 2020; Accepted 15 April 2020

Available online 18 April 2020

0889-1591/ © 2020 Elsevier Inc. All rights reserved.

contains data from different geographical locations that is segmented into countries, territories and cities; it also allows a custom time range to be set.

Data was retrieved for the period starting 15 January 2020, as this was when relevant data started appearing on GT. The data comes from a textual search with five geographical settings: 1) worldwide, to see the global interest in coronaviruses; 2) China, where there is currently the highest number of cases; 3) South Korea, where interest has increased since 19 February because hundreds of new cases were reported; 4) Italy; and 5) Iran, where since 22 February hundreds of new cases have been reported. Data from GT related to interest in coronavirus was compared with confirmed reports of new cases provided by WHO (World Health Organization, 2020b). The collected data relates to the search topic: *Coronavirus*. This topic allows the popularity of all related keywords across all available languages and regions to be compared (Kamiński et al., 2019).

On Google Trends, the first wave of interest in coronavirus peaked on 31 January 2020. This is measured globally for all GT data for the *coronavirus* search topic. Since 1 February, global interest has decreased even though the number of new cases reported daily is increasing. In the first wave, the highest number of confirmed new cases was on 5 February.

Fig. 1 presents the global, Chinese, South Korean, Italian and Iranian results compared to the number of new COVID-19 cases. GT data ends on April 11, 2020. The left axis shows normalized GT search volume. The right axis shows new COVID-19 cases on logarithmic scale (World Health Organization, 2020a). The data interval is one day.

The situation has changed since a rapid increase in cases was reported in South Korea, Italy and Iran. GT data reveals the rapid growth of the second wave of interest in coronavirus since 21 February 2020. This rising interest trend is observed worldwide and in the presented countries, where a rapid increase in cases of laboratory-confirmed COVID-19 has been reported since 21 February 2020 (World Health Organization, 2020c).

On Google Trends, the second wave of interest in coronavirus has last peak on 5 April 2020. This is measured globally for all GT data for the *coronavirus* search topic. Since 6 April, global interest has decreased even though the number of new cases reported daily is increasing. In

the second wave, the highest number of confirmed new cases was on 11 April.

The key finding is that GT forecasted the rise of new cases. In first wave, new cases increased day-by-day for 6 days after the highest peak of GT worldwide interest. In the second wave, number of new cases also has risen day-by-day for 6 days after the last peak.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

- Chen, Y., Liu, Q., Guo, D., 2020. Emerging coronaviruses: genome structure, replication, and pathogenesis. *J. Med. Virol.* 92, 418–423. <https://doi.org/10.1002/jmv.25681>.
- Dong, E., Du, H., Gardner, L., 2020. An interactive web-based dashboard to track COVID-19 in real time. *Lancet Infect. Dis.* [https://doi.org/10.1016/S1473-3099\(20\)30120-1](https://doi.org/10.1016/S1473-3099(20)30120-1).
- Kamiński, M., Łoniewski, L., Marlicz, W., 2019. Global internet data on the interest in antibiotics and probiotics generated by Google Trends. *Antibiotics* 8, 147. <https://doi.org/10.3390/antibiotics8030147>.
- Mavragani, A., Ochoa, G., 2019. Google trends in infodemiology and infoveillance: methodology framework. *J. Med. Internet Res.* 21. <https://doi.org/10.2196/13439>.
- World Health Organization, 2020a. Naming the coronavirus disease (COVID-2019) and the virus that causes it [WWW Document]. URL [https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/naming-the-coronavirus-disease-\(covid-2019\)-and-the-virus-that-causes-it](https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/naming-the-coronavirus-disease-(covid-2019)-and-the-virus-that-causes-it) (accessed 4.13.20).
- World Health Organization, 2020b. Coronavirus disease (COVID-2019) situation reports [WWW Document]. URL <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports> (accessed 4.13.20).
- World Health Organization, 2020c. Joint WHO and ECDC mission in Italy to support COVID-19 control and prevention efforts [WWW Document]. URL <http://www.euro.who.int/en/health-topics/health-emergencies/coronavirus-covid-19/news/news/2020/2/joint-who-and-ecdc-mission-in-italy-to-support-covid-19-control-and-prevention-efforts> (accessed 4.13.20).

Artur Strzelecki

Department of Informatics, University of Economics in Katowice, Katowice, Poland

E-mail address: artur.strzelecki@ue.katowice.pl.