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GOOGLE TRENDS ANALYSIS OF PUBLIC AWARENESS LEVELS FOR INFLUENZA AND ACUTE RESPIRATORY INFECTIONS IN INDONESIA

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ABSTRACT

BACKGROUND. Google Trends (GT) has been widely used in public health for surveillance in the Big Data era. Although it is one of the most common respiratory tract infections, the rising trend of influenza cases in October 2025 requires vigilance from Indonesia health policymakers.

OBJECTIVE. This study aims to analyze public awareness of influenza infection compared to acute respiratory infections (ARIs) based on GT.

MATERIALS AND METHODS. Google Relative Search Volume (RSV) were performed using keywords in Bahasa Indonesia with for the influenza topic include "Influenza" + "gejala influenza" + "terapi influenza" + "obat influenza" and the keywords for ARI topic include "ISPA" + "gejala ISPA" + "terapi ISPA" + "obat ISPA" for ARI. RSV score then analyzed based on the western and eastern Indonesia region and compared with official influenza report. A p-value <0.05 indicates significant results.

RESULTS. Although there was an increasing trend of influenza scores in October 2025 which were higher than ARI scores, the average ARI score was higher than influenza scores (58.88±20.5 vs 42.91±15.33; $p < 0.0001$). Google Trends influenza and ARI are positively correlated with the number of officially reported influenza cases. Based on geography, the Western region had a higher influenza score than the Eastern region (45.85±16.92 vs 38.15±11.37; $p = 0.158$), while ARI scores were found to be higher in the Eastern region than in the Western region (77.00±18.76 vs 47.66±11.71; $p < 0.0001$).

CONCLUSIONS. Changes in Google Trends keyword trends for influenza and ARI in Indonesia may be influenced by officially reported influenza cases. There remains a gap in public awareness across Indonesia regarding both topics. Government and health policy holders need to increase public awareness of the spread of influenza infections and prevent future outbreaks.

Keywords: *big data, epidemiological monitoring, influenza, respiratory infection, surveillance*

INTRODUCTION

The use of non-hospital information that can be collected in real-time and accessed quickly has become common in the era of 'big data'. It is commonly used in epidemiological studies and public health surveillance, especially to monitor potential infections and outbreaks (1). One of the most commonly used data sources is Google Trends, which has been developed by Google Inc. to analyze the most frequently searched keywords from around the world (2). Specifically, this tool collects data automatically in real-time, and provides quantitative and qualitative data applied to informatics research of various infectious and non-infectious diseases (2). Several previous studies have demonstrated the use of this technology to track public attention to COVID-19 symptoms during the pandemic related to the spread of the virus (3,4).

The increase in the incidence of seasonal influenza caused by influenza viruses during the last few months of 2025 can cause a variety of clinical conditions ranging from mild to severe influenza-like illness (ILI), and sometimes results in hospitalizations and deaths (5). Reports from the World Health Organization (WHO) indicate an increase in influenza activity since October 2025 in both the northern hemisphere and in the southern hemisphere, which was previously rare (6). An increase in influenza incidence has also been reported in Indonesia, where by December 2025 the positivity rate reported by the Ministry of Health reached 28%, with a decrease compared to October 2025, when the positivity rate reached 36%. Because there are various forms of seasonal influenza and it has a rapid transmission, a system is needed to monitor surveillance and public awareness of influenza infections quickly (7).

One of the uses of Google Trends is to see the level of public awareness on various topics, including in the health sector. Since the COVID-19 pandemic era, the use of Google Trends to monitor public awareness has become a concern in epidemiological surveillance studies because it is related to the public's health behaviour at the beginning of the pandemic, which is illustrated by the low response of the community to adopt preventive health policies during early pandemics (8). Increased public awareness also presents searches for information related to diseases that contribute to early detection for diagnosis, thereby increasing efforts to find new cases (9). Therefore, attention to public awareness needs to be considered by public policy makers in efforts to detect early and prevent the spread of diseases both locally and globally (10).

Various studies have shown that Google Trends use can complement traditional public health surveillance by understanding public responses and sentiment towards potential outbreaks (11). In addition, Google Trends can help reveal the need for health-related

information through the frequency of searches accessed from the internet (12). In addition to the increasing positive trend in influenza, several other ILI conditions may be caused by acute respiratory infections caused by non-influenza pathogens, which also require attention from Indonesian health policymakers, especially to prevent future outbreaks of influenza or other viruses (13,14). Therefore, this study aims to analyze the level of public awareness about influenza and acute respiratory infections in Indonesia using Google Trends.

METHODS

Google Trends data is anonymous because no names or other personal information are revealed from search results. Google Trends provides comparisons of up to five search terms or topics. Google Trends results publish search volumes for terms submitted to Google's search engine for one or more specific keywords. For each search term or topic, they are associated with the maximum interest value for each query, set from 0 (least searched) to 100 (most searched) in the form of relative search volume (RSV).

This research was conducted in November 2025. Data collection was performed using the following settings in Google Trends (https://trends.google.com/trends): the period was set to "the last year," the region was selected as "Indonesia," and "all categories" and "web search" were set. Keyword selection is based on general knowledge using a collection of terms used by users in Bahasa Indonesia related to the influenza topic, which were represented as "Influenza" + "gejala influenza" + "terapi influenza" + "obat influenza", while the topic for acute respiratory infections (ARIs) or ‘infeksi saluran pernafasan akut’ (ISPA) uses the keywords "ISPA" + "gejala ISPA" + "terapi ISPA" + "obat ISPA". The search for both topics was conducted within the same time span (November 2024 – November 2025) and analysis and data collection were carried out simultaneously in order to achieve comparability of RSV values between each topic. The results obtained are in the form of RSV which is then downloaded in Excel format and calculated in the form of mean ± standard deviation to assess fluctuations each month.

RSV score then analyzed based on the western (Sumatra, Java, and Kalimantan) and eastern (Sulawesi, Bali, East Nusa Tenggara, West Nusa Tenggara Maluku Islands, and Papua) Indonesia region. To improve the quality of the study, RSV between the two topics was then analyzed with influenza case data officially reported by the Indonesian Ministry of Health between July 2025 and early November 2025. Reports of positive results can be accessed on the Ministry of Health website. (kemkes.go.id/id/layanan/laporan-pengawasan-kasus-influenza-dan-covid-19-tahun-2025).

The RSV score results were then analyzed using SPSS version 21 software to illustrate public awareness between November 2024 and November 2025. Retrieved RSV data were then analyzed using a T-test to compare the mean scores of the influenza and ARI topics between the western and eastern regions of Indonesia. The correlation between RSV and real data of reported positive influenza cases was analyzed using Pearson correlation. A p-value <0.05 indicates significant results.

RESULT

Based on Google Trends keyword search trends (Fig. 1. A), the trend analysis results show that searches for the keyword influenza increased simultaneously with the increase in positive influenza trends reported by the Indonesian Ministry of Health between from July – November 2025 (Fig. 1. B). Based on the average RSV over the past year, the analysis results show that the ARI-related keywords were found more often than the influenza-related keywords (58.88±20.5 vs. 42.91±15.33; $p < 0.0001$). However, during influenza rising case (July – November 2025), influenza-related keywords were higher than ARI-related keywords (31.70±20.30 vs. 23.88±4.62; $p < 0.0001$). Correlation analysis showed a positive correlation between RSV influenza-related keywords and ARI-related keywords with reported real-world influenza cases ($\rho = 0.710$ ($p < 0.0001$) and $\rho = 0.680$ ($p < 0.0001$) respectively)

Based on its distribution in Indonesia (Fig. 2), the keyword topic influenza is more frequently searched in the western region of Indonesia (East Java, West Java, Special Capital Region of Jakarta, Riau Islands), while in the eastern region, searches for the topic of ISPA are more commonly searched (except for the island of Bali where searches related to influenza are more common).

Based on geographical location, the Western region had higher influenza topic RSV than the Eastern region (45.85±16.92 vs. 38.15±11.37; $p = 0.158$) (Fig. 3), while ARI topic RSV was found to be higher in the Eastern region than in the Western region (77.00±18.76 vs 47.66±11.71; $p < 0.0001$) (Fig. 4).

DISCUSSION

This study reveals an increase in public attention, coinciding with the positive trend in influenza findings in Indonesia from August to November 2025. This finding is supported by a correlation analysis between keyword searches with Google Trends and influenza cases reported by the Indonesian Ministry of Health. Google Trends can capture public interest online, illustrating the speed of contagious disease spread by combining various other variable factors, such as environmental factors, although there is a weak correlation with clinical presentations

in the field (7,15-17). In addition to predicting outbreak speed, Google Trends can provide an early warning of public reaction before future outbreaks occur (7,18).

The use of Google Trends can be a tool for strategic planning in preventative disease control, as RSV trends can be seen to differ across different Google Trend search locations (19). In this study, the increase in trends was found to be uneven across Indonesia, with interest in influenza topics limited to certain regions (Java, Bali, and the Riau Islands), while topics related to respiratory tract infections were more common than influenza. The high level of interest in information about the topic of influenza may be related to the high mobility of the population in the region, which is related to the risk of spreading the virus (20) Other factors, such as the level of familiarity with the topic, can also influence Google Trends results, where people tend to search based on the most discussed topics and personal habits (12).

Public interest in ARI terminology can be influenced by familiarity with it as residents of a particular area, which is influenced by geographic bias. This difference in conditions was observed in another study in the UK, which found differences in respiratory diagnoses between regions in the UK, with upper respiratory tract infections (URTIs), lower respiratory tract infections (LRTIs), and asthma being higher in the poorest groups and also tending to increase with increasing urbanization, while Influenza-like illness (ILI) was highest in the least poor and rural areas (21). Trends in ARI were also not influenced by seasonal infections such as respiratory syncytial virus (RSV), which can vary across tropical countries, despite their geographical proximity, and can be influenced by various factors such as rainfall, climate patterns, and altitude (22).

The findings of this study indicate a positive correlation between changes in influenza-related keyword search trends and reports of influenza cases in Indonesia by the Indonesian Ministry of Health. The trends observed in this analysis show an increasing pattern between reported influenza cases and influenza-related keyword searches, indicating a relationship between public interest in influenza issues. Similar findings in other studies confirm the congruence between Google Trends and outbreaks such as measles and dengue fever, although only partial data are reported weekly in developed countries (18,23). Thus, Google Trends can capture information needs from official government reports and news reports as an important tool for public health interventions in the digital age (23).

Although the use of Google Trends as an early warning system for epidemics has been extensively researched, the use of keyword-based queries also has a bias that can lead to media coverage oversimplifying influenza and acute respiratory infections (ARI) topics compared to the actual epidemiological burden, and is merely speculative (24,25). Google Trends also tends

to underestimate or overestimate the actual epidemiological burden when the general public has poor knowledge of a disease (24). This was observed in the study of Olson et al (2013), where discrepancies were found in Google Trends' prospective estimates that missed the initial wave of the H1N1 virus pandemic in 2009 and overestimated the impact of the 2012/2013 epidemic in the United States (26). Also, data from Google Trends can be an overrepresentation that can be influenced by the effects of population density in an area, characteristics of a younger population, or a more educated population (27,28). Therefore, sampling support is needed in clinical populations to support the role of Google Trends as a public surveillance tool to predict potential outbreaks (24).

This study has several limitations, one of which is the inability to specifically analyze the characteristics of the population searching for topics using Google Trends. This results in demographic limitations affecting public interest in certain health topics, such as among the elderly population, who are not familiar with the internet (29). Google Trends also requires internet access, which in some regions of Indonesia has limited internet access, possibly resulting in RSV detection being missed. The data on influenza case reports reported by the Ministry of Health also does not include which provinces have found influenza cases, so it is not possible to conduct an analysis between each reported case and Google Trends. Nevertheless, the use of Google Trends can be expanded to analyze epidemics based on non-epidemiological data by taking into account various variables, including clinical data, geographic conditions, and weather, to monitor and prevent potential future outbreaks.

CONCLUSION

This study shows a similar pattern between influenza search topics from Google Trends and positive influenza findings based on Ministry of Health data from July – November 2025. However, the level of public awareness of influenza topics over the past year was lower compared to searches for ARI topics, especially in Eastern Indonesia. Influenza topics tended to be higher in Java, Bali, and the Riau Islands. The trend of public awareness in influenza is increasing along with the increase in officially reported case data. Further investigation of the influence of public health behavior and demographic factors on Google Trend topic searches is needed to improve the accuracy of public perspectives on influenza and other health topics to prevent potential future outbreaks.

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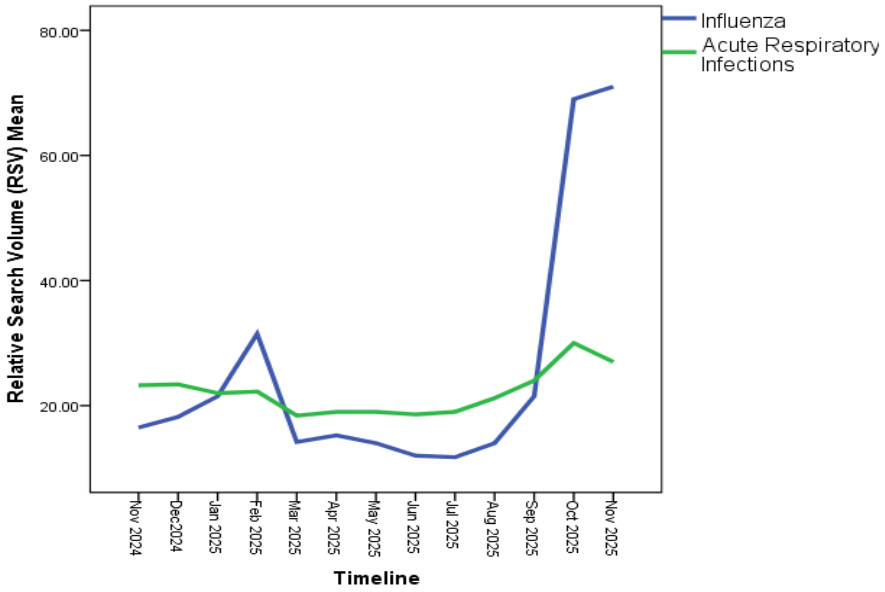
A



B

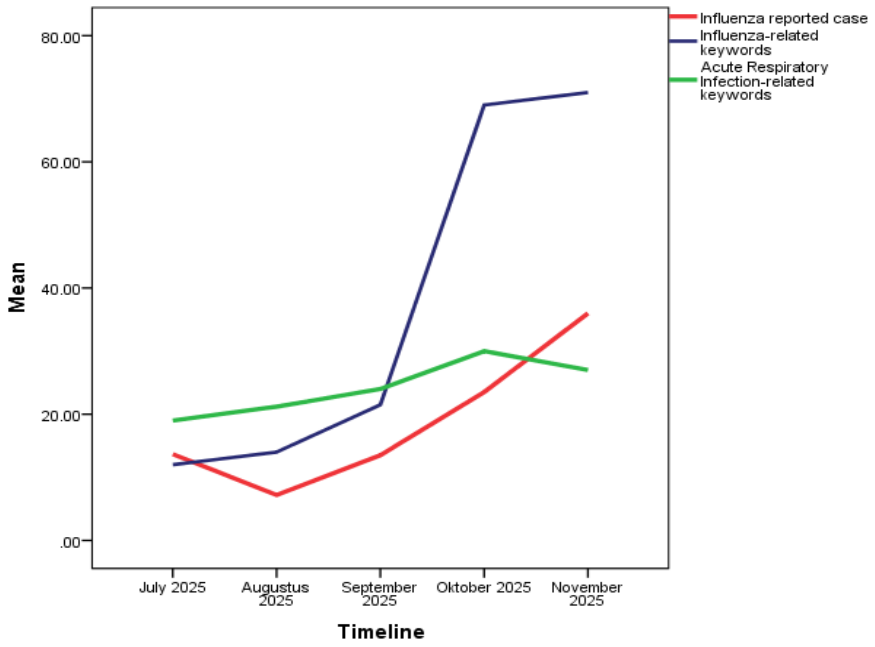


Fig. 1. A. Keyword search trends related to influenza and acute respiratory infections (ARIs) from Google Trends. B. Comparison between influenza-related and acute respiratory infections-related keywords with positive rates for influenza reported by the Ministry of Health of the Republic of Indonesia from July – November 2025

Fig. 2. Distribution of searches for influenza-related keyword (blue) and ARI-related keyword (red) based on geographic distribution between November 2024 – November 2025

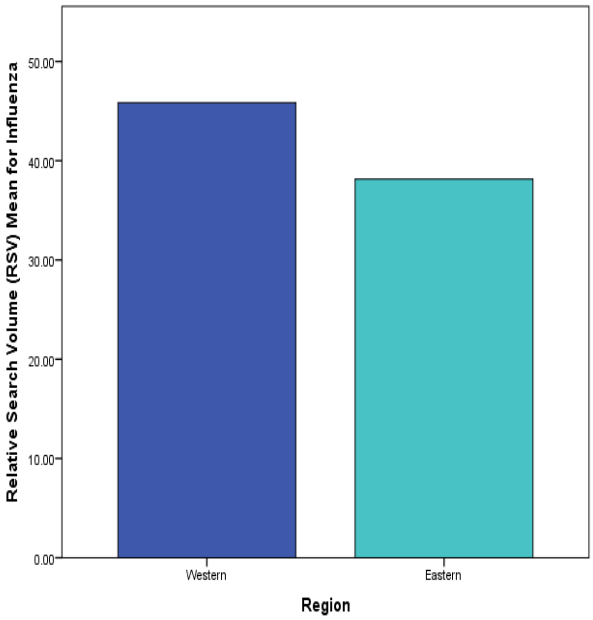


Fig. 3. Comparison of RSV influenza topics between western and eastern regions

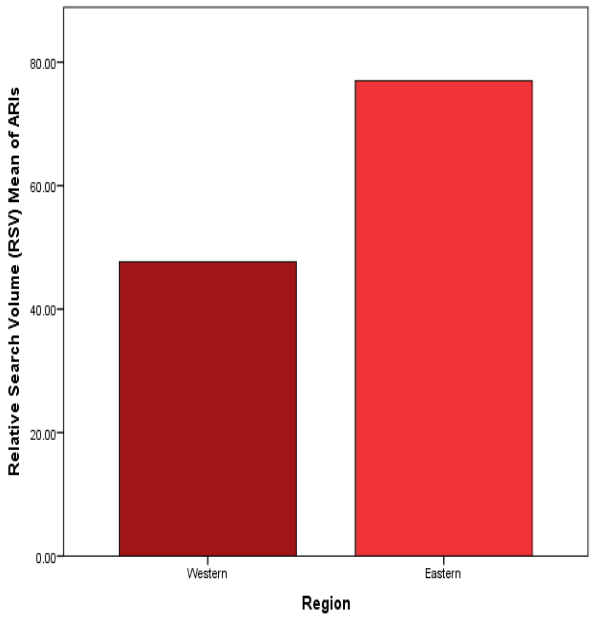


Fig. 4. Comparison of RSV ARIs topics between western and eastern regions