

## SHORT COMMUNICATIONS

# Philippine COVID-19 Vaccination Through an Infodemiological Lens: A One-year Web-based Search Volume Analysis From 2020 to 2021

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**ABSTRACT**

This infodemiological research explored the online public interest in COVID-19 vaccine registration and its association with Filipinos' interest in its side effects, efficacy, alcohol interaction, safety, and dangerousness. It utilized Google Trends to gather search volumes in the Philippines from December 2020 to November 2021. After describing the queries and search volumes, multiple linear regression was done. The results showed that the Filipino public was more interested in the safety of COVID-19 vaccines than their danger. Interest in its efficacy, interaction, and side effects initially increased but decreased over time. Vaccine registration initially dropped but later increased in November 2021, perhaps due to a national holiday for public vaccination. Strikingly, interest in COVID-19 vaccine registration was only associated with its safety and had no relationship with interaction, efficacy, and side effects. Therefore, reliable online information on the safety of COVID-19 vaccines is crucial to improving public interest in COVID-19 vaccination.

*Malaysian Journal of Medicine and Health Sciences* (2024) 20(1):369-373. doi:10.47836/mjmhs.20.1.45

**Keywords:** COVID-19; vaccines; vaccine hesitancy; internet use; Philippines

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**INTRODUCTION**

As the world navigates the COVID-19 pandemic, calls for a vaccine has predominated on the Internet and the media. However, vaccine hesitancy may dissuade the public from vaccination due to dangerous claims, including vaccine-related autism and mercury poisoning (1). In the Philippines, vaccine hesitancy and preference have also been noted. The preference for certain COVID-19 vaccine brands may be due to different experiences and knowledge regarding the efficacy and side effects profiles of various vaccine brands (2).

Philippine authorities have also claimed vaccine preference and disinformation have led to hesitations in COVID-19 vaccine registration (2). However, while authorities have used social modeling, including the real-time broadcast of public figures' vaccination and weekly information campaigns by the Department of Health (DOH) since the start of COVID-19 vaccination in March 2021, vaccine hesitancy and preference remained (2, 3).

To strengthen its efforts in addressing these predicaments to COVID-19 vaccination, the Philippines launched several programs to encourage vaccination, including fewer movement restrictions and quarantine time for vaccinated individuals (4, 5), promoting the different vaccines as equally effective against severe COVID-19 (6), and "National Vaccination Days," a public holiday for people to get vaccinated in December 2021 (7). However, public hesitancy and preference reportedly remained (2-7). Thus, there is a need to explore these COVID-19 vaccine-related concerns to improve the Filipino public's vaccination rate.

Given these vaccine-related concerns have yet to be explored along with the limited resources of the Philippines (8), cost-efficient alternative methods of collecting information may be needed. Infodemiological tools such as Google Trends have been used to analyze web-based search patterns as a cost-effective alternative and surrogate measure of public health interest, awareness, and behaviors since online health-related information is growing (9,10). These infodemiological tools have also been used in health-related behavior studies, including mental health, HIV, and COVID-19 (1, 10-12). Google Trends, a public repository of Google searches, can be a valuable and appropriate infodemiological tool in the Philippines since Google

has the largest search engine market share (96%) among the 73 million regular internet users in the Philippines (12-14).

Given these, Google Trends can be used to analyze Filipinos' interest and perception of the COVID-19 vaccine and other vaccine-related concerns, including vaccine registration, efficacy, safety, danger, and side effects. Likewise, Google Trends also shows the search-related queries associated with the keywords of interest. This can be used to elucidate other public interests related to COVID-19 vaccines (10, 12). Therefore, this study used Google Trends to explore the interest of Filipinos in COVID-19 registration, efficacy, side effects, safety, and danger from December 2020 to November 2021. Its findings may help guide vaccination efforts in the Philippines while its research design can be replicated in other resource-scarce localities.

## MATERIALS AND METHODS

This infodemiological research used aggregated data from Google Trends regarding COVID-19 vaccine registration, efficacy, safety, side effects, efficacy, alcohol interaction, and danger from December 2020 to November 2021 in the Philippines. The data from Google Trends analyzed for this study were Search Volume Index (SVI) and top and rising search-related topics and queries. This study does not necessitate ethical approval since the data is publicly available and there was no human participant.

### Data and measures

SVI is determined by the Google Trends system by automatically anonymizing users' data, categorizing their search queries, and aggregating these searches as a single topic. The resulting number for each data point (for this study, weekly data point) is normalized against the highest search volume in the specified period and location. Due to this normalization, SVI is a relative value from 0 to 100. Wherein 0 corresponds to the lowest search volume while 100 corresponds to the highest search volume in the specified geographical area and period (9-12). This study used weekly SVI as an alternative measure of public interest in the COVID-19 vaccine and other vaccine-related concerns, including registration, efficacy, safety, side effects, alcohol interaction, and dangerousness.

The top and rising search-related queries are the terms that online users search for concerning keywords of interest. These can be used to assess the changes in other related interests about the keywords over a period (9-12). For this study, these queries were used to note changes in other public concerns regarding COVID-19 vaccines and other vaccine-related concerns, including registration, efficacy, safety, side effects, alcohol interaction, and dangerousness.

### Data collection

Following the methodological framework suggested by Mavaragani and Ochoa (15), a web-based search query using the keyword "COVID-19 Vaccine (Vaccine)" was made using the Explore feature of Google Trends. This keyword was used to determine the trends in online interest and related concerns for COVID-19 Vaccines among Filipinos. With this, Google trend was set using a Region filter of "Philippines" and a Time Range filter from December 2020 to November 2021 to restrict the returned data to Philippine-based Google searches during the specified period. The search-related interest in COVID-19 vaccines revolved around vaccine registration, side effects, efficacy, and alcohol interaction. These were explored in Google Trends using the keywords "COVID vaccine registration", "COVID vaccine side effects", "COVID vaccine efficacy", and "COVID vaccine alcohol", respectively. Afterward, concerns about vaccine safety and dangerousness were explored using the keywords "COVID vaccine safe" and "COVID vaccine dangerous", as suggested by Pullan and Dey (1). All SVIs and top and rising search-related queries were noted and subsequently analyzed.

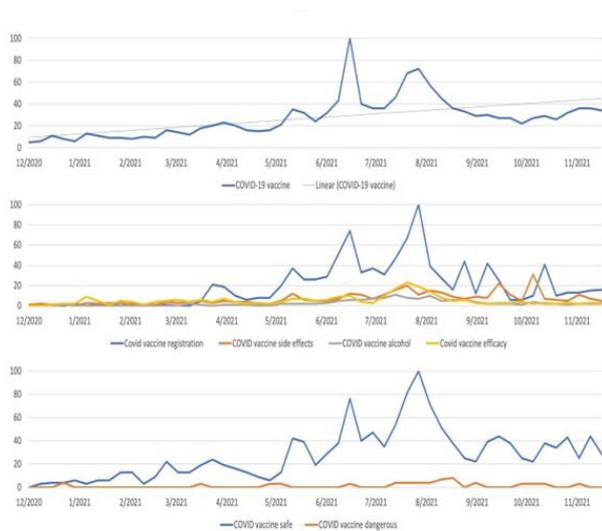
### Data analysis

Initially, SVIs and top and rising search-related queries for all the keywords were descriptively compared and analyzed. As suggested in a review by Mavragani et al. (16), the search volume data set can be analyzed through various statistical analyses used for continuous data. Thus, a multiple linear regression was done to determine the relationship between the keywords. In this model, the keyword for COVID-19 vaccine registration was used as the dependent variable, while the keywords for vaccine efficacy, safety, side effects, alcohol interaction, and dangerousness were used as predictors. All statistical analysis was done using SPSS. A p-value of .05 was considered significant.

## RESULTS AND DISCUSSION

### Search volume trends for the COVID-19 vaccine

For the keyword "COVID-19 Vaccine (Topic)", a rising trend was observed with increases in SVI from March to August 2021, but a decreasing trend was observed in September 2021 (Fig. 1). The keyword's rising and top related queries revolved around COVID-19 vaccine registration, side effects, alcohol, and efficacy (Table I). These signify a rising interest in COVID-19 vaccine registration starting in March 2021 during the start of COVID-19 vaccination in the Philippines (3). There was also a peak in interest in June 2021 that coincided with the Philippine government's measures to ease domestic travel restrictions and shorter quarantine periods for people who are vaccinated (4, 5). This suggests that incentivizing people with less movement restriction may be helpful in encouraging interest in vaccination.



**Figure 1: The upper graph depicts the trend of Google search volume over time for the keyword “COVID-19 vaccine (Vaccine)” from December 2020 to November 2021; the Middle graph depicts the trend of Google search volume over time for the keywords for COVID-19 registration, side effects, alcohol interaction, and efficacy from December 2020 to November 2021; Lower graph depicting trend of Google search volume over time for the keywords for COVID-19 vaccine safety and dangerousness from December 2020 to November 2021; Y-axis refers to SVI; X-axis refers to the months of the study period**

**Table I: Types of COVID-19 vaccine-related search queries.**

Keyword	Category	Associated terms	Examples of specific queries
COVID-19 Vaccine (Vaccine)	COVID-19 vaccine	Vaccine registration, side effects, efficacy, and alcohol interaction	“registration for covid vaccine”, “register for covid vaccine”, “sinovac efficacy”, “covid vaccine efficacy rate”, “sinovac side effects”
COVID vaccine registration	Vaccine registration	Vaccination schedules and location	“covid registration manila”, “covid vaccine registration cavite”, “online registration for covid vaccine”
COVID vaccine side effects	Vaccine side effects	Side effects of different brands of COVID-19 vaccines	“pfizer vaccine”, “sinovac vaccine”, “sinovac”, “astrazeneca vaccine side effects”, “moderna covid vaccine”
COVID vaccine efficacy	Vaccine efficacy	Efficacy of different brands of COVID-19 vaccines	“sinovac vaccine efficacy”, “astrazeneca vaccine efficacy”, “pfizer vaccine efficacy”, “moderna”
COVID vaccine alcohol	Vaccine alcohol interactions	Alcohol interaction with the COVID-19 vaccines	“can you drink alcohol after covid vaccine”, “how many days can drink alcohol after covid vaccine”, “can you drink alcohol before covid vaccine”
COVID vaccine safe	Vaccine safety	Pregnancy	“is covid vaccine safe for pregnant”, “covid vaccine safe for pregnancy”, “is covid vaccine safe for pregnancy”
COVID vaccine dangerous	Vaccine dangerousness	none	none

**Search volume trends for COVID-19 vaccine registration, efficacy, side effects, and alcohol interaction**

SVIs and search-related queries for the keywords for COVID-19 vaccine registration, efficacy, side effects, and alcohol interaction were also entered and analyzed. SVIs for these keywords increased until their peak around June to September 2021 (Fig. 1). For registration, the top and rising search-related queries revolved around vaccination schedules and location (Table I). The top and rising search-related queries for side effects and efficacy were the different COVID-19 vaccines, including Sinovac, Pfizer, and Moderna. Lastly, the related queries for alcohol revolved around its interaction with the COVID-19 vaccines. These may signify Filipinos’ concerns about the efficacy, side effects, and alcohol interaction of different vaccines.

These findings suggest that public interest in COVID-19 vaccine registration, efficacy, side effects, and interaction has increased since its inception. This may be attributed to the rollout of different brands of COVID-19 vaccine during these months, which may also explain search-related queries about various vaccine brands (4, 5, 17). This also suggests that the public may be comparing the efficacy and side effects of different vaccine brands using the Internet. Notably, Filipinos appeared to be concerned about alcohol interaction with the vaccine. This concern may be because alcohol is consumed by approximately half of the Philippine population (18).

While SVIs for side effects, efficacy, and alcohol interaction decreased from October to November 2021, an increase was noted for registration. This renewed interest in COVID-19 vaccine registration may be due to the “National Vaccination Days” holiday announcement along with the expansion of COVID-19 vaccination to minors and the provisions for vaccine boosters (7). Therefore, allotment of specific days for vaccination may be helpful in future efforts to achieve herd immunity.

**Search volume trends for COVID-19 vaccine safety and dangerousness**

This study also found that SVI for “COVID vaccine safe” followed a similar pattern with registration and COVID-19 vaccine. On the other hand, “COVID vaccine dangerous” had no to minimal increases (Fig. 1). Although there were no search-related queries returned for vaccine dangerousness, pregnancy safety concerns were seen for vaccine safety (Table I). These may indicate that Filipinos are concerned about the vaccine’s safety during pregnancy. Thus, targeted education programs that provide easily understandable information regarding the vaccine’s safety during pregnancy may be necessary. For instance, obstetrics and midwifery clinics can give their clientele pamphlets about vaccine safety during pregnancy.

**Linear regression of COVID-19 registration with efficacy, safety, side effects, alcohol interaction, and dangerousness**

Table II showed the results of the linear regression where it showed the collective importance of the predictors in determining the online interest for the COVID-19 registration,  $F(50)= 36.098$   $p <.001$ , with an index determination of 77.8% (Adjusted  $R^2=77.8$ ). Based on this model, interest in vaccine registration has no statistically significant association with the public interest in vaccine efficacy, safety, side effects, alcohol interaction, and dangerousness ( $p >.05$ ). On the contrary, vaccine safety searches were positively correlated with vaccine registration ( $B=721$ ,  $SE=.119$ ,  $p <.001$ ).

Given these results, while Filipinos may be knowledgeable and concerned about different side effects, efficacy, and interactions profiles of different vaccine brands, Filipinos seemed to be interested in registering for COVID-19 vaccination if they are well-informed of its safety profiles. Therefore, information campaigns must highlight the safety of the COVID-19 vaccine among the public. Likewise, misinformation and disinformation about COVID-19 vaccines and their safety must also be addressed (19). For instance, relevant information technology government agencies can block websites containing misinformation.

**Table II: Multiple linear regression of COVID-19 registration with keywords for public interest in vaccine efficacy, safety, side effects, alcohol interaction, and dangerousness**

	Linear Regression				
	B	Std. Error	Beta	t	Sig.
Side Effects	-.390	.336	-.108	-1.161	.252
Alcohol	1.516	.906	.202	1.674	.101
Efficacy	.638	.491	.136	1.298	.201
Safe	.721**	.119	.727	6.061	<.001
Dangerous	-1.015	.831	-.094	-1.222	.228

Note: \*\* $p <.01$ ; \* $p <.05$

While this study elucidated new insights into the Philippine COVID-19 vaccination program, several caveats are worth mentioning. First, Google Trends reflects the online interest of those who use the Google search engine (12). Therefore, the findings may not fully reflect the general Filipino population. Second, web-based search analysis is an alternative measure of public interest and awareness. Hence, traditional measures, including surveys, can be used to comprehensively assess COVID-19 vaccination (12). Third, vaccination decisions are influenced by multiple individual and social factors, such as news reports of COVID-19 cases and deaths (19, 20). Thus, future research can explore other factors influencing public interest in COVID-19 vaccine registration.

**CONCLUSION**

Overall, online interest in COVID-19 vaccination in the Philippines continued to rise with the current government programs. While Filipinos seemed to compare vaccines based on their efficacy and side effects, these comparisons may not hinder Filipinos’ interest in registering for COVID-19 vaccination. The findings also suggest that promoting COVID-19 vaccine safety can be an important central strategy that can be mustered and strengthened to stimulate the public’s COVID-19 vaccination registration. Likewise, considering that the Internet is increasingly used as a source of information for COVID-19, it is necessary to improve the searchability of reliable online information on the safety of the COVID-19 vaccine (1, 12, 14). Additionally, this infodemiological design can be replicated as a valuable and cost-effective alternative measure used to guide and monitor vaccination programs in resource-scarce countries.

**REFERENCES**

1. Pullan S, Dey M. Vaccine hesitancy and anti-vaccination in the time of COVID-19: A Google Trends analysis. *Vaccine*. 2021 Apr 1;39(14):1877-1881. doi: 10.1016/j.vaccine.2021.03.019.
2. CNN Philippines. Vaccine hesitancy, preference still slowing down PH inoculation rollout – DOH [Internet]. Philippines: CNN Philippines. [updated 2021 Nov 9; cited 2021 December 4]. Available from: <https://cnnphilippines.com/news/2021/11/9/COVID-19-vaccine-hesitancy-still-a-problem-PH-rollout.html>
3. Tan, L. State hospital PGH’s director first to receive COVID-19 vaccine in PH [Internet]. Philippines: CNN Philippines. [updated 2021 Mar 1; cited 2021 December 4]. Available from: <https://www.cnnphilippines.com/news/2021/3/1/COVID-19-vaccine-PGH-Philippines-Sinovac.html>
4. Parocha, A. IATF releases’ protocols’ for fully vaccinated individuals [Internet]. Philippines: Philippine News Agency. [updated 2021 July 4; cited 2021 December 4]. Available from: <https://www.pna.gov.ph/articles/1145932>
5. Valente, C. 7-day quarantine for vaccinated individuals in PH effective June 22 – Palace [Internet]. Philippines: The Manila Times. [updated 2021 June 18; cited 2021 December 4]. Available from: <https://www.manilatimes.net/2021/06/18/latest-stories/7-day-quarantine-for-vaccinated-individuals-in-ph-effective-june-22-palace/1803692>
6. Department of Health. DOH, NTF REITERATE THAT ALL VACCINES ARE EFFECTIVE AGAINST COVID-19; REMIND MEDICAL PROFESSIONALS TO BE MORE RESPONSIBLE WITH THEIR PUBLIC

- STATEMENTS [Internet]. Philippines: Department of Health. [updated 2021 August 28; cited 2021 December 4]. Available from: <https://doh.gov.ph/press-release/DOH-NTF-REITERATE-THAT-ALL-VACCINES-ARE-EFFECTIVE-AGAINST-COVID-19-REMIND-MEDICAL-PROFESSIONALS-TO-BE-MORE-RESPONSIBLE-WITH-THEIR-PUBLIC-STATEMENTS>
7. Geducos, AC. National Vaccination Days on Nov. 29, Dec. 1 will be special working days — Nograles [Internet]. Philippines: Manila Bulletin. [updated 2021 Nov 21; cited 2021 December 4]. Available from: <https://mb.com.ph/2021/11/19/national-vaccination-days-on-nov-29-dec-1-will-be-special-working-days-nograles/>
  8. Alibudbud R. Beyond prioritization: Challenges to the COVID-19 vaccination of people with mental disorders in the Philippines. *Asian J Psychiatr.* 2022;67:102954. doi: 10.1016/j.ajp.2021.102954.
  9. Arora VS, McKee M, Stuckler D. Google Trends: Opportunities and limitations in health and health policy research. *Health Policy.* 2019;123(3):338-341. doi: 10.1016/j.healthpol.2019.01.001.
  10. Nuti, S. V., Wayda, B., Ranasinghe, I., Wang, S., Dreyer, R. P., Chen, S. I., & Murugiah, K. (2014). The use of google trends in health care research: a systematic review. *PloS one*, 9(10), e109583. doi:10.1371/journal.pone.0109583
  11. Knipe D, Evans H, Marchant A, Gunnell D, John A. Mapping population mental health concerns related to COVID-19 and the consequences of physical distancing: a Google trends analysis. *Wellcome Open Res.* 2020;5:82. doi: 10.12688/wellcomeopenres.15870.2.
  12. Moalong KMC, Jamora RDG, Roberto KT, Espiritu AI. Patterns of Google search behavior for epilepsy and seizures in the Philippines: An infodemiological study. *Epilepsy Behav.* 2021;125:108377. doi: 10.1016/j.yebeh.2021.108377.
  13. Manila Standard. Filipinos' reliance on internet at an all-time high [Internet]. Philippines: Manila Standard. [updated 2021 June 18; accessed 31 October 2021]. Available from: <https://manilastandard.net/mobile/article/357427>
  14. Statista Research Department. Market share of leading search engines across the Philippines as of June 2021 [Internet]. New York: Statista. [updated 2021; accessed 30 October 2021]. Available from: <https://www.statista.com/statistics/954885/philippines-market-share-of-search-engines/>
  15. Mavragani A, Ochoa G. Google Trends in Infodemiology and Infoveillance: Methodology Framework. *JMIR Public Health Surveill.* 2019;5(2):e13439. doi: 10.2196/13439.
  16. Mavragani A, Ochoa G, Tsagarakis KP. Assessing the Methods, Tools, and Statistical Approaches in Google Trends Research: Systematic Review. *J Med Internet Res.* 2018;20(11):e270. doi: 10.2196/jmir.9366.
  17. De Leon, D. PH begins rollout of J&J COVID-19 vaccines [Internet]. Philippines: Rappler. [updated 2021 July 21; cited 2021 December 4]. Available from: <https://www.rappler.com/nation/philippines-begins-rollout-johnson-johnson-covid-19-vaccines-july-20-2021/>
  18. World Health Organization. Philippines. Switzerland: World Health Organization. [updated 2018; cited 2021 December 4]. Available from: [https://www.who.int/substance\\_abuse/publications/global\\_alcohol\\_report/profiles/phl.pdf](https://www.who.int/substance_abuse/publications/global_alcohol_report/profiles/phl.pdf)
  19. Rovetta A, Bhagavathula AS. COVID-19-Related Web Search Behaviors and Infodemic Attitudes in Italy: Infodemiological Study. *JMIR Public Health Surveill.* 2020;6(2):e19374. doi: 10.2196/19374.
  20. Boucher JC, Cornelison K, Benham JL, Fullerton MM, Tang T, Constantinescu C, Mourali M, Oxoby RJ, Marshall DA, Hemmati H, Badami A, Hu J, Lang R. Analyzing Social Media to Explore the Attitudes and Behaviors Following the Announcement of Successful COVID-19 Vaccine Trials: Infodemiology Study. *JMIR Infodemiology.* 2021;1(1):e28800. doi: 10.2196/28800.