



## Cancer-Related Search Queries in the Philippines: A Trend Analysis Across a Fifteen-Year Period

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### Abstract

Analyzing the trends of internet search queries can provide rapid, unrestricted, and valuable insight on health-seeking behaviors of entire populations. More than half of the Philippine population use the internet; however, trends of search queries have rarely been analyzed. This study analyzed the trends of cancer-related search queries in the Philippines over a fifteen-year period. For the period spanning December 31, 2007 to December 31, 2022 in the Philippines, Google Trends™ was used to compute the search volume index (SVI) for pre-selected cancer-related search terms. Two-way repeated measures analysis of variance with post-hoc Dunnett's multiple comparisons test was performed to detect a difference between the search terms across the period of study and to explore the trend of these differences. We observed statistically significant increases in SVI for the pre-selected terms from 2016 to 2022, indicating a significant increase in cancer-related search activity in the Philippines in recent years.

**Keywords:** cancer, oncology, Philippines, telemedicine, ehealth

### 1. Introduction

Each day, more than 12.5 million health-related computer searches are conducted on the internet (1). Historically, cancer has been and still is one of the most popular health-related searches worldwide, accounting for 5-10% of all search terms (2-4). Internet use is ubiquitous among patients across the full spectrum of cancer care, from early investigations to post-treatment follow-up (4).

By supplementing the health information they receive from their healthcare providers, as well as in engaging in and being part of online support groups, the internet can help cancer patients navigate through the complexities of their disease. However, the internet is likewise replete with misinformation, inconsistencies, and unregulated advice for which both the patient and the physician must be vigilant (5,6). For this reason, there is growing interest in analyzing the trends of internet search queries as a means of gauging population perceptions of

and attitudes and behaviors towards health (7-9). One of the most commonly used avenues is the Google search engine, being the world's largest as it accounts for more than 70% of the web search industry (10-11).

The Philippines, a developing country in Southeast Asia, has a population of more than 109 million people, making it the 8th most populated country in Asia and the 13th most populated in the world (12). Approximately 67% of the entire Philippine population have access to the internet (13). Despite the prevalence of internet usage in the country, however, trends of search queries have rarely if at all been analyzed and thus utilized to inform patient and physician behavior and public policy. It is this gap which this study seeks to fill.

## 2. Methods

All search queries in Google are indexed and can be accessed using Google Trends™, an unrestricted and open-access online tool. Analyzing the trends and patterns of a particular search query using Google Trends™ necessitates specifying a time period and geographical area/s for analysis. One subsequently specifies a search term/s. For every selected time point, Google Trends™ then calculates what is called a "Search Volume Index" (SVI) which specifies the proportion of search queries containing the inputted search term/s compared to the total number of searches performed during the specified time period and geographical area/s of study. The SVI ranges from 0 to 100; an SVI of 100 signifies the peak popularity of search queries containing the specified search term/s whereas an SVI of 0 indicates insufficient data for the search term/s.

For this study, the following cancer-related search terms were pre-selected- "cancer", "kanser" (Filipino translation for "cancer"), "tumor" (the favored spelling in American English which is more commonly used in the Philippines), and "bukol" (Filipino translation for "tumor"). Each was then inputted into Google Trends™, with the following search parameters

set: "Philippines" as geographical area, "Custom time range" set to December 31, 2007 to December 31, 2022 as the time period, "All categories" set as the search category, and "Web Search" set as the search modality. SVI values were then calculated in monthly intervals. Comma Separated Values (CSV) files were then downloaded into Microsoft Excel for each of these four search terms. The SVI data from the CSV files were arranged in arrays and transferred to IBM SPSS Statistics 21. A two-way repeated measures (RM) analysis of variance (ANOVA) was then performed to determine whether there exists a difference between the specified cancer-related search terms across the time period of study. If a statistically significant difference was found, post hoc Dunnett's multiple comparisons test would then be performed to explore the trend of these differences, with 2007 set as the baseline.

## 3. Results

Two-way RM ANOVA revealed a statistically significant difference between the cancer-related search terms across 2007 to 2022,  $F(5.724, 172.8) = 153.0, p < 0.001$ ; thus, Dunnett's multiple comparisons test was subsequently performed. Statistically significant increases in SVI were noted for the search term "cancer" in 2016 ( $p = 0.021$ ), 2017 ( $p = 0.025$ ), 2018 ( $p = 0.019$ ), 2019 ( $p = 0.010$ ), 2020 ( $p = 0.001$ ), 2021 ( $p = 0.001$ ), and 2022 ( $p = 0.009$ ). For the search term "kanser", statistically significant increases were noted for 2018 ( $p = 0.021$ ), 2019 ( $p = 0.032$ ), 2020 ( $p = 0.012$ ), 2021 ( $p = 0.019$ ), and 2022 ( $p = 0.022$ ). There was a statistically significant increase in the search term "tumor" for 2017 ( $p = 0.032$ ), 2018 ( $p = 0.042$ ), 2019 ( $p = 0.026$ ), 2020 ( $p = 0.020$ ), 2021 ( $p = 0.018$ ) and 2022 ( $p = 0.011$ ). Finally, for the search term "bukol", a statistically significant increase was noted in 2019 ( $p = 0.018$ ), 2020 ( $p = 0.020$ ), 2021 ( $p = 0.039$ ), and 2022 ( $p = 0.022$ ).

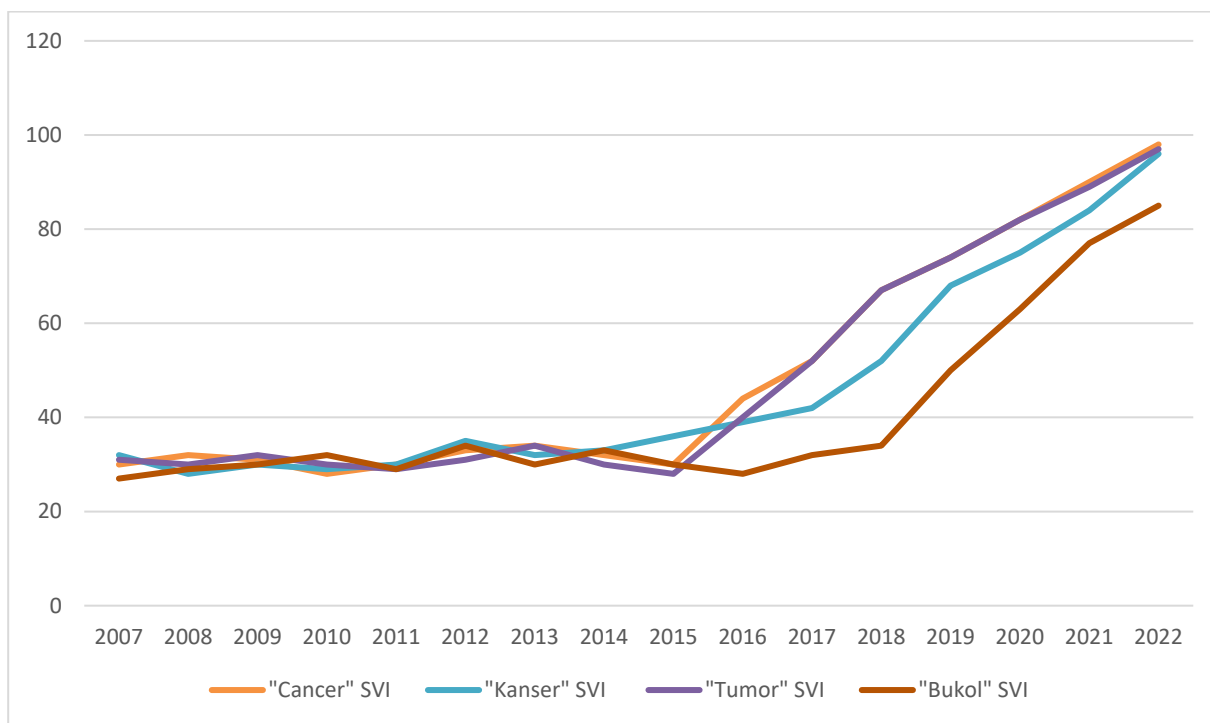


Figure 1. Search volume indices of the pre-selected cancer-related search terms (y-axis) vs year (x-axis)

Table 1. Comparison for each of cancer-related search term from 2007 to 2022 in the Philippines

Search term	Year	Mean difference	95% confidence interval of difference	P-value
<b>Cancer</b>	2007 vs 2008	9.600	-7.263 to 21.735	0.273
	2007 vs 2009	7.624	-6.738 to 19.629	0.193
	2007 vs 2010	5.402	-3.488 to 17.773	0.256
	2007 vs 2011	7.256	-6.923 to 18.003	0.229
	2007 vs 2012	3.409	-5.435 to 4.259	0.109
	2007 vs 2013	-0.949	-11.351 to 2.398	0.126
	2007 vs 2014	-11.650	-29.845 to 15.845	0.099
	2007 vs 2015	-17.624	-44.537 to 4.329	0.079
	<b>2007 vs 2016</b>	<b>-22.639</b>	<b>-47.893 to -2.946</b>	<b>0.021</b>
	<b>2007 vs 2017</b>	<b>-32.960</b>	<b>-66.920 to -10.204</b>	<b>0.025</b>
	<b>2007 vs 2018</b>	<b>-40.700</b>	<b>-71.092 to -20.920</b>	<b>0.019</b>
	<b>2007 vs 2019</b>	<b>-38.092</b>	<b>-69.451 to -18.837</b>	<b>0.010</b>
	<b>2007 vs 2020</b>	<b>-66.734</b>	<b>-83.876 to -32.756</b>	<b>0.001</b>
	<b>2007 vs 2021</b>	<b>-68.876</b>	<b>-88.637 to -40.265</b>	<b>0.001</b>
<b>2007 vs 2022</b>	<b>-81.630</b>	<b>-92.645 to -64.282</b>	<b>0.009</b>	
<b>Kanser</b>	2007 vs 2008	7.367	-6.369 to 16.726	0.458
	2007 vs 2009	7.103	-6.736 to 15.358	0.470
	2007 vs 2010	2.539	-4.628 to 10.036	0.274
	2007 vs 2011	2.028	-4.725 to 8.357	0.223
	2007 vs 2012	0.629	-10.095 to 5.640	0.109
	2007 vs 2013	0.067	-18.630 to 2.003	0.098
	2007 vs 2014	-4.694	-27.734 to 2.563	0.126
	2007 vs 2015	-10.729	-41.047 to 1.374	0.094
	2007 vs 2016	-15.369	-41.994 to 0.834	0.087
	<b>2007 vs 2017</b>	<b>-20.946</b>	<b>-50.082 to 0.083</b>	<b>0.602</b>
	<b>2007 vs 2018</b>	<b>-55.560</b>	<b>-52.910 to -9.269</b>	<b>0.021</b>

<b>Tumor</b>	<b>2007 vs 2019</b>	<b>-30.625</b>	<b>-59.637 to -20.638</b>	<b>0.032</b>	
	<b>2007 vs 2020</b>	<b>-40.268</b>	<b>-63.057 to -31.946</b>	<b>0.012</b>	
	<b>2007 vs 2021</b>	<b>-53.285</b>	<b>-66.637 to -59.364</b>	<b>0.019</b>	
	<b>2007 vs 2022</b>	<b>-67.474</b>	<b>-83.570 to -70.364</b>	<b>0.022</b>	
	2007 vs 2008	4.357	-0.537 to 10.182	0.061	
	2007 vs 2009	3.250	-2.767 to 9.528	0.155	
	2007 vs 2010	3.585	-4.634 to 11.589	0.229	
	2007 vs 2011	2.267	-6.075 to 10.610	0.438	
	2007 vs 2012	1.259	-5.240 to 6.456	0.296	
	2007 vs 2013	0.940	-4.793 to 5.638	0.529	
	2007 vs 2014	-13.432	-18.378 to 2.379	0.334	
	2007 vs 2015	-24.359	-38.362 to 1.374	0.165	
	2007 vs 2016	-30.368	-41.364 to 0.936	0.104	
	<b>2007 vs 2017</b>	<b>-43.673</b>	<b>-51.163 to -16.175</b>	<b>0.032</b>	
	<b>2007 vs 2018</b>	<b>-44.426</b>	<b>-56.921 to -31.926</b>	<b>0.042</b>	
	<b>2007 vs 2019</b>	<b>-55.573</b>	<b>-60.450 to -30.695</b>	<b>0.026</b>	
	<b>2007 vs 2020</b>	<b>-71.527</b>	<b>-70.363 to -45.263</b>	<b>0.020</b>	
	<b>2007 vs 2021</b>	<b>-77.473</b>	<b>-80.364 to -67.474</b>	<b>0.018</b>	
	<b>2007 vs 2022</b>	<b>-80.376</b>	<b>-85.373 to -71.374</b>	<b>0.011</b>	
	<b>Bukol</b>	2007 vs 2008	2.437	-11.469 to 18.153	0.702
		2007 vs 2009	3.750	-9.120 to 16.624	0.402
		2007 vs 2010	3.833	-9.556 to 17.234	0.411
2007 vs 2011		2.267	-6.075 to 10.614	0.439	
2007 vs 2012		1.258	-5.246 to 6.499	0.295	
2007 vs 2013		0.947	-4.794 to 5.736	0.529	
2007 vs 2014		-1.0833	-14.646 to 12.474	0.961	
2007 vs 2015		-14.670	-30.689 to 1.485	0.071	
2007 vs 2016		-20.101	-31.226 to 11.164	0.074	
2007 vs 2017		-32.404	-45.963 to 13.526	0.185	
2007 vs 2018		-34.637	-50.364 to 20.639	0.237	
<b>2007 vs 2019</b>		<b>-44.423</b>	<b>-56.923 to -31.925</b>	<b>0.018</b>	
<b>2007 vs 2020</b>		<b>-45.574</b>	<b>-60.459 to -30.684</b>	<b>0.020</b>	
<b>2007 vs 2021</b>		<b>-55.992</b>	<b>-67.264 to -40.263</b>	<b>0.039</b>	
<b>2007 vs 2022</b>		<b>-70.374</b>	<b>-70.364 to -48.362</b>	<b>0.022</b>	

#### 4. Discussion

For all the pre-specified cancer-related search terms, statistically significant increases in SVI were noted from 2016 up to 2022, pointing to a significant increase in cancer-related search activity in the Philippines in recent years.

There are several possible reasons behind this finding. First, granted a steady and constant increase in global population and of subsequent internet users in every succeeding year, there is likely an increased interest in the disease in question, as similarly demonstrated by a trend analysis by Dalanon and Matsuka (2020) which correlated increased dental health-related search activity with increased overall interest on the subject (7).

An increase in search activity for a particular disease may likewise parallel an increase in its incidence. Indeed, there has been an overall increase in the incidence of all cancers in the last two decades in the Philippines. Increased screening measures and earlier detection rates are believed to be key drivers, together with the ever-increasing adoption of a highly Westernized lifestyle and diet (13-14). Similarly, increased online search activity for cardiovascular disease (15), type 2 diabetes mellitus (16), and obesity (17) have likewise paralleled an increase in their respective incidences on a global scale.

Finally, an increased health-related search activity may also parallel a gradual shift away from the previous unilateral, paternalistic, physician-centric model of healthcare towards a more empowered patient population actively

participating and engaging in their own health. Increasingly, rather than simply relying on healthcare professions as the sole source of medical information, patients desire to learn more about their health on their own (18-19).

As more and more Filipinos turn to the internet for their cancer-related queries, so do healthcare professionals increasingly need to meet them halfway in this cyber terrain. The present-day oncologist needs to recognize the ever-increasing role and significance of the internet in Philippine cancer care. Utilized appropriately for purposes of patient education and health information dissemination, the internet can serve as one of our most powerful allies in the care of the present-day cancer patient. For example, at the point of care, cancer patients and their caregivers can receive a list of websites which will serve as sources of verified information to help them navigate through their diagnosis and therapeutics. Healthcare providers can also be more proactive in developing their own information and educational pages, adapted to the needs and nuances of their particular patient population.

#### **Abbreviations:**

ANOVA – analysis of variance  
CSV – comma separated values  
RM – repeated measures  
SVI – search volume index

#### **Statements:**

**Author's contributions:** JHZ, JJM, and APC conceived of the discussed topic; JHZ, ANA, VCG, and JLL drafted the initial paper; JHZ, ANA, AGT and MCM made the final revisions to the final paper.

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This study has several key limitations. First, demographic data such as age and sex not otherwise available in Google Trends™ would have provided a deeper profile behind the internet users making these cancer-related search queries. Second, although Google is the predominant search engine both locally and worldwide, there are other, non-search engine platforms, including social media, from which internet users can obtain health information. Third, this study only focused on general cancer-related search terms; further research is recommended to focus on specific cancer types and cancer therapeutic modalities.

#### **5. Conclusion**

This study has shown a significant increase in internet searches for cancer information in the Philippines since 2015-2016. Proactively providing reliable information to patients regarding their disease, its therapies and concomitant potential side effects and can help them better understand and cope with their condition, hence transforming them into active participants of their care.

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